

PLANNING AND DEVELOPMENT COLLABORATIVE INTERNATIONAL, INC.

FINAL REPORT

CARIBBEAN DISASTER MITIGATION PROJECT

January 1992

PROVIDES GOVERNMENTS AND PRIVATE CLIENTS IN DEVELOPING COUNTRIES WITH SERVICES IN PLANNING, MANAGEMENT, FINANCE, ECONOMICS AND TRAINING FOR URBAN, RURAL AND REGIONAL DEVELOPMENT

FINAL REPORT

Caribbean Disaster Mitigation Project

Prepared for

**Regional Housing and Urban Development Office/Caribbean
Office of Housing and Urban Programs
United States Agency for International Development**

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PREFACE

Field work for this assignment was done between September 2 and 20, 1991. Team members visited Barbados, Belize, the Dominican Republic, Haiti, Jamaica, St. Kitts, and St. Lucia. Meetings were held with the staff of USAID Missions and public and private officials involved in disaster preparedness and the built environment. Country reports of the field visits are attached in Annex B.

The members of the field team were Robert Olsen, Dan Coleman, Tony Gibbs, Desmond Imbert, David Brower, Mark Ward, O'Neil Cuffe, and David Scott Luther. Team members prepared country reports and activity descriptions that have been incorporated into the draft report that was prepared in Washington, DC during the month of October. Duane Kissick and Peter Rabley prepared the draft final and final reports.

The team appreciates the time and information that was so freely provided by the many officials visited during the assignment. Their input was valuable in gaining an understanding of the problems and issues. The staff of the USAID Missions in Barbados, Belize, the Dominican Republic, Haiti, and Jamaica were very helpful in arranging schedules and providing insights from their own experience and knowledge of the countries. Special appreciation goes to William Gelman, Head RHUDO/CAR, and Keith Ford, Regional Disaster Advisor, for their support and guidance in preparing the report.

LIST OF ACRONYMS

BEB	Belize Electricity Board
Caricom	Caribbean Community
CARILEC	Caribbean Electrical Utility Services Corporation
CARITAS	Catholic Relief Service - Dominican Republic
CAST	College of Arts, Science and Technology
CCEO	Council of Caribbean Engineering Organizations
CDB	Caribbean Development Bank
CDMP	Caribbean Disaster Mitigation Project
Cedois	(National association of PVOs)
CDERA	Caribbean Disaster Emergency Response Agency
CERO	Central Emergency Relief Organisation
CERMES	Centre for Resource Management and Environmental Studies
CIDA	Canadian International Development Agency
CRDC	Caribbean Resource Development Centre
CDRH	Centre de Développement des Ressources Humaines
CUBiC	Caribbean Uniform Building Code
DSU	Disaster Studies Unit (UWI)
GIS	Geographic Information Systems
HEART	Human Employment and Resource Training
IAC	Insurance Association of the Caribbean
IBRD	International Bank for Reconstruction and Development
IDDI	Instituto Dominicano de Desarrollo Integral
IDNDR	International Decade for Natural Disaster Reduction
NGOs	Non Governmental Organizations
OAS	Organization of American States
ODP	Office of Disaster Preparedness
OECS	Organization of Eastern Caribbean States
OFDA	Office of Foreign Disaster Assistance
OFDA LAC	Office of Foreign Disaster Assistance/Latin America and the Caribbean
PAHO	Pan American Health Organization
PCDPPP	Pan Caribbean Disaster Preparedness & Prevention Project
PILs	Project Implementation Letters
PMU	Project Management Unit
PVOs	Private Voluntary Organizations
RDO	Regional Development Office
RHUDO/CAR	Regional Housing and Urban Development Office for the Caribbean
UNCHS	United Nations Centre for Human Settlements
UNDP	United Nations Development Project
UNDRO	United Nations Disaster Relief Organisation
UWI	University of the West Indies

Caribbean Disaster Mitigation Project (CDMP) Executive Summary

INTRODUCTION

The island nations of the Caribbean are particularly vulnerable to natural disasters such as hurricanes, earthquakes, and floods because of their frequency and breadth, and the physical and economic devastation they wreak. Hurricanes David and Frederick, for example, caused about \$800 million in physical damage to homes and infrastructure and left 100,000 families homeless. Economically, the damage caused by Hurricane Hugo was more than five times the annual GDP of Montserrat.

Unfortunately, natural disasters require extremely long recovery periods due to the fragile physical and economic environment of the Caribbean. During such periods there is not only a loss of income, but a diversion of capital into reconstruction that might have been used for other social or economic purposes.

Natural disasters cannot be prevented but their impact and severity can be lessened or mitigated. Mitigation can reduce the injury and destruction that such disasters inflict on human lives, the built environment, and the general economy. Disaster mitigation differs from, but is complementary to, disaster response and relief efforts.

An indication of the need for disaster mitigation to reduce future risk is the withdrawal of re-insurance companies from the Caribbean because of the level of disaster-induced damage. As a result, regional insurance companies are having difficulty obtaining such coverage, insurance rates are rising, and a negative investment climate is developing which could hinder future economic development efforts. Thus, there is an increasing need for an appropriate and effective response.

While the Caribbean is generally vulnerable to natural hazards, the degree of risk depends on the type, location, and density of the area concerned. Coastal settlements and tourism sites are most notably at risk from natural disasters and could directly benefit from a mitigation program.

Mitigation measures are either structural or non-structural in nature. Structural mitigation involves physical construction—such as seawalls and construction techniques—to help withstand the effects of natural hazards. Non-structural measures involve policy and management practices that reduce risk related to the type, location, and density of development.

OBJECTIVES AND PRINCIPLES OF THE PROJECT

The Caribbean Disaster Mitigation Project (CDMP) was formulated by the Regional Housing and Urban Development Office/Caribbean (RHUDO/CAR) with support from the Office of Foreign Disaster Assistance. The purpose of the CDMP is to provide an avenue and resources for Caribbean entities, USAID missions, and potentially other donors, to support practical and self-sustaining disaster mitigation initiatives in the areas of urban infrastructure, lifeline facilities and shelter.

The key objective of the CDMP is to establish sustainable mechanisms for disaster mitigation which measurably lessen loss of life, physical and economic damage, and reduce the length of disaster recovery. The guiding principles of the CDMP are:

- To complement previous Caribbean initiatives in disaster preparedness and relief.
- To utilize and reinforce existing regional and country-wide experience.
- To institutionalize self-sustaining disaster mitigation practices with emphasis on private and non-governmental groups in the development process—investors, architects and engineers, builders, suppliers, insurers, lending institutions, utilities, and community groups.
- To provide a vehicle for training and information dissemination which will help shape behavior among these key actors and users.
- To support mutually beneficial linkages between public and private entities in the United States and the Caribbean which are directly concerned with disaster mitigation issues, U.S. reinsurers, the U.S. Hurricane Center, the Building Officials and Code Administration, and other public and private groups.
- To selectively support, through a well developed monitoring and evaluation system, genuine interest and performance-oriented mitigation initiatives.

All project components shall build on existing indigenous activities and make full use of human resources from the region.

ELEMENTS OF THE CDMP

A. Regional Services

A recommended component of the project will involve the establishment of a project management unit, information center, and regional training program for the provision of up-to-date and reliable information to support disaster mitigation. The unit would carry out the following activities:

- Evaluate solicited and unsolicited disaster mitigation proposals for recommended funding.
- Subcontract for and supervise CDMP programs.
- Develop indicators for performance monitoring and evaluation.

- **Collect and provide relevant data on the impact of previous disasters and past and ongoing mitigation initiatives.**
- **Serve as an information clearinghouse for the project.**

RHUDO/CAR will support the project by directing a regional training program.

B. The Built Environment

Both structural and non-structural measures are appropriate to mitigate damage to the built environment. Key programmatic themes include:

1. Utilities and Lifeline Facilities: Risk Audits

- **Mitigation support for utilities and infrastructure.**

Risk audits and mitigation studies for key infrastructure facilities—power, water supply, and communications.

Initially, risk audits, retro-fitting programs, and training will be executed for 10 electrical utilities throughout the Caribbean.

- **"Lifeline" programs for critical facilities.**

Central schools, central hospitals, police and security facilities need to be designed to withstand the effects of disasters.

Initially, hospitals in five countries will benefit from risk audits, development of improvement programs, and training.

2. Shelter

- **Improved building practices and codes.**

Wide regional promotion and training to instill improved building practices among professionals, developers, builders, and community groups.

Evaluation, testing, and revision of building codes; integration with measures to improve insurance underwriting and improved siting.

Market analysis and promotion of improved building technology and materials.

Improved insurance underwriting schemes, rate structures, and inspection to encourage builders and homeowners to adopt better selected sites and disaster resistant building practices.

Curriculum development, incentive-based retraining, specialized seminars, workshops and short courses, community education and information dissemination—videos, radio and television broadcasts, handbooks, leaflets and other materials for dissemination.

The program will be executed throughout the Caribbean over the life of the project.

