

**NOTES FOR PRESENTATION
ON**

DISASTER MITIGATION IN THE CARIBBEAN

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The Caribbean island states are vulnerable to the effects of a variety of natural and man-caused disaster events. Their impact on the region has led to loss of life and injury; physical damage; destruction of property and infrastructure; economic loss and ultimately the setting back of efforts at development. Recent studies have indicated that the impact of extreme events on the island states may be a significant factor in setting back efforts at regional, national and local development.

On numerous occasions Earthquakes, Volcanic Eruptions, Hurricanes, Floods, Landslides, Droughts, and other natural events have killed and injured persons in many of the territories of the Caribbean. Unfortunately, the social, psychological and economic impacts of these events are not as well documented as the physical impacts and the rather bald numbers relating to death and injury. Hurricanes Gilbert, Joan, and Hugo are therefore merely the most recent manifestations of an intrinsic element of the Caribbean environment. In the past the region has also been affected by major epidemics, and the effects of plant and animal diseases.

This meeting is taking place at a time when most of our islands are bracing for the arrival of Cholera, a timely reminder of the regions vulnerability and also a positive signal that there is much we can do together to prevent a repetition of the events of the past by applying the tools of modern science to cope with the threats facing us.

The potential for future environmental and technological incidents (nuclear accidents, oil spills, pollution incidents etc) is also a reality in the region and has engaged the attention of our growing cadre of persons concerned with Mitigation and Loss Reduction.

MITIGATION AND PREVENTION

Spatial analysis of risk and application of land-use zoning techniques to reduce losses has been the subject of a variety of efforts and activities in the region. It was heavily promoted by the PCDP, and the Organization of American States (OAS) Natural Hazards Project. Several governments, for instance, in Cuba, Jamaica, and Puerto Rico, have developed flood plain map as a part of national development programmes. In Dominica, Grenada, St. Lucia, and St. Vincent, landslide maps have been developed under the OAS pilot project. In several other states, including Jamaica and Trinidad, preliminary landslide maps have been drafted. Zoning of high risk earthquake areas has been undertaken in Cuba, the

French territories, and Puerto Rico. In other parts of the Caribbean, such maps are considered desirable but have yet to be fully developed under the country programmes.

The PCDDPP during its existence actively also promoted other mitigation measures including the legal adoption of the CUBIC regional building code, standards for disaster resistant low income housing and locational standards for safe development. Implementation of such measures will lead to better use of existing resources, rational development of a comprehensive integrated emergency system, timely emergency responses, appropriately staged responses and more effective damage control and loss reduction in potential and actual crisis situations.

The CARICOM Secretariat in 1989 with the support of the PCDDPP mobilised a Response Unit to deal with the logistical and operational coordination of the immediate response to hurricane HUGO and to provide some of the immediately required services, including electrical and building repair skills. This CARICOM initiative has led to the establishment of the Caribbean Disaster/Emergency Response Agency (CDERA) to deal initially with the Emergency Management functions at the regional level and to serve as an interim focal point for further regional initiatives.

The need still exists for a wide range of possible and practical pre disaster actions encompassing Emergency Management and Mitigation which the governments in the region can undertake and actively encourage if sustainable development is to be realised in spite of the disaster threats which are a part of the Caribbean environment. These actions include -:

- * The identification of high risk areas,
- * Land use management to rationalise investment in high risk settings,
- * Establishment/enforcement of adequate structural standards
- * Policies for ensuring the survival of lifelines, critical facilities, essential utilities, emergency services and vital economic sectors (agriculture/tourism/banking/industry).
- * Procedures for emergency action including warning, mobilisation search, rescue, emergency health management, first aid, sheltering of victims, protection of vital supplies, telecommunications, damage assessment.
- * Sensitising technical specialists in fields such as earthquake engineering, flood control measures, emergency medical care, to the need for continued attention to emergency issues in their ongoing programmes. Improving industrial safety systems.
- * Strengthening the emergency skills training in the emergency and essential services (police, military, health, public works, utilities etc)
- * Involving the private sector and citizens organizations,

local communities, trade unions, uniformed youth groups (scouts etc), the schools, private sector and non governmental organisations (Red Cross, churches, credit unions etc) in mitigation and emergency planning at the workplace as well as at personal and family levels.

