I. INTRODUCTION

1. Natural disasters in Latin America and the Caribbean

The natural phenomena which have caused disasters in the countries of Latin America and the Caribbean in recent years have had a number of origins and have varied in intensity. Generally speaking, the phenomena which have occurred most frequently are of meteorological origin, while those of geological origin have caused a greater degree of destruction to the physical infrastructure. It has been estimated that, all told, such disasters cause the death of 6,000 people and generate US$ 1.5 billion worth of losses in the region every year (Jovel, 1989). Obviously, such losses have a major negative impact on the living conditions of the people affected, while at the same time hampering national efforts to achieve economic growth.

Each year, weather bureaux in the region announce the appearance of tropical storms in the Caribbean, and issue warnings about droughts and floods caused by climate changes to the Continental Shelf. Geological monitoring stations, meanwhile, are aware of the potential both for earthquakes in areas vulnerable to the movement of tectonic plates and for volcanic eruptions in areas prone to such activity. Damage has continued to be inflicted on persons, and this has led over the past two decades to the adoption of preventive measures; nevertheless, there is a belief that the disaster mitigation measures taken thus far still do not go far enough, given the size of potential disasters.

In particular, when damage extends to basic medical facilities, it sometimes entails the disappearance of major parts of the available infrastructure in the country in question, as well as the suspension of or delay in the delivery of medical services to the affected population. Damage to infrastructure is also accompanied by indirect effects, such as the costs incurred by a country when it conducts campaigns designed to prevent epidemics, treatment of the populace with portable equipment, and the resulting increase in expenditure on transportation, staffing and medicines.

The above-mentioned considerations serve to underline the urgent need to set up a network of guidance and support services designed to safeguard medical resources in the affected region; these include an effective assessment of the resources available before, during and after the disaster, in order to facilitate the channeling of domestic and overseas assistance to the health sector.

2. Methodologies for the assessment of direct and indirect losses

a) General considerations

Based on the experience acquired by ECLAC in assessing the socio-economic impact of dozens of disasters which have occurred in the region, it has been possible to generate a conceptual and regulatory framework which covers the main sectors of activity, including those relating to the delivery of health services (ECLAC, 1991). This methodology, which has served as the technical

basis for the execution of the present study, is complemented by documents on national experiences which make particular reference to assessments of damage sustained by hospital facilities.

Any preliminary assessment of the damage caused by a disaster should be both timely and reliable. To this end, the evaluator will need to focus on identifying and quantifying the direct and indirect effects of the disaster, and this will serve as the basis for rehabilitation/reconstruction programmes, as well as the quantification and distribution of the assistance that will be received. The effects of a natural phenomenon have been grouped into three broad categories (UNDRO, 1979).

i) **Direct** effects, which include losses of capital stock and the assets of people, businesses or institutions in general.

ii) **Indirect** effects, which result from the decline in incomes of households, businesses or institutions, and the diminished production of goods and services, as a flow-on effect. Also included are increased expenditures related to the disaster, the aim of which is to provide services to the population on a provisional basis until such time as the original operating capacity of the lost stock can be restored.

iii) **Secondary** effects, which measure the disaster's impact on the major economic aggregates, such as inflation, economic growth, balance-of-payments problems, increases in public expenditure, falling international reserves, increased inequalities in family incomes or the isolation of particular rural areas.

Direct effects are felt at the time of the disaster or immediately after its conclusion. In contrast, indirect or secondary effects are felt over a period generally put at two years, but which, depending on the seriousness of the disaster, may extend for up to five years. As will be shown in this study, some indirect costs cannot be measured in monetary terms.