C. Risk Mapping and GIS Services

Improved site selection needs to become "common practice" among the key actors in site development. These practices, in turn, need to be reinforced by public sector planning and enforcement mechanisms. Elements will include:

- GIS techniques to identify areas subject to natural hazards; e.g. wind, flooding, storm surges.
- Hazard mapping - publicly accessible risk assessment maps, to support improved planning and siting by public and private groups, and underwriting for insurance and lending institutions.
- Technical assistance and training in the use of Geographic Information Systems and modelling techniques.

Initial demonstration programs will be launched in Belize City and Portmore, Jamaica, to be followed by two additional pilot programs.

D. Disaster Mitigation Planning and Program Development

- **Establishment of Disaster Coordination Committees.**
Mitigation planning and coordination by public agencies, private businesses, community groups, and NGOs.
- **Seminars and workshops.**
 - Interagency planning and cooperation
 - Mitigation experience and problem identification
 - Mitigation techniques and action planning
- **Program development and implementation.**
An initial demonstration program will be launched in the Dominican Republic.

Summary of CDMP Components and Programs			
Components/ Programs	Activities	Potential Implement- ing Agencies	Outputs/Indicators
A. Regional Services			
a. Project management unit/Information Center	a. Subcontracts management, monitoring, database development, info. dissemination	a. OAS U.S. Contractor UWI	Direct Project Outputs a. Evaluation of proposals, 8 subcontracts, database and monitoring system b. Baseline data and indicators c. 15 regional training programs Intermediate Outputs a. Adoption of mitigation and monitoring by executing agencies b. Adoption of indicators by agencies c. Adoption of mitigation technique Direct Project Beneficiaries a. Executing agencies, respective assets b. Executing agencies, respective assets c. Executing agencies, trainees, related assets
b. Baseline data and indicators	b. Collection of data standardization	b. CDERA UWI	
c. RHUDO regional training	c. Training program development, execution	c. RHUDO/CAR	
B. Built Environment			
1. Utilities and Lifelines Facilities: Risk Audits			
a. Electrical Utilities	a. Risk audits, mitigation program development, manuals, and training	a. CARILEC	Direct Project Outputs a. Up to 10 risk audits for electrical utilities; key staff of up to 10 utilities trained b. Up to 20 risk audits for hospitals in 5 countries, up to 20 administrators and key staff trained Intermediate Outputs a. Electrical utilities adopt risk audits as SOP, other utilities follow suit b. Hospitals adopt risk audits as SOP, other lifeline facilities follow suit Direct Project Beneficiaries a.&b. Facilities and respective communities at large
b. Hospitals	b. <i>idem</i>	b. PAHO	

Summary of CDMP Components and Programs			
Components/ Programs	Activities	Potential Implement- ing Agencies	Outputs/Indicators
2. Shelter			
a. Building practices and codes	a. Review of current practices and codes; identify needed changes, code revision; training program development and execution	a. CCEO Engineering Faculty, CAST-UWI	Direct Project Outputs a. Revised codes, 32 training workshops, training programs and materials b. Revised underwriting standards and rate structure, 16 training workshops Intermediate Impacts a. Improved permitting and inspecting procedures b. Underwriting better reflects risk Direct Beneficiary Impact a. Public and productive assets at large b. Public and productive assets at large
b. Insurance underwriting	b. Review of underwriting and inspection, revisions, training program development and execution	b. IAC - Insurance Association of Caribbean	
C. Risk Mapping and Geographic Information Systems (GIS): Pilot Programs			
a. Belize City, Belize	a. Base mapping, disaster impact assessment, risk mapping and GIS applications training, info. dissemination	a. CERMES	Direct Project Outputs a. Risk maps - Belize City, 3 training workshops, handbooks b. Risk maps, geographic underwriting system, 3 training workshops, handbooks Intermediate Outputs a. Risk mapping adopted by agencies as SOP; public-private decision-makers make use of data to reduce risk b. <i>idem</i> Direct Beneficiary Impact a. Settlement population and productive assets at large b. <i>idem</i>
b. Portmore, Jamaica	b. <i>idem</i> ; sea rise model geographic underwriting system design	b. GOJ Department of Land Titling and Surveying	
D. Disaster Mitigation Planning and Program Development: Pilot Programs			
Dominican Republic	Workshops devoted to coordination and planning, pilot project identification, execution	IDDI (Instituto Dominicano de Desarrollo Integral)	Direct Project Outputs 4 workshops, 3 pilot projects Intermediate Impacts Improved disaster mitigation coordination and planning; adoption of mitigation procedures

CDMP OPERATIONAL AND MANAGEMENT CONSIDERATIONS

Operational and management options for the CDMP are to be discussed among all concerned parties before a final decision is made. Regardless of the option selected, it is anticipated that OFDA will provide project funding, and RHUDO/CAR will provide support for training, monitoring, and evaluation. In addition, a Project Steering Committee composed of representative public and private groups will be formed.

Management Options for Implementation

- **Option 1: Contracting for project components by RHUDO or Missions.**
 - OFDA allotment of project funds to RHUDO/CAR.
 - RHUDO/CAR sub-allotments to cooperating missions.
 - RHUDO/CAR contracts or grants to local/regional organizations for the execution of project programs.

This option would provide the RHUDO and Missions with an opportunity for direct project involvement and supervision, but it would require significant staff and resource commitments for administering numerous individual contracts and grants. Three people would be required to manage activities and claims would be made on Mission Controller and Executive Office staffs.

- **Option 2: Contracting for Project Management via PRE/H.**
 - OFDA allotment of project funds to the Office of Housing and Urban Programs (PRE/H).
 - PRE/H contracting of a Project Management Unit (PMU).
 - Evaluation of mitigation proposals, subcontracting, and grants to U.S. and Caribbean organizations for implementation of project programs.
 - Advisory/field oversight by USAID missions.

This option places the burden of contract administration on PRE/H. The PMU provides a vehicle for central management and coordination without requiring major staff and resource commitments from USAID missions and RHUDO/CAR. Technical and contract oversight, however, may be too far removed from field operations, and the administrative budget would be increased, perhaps substantially. It would be a centrally managed enterprise similar to projects such as WASH.

- **Option 3: RHUDO Contracted Project Management Unit.**
 - OFDA allotment of project funds to RHUDO/CAR.
 - Sub-allotments by RHUDO/CAR for special programs by USAID missions.
 - RHUDO contracting of a PMU; subcontracts and grants to U.S. and Caribbean organizations for implementation of project components and activities.

This option would place a lesser administrative burden on RHUDO/CAR and USAID missions than Option 1, yet provide an avenue for regional and country control over project

components and activities. Also, costs would probably be less as the incremental increase in burden on Missions would not be great, and some costs such as for contracting services would be absorbed by Missions in the region.

Several options exist for project management unit services: a cooperative agreement with a multi-lateral organization in the region; grants or contracts with a US private voluntary organization or university; or, contract with a US consulting firm. All modes have been used by USAID.

Execution of Project Components and Activities

It is anticipated that approximately US\$1 million per year will be made available for project activities over a five year period. It is the intention of the project to utilize the services of several qualified bodies in the Caribbean for the execution of project components and programs. Some potential executing agencies for CDMP programs include:

A. Regional Services

- **PMU/Information Center**
 - Organization of American States
 - University of the West Indies (UWI)
 - U.S. contractor
 - Caribbean Disaster Emergency Response Agency (CDERA) - Baseline data and indicators
 - RHUDO/CAR - Regional training program

B. The Built Environment

- **Utilities and Lifeline Facilities: Risk Audits**
 - Caribbean Electric Utility Services Corporation (CARILEC)
 - (Similar groups in Water Supply and Communications)
 - Pan American Health Organization (PAHO)
- **Improved Building Practices**
 - Council of Caribbean Engineering Organizations (CCEO)
 - UWI
- **Insurance Underwriting**
 - Insurance Association of the Caribbean (IAC)

C. Mapping and GIS Services

- Center for Resource Management and Environmental Studies (CERMES)
- Office of Disaster Studies
- UWI

D. Disaster Mitigation Planning and Program Development

- Instituto Dominicano de Desarrollo Integral (IDDI)

The CMDP, through the regional training program, will foster linkages between these groups and similar U.S. public and private parties for service delivery and transfer of practices and methodologies.

E. Monitoring and Evaluation

Monitoring and evaluation will be the responsibility of RHUDO/CAR. However, the PMU will monitor ongoing programs as part of its management function. It will be assisted in this regard by a special program to establish baseline data and performance indicators to be launched early in the project. These shall be organized along the following lines:

- Direct project outputs (e.g., number of training programs held)
- Intermediate impacts of project activities (such as changes in policy and procedures)
- Direct beneficiary impact (population, productive assets protected).

CHAPTER 1

DISASTER MITIGATION IN THE CARIBBEAN

MITIGATION

1.1 INTRODUCTION

The Caribbean Region is extremely vulnerable to natural disasters; hurricanes, floods, landslides, earthquakes, tsunamis (great sea waves caused by submarine earthquakes or volcanic eruptions), and volcanic eruptions. The history of the region is replete with massive destruction caused by each of them.

