

## CONTENTS

INTRODUCTION . . . . .	1
I. GENERAL CONSIDERATIONS . . . . .	4
1. The phases following a disaster . . . . .	4
2. Types and main characteristics . . . . .	4
3. Damage assessment . . . . .	8
4. Some conceptual considerations . . . . .	16
II. ASSESSMENT OF SELECTED DISASTERS USING THE ECLAC METHODOLOGY . . . . .	20
1. Analysis of selected major disasters . . . . .	20
2. The effects of other disasters that have occurred in the Latin America and Caribbean region. . . . .	24
III. THE LONG-TERM IMPACT OF DISASTERS . . . . .	27
1. Impact on development prospects . . . . .	27
2. Impact on economic performance . . . . .	28
3. Effects on institutional arrangements . . . . .	29
4. Implications for the international donor community . . . . .	30
IV. SUMMARY . . . . .	33

### Annexes

1. Resolution on Economics and Natural Disasters
2. Documents on estimation of socio-economic effects of disasters
3. Map showing location of selected disasters analyzed

## INTRODUCTION

Natural disasters have numerous impacts on national economies that can bear on the conduction of economic policy, on the sustainability of their long-term development strategies and their productive performance. These types of impact have been particularly relevant in the countries of Latin America and the Caribbean, which are frequently affected by natural disasters of different origin and intensity, with the sequel of human lives lost and grave economic and social impact.

It has been appreciated that during the last three decades the frequency and severity of disasters and adverse natural cycles has been compounded by the emergence of new, "quasi-natural" and unpredictable events. A nation or a society's capacity to respond and face these unscheduled happenings and the nature of the actions necessary to face them is in an important measure affected by the ability to measure, appraise and evaluate the damages caused.

The complex matrix of such events is seen to comprise both natural disasters like earthquakes, tsunamis, hurricanes, floods, volcanic eruptions, plagues, and relatively new phenomena that can be man-made or induced by human conduct such as ecological disasters, decertification, mega-accidents, urban disasters or civil wars. Their impact can be seen, firstly, in the loss of human capital and, secondly, on productive capital. In the vast majority of cases, emergency actions tend to alter the conduction of prevailing, current policies and the reconstruction efforts have induced serious changes in economic policies in the medium term. In some cases the effects impinge on national priorities and have led to modifications of development policy with projection into the longer term causing irreversible adverse effects. Furthermore, depending on its economic position prior to the disaster, a country may find itself unable to undertake the required program and projects for rehabilitation and reconstruction, and require international cooperation --both technical and financial-- for their implementation.

Some intrinsic elements of the nation, society or economy affected have, in general, implications for the efforts needed to face the emergency, face the reconstruction and, finally, surmount the consequences of the disaster. Relative size of the economy affected, the magnitude and depth of the event, the economic and socio-political conditions of the country at the time are some of these elements. Given the persistence of these phenomena, the growing diversity of them and the magnitude of their socio-economic consequences, it is natural for the international community to give increasing attention and support to the development of means to prevent or, at least, mitigate their more severe negative effects.

The international community --via multi-lateral lending and technical cooperation organizations and/or bi-lateral assistance programs of donor countries-- is always willing

to support these undertakings, and requires detailed and reliable information concerning the magnitude of the damages. Potential donors expect a precise determination of the most affected sectors and areas, the identification of the post-emergency projects and plans that require financial and technical cooperation, and the determination of the country's capacity to handle its share of the burden in the rehabilitation and reconstruction efforts. Most recently, at the XXV Session of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) member countries approved a resolution requesting the undertaking of a systematic research and analysis of the economic effects from disasters in countries in the region as well as on possible undertakings to reduce their effects, prevent and mitigate them. 1/

This paper pretends to provide some elements that may shed light on this latter preoccupation. In it its authors present a summarized synthesis of experiences accumulated in the last twenty years by observing and appraising natural disasters in Latin America. It is not their intention to make exhaustive reference to the events themselves but to point out some conclusions derived from their observation as to the immediate, medium and long-term effects and actions to be undertaken. Since 1972 ECLAC has been assisting member states located within its geographical jurisdiction in the assessment of damages caused by natural disasters. A damage assessment methodology has been developed and tested 2/ to estimate the extent of the damages, their economic impacts and the requirements for rehabilitation and reconstruction, based on the country's post-disaster execution capacity. The ECLAC methodology facilitates the systematic definition of international cooperation requirements in a period of time that does not exceed 1 to 2 months-- and requires information that can be collected in the days immediately after the disaster strikes and its comparison to macroeconomic data and forecasts available before the disaster.