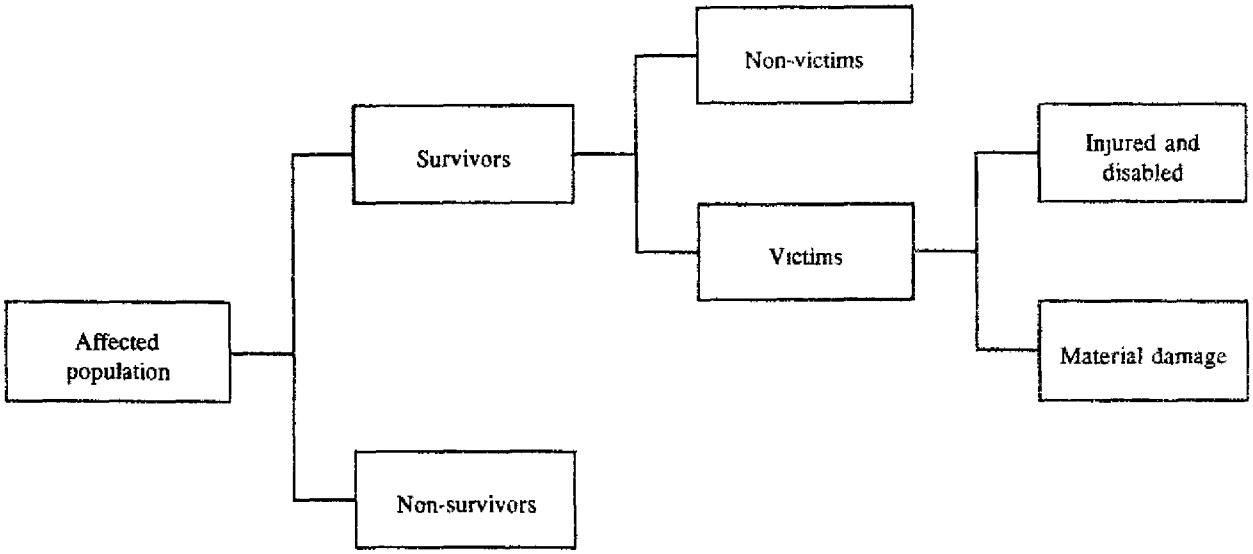
The assessment of the direct losses will need to take into account the current value less depreciation of the destroyed property, depending on its average life and its total estimated useful life. In countries with high inflation, the book value of destroyed property is of little use, unless it has been subject to periodic revaluations. As a general rule, totally destroyed assets should be valued at their replacement cost (e.g. the price per cubic metre of construction for buildings with similar characteristics). In the case of equipment and furnishings, it will be necessary to take into account, where appropriate, possible qualitative improvements made at the time of replacement, including technological changes considered feasible.

b) Determination of the affected population

The evaluator will need to begin his assessment by considering the geographic area and population affected by a disaster. In order to do this, he/she will need to consult population censuses for the area and the hospital facilities affected, including official, academic or private reports. It will also be necessary to gather extensive information from affected population centres, before subsequently condensing the contents (see table 1).

Table 1

INFORMATION ON THE AFFECTED POPULATION



Specific aspects.

- Affected zone. Politico-administrative division.
- Population. By area; rural/urban area of residence.
- Number of primary victims.
- Persons in shelters; number of families and costs.
- Injured and disabled. Medical classification, rural/urban residence; age; sex; ethnic classification, educational level; occupational category
- Deaths. Quinquennial or broad age groups; rural/urban; sex; ethnic classification; educational level; occupational category.
- Secondary victims (not residents). Identification and description
- Attributable costs by sector: public or private.

The assessment process will incorporate elements such as information related to the census of the affected population, its characteristics, and the circumstances in which the disaster occurred. Consistent data collection will help orient efforts to deal with the emergency.

A record will need to be established of primary victims -i.e. those people affected directly by the disaster. The record will comprise the dead, injured and disabled; these may include medical or paramedical personnel, for whom a separate record should be kept. Secondary victims are those segments of the population which are subject to the indirect effects of the disaster and who find themselves within the boundaries of the impacted area. Tertiary victims are those located outside the affected zone.

Collection of data concerning primary victims will facilitate the survey of direct effects which in many cases are unquantifiable; these include changes to communications, education and cultural systems, disruption to goods distribution networks, losses of homes and deterioration of standards of living. Unquantifiable indirect effects include, for example, psychological damage and changes to social relationships. The data may be presented in a diagram showing the direct damage losses or in a more detailed breakdown including the affected population by impacted regions or hospital units, age, sex, or rural and urban location (see tables 2 and 3).