There are many examples of the impact of natural disasters on the people and economies of the small nations of the Caribbean. The Dominican Republic suffered a major loss of life and massive damage to property when Hurricanes David and Frederick came ashore within a five day period in September of 1979. These two hurricanes brought winds of 150 MPH causing massive flooding and damage which so devastated the country that it still has not completely recovered.

Assessment of the damage and losses from Hurricanes David and Frederick illustrate the extent of devastation that disasters wreak: the physical damage alone has been estimated at \$800 million. In addition to leaving 100,000 families homeless, hundreds of thousands of other homes were damaged. Some 2,000 km of roads were badly damaged while 58 bridges were completely destroyed. Over 2,000 people were killed, with thousands more hurt. A total of 1.2 million people or 30 percent of the population were directly affected by these two hurricanes.

Hurricane Gilbert in 1988 was particularly destructive to Jamaica and Haiti. In Jamaica 49 people were killed and more than 800,000 people were affected by Gilbert. The estimated economic loss was approximately \$1 billion, yet Jamaica received just over \$100 million in international assistance. The country is still struggling to recover from the impact several years later.

Hurricane Gilbert caused an estimated \$92 million damage in Haiti, killed 54 people, and affected 50,000 people. A total of \$3.3 million in international assistance was provided to Haiti after the disaster. In both cases only ten and three percent, respectively, of the total cost of the disaster was offset by outside financial assistance. In general, international assistance to countries following a disaster is only a fraction of the total physical and economic loss inflicted. As a result, after a disaster, scarce national resources that could otherwise be spent for development purposes must be used for reconstruction.

The impact of a major disaster is greater on smaller and less developed islands, since their entire economies may be impacted. For instance, in Montserrat the damage from Hurricane Hugo was more than five times the Gross Domestic Product (GDP), while damage to Jamaica caused by Hurricane Gilbert was only one third of GDP. Thus, mitigation is particularly important in these countries.

Human lives and the built environment are always at risk when they are within an area that is vulnerable to a natural hazard. However, the degree of risk depends in large part on the type and location of the built environment. For example, low areas adjacent to gullies, streams, and rivers are much more prone to flooding than are higher grounds; coastal plains and wetlands are much more vulnerable to storm surge and tsunamis than are firmer, higher grounds.

If the population of a country is heavily concentrated in areas of existing high hazard risk; such as coastal and low lying areas, then the potential damage to that population and to the country is substantial. Since many of the tourism and urban centers in the Caribbean are located in coastal areas that are more vulnerable to disasters, increasing numbers of people and investment are at higher risks as urban places expand.

By the same token, if the development that is fundamental to the economy of a country is concentrated in high hazard areas, the economy of that country is more at risk than if it were located in safer areas. The economic gains that have been made through many years of development assistance can be wiped out in a single event. Therefore, it is important that disaster mitigation techniques such as risk audits and hazard mapping be utilized to reduce such risk.

Recent natural disasters combined with a lack of mitigation procedures has lead several leading European and U.S. re-insurance agencies to threaten to withdraw their coverage for the region. In the case of one large U.S. insurer the threat was not hollow; they have indeed withdrawn. As a result, the local insurance industry is faced with a situation in which it must improve its assessment methods and techniques in order to provide a true estimate of potential risk and exposure. In the meantime higher rates combined with loss deductibles of two percent have been introduced. On the positive side there is now considerable support from the insurance sector for a mitigation project, and in some cases, financial assistance has been offered. The loss of re-insurance coverage to the Caribbean would have a devastating impact on the investment climate and could stall any new private development plans.

Thus, disaster mitigation is particularly relevant to the Caribbean. Without it, economic and social development cannot be suitably sustained.

1.2 THE CONCEPT OF DISASTER MITIGATION

Natural hazards cannot be prevented. What can be mitigated is the injury and destruction that they inflict on human lives, the built environment, and the economy. The magnitude of a disaster depends on two factors: the magnitude of the hazardous event itself and the magnitude of the risk. While a significant hurricane may cause little or no damage if it stays at sea,

a relatively minor hurricane may cause significant damage if it strikes an intensely developed area.

Through experience and study, we know a great deal about these phenomena, how they function and how they affect development of different types in various locations. This allows us to have some control over the way the event will affect us and our environment. This is called mitigation. The dictionary definition of mitigation is: to make less severe; to moderate.

1.2.1 Approaches to Mitigation

While post-disaster relief is generally well understood, three types of planning activities have been associated with reducing the negative effects of a disaster before it occurs:

- **Disaster Preparedness** is planning intended to cope with disaster situations or similar emergencies that cannot be avoided. It seeks to minimize loss of life and damage and to organize and facilitate timely, effective search and rescue, relief, provision of shelter and rehabilitation. Examples of preparedness activities include forecasting, warning, and organizational and operational planning.
- **Disaster Prevention** focuses on the hazard that causes the disaster and tries to eliminate its effects, for example, by building embankments to control flooding.
- **Disaster Mitigation** is aimed at reducing the destruction associated with disasters including their economic impact. Mitigation techniques include risk management and promotion of disaster resistant construction.

For the purposes of the Caribbean Disaster Mitigation Project (CDMP), mitigation will also cover some of the areas of prevention and preparedness: design of devices to control damage and education, public awareness, and training.

1.2.2 The Need for Disaster Mitigation Policy

A disaster mitigation policy is needed to protect public and private investment and welfare. When crops, agricultural lands, housing, industry, roads, bridges, schools, hospitals, and other country infrastructure are damaged, there is not only a loss of income and service, but a diversion of resources into redevelopment and reconstruction. Policy makers and economic planners should establish disaster mitigation policies and programs to help offset recurring physical and economic losses. There are two forms of disaster mitigation: structural and non-structural.

Structural mitigation refers to the construction of devices such as sea walls, bulkheads, and revetments that will protect development from a storm surge resulting from a hurricane; the construction of drainage ways, culverts, and bridges that permit floodwater to dissipate without inflicting damage; and the use of construction techniques and practices to construct buildings to withstand the onslaught of wind and water.

Structural measures are often used to remedy already existing situations, e.g., to protect an important facility located in a hazardous area, or in new construction in areas that are known

to be hazardous. In each case, design techniques are used to try to insure that the structures will be able to withstand the force of the hazard.

Non-structural mitigation refers to public policy, usually risk management, that influences the type, location, and density of development—guiding it so that it occurs in less hazardous areas. Non-structural measures are most often used to lessen the risk of disaster by discouraging new development in high hazard areas and, in cases, encouraging already existing development to move to less hazardous areas.

Both approaches can be effective, but, because they are designed to simply avoid risk, non-structural approaches are generally more cost effective and have much broader potential impact. For example, it is far cheaper to build a facility in a safe place than it is to build a sea wall to protect a facility that has been built in a hazardous area.

Information is a critical input into mitigation policy. For example, in order for planning agencies and insurance groups to plan strategies and assess risk they will need to know where the areas of high risk are, who and what investment is currently located there, and what the potential cost of a disaster will be given these factors.

It is important for agencies and groups to be presented with viable alternatives. For example, if a proposed site for development is found to be in an area of high risk, is there an alternative location with lesser risk? If so, can that site be identified and developed? If not, then what measures **must** be enacted to afford the greatest protection to that development? In other words, if a high risk site is selected then insurance premiums should be higher, more stringent building codes should be enforced, and more rigorous construction techniques employed.

The impact and effect of disasters, especially for formal sector construction, can be mitigated through better pricing of insurance risk. Therefore, mitigation policy is as much driven by the private sector as it is by a land use and building codes regulatory framework established by public policy. More precise pricing policies by insurers should have an impact on building and siting decisions. It is hoped that the CDMP will provide an innovative approach to mitigation through a flexible framework of private and public sector cooperation, especially on the utilization of appropriate codes, training of builders, and incentives such as insurance pricing.

1.3 THE CARIBBEAN DISASTER MITIGATION PROJECT

1.3.1 Background and Purpose

The Caribbean Disaster Mitigation Project (CDMP) was formulated as part of a collaborative effort between the Office of Housing and Urban Programs (PRE/H) and the Office of Foreign Disaster Assistance (OFDA). The CDMP was conceived and developed by the Caribbean Regional Housing and Urban Development Office (RHUDO/CAR) with the support of PRE/H and OFDA. RHUDO/CAR has worked closely with USAID Missions in Barbados

(for the Eastern Caribbean), Belize, the Dominican Republic, Haiti, and Jamaica on the design of the project. These Missions have all expressed interest in the project.

The purpose of the CDMP is to provide an avenue and resources for Caribbean entities, USAID missions, and potentially other donors, to support practical and self sustaining disaster mitigation initiatives in the areas of urban infrastructure, lifeline facilities, and shelter.

The CDMP is designed to be responsive to the differing geographic, demographic, social, and economic characteristics of the Caribbean nations. It is planned for a period of five years with funding from OFDA. This report provides a basis for discussion among all concerned parties particularly with regard to project implementation.