PUBLIC INFORMATION AND MEDIA SUPPORT.

In spite of the implementation of all the measures set out above, purely technical mitigation and loss reduction measures are not likely to succeed unless public education, public information, warning procedures and effective communication techniques are seen to be essential components of any countries disaster mitigation and emergency management programme. An informed and aware public is possibly the greatest asset a country can have in ensuring appropriate response before, during, and after disaster events.

It is unfortunately one consistent observation that countries with no recent disaster experience tend to become complacent and thus more vulnerable unless they mount effective public awareness programmes as an integral part of their disaster mitigation efforts. Such public awareness efforts are most effective when they are developed and implemented by multi sectoral groups embracing the government, the media, educators, key sectors, non governmental and private sector organizations etc.

THE INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

The designation of the 1990s by the United Nations as the INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION (IDNDR) is the focus of this meeting and every effort should be made to ensure that the objectives of the IDNDR are translated into action at the local, national and regional level. The IDNDR places emphasis on reduction of losses in disaster prone regions such as the Caribbean and the resolution approved by the General Assembly draws specific attention to the special problems of island states.

The IDNDR was expected to facilitate and accelerate national loss reduction and mitigation programmes and further reinforce the view that disasters are not "acts of god" but are often the consequence of neglect by man of existing traditions, scientific knowledge, technology, as well as the experience of international agencies.

It is important to note that the disaster loss reduction measures implied by the decade apply to all types of events and that the need exists for the Caribbean efforts to be widened to include all credible disaster events. It is hoped that the IDNDR will be the catalyst for these disaster loss reduction programmes which are intended to strengthen the disaster management capacity of the region. The IDNDR objectives need to receive the support of the Scientific and Technical public as well as the media and the public in the Wider Caribbean.

The following pages set out an approach to Mitigation and the activities of the Decade derived from several sources for the consideration of the meeting.

DISASTER MITIGATION

The aim of disaster mitigation is to ensure that populations at risk are able to absorb the impact of a natural hazard(s) with minimum casualty and physical damages.

Mitigation simply describes "any actions taken to reduce the likely or actual effect of a hazard on people and their built environments." Such actions are taken months or years before a disaster may strike.

Mitigation strategies include:-

- modifying or altering the hazard (e.g. channeling rivers, building levees);
- avoiding man-made aggravation of the hazard;
- identifying and improving or avoiding the sites where a hazard is likely to occur;
- physical planning and building to reduce the vulnerability of elements-at-risk including the population;
- regulating land-use and establishing public safety standards;
- rehabilitating or replacing unsafe buildings and poorly engineered structures;
- instituting programmes for the protection and maintenance of lifeline systems and critical facilities;
- instituting on-going disaster awareness education and early warning systems;
- initiating emergency preparedness programmes to safeguard life, property and personal assets.

Mitigation measures anticipate a disaster. They are effective when supported by community-based systems and organizations capable of managing all phases of a real disaster event.

The mitigation of possible disaster threats inform preparedness, response, recovery and reconstruction actions (See Diagram: Disaster Management Cycle).

The nature of the hazard threat determines what loss reduction measures will be necessary, including structural and non-structural options.

ASSESSING NATURAL HAZARDS RISK & HUMAN VULNERABILITY

Every disaster-prone region needs to have information to determine the vulnerability of human settlements and the necessary safeguards for asset protection and loss reduction.

Also, to identify the acceptable levels of risk that can be accommodated, and the priorities for mitigative and preparedness actions.