The **first part** of the paper expresses some general remarks on the successive phases that take place after the event, its typology and salient characteristics as well as some methodological insights in respect of damage appraisal. Some conceptual remarks are made here on the linkages between the nature of the country affected, the dimension of the event and its socio-economic consequences. From these derive some concepts that will be used in the rest of the paper as well as some working hypothesis.

---

1/ Cartagena de Indias, Colombia, 20-27 April 1994. The text of this resolution is annexed to this paper.

2/ See ECLAC, Manual para la estimación de los efectos socio-económicos de los desastres naturales, Santiago, 1991.

The **second part** of the paper presents an analytical description of the components for the methodology developed in order to appraise the different types of disasters as well as to measure their effects in the national economy and society. An effort is made here to summarize in systematic form the experience of such tasks and present some of the implications on a country's institutions that disasters may have, depending on the political or economic short term situation present when the disaster occurred.

A **third section** tries to synthesize the different types of consequences that disasters have on the long term, both in respect of development perspectives and the most significant variables that affect economic performance, such as the balance of payments, production and income growth, public finance, etc. Special attention is paid to institutional organization in the face of the impact from disasters --in terms of damage control and reconstruction-- and how they affect national priorities and the country's capability to return to its development path. In this last context the bearing that in each case has the international donor community and the need for external resources is specifically addressed.

Finally, in the last section, some **conclusions** will be drawn with respect of the international efforts needed to advance on the difficult path of disaster prevention. It is considered disaster prevention and reduction of their impact must be part of a systematic approach that does not stop with emergency assistance or aid on the reconstruction process but goes beyond, linking development potential and sustainability to these actions.

## I. GENERAL CONSIDERATIONS

### 1. The phases following a disaster

The post-disaster cycle is usually divided in the following three phases: a) emergency, b) rehabilitation and immediate recovery or transition period, and c) reconstruction.

The **emergency** phase refers to the most immediate period after the disaster strikes, when actions to save human lives or to provide first aid are undertaken. It may include such actions as search and rescue, emergency first aid, temporary shelter, provisional restoration of transportation and communication links, emergency repairs to essential utilities and services, and the first efforts to assess the number of persons affected and to estimate damages suffered by public and private property.

The **rehabilitation or transition** phase covers a time frame devoted to efforts to restore the most pressing services and most essential social infrastructure. It includes the temporary building of shelters as well as the repair of transport infrastructure and public utilities and services. The return to normal work, the creation of new jobs, the availability of credit and financial resources, and the initiation of projects to face the immediate consequences of the disaster are among the rehabilitation measures to assist effectively the population and communities affected.

The **reconstruction** phase refers to the period required to restore the physical infrastructure and services damaged or destroyed by the disaster.

### 2. Types and main characteristics of disasters

There are different classifications on the types of disasters that may occur. A broad definition includes dramatic, sudden, unscheduled events that are often accompanied by large losses of human life and cause suffering and affliction to a society or a significant part of it, a temporary breakdown of prevailing lifelines and systems. The considerable material damages that are produced by such events cause difficulties in the normal functioning of an economy and in the society in general. <sup>3/</sup> Disasters so defined can be classified in two broad groups in relation to their origin: natural and man-made. The post-disaster cycle is usually divided in different phases. The most commonly used division distinguishes namely three: a) emergency, b) rehabilitation and recuperation or transition period, and c) reconstruction.

---

<sup>3/</sup> There are other types of natural events, such as droughts, that take a long time in developing into a major disaster and may cause devastating effects in society.

a. The **emergency** phase refers to the period while actions are still being carried out to save human lives. It includes such actions as search and rescue, emergency first aid, temporary provisional restoration of transportation and communication links, emergency repairs to essential utilities and services and the first actions to account those affected and register damages done to public and private property.

b. The **rehabilitation or transition** phase includes all those actions intended to return to normal areas and communities affected. It includes the temporary building of shelters as well as the repair of transport infrastructure and public utilities and services. During this phase are faced the problems of an emotional or psychological nature that affect the inhabitants of areas affected by the disaster. Return to normal work, the creation of new jobs, the availability of credit and financial resources, and the initiation of projects to face the immediate consequences of the disaster are among the rehabilitating measures to assist effectively the population and communities affected.

c. The **reconstruction** phase covers all those activities that restore and modify the physical structure and the environment in order to attend the emerging social priorities as modified by the disaster.