1.3.2 Project Objectives and Guiding Principles

The key objective of the CDMP is to establish sustainable mechanisms for disaster mitigation which measurably lessen loss of life and physical and economic damage and reduce the length of disaster recovery. Mechanisms will be established to solicit, review, and fund mitigation proposals and to monitor implementation for effectiveness and sustainability. Non-performing initiatives will be terminated and funds made available for other proposals. Special effort will be made to engage the private sector actors (e.g. businesses, investors, and insurance companies) that have a vested interest in adopting mitigation techniques.

The guiding principles of the CDMP are:

- To complement previous and ongoing Caribbean initiatives in disaster prevention, preparedness, and relief.
- To build on existing indigenous activities in disaster mitigation and make full use of human resources from the region.
- To transfer appropriate disaster mitigation technology from foreign sites.
- To help institutionalize self-sustaining and self-promoting disaster mitigation practices with an emphasis on private and non-governmental groups in the development process.
- To provide a vehicle for training and information dissemination which will help shape behavior among these key actors and users.
- To selectively support, through a well developed monitoring and evaluation system, genuine interest and performance-oriented mitigation initiatives.
- To develop a consistent and accurate data bank and resources that relate to all ongoing disaster activities and facilitate information dissemination.
- To facilitate regional cooperation through shared resources not only among government groups and donors but also among utilities, insurers, banks, and commercial enterprise.

As has been previously illustrated, natural disasters in the Caribbean have taken a high toll in life and economic loss. The protection of life, economic base, and the improved ability of

countries to recover rapidly from a disaster with minimum disruption of the country's economy as a result of mitigation measures are the key concerns of the CDMP.

The CDMP can help bring about changes in development behavior. This will require integration of mitigation policy and techniques into other projects and general day-to-day activities. If an appreciation of the benefits of mitigation are gained by people and included in regular routines, then the project will have a lasting impact. Working with local public and private-sector organizations, community groups, and individuals can help to make disaster mitigation part of ongoing practices.

A review of the RHUDO proposal in AID/W by several economists engaged in the field indicated that the proposal represents a cost effective approach to mitigation and particularly encouraged the importance of monitoring and evaluation to improve targeting of activities over time.

There are numerous regional and country specific organizations in the Caribbean which could assist in project implementation. Whenever possible, such regional groups will be linked with similar foreign organizations in execution of the CDMP programs. This will provide an opportunity for skills transfer and lasting impact.

Mutually beneficial linkages will be established between public and private entities in the United States and the Caribbean which are directly concerned with disaster mitigation issues. Such groups may include: the U.S. Hurricane Center, the Reinsurance Association of America, U.S. universities, the Building Officials and Code Administration, and other interested private or public sector groups together with counterparts in the region. Linkage will be arranged through the proposed regional training program.

Particular emphasis should be given to the coordination of mitigation activities within the objectives and programs of the USAID Missions. The CDMP can help to protect USAID investments and development gains. Furthermore, the CDMP is closely allied with institutions in the region and Agency and mission interests in natural resources and environment, private sector development and other key policy thrusts.

1.4 COMPONENTS

Project components represent the principal themes to be addressed by the CDMP. Programs are those activities to be undertaken in the context of each project component.

As noted above the impact of disasters varies considerably depending on the size of the country and the diversity of its economy. A project activity that works well in one country may not be as effective in the differing conditions of another country. As a result, specific project components will be tailored to that country and its special situation while other components will be geared to the entire region.

The countries that have expressed interest in the project are listed below. A key concept of the CDMP is that only those agencies or countries that express a definitive interest to progress with mitigation policies will be actively supported. This will ensure that development resources will be maximized and that sustainability is likely after the initial five years.

Project Countries:

Antigua & Barbuda
Barbados
Belize
Dominica
Dominican Republic

Grenada
Jamaica
St. Kitts & Nevis
St. Lucia
St. Vincent

This group of nations breaks naturally into separate geographic entities. The first are the small island nations that are grouped in the eastern Caribbean and include Antigua and Barbuda, Barbados, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, and St. Vincent. The outer chain of islands are low lying, relatively arid, and of coral formation while those in the inner chain are hilly, volcanic, and receive heavy rainfall. The economies of this group are marked by small domestic markets, vulnerability to external events, and heavy dependence on foreign trade. Agriculture and tourism are the most important sectors of their economies. While there is no USAID program in Barbados, Agency activities in these OECS countries are managed by RDO/C located in Barbados.

The second group are the larger island nations such as the Dominican Republic, Haiti, and Jamaica, which are located in the central Caribbean. The terrain of the islands is mountainous with varied climatic conditions due to their size. While these countries are physically similar, they are quite different in culture, historical background, and language. Their economies are more diversified than the those of the smaller islands, but they are still heavily dependent on agriculture for employment and exports. Haiti is the most impoverished of the three.

As a result of recent coups and political unrest in Haiti, USAID has suspended its activities in the country. Haiti was visited by the project team prior to the coup and potential activities were identified. However, no programs are anticipated there unless AID re-initiates operations in Haiti.

The final group is represented by Belize which is the only mainland nation presently included in the project. It has the lowest population density in the Caribbean. About one-half of its total population is located in the low lying coastal zone. The interior mountainous areas are sparsely populated. Given Belize's small domestic market and its lack of capital, it has limited industrial development. As a result, the country's economy and exports are heavily dependent on agriculture. Belize is among the most vulnerable countries due to its enormous low lying coastal zone and geographic location.

Several CDMP components have been identified, with a number of programs included under each component as outlined in Figure 1.1. Programs are discussed in more detail in Chapter 3.

Figure 1.1. Project Components and Programs	
Regional Services	
Programs:	Project Management Unit/Information Center Database Development and Indicators Regional Training Program
The Built Environment	
Component:	Utilities and Lifeline Facilities: Risk Audits
Programs:	Electrical Utilities Hospitals
Component:	Shelter
Programs:	Building Practices and Codes Insurance Underwriting
Risk Mapping and GIS	
Programs:	Belize Jamaica
Disaster Mitigation Planning and Program Development	
Program:	Dominican Republic

1.5 REGIONAL SERVICES

A proposed project management unit will manage and monitor the project. It will subcontract for services, coordinate findings, inventory on-going mitigation initiatives, maintain a CDMP database and information clearinghouse, develop indicators for monitoring and evaluation, and support the regional training program to be managed by RHUDO/CAR. In addition, the PMU will evaluate solicited and unsolicited disaster mitigation proposals for possible funding.

Training and "twinning" arrangements with appropriate U.S. organizations are a major element of the CDMP and its programs. RHUDO/CAR will coordinate the regional program, including an overview of material, curricula, and activities. Early in the project a planning workshop will be held, involving OFDA/W, PRE/H, RHUDO/CAR, and OFDA LAC's Regional Adviser to develop training policy and guidelines for the project.

1.6 THE BUILT ENVIRONMENT

1.6.1 Utilities and Lifeline Facilities: Risk Audits

Activities in this program will be directed at strengthening existing installations and encouraging proper construction of new facilities. Beneficiary agencies would include public and private utility companies providing electricity, telecommunications, and water and lifeline facilities. They would be provided with technical assistance to prepare risk audits or assessments of their facilities along with a program and cost estimates for upgrading.

While retrofitting programs will be developed, the CDMP will not fund capital improvements. Experience shows that mitigation improvements need not be expensive. Such improvements may be financed internally or by external sources such as the Caribbean Development Bank (CDB), private banks, etc. This component would help insure that services that are essential to the economy and public welfare would be restored in a shorter time, and at less cost than if no disaster mitigating measures had been taken.

Critical "lifeline" facilities such as central hospitals, shelters and police stations must remain operational after a disaster strikes. This project will provide a vehicle for identifying critical lifeline facilities, assessing their ability to withstand the effects of a disaster, and elaborating needed improvement programs. As noted above, the CDMP would not provide capital funding for these improvements.

1.6.2 Shelter: Building Practices and Codes

This component will emphasize a change in building practices, adoption of revised codes, and use of improved technologies and materials. Changes in practice involve the difficult tasks of re-orientating behavior. This requires that all parties in the building community (government operations, private contractors, architects, engineers, planners, suppliers, and small tradesman in the informal sector) be provided training on improved technology to build better structures. Realistically, the only way to have active participation is to ensure that positive and negative incentives exist for everyone. This will require information exchange, training, and enforcement.

Presently, building codes are largely ignored. The reasons for this are complex and multi-fold. In any event, inconsistent application of building codes results in greater vulnerability to disasters and greater exposure for the insurance industry and financial sector. This component will work with financial institutions, insurance carriers, and officials concerned with the Caribbean Uniform Building Code (CUBiC) to determine to what extent the Code should reflect differences in risk depending upon location and construction characteristics. The insurance and financial institutions may also provide a vehicle for routine building inspection.

If the revised codes are to be implemented, they must be perceived by the users as appropriate and beneficial, and they must be enforced. Training programs will assist in each case. With respect to enforcement, it will be necessary to enhance local inspection capacity, reform

permit processes, fees, inspection, and sanctions. Cooperation would also be useful between public sector and private sector parties on common compliance concerns.