Hazard assessments take into consideration: the location, magnitude, intensity, frequency and distribution of risk of varying types of meteorological, hydrological and geological hazards. Assessments also identify specific social features, cultural practices and environmental conditions within a disaster-prone region which contribute to disasters.

Assessment Goal & Objectives

The goal of a natural hazard assessment, is to correctly identify the likely threats to and probable effects of the occurrence of a natural hazard, upon a given area.

A natural hazard assessment is conducted to achieve the following objectives:

1. To identify the natural hazard(s) most likely to occur in a given area, within a specific period of time;
2. To identify specific features of the natural, social and cultural environments capable of enhancing the damage potential of the hazard(s);

DISASTER MANAGEMENT CYCLE



Caribbean Disaster News - MARCH 1990

3. To identify the population as well as the physical and economic structures, critical social facilities and lifeline systems most exposed to the hazard(s);
4. To determine human vulnerability and the acceptable levels of risk which can be accommodated by the affected community;
5. To lay the basis for identifying appropriate mitigative and emergency measures to protect life and property;
6. To incorporate all relevant data in physical and economic development planning decisions

The value of community participation in the hazard assessment process, cannot be over-emphasized.

People's knowledge of their natural and social environments inform what they do in emergency situations and constitute systems of adjustment and adaptation. This information is especially useful to forecasting possible community responses to official mitigation policies and programmes (e.g. land use regulations, building construction standards and appropriate agricultural, industrial and commercial practices).

Data Sources & Assessment Tools

Hazard assessment exercises have benefited greatly from the use of modern computer technologies which are capable of processing scientific data with considerable accuracy.

Computer modelling techniques, are being used increasingly by scientists to construct worst-case scenarios or "design events" based on probability factors. Scientists, nonetheless, value information inputs from a variety of sources, including the people's knowledge and experiences.

Sources of valuable data on natural disasters include:

- **Historical records**, whether documented by scientists/ researchers or made available via oral accounts;
- **Newspaper reports** of actual disaster events;

- **Government files**, the records of international aid/donor agencies and private voluntary organizations;
- **Field surveys** and on-site observations of hazardous regions;
- **Aerial photography**;
- **Community-based early warning systems**;
- **Local monitoring systems** of both hazard threats and real-time events.

Several technological tools are used to assess the threat of a variety of natural hazards affecting the Caribbean region, including:

- **Radar and satellite monitoring systems** for hurricanes;
- **Networks of micro-seismometers** which can pinpoint the potential for earthquakes and volcanic eruptions;
- **Computer estimations** of still water elevations, rainfall, streamflow and wave height factors which contribute to flooding,
- **Instruments** for the assessment of natural landslide characteristics and man-made factors which contribute to earth movements;
- **Topographic and hydrologic maps** of hazardous or high-risk regions.

Hazard Mapping

The mapping of natural hazards is complex and involves the collection and analysis of technical, scientific, institutional and socio-economic data.

The mapping of individual hazards is a new discipline, and comprehensive hazard mapping has not yet been developed in the Caribbean region, because data resources are either sparse or incomplete.

The Flood Plain Mapping Project (FPMP) sponsored by the Government of Jamaica in collaboration with the United Nations Development Programme (UNDP) and the World Meteorological Organization (WMO), and coordinated by the Office of Disaster

Preparedness (ODP) was the first project of its kind in the ~~developing world~~ to address the need for specific hazard mapping.

The aim of the FPMP was to produce hazard risk maps defining the threat of recurrent flooding in all major flood plains (especially where human settlements are sited) at 100-year, 50-year, 10-year and 5-year intervals.

The development of such flood plain hazard maps, informs national development planning decisions and are essential to determining appropriate flood warning systems, flood control measures, public education and emergency planning activities critical to high-risk communities.

Computer modelling techniques enable engineers to produce maps indicating the features of the flood threat, the vulnerability of the population and the risks to life and property.