Table 2

ECONOMIC DAMAGE ATTRIBUTABLE TO HE AFFECTED POPULATION

(In millions of dollars)

Victims	Total	Direct	Indirect
Total			
Primary victims	-	-	-
Trauma victims	-	-	-
Disposition, treatment and recovery	-	-	-
Income and production losses	-	-	-
In shelters	-	-	-
Transport and support of family	-	-	-
Additional household income and production losses	-	-	-
Infrastructural damage	-	-	-
Secondary and tertiary victims			
In shelters	-	-	-
Transport and support	-	-	-
Additional household losses	-	-	-

Table 3

PRIMARY VICTIMS, BY REGION OR HOSPITAL UNIT

Category	Total	Affected zone	
		Region/ Unit 1	Region/ Unit 2
Deaths	-	-	-
Injuries	-	-	-
Minor	-	-	-
Severe	-	-	-
Disabled	-	-	-
Recuperation possible	-	-	-
Partially permanent	-	-	-
Permanent	-	-	-
Total primary victims	-	-	-
Gender			
Deaths			
Women	-	-	-
Men	-	-	-
Injured and disabled			
Women	-	-	-
Men	-	-	-
Age			
Deaths			
Under 5 years	-	-	-
Between 15 and 50 years	-	-	-
Over 50 years	-	-	-
Injured and disabled			
Under 5 years	-	-	-
Between 15 and 50 years	-	-	-
Over 50 years	-	-	-
Rural/urban residence			
Deaths			
Women	-	-	-
Men	-	-	-
Injured and disabled			
Women	-	-	-
Men	-	-	-

c) Assessment of damage to hospitals

1) Direct damage. The experience gleaned during assessments of damage to medical facilities suggests that the team in charge of performing this task should establish an effective strategy enabling it to carry out its activities in spite of the disruption caused by the tragedy. Such a strategy should be geared to the nature of the disaster. Total collapse of installations is a frequent occurrence following earthquakes; in such instances, data collection would need to be carried out at levels above or parallel to the damaged facilities, since records on building infrastructure, service capacity and the number of persons present at the time of the disaster may quite possibly have disappeared.

Past cases show that losses are more likely to be limited following floods, tidal waves, volcanic eruptions or low-intensity tremors, and this provides for clear identification of material damage to buildings. At the onset of the assessment process, evaluators will need to identify the exact nature of the damaged facility since, depending on the degree of health care provided to the population, it will be necessary to define the strategy for the collection of data on the type and extent of the damage caused (Barquín).

There are three recognized levels in medical care systems. Level I encompasses medical facilities which provide elementary care, covering 70% of community health problems; level I includes medical centres, rural or suburban clinics, and family medical posts. Level II facilities take care of problems transferred from level I and are equipped to deal with 12% of surgery: they undertake environmental and epidemiological control and monitoring and are administered on a regional basis. Level II facilities include general hospitals and health centres. Level III facilities deal with the remaining 8% of demands for consultations and specialized hospitalizations, which require more sophisticated services over; this level operates in a broader geographical area and comprises specialist hospitals and institutes.

In buildings where first level care is provided, it is possible to identify facilities for emergencies, operating theatres, and divisions for basic specialties: dental consultations, otorhinolaryngology, ophthalmology and dermatology. There may also be support services such as a laundry, kitchens, pharmacies, drug warehouses, stores which stock basic materials and equipment, transportation equipment, areas for parking and offices. Such a range of material resources is broadly associated with communities of no more than 50,000 users It is possible to find smaller regional medical posts, serving to a dispersed population, which are able to rely on a more extensive first or second level facility.

Buildings housing second level care installations (general hospitals) have more complex facilities; in addition to first level specialties, they provide specialties such as internal medicine, gynaeco-obstetrics, paediatrics, surgery and traumatology, clinical laboratory, haematology, bacteriology, serology, clinical chemistry, pathological anatomy, sanitary control laboratory, bloodbank, clinical radiology, electrocardiography, and disability prevention. Furthermore, they are likely to be equipped to provide special services such as sanitary control, environmental control, training, epidemiological and clinical research, and health services.

Typically, a minimum of 30 registered beds are available for hospitalizations for a user population of between 30,000 and 60,000 inhabitants. Facilities offering third level care (specialist

hospitals) are characterized by the high degree of technical complexity for dealing with harder-to-treat health problems. In addition to the above-mentioned second level specialties, such buildings house areas for epidemiological monitoring, highly specialized laboratories and areas for gastroenterology, cardiology, pneumology, psychiatry, genetics, oncology, nutrition, nephrology, endocrinology, allergology, infectology, specialized surgery, neonatology and perinatology. They may also house areas for physical and social rehabilitation, teaching, medical research and environmental control.