Greater use of improved building technology and materials will require training and information dissemination. It will also require support for marketing of devices such as hurricane straps. Emphasis will be placed on curriculum development and training in the building trades. There are serious concerns about the quality of new construction in the Caribbean—particularly in the informal housing communities. Improved shelter quality in these settlements is essential if the effects of disasters in these areas are to be mitigated.

There will also be specific training activities aimed at increasing public awareness of the importance and advantages of disaster mitigation. This would include workshops and short courses, videos, radio and television broadcasts, handbooks, leaflets, and other materials for dissemination.

It is becoming much more difficult to obtain re-insurance for the Caribbean countries in the international market. Thus, insurance underwriting, inspection, and rate structures will be established which encourage developers to select less hazardous sites, to adopt improved structural design, construction techniques, and materials.

1.7 RISK MAPPING AND GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Risk assessment and mapping information needs to become available to the key actors in site development—the public sector, developers, engineers, builders, financiers, insurers, and land users—if behavior is to change and human life and investments are to be protected.

The main objective of this component is to locate high risk areas and provide timely and accurate risk and hazard information. This information will help to discourage development in high risk areas and identify alternative, less hazardous sites. This component will also offer tools such as Geographical Information Systems (GIS) and modelling which will allow data to be created, manipulated and displayed in graphic or tabular form.

Where appropriate, either new mapping will be done or existing maps will be upgraded or used to highlight the degree of disaster exposure to high winds, flooding, storm surges, and tsunamis by location. Coastal areas, due to their natural vulnerability and dense population centers, will be areas of specific concern.

Such information may also be used to help establish appropriate building and construction standards in high risk areas as well as insurance rate structures. Finally, since most hazard prone areas are fragile environments, this activity, if it discourages development in those areas, should have substantial ecological payoffs as well.

1.8 DISASTER MITIGATION PLANNING AND PROGRAM DEVELOPMENT

Coordination of parties involved in disaster planning will be fostered through this component (Civil Defense, Public Works, Health and Education, Utilities, Chamber of Commerce, Red Cross, private businesses, community groups, and NGOs). This will help to reduce duplication of effort, funds, and data and help to increase the effectiveness of all ongoing projects. It will also help to promote long term programs such as the current United Nations initiative to make the 1990s the International Decade for Natural Disaster Reduction (IDNDR).

Activities may involve:

- Establishment of National Disaster Mitigation Coordination Committees
- Seminars and workshops for numerous public and private groups on:
 - Interagency planning and cooperation
 - Mitigation experience and problem identification
 - Mitigation techniques
 - Action planning and pilot project identification.

The Dominican Republic will serve as the first pilot country for this program as it has expressed particular interest in this component. However, this component can be applied to all other countries as well.

1.9 PROJECT COSTS

The CDMP Project for the Caribbean is programmed for five years at a level of funding of approximately US\$1 million per year or a total of US\$5 million. Costs have been estimated on the basis of the initial pilot projects and extrapolated over the five year project period on the presumption that additional projects will come on stream.

It is proposed that the project have a two year rolling budget with an annual review of the project activities and preparation of a new two year budget. This will give the flexibility needed to adjust funding for activities and to fund new activities that meet the future priorities of USAID. The proposed level of funding for the five years, not including contingencies, is:

Figure 1.2. Five Year Project Budget							
Component/Program	Year 1	Year 2	Year 3	Year 4	Year 5	Total	% of Total
Regional Services							
PMU/Information Center	278,000	278,000	278,000	278,000	278,000	1,390,000	26.4
Baseline Data and Indicators	220,000	--	--	--	--	220,000	4.2
RHUDO/Regional training	110,000	110,000	110,000	110,000	110,000	550,000	10.4
Utilities and Lifeline Facilities							
Electrical Utilities	60,000	125,000	125,000	125,000	--	435,000	8.3
Hospitals	--	75,000	75,000	75,000	--	225,000	4.3
Shelter							
Building Practices & Codes	225,000	225,000	225,000	225,000	225,000	1,125,000	21.3
Insurance Underwriting	--	100,000	130,000	100,000	--	330,000	6.3
Risk Mapping/GIS							
Pilot Programs	150,000	150,000	150,000	150,000	50,000	650,000	12.3
Disaster Mitigation Planning/ Program Development							
Pilot Programs	50,000	100,000	150,000	50,000	--	350,000	6.6
TOTAL	1,093,000	1,163,000	1,243,000	1,113,000	663,000	5,275,000	100.1

Note: Percentage total does not add due to rounding.

1.10 EVALUATION

After Year 2 an evaluation will be conducted. Programs will be continued only if they are deemed successful. While a formal evaluation will take place at the end of Year 2, all components will be subject to ongoing performance monitoring. As noted above, a special program will be launched early in the project to establish baseline data and indicators. These will involve direct project outputs, intermediate impacts, and direct beneficiaries.

CHAPTER 2

DISASTER MITIGATION PROGRAMS

This chapter outlines an implementation program, describes project programs, suggests possible implementing organizations; and provides guidelines for evaluation.

2.1 CRITERIA FOR PROGRAM SELECTION

The selection of program activities was guided by the following criteria:

- **Local Interest and Support.** For activities to be successful, there must be strong commitment from local public and private agencies involved and USAID Missions. The degree of interest and support will be an important factor in deciding which country programs are to be launched and sustained.
- **Impact/Results.** The project will emphasize practical problem solving. While studies such as risk assessments and audits will be conducted, they will be geared towards concrete actions to mitigate the effects of disaster. The indicators discussed in this chapter are designed to measure the performance of the CDMP initiatives. To further this goal, a special program has been established for the elaboration of suitable indicators.
- **Sustainability.** The greatest measure of sustainability will be the ability of the project to instill practices and procedures in disaster mitigation among both public and private parties which will endure well beyond the project. This will require a clear perception of the benefits of these groups in adopting such practices. Sustainability will also be heightened by the continued involvement of concerned public and private agencies in disaster mitigation activities after the project is completed.
- **Performance.** There are clear roles for numerous local and regional institutions in executing the project's components. To the extent feasible, potential implementing agencies will be required to submit proposals for the implementation of components and activities under the project. If selected, implementing organizations will be required to maintain satisfactory performance levels to retain funding over the life of the project.
- **Support to Other Projects.** In order to help institutionalize mitigation activities, the activities of this project should be coordinated with those of other compatible projects. Priority has been given to countries with projects that can be supported or strengthened by including mitigation activities.
- **Definitions.** Throughout the rest of the document mention will be made of component(s) and program(s). The latter indicates the categories that the overall CDMP will be divided into, while the former refers to the individual programs that fall under each of the components.

2.2 POTENTIAL LOCAL IMPLEMENTING ORGANIZATIONS

There are many regional and local organizations that could serve as implementing bodies for the CDMP. By contracting for their services, the CDMP will help strengthen them and institutionalize mitigation activities into their normal operations. While there does not appear to be an indigenous organization that could manage all components of the project, there are several that can assume responsibility for specific activities.

As discussed in Chapter 3, a project management unit is recommended to manage the activities over the life of the project. The PMU would, in turn, subcontract for execution of CDMP components and programs. In doing so, it would help instill mitigation procedures and practices which would continue after the completion of the project. Brief descriptions of potential implementing organizations are presented in Annex A.

2.3 PILOT COUNTRIES

Members of the project team made visits to the USAID missions in the Caribbean to discuss the project concept and ascertain Mission priorities. Meetings were also held with other agencies and individuals involved in disaster preparedness and the built environment to discuss project options and priorities in each country. The country reports are attached in Annex B.

There was quite naturally considerable variation in priorities among the countries visited. Therefore, it was decided that a project with several components was most appropriate. In the Dominican Republic, for example, the mission prefers to support a process to identify appropriate mitigation initiatives. This will involve broad participation by public and private groups and institutional coordination. Based on the information gained from the field visits and the criteria outlined above, priority programs were identified.

Figure 2.1 and the map below show the proposed location for each of the pilot programs. While some of the activities are specific to one country, they may be applied to other countries as well. Expansion of activities will depend on the interest of the local Mission. It is intended that the project be demand-driven by local interest rather than imposed from the outside.