VULNERABILITY ANALYSIS

Vulnerability refers to "the probable degree of loss, damage or failure to an element or system when it is exposed, by virtue of location or construction, to a natural hazard of a certain intensity."

Information essential to the total disaster management effort and included in a Vulnerability Analysis includes:

- Hazard Assessments.
- Damage Assessment Reports.
- Local records and disaster history.
- Survey data collated by Government agencies as well as the reports of international aid agencies and private voluntary organizations.
- Field observations by trained researchers and scientists.
- Public health and hospital records.
- Folk knowledge and oral accounts.

Factors Considered

Physical and socio-economic factors considered in a vulnerability analysis include:-

- * Geographic location; physical size.
- * Terrain characteristics.
- * Distribution of people, property and other resources.
- * Agricultural patterns and commercial practices.
- * Types of housing, and methods of building construction, building materials, maintenance and resistance.
- * The design and location of such lifelines as roads, bridges, utility and communications systems and critical facilities such as hospitals.
- * Community history, cultural traditions and the experience of dealing with previous disasters.
- * The capacity of social and political organizations to coordinate effective relief, evacuation and disaster recovery and rehabilitation responses.
- * Changes in the natural and social environments that could increase vulnerability.

A Vulnerability Analysis is fundamental to physical and land-use planning, the formulation of building codes and standards for public safety, disaster awareness education programmes and contingency planning.

From the information identified above, it is possible to picture the likely effects of a disaster in terms of:

- Loss of life, injury;
- Destitution, homelessness, trauma;
- Damage to and destruction of residential and commercial property and personal assets;
- Damage to subsistence agriculture and industries dependent on the raw materials of natural eco-systems;

- Disruption of life-styles;
- Loss of livelihood, employment;
- Disruption of or severe damage to essential services, infrastructure and administrative mechanisms;
- Long-term economic and social loss.
- demographic pressures;
- proximity to employment centres, social/cultural amenities, etc;
- ignorance of a disaster threat;
- ignorance of the area's vulnerability to natural hazards and the precautions that should be taken to ensure a relatively safe existence.

A Vulnerability Analysis is a step-by-step process, designed ultimately to provide a complete overview of the relationship between a hazard threat and the damage potential to a vulnerable human settlement.

A Vulnerability Analysis determines what immediate counter-disaster policies need to be adopted; what resources will be required to mitigate a disaster and what community tasks will be necessary in the long-term, to ensure recovery to at least pre-disaster conditions.

Equal But Different

Disaster impacts are received and felt differently by even different groups within the same community. While in one area, isolation may be a primary contributing factor, in another area, vulnerability could be compounded by high density housing, significant infrastructure development on reclaimed, artificial-fill or coastal lands, watershed mismanagement, changes in building styles, engineering technology and construction materials, etc.

Reducing Vulnerability

The region's dependence on radio broadcasts and telecommunications was severely tested by Hurricanes Gilbert (1988) and Hugo (1989). These disasters pointed to the need for greater community effort in improving the hazard resistance and maintenance of lifeline systems and critical facilities and in establishing informal communications networks (e.g. amateur radio operators, citizens band clubs) to "pick up the slack" when major systems fail.

People build in vulnerable areas for several reasons, among them:

- availability of affordable land for residential and commercial uses,

The issue of public safety turns ultimately on the level of risk which people decide is acceptable.

Mitigation measures may reduce vulnerability; they do not confer immunity. It is the responsibility of every citizen, to access all relevant, hazard-related data, before embarking on costly residential and commercial developments.

RISK ASSESSMENT

Risk has been defined as "the expected number of lives lost, persons injured, property damaged and the disruption of economic activity due to a particular natural phenomenon (UNDRO, 1979). It is the sum total of the disaster threat and vulnerability factors.