TABLE 1  
IMMEDIATE ECONOMIC AND SOCIAL EFFECTS OF NATURAL DISASTERS

Type of disaster	Temporary migration	Permanent migration	Loss of housing	Loss of industrial production	Loss of commerce	Loss of agricultural production (plant crops and harvest)	Damage to infrastructure	Market and distribution disorder	Interruption of transportation systems	Breakdown of communications	Panic	Social disruption
Earthquakes			X	X	X		X	X	X	X		X
Cyclones			X	X	X	X	X	X		X		X
Floods			X	X	X	X	X		X	X		
Tsunamis			X	X	X	X	X			X		
Volcanic eruption			X			X		X				
Fires			X	X	X	X	X			X	X	X
Drought/ Famines	X	X										

Source: Adapted from Frederick C. Dury, *Disasters and Prevention*, Oxford University Press, New York, 1983

TABLE 2  
NATURAL DISASTERS: EFFECTS ON EARTH SURFACE, INFRASTRUCTURE AND AGRICULTURE <sup>a/</sup>

Type of disaster	Effects on Earth Surface	Effects on Infrastructure	Effects on Agriculture
Earthquakes	Tremors and fissures Landslides Liquefaction of earth Underground collapses Avalanches	Damage to constructions, roads, ditches and bridges Covering and burying of structures embankments on rivers that cause local flooding Damage to buildings that sink Can damage underground constructions, conduits and underground cables change in course of underground waters Damage to buildings, roads, ditches and bridges	None Some local losses in affected areas None Temporary loss of irrigation Local losses in plants and forests
Hurricanes, typhoons and cyclones	Strong, gusty winds Flooding (through rainfall) Flooding (through storm)	Damage to buildings, distribution and high-tension lines Damage to bridges and buildings, landfills and landfills Damage to bridges, roads and buildings	Loss of trees, damage to plants, specially grains Loss of plants, specially roots and tubers; erosion Extreme damage to plants and irrigation systems; saline deposits, earth contamination and erosion
Droughts	Dryness of earth Wind gusts Desertification	No major damages Minor damages Considerable damages do not occur	Rains crops and forests Erosion and minor damages to forests Covers land with sand, alters type and time of crops; ruins trees, increases dry-resistant thorny bushy vegetation
Floods	Erosion Water-saturation and landslides Sedimentation	Softens building's foundations Buries buildings and damages other structures Does not produce major effects	Destroys crops, alters type and time of harvest Localized damage to crop-fields and forests Tends to improve quality of terrain
Tsunamis	Floods	Destroys or damages buildings, bridges, irrigation systems pollution of waters and water weirs	Localized destruction of crops; saline deposits and destruction of coastal forest and vegetation
Volcanic eruptions	Eruption and deposit of debris on surface	Destroys or damages buildings and other structures Damage and burying of buildings, industries and causes fires Damage to buildings, ditches and b-cque	Extensive defoliation, forest damage and losses near eruption site Buries crops and destroys earth, causes forest fires, temporary damage to earth, pollution, destroys forests

Source: Adapted from Frederick C. Cuy *Disasters and Prevention* Oxford University Press, New York, 1983

<sup>a/</sup> Effects on other productive sectors such as industry and services are mostly reflected in infrastructural damages



The most important natural phenomena, according to the frequency of their occurrence worldwide in the last twenty years, would be the following: floods, typhoons, hurricanes and cyclones, earthquakes, tornadoes, whirlwinds and thunderstorms, snowstorms and blizzards, heat-waves, cold-spells, volcanic eruptions, landslides and landslips, avalanches, tidal waves and tsunamis, blasting mildew, frost, droughts, sand or dust storms.

The most common man-made disasters are those caused by explosions, firestorms, airplane crashes and collisions, disasters caused by the earth or water movements, the collapse of dams, embankments and water reservoirs.

A growing list of "quasi-natural" disasters can be added to these, including such processes as air, water or land pollution, forest reduction and destruction. Also to be considered are "social" disasters that would include such phenomena as epidemics, famine, riots and pogroms, massacres, terrorist acts and wars.