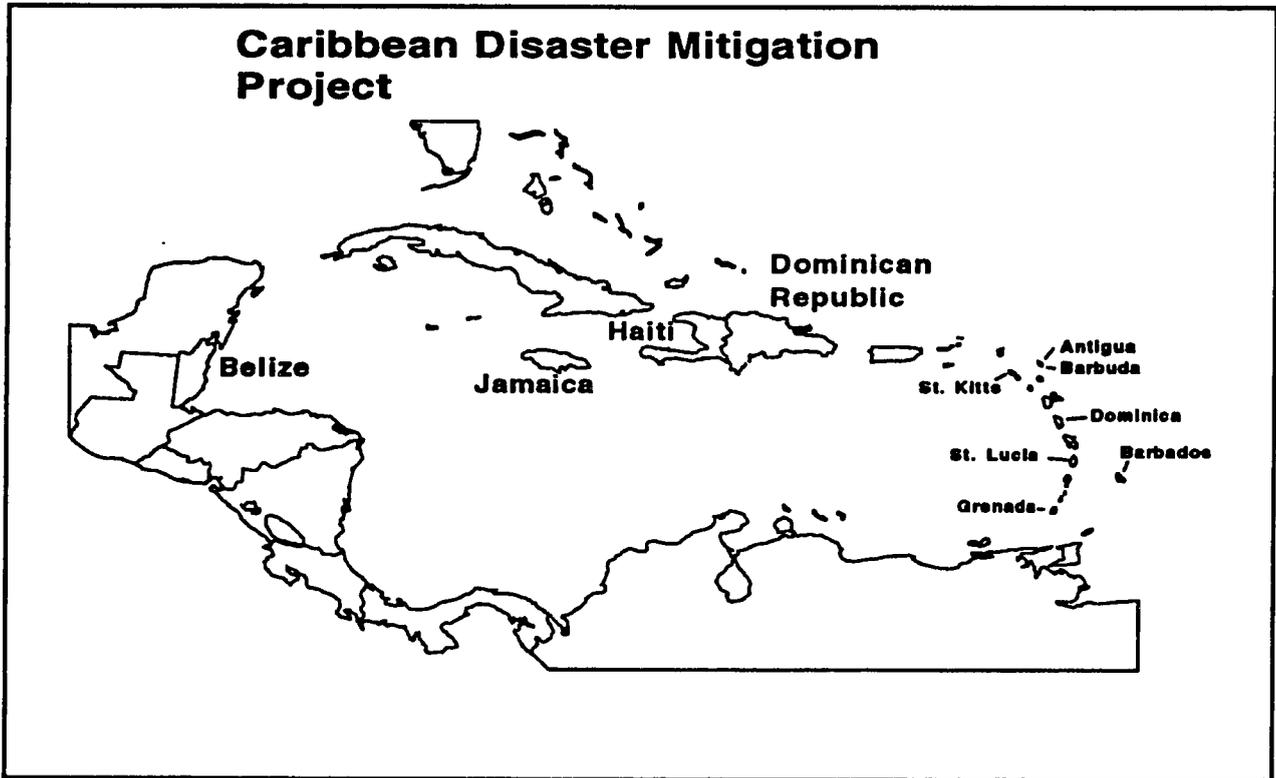


Figure 2.1. Location of Programs

PROGRAM	Antigua & Barbuda	Barbados	Dominica	Grenada	St. Kitts & Nevis	St. Lucia	St. Vincent	Dominican Republic	Belize	Jamaica
REGIONAL SERVICES										
Project Management Unit/Information Center	○	○	○	○	○	○	○	○	○	○
Baseline Data and Indicators	○	○	○	○	○	○	○	○	○	●
RHUDO/Regional Training	○	○	○	○	○	○	○	○	○	●
THE BUILT ENVIRONMENT										
Risk Audits: Utilities and Lifeline Facilities	●	●	●	●	●	●	○			
Shelter: Building Practices and Insurance Underwriting	○	○	○	○	○	○	○	○		
RISK MAPPINGS										
Pilot Programs									●	●
MITIGATION PLANNING AND PROGRAM DEVELOPMENT										
Pilot Programs: Dominican Republic								●		
Legend: ● Pilot country ○ Regional program										

2.4 REGIONAL SERVICES

In order to meet the management objectives of the project, the following is recommended:

- a) Establishment of a project management unit (PMU) and project clearinghouse function
- b) Development of baseline data and indicators for monitoring and evaluating project performance
- c) Development and coordination of a regional training program.

2.4.1 Program Description

PROJECT COMPONENT:	Regional Services
PROGRAM NAME:	a) Project Management Unit/Information Center b) Baseline data and indicators c) Regional training program
COUNTRY:	a) Regional b) Regional c) Regional
IMPLEMENTING AGENCIES:	a) Contractor - candidate OAS, UWI b) Contractor - candidate CDERA c) RHUDO/CAR
PROGRAM COSTS:	a) US\$1,390,000 b) US\$220,000 c) US\$550,000
TECHNICAL ASSISTANCE INPUTS:	a) Project manager, information management specialist, contracts manager, office manager, technical assistants b) Monitoring and evaluation specialist, data specialist, technical assistant c) Training coordinator
OUTPUTS:	a) Project Management Unit b) Baseline data and indicators c) Coordinated regional training program

2.4.2 Risks and Problems

Effective project management is a priority concern. The CDMP involves several components and programs to be executed across the Caribbean. Synergy and coordination among the

CDMP components and with the regional training program is vital to the project's success. In addition, the project requires viable performance indicators for monitoring and evaluation purposes.

2.4.3 Objectives

- a) Successfully manage CDMP components.
- b) Implement an effective monitoring system including baseline data and performance indicators.
- c) Implement a successful regional training program.

2.4.4 Activities

- a) PMU/Information Center
 - PMU mobilization
 - Development of a detailed CDMP Work Plan
 - Definition of subcontract requirements, bidding, selection, and management procedures
 - Management, support, and monitoring of programs.
- b) Baseline Data and Indicators
 - Collection and standardization of data
 - Design and development of a database for monitoring purposes
 - Ongoing data maintenance and collection; monitoring.
- c) Regional Training Program
 - Development of a regional training plan
 - Management and coordination of training activities.

2.4.5 Implementation

The following groups are deemed appropriate for implementing these functions:

- a) The OAS, U.S. contractors, Disaster Studies Unit - UWI
- b) CDERA, UWI, U.S. contractor
- c) RHUDO/CAR

RHUDO/CAR would be responsible for CDMP oversight involving all management elements.

2.4.6 Evaluation

- **Direct project outputs.**
 - a) Effective management unit and CDMP clearinghouse established
Subcontracts awarded, managed, and monitored
 - b) Data management and monitoring system developed and implemented
 - c) Regional training program developed and implemented.
- **Intermediate impacts.** Program executing agencies adopt:
 - a) Mitigation procedures
 - b) Monitoring procedures
 - c) Training programs for disaster mitigation.
- **Direct Beneficiary Impact.**
All impact is indirect (via CDMP programs).

Beneficiaries: all parties concerned by the project.

2.5 THE BUILT ENVIRONMENT

A. Utilities And Lifeline Facilities: Risk Audits

Risk audits for utilities and lifeline facilities are needed to identify vulnerability to disaster and to provide the basis for development of retrofitting programs. The CDMP will not provide capital funding for improvement programs; rather, the facilities will seek financing from the CDB, the IBRD, and other sources.

2.5.1 Program Description

PROJECT COMPONENT:	The Built Environment
PROGRAM NAME:	Utility and Lifeline Facilities
SUBPROGRAMS:	a) Electrical utilities b) Hospital lifeline facilities
COUNTRY:	a) Regional - Eastern Caribbean b) Regional for manual; St. Lucia for pilot activity
IMPLEMENTING AGENCIES:	a) Candidate: Caribbean Electrical Utility Services (CARILEC), local utility companies b) Candidate: Pan American Health Organization (PAHO)
PROGRAM COSTS:	a) US\$435,000 b) US\$225,000
TECHNICAL ASSISTANCE INPUTS:	a) Program manager, engineering consultants, trainers b) Engineering consultants, training specialists
OUTPUTS:	a) Risk audits, retrofitting programs, training for up to 10 electrical utilities b) Up to 20 risk audits, retrofitting programs, and training in 5 countries

The electric utility companies have suffered extensive damage in recent years from Hurricanes Gilbert and Hugo. In Jamaica it took almost three months, even with external assistance, to restore full service to the island. Not only does the interruption of service have a major impact on the finances of the utility but on the well being and economic recovery of the country as well. Transmission and distribution systems as well as generating facilities and other structures are at risk to natural disasters.

Lifeline facilities such as hospitals, shelters and police stations are most needed after a disaster hits to provide assistance and relief. When lifeline facilities are damaged it places an extra burden on people and officials trying to deal with the disaster. During Hurricane Hugo, the only hospital in Montserrat was destroyed and patients had to be evacuated. In Jamaica during Gilbert, the Morant Bay and Lucea hospitals were destroyed. While there are needs to upgrade different types of facilities, during the initial phase, efforts will be directed toward hospital facilities.

2.5.2 Objectives

The objective of risk audits for utilities and lifeline facilities is to identify means to reduce potential damage from natural disasters, and to shorten their time of recovery when disaster strikes. To assist in this regard, technical assistance will be provided to assist them to identify vulnerabilities and design disaster mitigation programs to upgrade such facilities.

2.5.3 Activities

Detailed risk audits will be conducted to determine mitigation requirements. The audits will include detailed recommendations for retrofitting, improved maintenance, or rebuilding as may be necessary to reduce the vulnerability of structures to natural disasters. Outputs from the audits will be a detailed set of recommendations and improvement costs for each facility with drawings where needed to illustrate the work required and specifications of the work to be done. The audits will be carried out by engineers experienced in risk audits.

For electrical utilities, the audits will embrace all structures including power stations, substations, stores facilities, offices, transmission towers, and distribution lines. For hospitals it will involve the structures, critical facilities, and services (e.g., operating rooms, water, and power).

The risk audits will provide a basis for the facilities to seek funding from internal or external sources. For both electrical utilities and hospital risk audits, manuals, and training will be prepared and conducted for administrators and generalized for use in OECS countries.