The risk to a given site, includes:

- The hazard(s) threat;
- Vulnerable physical and socio-economic features of the area;
- Demographic pressures;
- The location of lifeline systems and critical facilities;
- The area's disaster history and potential for disasters;
- A "worst case scenario" and the capacity of residents to withstand or cope with the real event.

Vulnerability Analyses provide a simple framework for pinpointing the root causes of natural hazards risk. Risk Mapping provides a useful descriptive instrument with which to plan for the relatively safe

development of human settlements and land resources.

Risk maps consider all the factors that are critical to designing mitigation, prevention and preparedness actions in disaster-prone communities. They provide a

framework to ensure that the urgency to return "to normal" does not repeat the conditions that contributed to a disaster.

FRAMEWORK FOR THE CARIBBEAN

INTERNATIONAL DECADE FOR NATURAL DISASTER REDUCTION

A. Formation of National Committees

The organizational mechanism recommended to formalize and carry out an Agenda for each Caribbean island is a **National IDNDR Committee**.

B. Membership

In addition to the national committees, it is envisaged that a Caribbean regional IDNDR committee will be established to coordinate regional activities.

Ultimately, each committee will establish realistic programme implementation and outreach goals and formal actions through policy, engineering and education to lessen the nation's exposure to natural hazards.

C. Composition

In view of the diversity of the activities envisaged, it is desirable that the national and regional body include representatives of governmental agencies, academic, public and private professional institutions that are concerned with the objective and goals of the Decade, including for example the following:

- Government agencies concerned with public works, urban and regional planning, transport, scientific and technical research, education, health, defense, public information, etc.
- Meteorological, hydrological, geological and oceanographic departments and services.
- Academic institutions concerned with research on natural hazards, civil and structural engineering, social sciences, economics, etc.
- Public and private investment and development corporations including such financial institutions as commercial banks, mortgage institutions and insurance companies.
- Non-governmental professional associations and voluntary social welfare agencies concerned with one or other aspects of disaster prevention and preparedness.

Given the wide range of activities that the Decade will involve, and the need for their effective co-ordination, it is desirable that the responsible national body be chaired by a high-level member of the Government (or his representative) and that they report directly to him.

D. Functions

It is assumed that the main task of each national body will be to plan and co-ordinate activities related to the objective and goals of the Decade, not only those activities that are confined to the country itself but those of regional or global character in which the country decides to participate.

In general, such activities will fall into one or other of the following categories:

1. Identification of hazard zones and hazard assessment;
2. Monitoring, prediction and warning;
3. Short-term protective measures and preparedness;
4. Long-term preventive measures;
5. Land-use and risk management;
6. Public education and information dissemination.

The initial task of the National Committee will be to draft a **WORKPLAN** that identifies appropriate roles for key participants, compatible with the Decade's goals, objectives, structure and required resources.

The Workplan should provide sufficient details to guide both the action agenda and legislative initiatives.

Consistent with the spirit of the International Decade, individuals drawn from all broad-based community groups in regions at risk from natural hazards should be involved in formulating the national agenda. Equally, there should be participation at the regional level to encourage the use of common criteria in defining IDNDR projects.

E. Issues for the Decade and Suggested Priority Activities

Creating the National/Regional Agenda is a complex task because of the rapid evolution in how each hazard is viewed and managed and because of the limited resources available for hazard mitigation. Nonetheless, the extensive hazard research and mitigation activities of recent years have resulted in a host of opportunities for achieving meaningful hazard reduction in the course of the Decade. These

opportunities range from basic and theoretical research to technology and policy implementation, and they affect all stages of the hazard mitigation process, from pre-disaster planning to post-disaster reconstruction.

The following suggests areas of activities, likely participants, and potential benefits, so that those considering the merits of the International Decade for Natural Disaster Reduction will have a sense of its potential breadth and depth.