Most of the remarks made in this paper relate to the major natural disasters that have caused most damage in Latin America and the Caribbean; they have either a meteorological or geological origin. Tables 1 and 2 summarize the economic and social effects most commonly associated with natural disasters, grouped by major categories. A specially interesting and devastating natural phenomenon in Latin America has been the modification of sea currents and wind patterns that has caused major floods and short-term modifications of the climate, water quality and fishing patterns in the Pacific shores of South America. The Latin America and Caribbean region is particularly prone to natural phenomena in such areas as the Caribbean which is the path for major tropical storms and hurricanes. The region is also part of the so-called "Fire Ring" that encompasses the Pacific Ocean, and which delineates the contact zones of the major tectonic plates where many earthquakes and volcanic eruptions occur. <sup>4/</sup>

### 3. Damage assessment methodology

a) Definitions. To facilitate understanding of the methodology, a definition of terms to be used throughout the paper is presented. It refers to direct and indirect damages and to secondary effects.

---

<sup>4/</sup> A non-exhaustive list of the major disasters that have affected Latin America and the Caribbean in the last thirty years is given in table 3. Annex II provides a list of the documents prepared by ECLAC since 1972 to appraise the economic effects of natural disasters.

A. Direct damage refers to all damage to fixed assets, capital and inventories of finished and semi-finished goods, raw materials, and spare parts.

Direct damage essentially involves damage to property which occurs simultaneously with the natural phenomenon that causes the disaster. It includes total or partial destruction of physical infrastructure, buildings, machinery and equipment, transport and storage facilities, furniture, damage to farmland and soils, irrigation and drainage works, dams, etc. In the particular case of agriculture, the destruction of crops ready to harvest is considered as direct damage.

Essentially, direct damage refers to physical destruction, whether complete or partial, that occurs simultaneously or immediately after the disaster.

B. Indirect damage refers to damage to the flow of goods that will not be produced and of services that will not be provided after the disaster strikes, for a period of time beginning immediately after the disaster and of a duration which may last several months or years depending on the type and characteristics of the disaster.

Indirect damages are measured in monetary --not physical-- terms and may include inter alia the following:

- increased operational expenditures in a given sector due to the destruction of physical infrastructure or inventories, and increased costs for the provision of services;
- additional costs incurred in a given sector or activity due to the need to use alternative means of production or for the provision of a service, such as higher transportation costs when using longer deviations;
- losses of income as a result of the non-provision of services in utilities and losses of personal income in the case of individuals losing --totally or partially-- their means of livelihood;
- unexpected expenditures related to meeting "new" needs arising from the disaster, such as the costs of vaccination campaigns to avoid epidemics;
- production or income losses in activities located either "downstream" or "upstream" of activities directly affected by the disaster, such as in the case when the destruction of an industry results in the cutback of activities of a supplier who has no alternative markets or customers who have no other suppliers; and

investments incurred to respond to the need to relocate fixed assets or activities to safer areas after a disaster has demonstrated such need.

The summation of direct and indirect damages represents the total --material and monetary-- damage inflicted by a disaster. Care must be exercised when assessing disaster damage to include both types of damage in the estimations, since it is very frequent that indirect damages may exceed the amount of direct damages, and they may cripple a weak economy and render it unable to meet by itself the resulting rehabilitation and reconstruction requirements.

I. Secondary effects refer to the impact of the disaster on the overall economic performance of a country as measured through the most significant macroeconomic variables. The estimation of changes in these variables due to the disaster complements that of direct and indirect damages, although they can not be mathematically added to express the total amount of damage inflicted by a disaster.

A disaster's main secondary effects are those which have an impact on:

- the overall and sectoral **gross domestic product (GDP)**;
- the **balance of trade** and the **balance of payments**;
- the **level of indebtedness** and of **monetary reserves**;
- the state of **public finances**; and
- the amount of **gross capital investment**.

Depending on the nature of the disaster, the secondary effects of **inflation, in employment and household income** may also be of relevance.