2.5.4 Implementation

The Caribbean Electric Utility Services Corporation (CARILEC) is a candidate to execute the electrical utility program. The agency was set up with assistance from USAID to provide services and training to the electric utilities of the Eastern Caribbean. CARILEC has contacts with utilities outside the Eastern Caribbean and will provide assistance to all interested utilities in the project area.

PAHO is a candidate to execute the hospital "lifeline" risk audits. It would prepare audit guidelines, provide consultants to carry out the audits, and develop retrofitting programs for St. Lucia and other OECS countries. It would also coordinate its activities with the OAS; utilizing the lifeline assessments which it has already sponsored.

Risk audits should be conducted for those electrical utilities and hospitals which request assistance, provide support, and commit to seek funding for capital improvements.

2.5.5 Evaluation

- **Direct project outputs.**
 - a) Risk audits for 10 electrical utilities, risk audit manuals, training of administrators.
 - b) Hospital risk audits in 5 OECS countries for up to 20 hospitals, risk audit manuals, training of administrators.
- **Intermediate outputs.**
 - a) Utilities adopt risk audits as standard procedure; future facilities adopt mitigation guidelines; retrofitting program is funded.
 - b) *Idem.*
- **Direct beneficiary impact.**
 - a) Utility assets protected. Beneficiaries vary according to facility.
 - b) Hospital assets protected. Beneficiaries vary according to facility.

Beneficiaries: the utilities and communities at large.

B. Shelter

Throughout the Caribbean there is increasing concern about the quality of construction. Most public authorities interviewed believe that building practices must be improved if the effects of potential disasters are to be mitigated.

2.5.6 Program Description

PROJECT COMPONENT:	The Built Environment
PROGRAM NAME:	Shelter
SUBPROGRAMS:	a) Building practices and codes b) Insurance underwriting for shelter
COUNTRY:	English-speaking countries
IMPLEMENTING AGENCIES:	a) Candidate: Council of Caribbean Engineering Organizations (CCFO), Engineering Faculty (UWI); College of Arts, Sciences, and Technology (UWI) b) Candidate: Insurance Association of the Caribbean
PROGRAM COSTS:	a) US\$1,125,000 b) US\$330,000
TECHNICAL ASSISTANCE INPUTS:	a) Project manager, architect, engineer, curriculum specialist, trainers, research assistants b) US underwriting specialist, training specialist
OUTPUTS:	a) Revised building code, revised curriculum for building trades, community education programs, training workshops, and materials b) Revised underwriting procedures, rate structures, training workshops, and materials

2.5.7 Risks/Problems

The study team was advised that over the years the quality of construction and building practices in the Caribbean have declined. New building designs do not adequately take into account hazard mitigation. The apprenticeship program has all but disappeared with the passage of time and scarcity of resources. The result is that the body of skilled artisans is not being replenished and the building trades are being corrupted with unskilled persons. Furthermore, since low income households must construct their own dwellings, housing quality suffers. The need exists for training at both the formal and informal levels to increase awareness of disaster problems and to introduce improved building practices.

The first draft of the Caribbean Uniform Building Code (CUBiC) was developed in the early 1980s with financial assistance from USAID. Since the completion of the documents there has been no attempt to monitor the use of the Codes, nor review them. Discussions with many engineers, architects and builders of the Caricom States suggest that the Codes are not in general use.

Inconsistent application of building codes and substandard construction has created problems for the insurance industry. It is felt that much of the damage in Jamaica from Hurricane Gilbert resulted from faulty roof construction and that claims could have been substantially reduced through enforcement of building standards. The underwriting practices of the industry may have contributed to the problem since inspections are seldom done and differential rates have not been established based on hazardous and non-hazardous sites and the quality of construction and materials used.

2.5.8 Objectives

Mitigation in the construction sector must clearly involve use of standards, design, techniques, and materials which will enable structures to better withstand the effects of natural disasters. Key objectives are thus to:

- Introduce changes in "building practices" and behavior among parties concerned with building design and construction.
- Introduce improved technologies and building material supply (e.g. the availability of hurricane straps).
- Introduce improved training curricula for the building trades.
- Improve the applicability of CUBiC as a tool in this process including, if appropriate modification for hazardous and non-hazardous sites.
- Introduce improved underwriting and inspection procedures, and differential rate structure to better reflect risk.

2.5.9 Activities

- **Building Practices.** For the first block of activities, a working relationship over the life of the project will be established between representative actors in the building sector (architects, engineers, contractors, informal sector builders, community groups, suppliers). The initiative will involve:
 - A review of current building practices
 - Identification of necessary changes, incentives, and disincentives
 - A review of materials and technology necessary for mitigation; an assessment of their availability; necessary incentives for use; and marketing requirements
 - Training and information needs assessments designed and executed to institute desired practices
 - Survey and review of curricula for the building trades
 - Curricula development to incorporate materials on hazard mitigation
 - Coordination with UNCHS, CRDC, and other groups.

- **Building Codes.** A second block of activities will be launched to:
 - Review the applicability of the CUBiC in the context of disaster mitigation and the current practices noted above.
 - Assess the cost impact of CUBiC on typical structures; the technical reasonableness of CUBiC recommendations; and differences in current practices.
 - Review all Codes to ensure that they are responsive to current technology.
 - Undertake workshops and form technical committees drawn from the professional organizations for the reviews.
 - Refine Codes, including differentiation between hazardous and non-hazardous sites.
 - Field test appropriate revisions and models and incorporate these results within training and information dissemination. Jamaica will serve as the first country test site.

- **Develop Underwriting Procedures.** A study of present underwriting practices in selected countries will be done to identify strengths and problems. Companies that may have been more successful in reducing risks will be identified and their procedures reviewed.
 - Development of underwriting procedures that encourage proper siting and retrofitting of existing structures.
 - Development of standards and guidelines for inspection.
 - Development of differential rates which reflect mitigation in construction and siting.
 - Development of a pilot geographic underwriting system (in conjunction with the risk mapping component).
 - Training of agents in the use of new underwriting and inspection procedures.

- **Dissemination and Training.**
 - Dissemination of workable models in building practices, codes, and insurance underwriting.
 - Workshops and seminars (estimated 32 three day workshops). There will be a minimum of two professional workshops in each country, with the larger states requiring at least four workshops for builders, building professionals, and the insurance industry.
 - Community Education in building practices (pilot: Jamaica).
 - Newsletters, manuals, videos, and revised codes to be disseminated throughout the Caribbean. Cooperation will be sought with the UNCHS which is already active in this domain.

2.5.10 Implementation

The Building Practices and Codes program could be implemented by the Council of Caribbean Engineering Organizations with technical support from the Engineering and Architecture Faculties at UWI. In country, the CCEO would involve the participation of architecture and building associations as well as local chambers of commerce.

Curriculum development and community education could be carried out by CAST, HEART, UWI, and Vocational Training Centers in Jamaica and similar institutions in the OECS such as the Sir Arthur Lewis Institute in St. Lucia.

The Insurance Underwriting subprogram could be managed by the Insurance Association of the Caribbean working with a foreign insurance company or insurance trade association.

2.5.11 Evaluation

- **Direct project outputs.**
 - a) **Building practices and codes**
 - 32 training workshops
 - revised building codes
 - revised curriculum for the building trades
 - community education program - Jamaica
 - regional dissemination of: codes, videos, handbooks.
 - b) **Insurance underwriting**
 - revised underwriting standards and inspection procedures, differential rates
 - 16 training workshops.
- **Intermediate impacts.**
 - a) – improved permitting and inspection procedures
 - builders, households adopt improved practices, codes.
 - b) – underwriting better reflects risk associated with wind and water damage, inspection improves.
- **Direct beneficiary impact.**

Public and productive assets at large.

Beneficiaries: Public sector agencies, builders and developers, businesses and insurance organizations, and the community at large.

2.6 RISK MAPPING AND GIS

Risk mapping and GIS will serve to help differentiate risk spatially for use in building codes and insurance underwriting. It will also provide CDMP program executing agencies with a state-of-the-art tool for data management and analysis (e.g., facility mapping for utilities, mitigation planning). Initial pilot initiatives will be launched in Belize City and Portmore, Jamaica.

2.6.1 Program Description

PROJECT COMPONENT:	Risk Mapping and GIS
PROGRAM NAME:	Pilot Programs
COUNTRY:	Regional; Pilot activities: Belize, Jamaica, two other countries
IMPLEMENTING AGENCIES:	Candidate: CERMES: Office of Disaster Studies, UWI GOJ Dept. of Land Titling and Surveying U.S. associate contractor: GIS services unit
PROGRAM COSTS:	US\$650,000
TECHNICAL ASSISTANCE INPUTS:	Program manager, US GIS/mapping specialist, cartographer, technical assistants
OUTPUTS:	Risk maps: Belize City and Portmore

2.6.2 Risks/Problems

Risk mapping is needed throughout the Caribbean for mitigation planning and control purposes. Coastal areas are particularly vulnerable and require special emphasis. In Belize the AID Mission is just starting a major coastal zone management project for the environment and is interested in including a disaster mitigation component. A storm surge modeling project is being done by the UNCHS that will provide important disaster information. An urban development plan for Belize City is also being completed and a management control organization has been set in place. As urban growth of Belize City accelerates, there is greater risk that such expansion will occur in high risk areas. The program will help address this problem by provision of risk mapping and GIS for mitigation and planning.