Prediction, Forecasting and Warnings

Activities pertaining to prediction might include:

- standardization of predictions and warnings for a variety of hazards to assure both credibility and common understanding;
- interaction with the media for proper dissemination of both warning and action advice;
- evaluation of predictions aimed at improving their credibility and value;
- upgrading of the quality of warnings or of their lead time; and
- upgrading monitoring and warning systems technology.

Land-Use Planning

Suggested land-use planning activities are:

- develop risk and hazard maps within 2 years;
- application of the knowledge of various hazards to zoning and other land-use planning techniques;
- coordination of land-use planning among the many government entities involved;
- tying of land-use planning to hazard insurance programmes to assure complementarity, rather than conflicting objectives;
- education and training of local government officials and land-use planners in addressing hazard risks; and

- minimization of risk for critical facilities, including the siting of hospitals, evacuation routes, and hazardous facilities.

Construction

This issue area might include the following activities:

- reducing the vulnerability of existing residential housing;
- improvement of design criteria for earthquake, wind and flood resistance;
- development of means for testing existing structures to determine whether they are hazard prone;
- development of improved retrofit techniques for existing hazard-prone structures;
- improvement of risk-based analysis for buildings and communities;
- improvement of siting and construction techniques for critical facilities;
- training of architects, engineers, and others involved in design and construction in issues associated with natural hazard resistance;
- development of construction techniques with "controllable failure modes" (e.g., for dams and high-rise structures);
- designing consumer/occupant education programmes.

Lifeline Maintenance

Lifeline maintenance activities might include:

- location and vulnerability of critical facilities (hospitals, evacuation routes, evacuation facilities, telecommunications equipment, emergency equipment, and critical utilities such as water, sewer, and energy lines) so as to reduce their exposure to risk;
- prevention or mitigation of the effects of fires following earthquakes;
- procedures for maintaining critical services under disaster conditions;

- rapid damage control, assessment and repair/restoration of systems.

Insurance

Insurance activities might include:

- evaluation of the role of the private insurance industry in fostering hazard-resistant design and construction;
- development of public programmes and their impact on private sector investment in hazard-prone areas;
- incorporation of hazard reduction criteria into aid programmes for such facilities as schools, residents, highways, airports, industrial development facilities and recreation areas;
- improved correlation of insurance costs with likely risks; and
- mandating of insurance as a means for reducing exposure by internalizing the cost of risk into public and private decision-making processes.

Public Awareness and Formal Education

Public awareness education activities might include:

- public knowledge of loss reduction possibilities through comprehensive and integrated multi-hazard and multi-sectoral initiatives.
- information to the general public, as well as decision-makers, and professionals on successes in Loss Reduction Programmes, drawing examples from the Caribbean and relevant international cases such as :-
 - a. Gilbert and Hugo Hurricane Warning
 - b. Jamaica Flood Plain Mapping Project
 - c. Puerto Rico Earthquake and Landslide Mitigation Project
 - d. Cuba Hurricane Reduction
 - e. San Francisco Area Earthquake
 - f. Mexico Earthquake
 - g. Columbia Volcano
- target information of their own risk and vulnerability to potential victims, local organiza-

tions representing potential victims, and the emergency services and resource agencies (including NGOs and the private sector) likely to respond to crisis needs.

- develop systems for dialogue and feedback from the potential victims through workshops, public fora, etc. Utilize mass communications, polling and perception studies methodologies to design appropriate programmes relevant to the social, cultural, political and social context.
- improve networking systems with environmental, community development, science and technology, professional and other interest groups who share similar environmental preservation goals.

Formal Education activities might include:

- development of formal training programmes for hazard reduction specialists, covering not just post-disaster response but also pre-disaster planning relating to land-use, telecommunications, emergency services, infrastructure protection, building codes and hazard mapping;
- introduction of hazard mitigation concepts into coursework in architecture, civil engineering, geology, land-use planning, finance, insurance, and other subjects contributing to the hazard reduction cycle;
- provision for the continuity of research and application efforts after the Decade has elapsed by assuring a reliable supply of trained personnel with advanced university degrees to carry on and strengthen the work of reducing the consequences of natural hazards;
- development of programmes that cut across individual hazards, so that mitigation techniques do not work at cross-purposes and efficiencies in the provision of mitigation services are provided efficiently; and
- development of curricula for primary, secondary and tertiary educational institutions to raise the level of awareness of the general

public about how to plan for and respond to natural hazards.