Gross domestic product can be reduced by the anticipated decline in the output of sectors that sustained direct and indirect damages; it can grow, however, due to the surge in the construction sector as a result of rehabilitation and reconstruction activities. The balance of trade and the balance of payments can be affected due to export shrinkage resulting from diminished output, and by increased import requirements to face unmet internal demands and the requirements of rehabilitation and reconstruction. Public sector spending grows to meet the needs of the emergency and rehabilitation phases and tax revenues may shrink because of reduced output and diminished exports, which may combine to create or increase fiscal budget deficits. Reconstruction efforts may involve acquiring or increasing foreign or local indebtedness.

Simultaneously prices may go up because of shortages or speculation, thus creating or worsening inflationary pressures on the economy. Moreover, depending on the economic position of the country prior to the disaster and if the secondary effects are sufficiently large, it is possible that the country's international reserves and its ability to meet external commitments can be jeopardized.

In order to assess the secondary effects of a natural disaster it is assumed that all direct and indirect sectoral damages have been evaluated beforehand, taking stock of the requirements of information for sectoral damages when appropriate. Interested parties can consult the ECLAC damage assessment manual to obtain details on the sectoral assessment methodology. Nevertheless, it must be indicated that to enable the assessment of secondary effects, sectoral evaluations of damages must include estimates of foreseeable losses in output (of goods and services) during the period required to rehabilitate farmlands, industrial production and physical and social infrastructure. They must also include estimations of indirect effects on household employment and income, exports and imports, gross investment, taxation, etc, for each sector affected. In addition, it is essential that an estimation be made of the period of recovery for each sector or activity during which the indirect effects are to be present.

b) Estimation of macroeconomic effects. The estimation of the effects of natural disasters on the economic position of a country is based on a comparison between the economic performance anticipated before the disaster struck and a modified projected performance estimated after the damage assessment has been completed.

In that respect, the ECLAC damage assessment methodology requires, as an essential base for comparison, the obtention of the macroeconomic performance prospects for the year during which the disaster strikes. The methodology involves estimating the amounts in which such projections will be altered as a result of the direct and indirect damages sustained during and after the disaster.

The basic macroeconomic information required for this work includes inter alia the following:

(i) projections of overall and sectoral economic growth for the year during which the disaster takes place and, hopefully, for the two subsequent years;

(ii) trends in the main balance-of-payments aggregates of exports and imports, levels of external financing, international reserves and foreign indebtedness, international prices and demand of the country's main export products, and debt servicing agreements;

(iii) the approved fiscal budget --including estimates of fiscal deficit if any-- for the year during which the disaster strikes, and fiscal income/expenditure estimates for the months preceding the disaster; and

(iv) other sectoral and macroeconomic statistics such as crop growth index, trends in manufacturing sector output, as well as monthly consumer and producer price index trends, urban/rural unemployment survey data, etc.

Effects on economic activity. The macroeconomic aggregate that best expresses variations in the overall level of economic activity is the GDP.

Constant prices --preferably current prices at the time of the assessment-- should be used in the estimates in order to illustrate the disaster's real effects on economic growth rates. It must be recognized that expressing the main aggregates that make up domestic supply (gross output for each branch of economic activity) and demand (expenditures for public and private consumption and capital formation) in current values for the year or period in which the disaster occurred frequently poses a statistical problem. That is due to the fact that in many countries this information is available only in constant prices for a given year, and usually a census year.

In order to solve that methodological problem, an appropriate and reliable price index --such as the GDP deflator, the wholesale price index or the cost-of-living index-- must be adopted to convert these figures into current values for the year in which the disaster occurred. After completing such adjustments, projected economic data for the year(s) following the disaster should be expressed in constant prices of the year in which the disaster struck, to eliminate the effects of inflation and enable a valid determination of the disaster's effects on real growth rates.

The sectoral damage or losses to be used in the macroeconomic assessment must include:

(i) products and services which, owing to the destruction of infrastructure and machinery, will no longer be produced; or

(ii) income that will no longer be received, estimated on the basis of salaries, wages and profits that will not be forthcoming while production plants are being rehabilitated; <sup>4/</sup> or

---

<sup>4/</sup> For the cases of small businesses in which a wide variety of goods and services is produced, this method of estimation is more feasible and reliable than the one described

(iii) in the special case of the "housing rental" sector --included in the national accounts-- losses are to be estimated as the result of multiplying the number of houses destroyed or damaged by the average monthly rent during the estimated rehabilitation and reconstruction period.

In each sector indirect losses must include both the volume (or units) of losses in future production of goods and services during the estimated period for recovery of full or previous productive capacity, and the price of these goods and services expressed in terms of producer prices or, in the case of services, consumer prices.