Thus, classified according to the type of care provided, the medical facilities which may sustain direct damage include medical centres, clinics, dispensaries, medical posts, general hospitals and specialist hospitals. They are classified according to whether they are located in rural or urban areas, and whether they belong to the national health system or the private sector. The main categories liable to be damaged in these facilities are: buildings; administrative, medical and sanitary installations; medical or auxiliary equipment and medical instruments; furnishings and office equipment; transportation facilities; warehouses and supplies. Other costs incurred, which may be considered to be direct damage, include the transfer, treatment and recovery of trauma victims when such activities extend beyond the emergency period.

Where damage assessment is concerned, it is important to bear in mind that the valuation should reflect the value of assets destroyed at the time of the disaster. The nature of the replacement process of these assets will depend on factors such as the characteristics of the hospitals requiring rebuilding, the resources available to the country in question, the institutional development of the sector, government policies concerning the priority of disaster relief, and the resulting budgetary allocations. Replacement value will be estimated on the basis of the cost of new equipment, and this frequently implies a technological upgrade of installations. In the case of repairs, the recommended yardstick will be the prevailing price in the market for inventoried assets.

It should be pointed out that the valuation will entail analysis of the damage caused to hospital infrastructure rather than to what is known as the "health sector", which encompasses urban infrastructure and equipment adjoining the buildings. In the period prior to a visit to the disaster area, the evaluator will conduct a preliminary survey of relevant data in the health sector, preparing lists of public and private institutions to contact, in order to gather general information on direct and indirect effects felt in the sector.

Table 4 presents a summary of health-sector damage, outlining post-disaster assessment activities.

Whether it is possible to separate direct, indirect and secondary effects will naturally depend on the availability of information and the relative importance assumed by the various concepts. Annex I gives a detailed explanation of the recommended methodology for calculating the effects of a natural disaster on hospital facilities.

ii) Indirect damage. Apart from estimating losses arising from the destruction of infrastructure, it is also necessary to estimate the indirect effects derived from the decrease in volume of services normally provided, and the additional costs involved in caring for disaster victims placed in provisional facilities during the reconstruction process, or transferred to other hospitals.

Table 4

SUMMARY OF HEALTH-SECTOR DAMAGE

(In millions)

Effects of the disaster	Cost			Component	
	Total a/	Sector		National	Imported
		Public	Private		
Direct effects	-	-	-	-	-
Damage to health infrastructure	-	-	-	-	-
Repair	-	-	-	-	-
Replacement	-	-	-	-	-
Damage to sanitation infrastructure	-	-	-	-	-
Repair	-	-	-	-	-
Replacement	-	-	-	-	-
Disposition, treatment and recovery of primary trauma victims	-	-	-	-	-
Indirect effects	-	-	-	-	-
Sanitation programme	-	-	-	-	-
Epidemiological monitoring and control	-	-	-	-	-
Higher costs for hospital care, outpatient treatment and first aid	-	-	-	-	-
Higher institutional and individual costs due to above-normal disease rates	-	-	-	-	-
Programmes for vulnerable groups	-	-	-	-	-
Lower earnings for unrendered services	-	-	-	-	-
Provision of a water supply and implementation of sanitation measures via alternative methods	-	-	-	-	-
Subtotal	-	-	-	-	-
Secondary effects	-	-	-	-	-
Sectoral public and private outlays	-	-	-	-	-
Services goals effect	-	-	-	-	-
Sectoral inflationary effect	-	-	-	-	-
Sectoral employment effect	-	-	-	-	-

a/ The total cost corresponds to the sum of costs for public and private sectors, which will be equal to the sum of costs of domestic and imported components

The term "indirect damage" covers a wide range of effects, including the following:

- An increased risk of the spread of infectious/ contagious diseases and health hazards;

- Higher costs -both public and private- for hospital, outpatient and other health care; and

- A reduction in the level of well-being and living standards of the affected population due to the lack or rationing of drinking water and water for other uses.

iii) Secondary effects. Secondary effects are those which have an impact on the economic and social conditions of the population, and the country affected as a result of the disaster. Secondary effects should be assessed along with direct and indirect effects.

One of the unique characteristics of natural disasters is their serious impact on social assets, especially the general services for low-income groups. Damage to hospital facilities may serve to worsen the deficiencies of a national health system, interfering with or causing delays to the provision of basic care to the population.

Measures to mitigate the effects that natural disasters may have on the health infrastructure in the countries of Latin America and the Caribbean will play a major role in preserving that infrastructure, irrespective of their cost, which will in any case always be less than that of reconstruction.