Post-Disaster Programmes

Suggested post-disaster programme areas are:

- training of emergency search and rescue and medical workers;
- maintenance of the public health; and
- meeting of infrastructure needs.

Social Science

Suggested social science activity areas are:

- understanding of public attitudes in regard to low-probability, high-risk events, such as earthquakes, volcanic eruptions, or tsunamis;
- development of a means for conveying warnings or instructions in an efficient and unambiguous manner while avoiding panic or disbelief;
- identification of similarities and differences in behaviour when confronting various hazards, and application of this knowledge to improve hazard mitigation practice; and
- study of cultural issues that affect the delivery and understanding of messages on hazard risk and the response to this risk.

Intra and Intergovernmental Issues

Governmental issues might include the following:

- strengthening of communication links among officials;
- building of improved links among central and local levels of government;
- assuring that the central government receives inputs from officials at local levels; and
- development of efficient lines of authority for decision making in single and multiple hazard events.

Demonstration Projects

Such demonstration projects might include:

- performance of a multihazard risk assessment for a selected region, including analysis of the reduction in risk offered by various mitigation strategies; such a demonstration project could be followed by disseminating what is learned to other areas of the country, as well as to other nations through the IDNDR framework;
- performance of jointly funded activities among various levels of government and the private sector (e.g., the insurance industry) so that costs are shared equitably and all participants are committed to implementing the results; and
- evaluation of such projects to determine their general validity and potential for broad dissemination.

Basic Research

Basic research activities might include the following:

- identification of key research areas in which potential advances could lead to significant improvements in the effectiveness or efficiency of hazard mitigation;
- identification of key equipment and other facilities needed to continue significant advances in hazard mitigation;
- comparison of research requirements for different hazards to identify common research opportunities;
- identification of skill groups critical to assuring continued advances in hazard science; and
- agreement on suggested roles for the government, universities, and others in supporting research, training, and implementation activities.

Data Handling and Information Flow

Suggested activities are:

- clarification of the role of the media in disseminating pre-disaster warnings and in reporting on post-disaster needs - both in support of the affected community and the general public;
- improvement of data volume and quality via upgraded sensors and reporting mechanisms;
- standardization of data particularly on an international level, to improve their comparability;
- implementation of improved data storage and retrieval; and
- development of enhanced analytical methods to improve prediction.

Regional Activities

Regional activities might be:

- establishment of a Caribbean focal point, as appropriate, to liaise with the United Nations Secretariat, which is responsible for coordinating the International Decade for Natural Disaster Reduction;
- interaction and cooperation among national committees or with counterpart organizations formed by countries participating in the IDNDR;
- communication with foreign and international organizations or institutions representing

the disciplines and professions associated with natural hazards;

- development of a consistent regional monitoring and telecommunication system to provide early warning for common natural hazards;
- development of consistent data base methodologies to improve the accuracy of data collection and to enhance availability;
- comparison of alternative technological, cultural, sociological, geopolitical means for addressing similar hazards;
- dissemination of information from the hazard reduction community in other countries and transmittal throughout the Caribbean region of information offered by other countries; this would include significant research activities and results, publications of broad interest, and announcement of conferences or other special calendar events;
- coordination of cooperative scientific and engineering investigation through appropriate regional agencies.
- promotion of the timely planning of actions to follow the occurrence of a natural disaster and the signing of bilateral and multilateral agreements for implementing these actions; such planning should cover the provision of mutual assistance, the sending or receiving of relief missions, and the performance of post-disaster studies.