The gross amounts thus estimated must be converted into value added to enable its incorporation into the projected GDP. To this effect national account information relating gross values to value added ones for leading economic sectors and branches of activity are utilized. Usually, a recent input/output matrix relating these values is available.

As indicated previously, the anticipated expansion of the construction sector as a result of the rehabilitation and reconstruction plan and activities will have a positive bearing in GDP, and must be estimated. In this respect, the annual growth of the sector must be calculated on the basis of the known capacity of the sector and of the expected amounts of investment for rehabilitation and reconstruction.

Sectoral-loss value added data and construction sector expansion information are superimposed on the anticipated sectoral estimates of GDP for the year in which the disaster occurs, and for subsequent years if the data is available and the type and magnitude of the disaster so warrants it.

An estimation of post-disaster GDP is thus generated. Global and sectoral economic setbacks due to the effects of the disaster can be easily identified from a comparison of the new GDP estimation and the pre-disaster projection for the same year. Trends in economic growth can be determined by comparing the newly estimated GDP and real GDP figures for previous years.

Effects on the external sector. The effects on the external sector of a country affected by a natural disaster include those that affect the balance of payments current account and, in some cases, the external financial requirements of reconstruction. These effects would be felt not only in the year during which the disaster occurred but in a longer time frame until the country's productive capacity is fully restored.

It is essential for the assessment process to obtain the most reliable and up-to-date information concerning the balance of payments situation for the whole economy and its projection for the year in which the disaster occurred --and the following years if possible. This should be complemented with other basic data on external indebtedness, debt servicing levels and international monetary reserves before the disaster struck.

The resulting current account of the balance of payments during the year of the disaster is estimated on the basis of both the envisaged account before the disaster and the following calculations based on the indirect damages for each affected sector:

(i) reductions in the export of goods and services, be it due to the destruction of their means of production or to its re-orientation towards internal markets. Losses in services refer to cases when a country has been affected in its tourism reception capacity, its shipping fleet or its engineering export capacity;

(ii) increases in imports of goods required for the rehabilitation phase, including fuel and food to replace insufficient internal production, as well as that portion of construction materials required for the reconstruction of destroyed assets;

(iii) donations in kind and in cash received to attend the emergency phase;

(iv) insurance and re-insurance payments from abroad to cover damages and destruction of assets; and

(v) possible reductions in interest payments to foreign creditors that may be agreed upon as a result of the disaster, and possible increases in payments related to new short-term loans requested to attend the emergency or for immediate rehabilitation of essential services.

The projection thus made will enable the determination of the possible occurrence or increase of a current account deficit in the balance of payments in the year of the disaster. Should the requirements for imports and/or the reduced export levels remain for a longer time period, a chronic deficit may occur as a result of the disaster.

The resulting capital account of the balance of payments must be estimated superimposing --on the before-the-disaster projection-- the information related to the medium- and long-term foreign financing requirements for the priority investment projects that are to be included in the reconstruction plans that will follow in the, say, next five years following the disaster.

It should also include the additional foreign financing required to compensate the possible chronic deterioration of the current account balance as determined above. These additional foreign financing requirements will have to be made compatible with prior foreign debts commitments and with the level of international reserves that the country may have. A change in the conditions governing foreign financing and debt servicing may have to be negotiated.

Effects on public finances. Using as a base the before-the-disaster fiscal budget, the following secondary effects are to be superimposed to determine the disaster's effects on public finances:

(i) reductions in tax revenue due to decreases in the production of goods and services, household income and consumption expenditures;

(ii) increased current expenditures to attend the emergency phase of the disaster; and

(iii) increased capital investments requirements for the rehabilitation and reconstruction program.

The first two types of secondary effects are usually felt during the same calendar or fiscal year, while the increased capital investment is usually spread over a number of years.

The reductions in tax revenues are estimated as part of the sectoral evaluation of indirect damages, based on the projections of production of goods and services. Further estimations of reductions in tax revenues should be made based on the expected reductions in household income and consumption expenditures. There are cases when governments may decide to reduce the level of taxes on exports, to foster or expedite recovery of production levels; these reduced tax revenues should also be entered into the equation. A similar case occurs when national or local governments can not collect property taxes on destroyed housing and business buildings.

Expenditures incurred by national governments to meet the unforeseen needs during the period immediately following the disaster, including the provision of temporary shelter and most immediate rehabilitation needs, should be determined during the assessment.

The result is a revised current account of the fiscal budget which shows the effects of the disaster. From it, resulting fiscal deficits and the possible non-compliance with agreed upon fiscal restraint targets may be identified.



In regard to the capital investment expenditures for rehabilitation and reconstruction, a preliminary program is prepared during the damage assessment mission. The following items must be taken into consideration:

(i) estimates of total investment required to rehabilitate and reconstruct infrastructure and to restore production; and

(ii) the known delivery capacity of the construction sector in the affected country or region(s).

An annual capital investment program for rehabilitation and reconstruction is thus prepared, to be superimposed on the program envisaged before the disaster had occurred. Should the new requirements be a sizable percentage or fraction of the capital investment envisaged under normal conditions, a revision of the country's overall investment program would be in order. Some already programmed development projects may have to be postponed or discarded, unless additional financing can be obtained as new priorities are forced upon by the disaster. Furthermore, if the additional financing is to come from foreign sources an additional analysis is to be made concerning the balance of payments and the country's ability to maintain an increased level of debt servicing.

Effects on inflation. Contrary to other macroeconomic effects, the resulting impact on consumer prices can not be quantitatively measured or estimated immediately after the disaster. A qualitative assessment can be made, however, based on the disaster-imposed short-term constraints on the local supply of manufactured goods and agricultural products, including the effect on the marketing channels and transport systems. It must be borne in mind that a lowering of consumer prices may occur whenever imported products are cheaper than domestic supplies.

Effects on employment. A disaster has both short and medium-term effects on employment and household income. Estimates of the short-term effects can be made on the basis of available data for the relations between employment and sectoral production, once the latter's losses as a result of the disaster have been estimated. Estimates of work-months to be generated in the medium term by the rehabilitation and reconstruction activities following the disaster can be made based on the existing ratios between labor requirements and construction investment levels. Both estimates must be combined to show the total effect of the disaster on this important social and economic variable.

#### 4. Some conceptual considerations

Some conceptual remarks are presented here in order to make reference to the main characteristics of the different types of disasters and their impact on the different

economies where they may strike. Examples are used to facilitate to portray the complex matrix that comprises the different possibilities as to the magnitude of the events, the main economic characteristics of the potentially affected country and the different alternative context and time frame in which a disaster may occur.

a) Linkages between the nature and dimension of the disaster, the type and size of the affected country, and the resulting socio-economic consequences. In general and on the basis of experience accumulated in the Latin America and Caribbean region, it can be stated that there is no predetermined pattern as to the consequences of different disasters. The resulting pattern of effects will be determined by the combination of many factors that include the economic situation prevailing in the country before the event, the productive structure of the country and the extent of damages sustained, the severity of the disaster's consequences, the time of the occurrence, the very nature of the phenomenon and, even, the way in which national authorities face the problem and the state of their relationship with the international community.

Some disasters may be concentrated over a relatively limited area, affecting one specific geographical territory, massively affecting one population group and devastating specific productive areas (See Managua '72). In these cases, even though the economic and social costs may be very significant, the disaster may affect a limited number of activities and, while complete recovery tends to be long and difficult process, reconstruction may have cause a concentrated stimulating effect and growth.

Other events may affect a wider geographical area (See Honduras '74, Grenada '75, Antigua and Barbuda '75, Guatemala '76), where --at least initially-- their effects and cost tend to be less evident making it harder to rally international cooperation. An exception to the latter case are the cases where, in part thanks to a timely damage assessment and appeal for international cooperation, the full backing of donors may be obtained (Guatemala '76). In these cases, the disruption to economic activity is widespread but can have a less evident macroeconomic impact. Depending on the prevailing economic and financial situation prior to the disaster, recovery from the negative impact of such a disaster can also imply a high cost and sacrifice for the country as a whole.

Major differences in impact can be observed when comparing the size and characteristics of damages with the size and complexity of the national economy that is affected by a disaster. A given disaster may involve very high costs in absolute terms - -such as the case of the US\$ 4,1 billion in the case of the Mexico City earthquake-- but, given the economic size of the country, reconstruction may have only modest macroeconomic effects. (See also Florida '93, Los Angeles '94). By contrast, other disasters may have very high global effects on the economy even though the relative size

of the damages, as compared to other disasters, may be very small. In this respect, consider that the 1972 Managua earthquake which in absolute terms was only a fraction in cost of the 1985 Mexico City quake, affected 46% of the industrial sector of the whole country due to the concentration of industries in the city. On the other side, some disasters (Grenada '75, Antigua and Barbuda '75, and Guatemala '76) whose total impact in dollar terms were only a fraction of the 1985 Mexico quake, required a long time period for the affected economies to recover. (Four years in the case of Antigua, ten years for Grenada and three in Guatemala)

In the damage appraisal of the Antigua and Barbuda disaster, it was pointed out that the nature and magnitude of the damages had to be put in the context of the economic size of the country, the nature and scale of its economic functions, and the limits of its financial capabilities both in the public and private sector. At the time of the disaster, the country had a population of 70 000 inhabitants --some 17 000 households--, a public sector with an annual budget of some 38 million dollars, a productive capacity oriented mainly towards the export sector and a high dependency on tourism. It was clear that the magnitude of the impact and the cost of rehabilitation and reconstruction were small in absolute terms, but that they represented a devastating burden for the country. <sup>5/</sup>

b) Some working hypothesis. From another point of view, even though all major disasters have significant negative impacts, it is necessary to differentiate between disasters that have mainly economic effects and those that involve more important social consequences. For instance, Hurricane Fifi (Honduras '74) and other disasters (such as Grenada '75, and Nicaragua '88) had basically economic consequences but did not have major impact of a social nature such as the disruption of ample population groups; their effects were less evident in sociological terms. In these cases of mostly economic consequences, the cost of recovery may be estimated with relatively better accuracy, and it is easier to rapidly prepare a portfolio of reconstruction projects that will receive attention and resources from the international donor community.

In contrast, other disasters may have more serious negative impacts on social groups than what the quantitative economic assessment would indicate. (See Nicaragua '79, Ecuador '87, El Salvador '92, Nicaragua '92). In these cases the assessment of effects on macroeconomic variables does not show the full extent of social consequences.

Furthermore, the relatively small absolute size of some of the latter also results in a limited interest from both national authorities and the international community. There

<sup>5/</sup> See ECLAC, Report on the damages and repercussions caused in Antigua and Barbuda by the 8 October 1974 earthquake (E/CEPAL/1000), 3 January 1975.

are many recent instances where, unfortunately, the estimated overall damage may be small in terms of the size of the country's economy but represents very high losses sustained by the affected local population groups in terms of family disruption, loss of assets and the virtual impossibility of recovering productive capacity on their own. Frequently these events cause dramatic individual damage that goes unnoticed, particularly when the population affected is concentrated in rural areas, and has an already low income and few possibilities of presenting their plight to the authorities or potential donors.

The time-frame in which a disaster occurs as well as its nature are also important. For instance, in the case of predominantly agricultural economies, the location in time when a disaster occurs within the productive cycle or season has a bearing on the amount of damages. Some hurricanes, floods and intense rainstorms have coincided with the harvest cycle (See Honduras '74) and thus have a larger immediate impact, as compared to other cases when most of the harvest activities have been completed.

In a broader sense, the impact of a disaster will be different depending on the trend that the affected economy was having prior to the disaster. In the case of San Salvador ('86) emergency and reconstruction activities were hampered by the extremely fragile financial position in which the country was and even more so by the costs of the prevailing military conflict. In this case, the urgency to face the crisis caused by the disaster came at odds with other social development plans. It was pointed out at that time that the relatively large amount of destruction, the urgency with which reconstruction was required, the weakening of the productive capacity, and the growing financial imbalances, posed serious dilemmas for the adequate order of priorities to be set in economic policy. These dilemmas occurred, inevitably, within the small space provided by a costly armed conflict, both in social and economic terms. 6/

In less dramatic although no less important cases, the urgency to reconstruct competes at a disadvantage with stabilization and structural adjustment programs which, when coupled to financial support from international financial institutions, will have strict conditionalities and macroeconomic goals. In these cases the purely economic alternative might be to risk "overheating" the economy in order to respond to the economic and social demands arising from the disaster and which often have a national dimension.

---

6/ See ECLAC, The San Salvador Earthquake of 1986: Damages, Consequences and Assistance Required (LC/MEX/L.39), 14 December 1986.