Portmore, Jamaica is another coastal settlement at high risk to water and wind damage from potential hurricanes and storm surges. It is in need of risk contours for mitigation planning which will also serve insurance underwriting purposes.

2.6.3 Objectives

Spatial differentiation of risk for planning, development control, and public-private decision-making (siting, construction standards, insurance underwriting, etc.):

- Discourage development in high risk areas
- Protect environmentally sensitive sites
- Reduce risks to population and productive assets.

2.6.4 Activities

- **Belize City.**
 - Base mapping of the urban area
 - Disaster impact assessments
 - Risk mapping, linkage with GIS to evaluate and differentiate risk
 - Assist the planning department incorporate risk mapping/GIS into planning and development review procedures
 - Information dissemination to public and private decision-makers, workshops, and seminars.
- **Portmore.**
 - Base mapping of the urban area including lots, roads, facilities, etc. to establish risk and hazard contours
 - Execution of a sea-rise model to show areas most susceptible to flooding
 - Evaluate impact and efficient evacuation methods for floodwaters
 - Examine potential of a geographic underwriting system using GIS for insurance purposes.
 - Information dissemination and workshops for public and private decision-makers.

2.6.5 Implementation

- **Belize pilot project.** CERMES has expressed interest in managing this program in association with a U.S. group. They would be willing to designate or hire a full-time project director/planner from their staff to carry out the work with assistance from staff members and graduate students at CERMES. A U.S. GIS specialist would assist with the development of computerized risk assessment maps, GIS applications, and training.
- **Portmore pilot project.** The Disaster Studies Unit (UWI) and the GOJ's Department of Land Titling and Surveying have expressed interest in managing this activity in association with a US group. They would be willing to designate or hire a full-time project director/planner from their staff to carry out the work with assistance from staff members and graduate students at UWI. A U.S. GIS specialist would assist with the development of the computerized risk assessment maps, GIS applications, and training.

2.6.6 Evaluation

- **Direct project outputs.**
 - Risk mapping for Belize, Portmore, and two other settlements
 - 46 workshops on the use of risk mapping and GIS for disaster mitigation.
- **Intermediate impacts.**
 - Risk mapping and GIS adopted by public agencies as mitigation tools
 - Public-private decision-makers make use of data to reduce risk.
- **Direct beneficiary impact.**
Settlement populations and productive assets at large.

Beneficiaries: Planning and control departments, sectoral agencies, private businesses, insurance organizations, and the community at large.

2.7 DISASTER MITIGATION PLANNING AND PROGRAM DEVELOPMENT - DOMINICAN REPUBLIC

This activity was designed specifically to support the objectives of the USAID Mission in the Dominican Republic, which intends to be active in its implementation. However, other missions (e.g., Belize) may be interested in adopting a similar program involving preparedness concerns.

2.7.1 Program Description

PROJECT COMPONENT:	Disaster Mitigation Planning and Program Development
PROGRAM NAME:	Pilot Programs
COUNTRY:	Dominican Republic
IMPLEMENTING AGENCIES:	Candidate: Instituto Dominicano de Desarrollo Integral, Disaster Steering Group
PROGRAM COST ESTIMATE:	US\$350,000
TECHNICAL ASSISTANCE INPUTS:	Program manager, technical assistant, facilitator
OUTPUTS:	Establishment of a Disaster Mitigation Coordination Committee; design of three mitigation projects

2.7.2 Risks/Problems

Hurricanes are the principal natural disaster risk in the Dominican Republic. Their occurrence usually results in major loss of life and massive damage to property. Hurricanes David and Frederick came ashore within a five day period in September of 1979. They brought winds of 150 MPH and caused massive flooding. The damage was so devastating that the country has still not recovered completely.

Despite the aftermath of that terrible hurricane season, little has been done to try to reduce possible damage from future such disasters. Furthermore, the different agencies responsible for disaster activities have not yet engaged in coordinated planning.

2.7.3 Objectives

This program is designed to promote the coordination of the various government, business, and community groups with responsibility for mitigating the effects of a hurricane. The assumption is that better liaison and communication among all these groups will promote and enhance the use of disaster mitigation and preparedness techniques and practices.

The following outputs from the program are anticipated:

- There will be better coordination and liaison among the many institutions and groups in the disaster area.
- There will be a larger role for communities and community groups in disaster mitigation and preparedness.
- The potential role of the business sector in the area of disaster mitigation will become better known to the general public and government agencies.
- The "triangle relationship" among government, businesses, and the community will be strengthened.

This program has a relationship with USAID's Democratic Initiatives Project. It is expected that this program will closely involve community groups and organizations in the design, implementation, and evaluation of this program. Moreover the program will require government, businesses, and community groups to work in tandem to ensure its success.

2.7.4 Activities

This project will consist of two phases. Phase I will involve establishing a Disaster Mitigation Coordination Committee, whose purpose is to promote coordination among the various groups involved in this type of activity and to design up to three mitigation projects. A series of four workshops will be given for between 20 and 25 government, business, and community organizations on the subject of disaster mitigation. The suggested topic for each workshop is as follows:

- **Workshop 1 - Getting to Know the Disaster Community.** The purpose of this workshop is to promote inter-agency cooperation and planning. Each participant will present a summary of its activities and role in preparing for and mitigating the effects of disasters.
- **Workshop 2 - Understanding the Problem.** The purpose here is to define the term "disaster mitigation", to understand fully the problems involved in mitigating disasters and to appreciate why mitigation efforts can make a difference when a hurricane strikes.
- **Workshop 3 - Analyzing the Possibilities.** At this workshop, the participants will analyze what has been done in the past to prepare for and mitigate disasters in the country, and more importantly, to determine what should be done.
- **Workshop 4 - Defining Projects.** At the final workshop, the participants will identify up to three disaster mitigation projects for further elaboration.

After action projects have been identified, one or more of the institutions participating in the workshop will be charged with developing and implementing each specific project. The institutions carrying out each project will be required to define its goals and objectives, describe the project fully, prepare a budget and timetable, and state clearly the expected results to be derived from the project. Areas of concern for the pilot projects include:

- **Consciousness raising as to the damage that hurricanes can cause and what can be done to mitigate the effects**
- **Guidelines for the construction of housing in rural areas and informal settlements**
- **Elaborating elements of the mitigation into the National Disaster Emergency Plan**
- **Risk audits and retro-fitting of infrastructure and lifeline facilities.**

2.7.5 Implementation

The four workshops will be organized by a Steering Group which will consist of key groups or actors involved in disaster preparedness and mitigation.

Insurance Companies	Ministry of Education
National telephone company, private	National Electricity Company
National housing agency	Catholic Relief Services
Asociación de San José de Ocoa (a community group)	Care Dominicana
National association of PVOs	PAHO
Ministry of Health	UNDP
	Bilateral donors

The Instituto Dominicano de Desarrollo Integral (IDDI) will function as coordinator for the Steering Group. As such it will essentially do the leg work required to organize and implement the program. Since funds will be required to carry out the project, IDDI will enter into a contract with USAID to undertake the program.

2.7.6 Evaluation

- **Direct project outputs.**
 - Coordination workshops
 - Pilot projects.
- **Intermediate outputs.**
 - Concerned agencies adopt coordinated planning procedures and mitigation techniques.
- **Direct beneficiary impact.**
 - Public and productive assets at large.

Beneficiaries: participating institutions and the community at large.

CHAPTER 3

PROJECT MANAGEMENT

3.1 MANAGEMENT OBJECTIVES

This project is intended to provide a framework for a dynamic disaster mitigation program aimed at: a) improving existing development practices within the public and private sectors; b) soliciting and reinforcing local initiatives in this regard; and c) promoting alliances between US and Caribbean groups with similar functions and objectives. This creative approach runs the risk of being management intensive. Yet it is clear that the management load on USAID missions, RHUDO/CAR and OFDA staff must be kept within acceptable limits due to Agency reductions in funding and staffing. The purpose of this chapter is to explore potential management options.

3.2 CONCERNED USAID ORGANIZATIONS

Disaster mitigation in the Caribbean is of interest to a several USAID offices. These are:

- **Office of Foreign Disaster Assistance (OFDA)**, Washington. OFDA to provide funding for the project.
- **Office of Housing and Urban Programs (PRE/H)** in the Private Enterprise Bureau, Washington. The Disaster Officer at PRE/H provides liaison with OFDA and mobilizes PRE/H support for disaster related programs. PRE/H can serve as a resource for CDMP technical backup and contracting support.
- **Regional OFDA Office** in San José, Costa Rica. The Regional Office is responsible for disaster response activities in the Caribbean and Latin America. It can provide technical support to the project as required.
- **Regional Housing and Urban Development Office (RHUDO/CAR)**, Kingston, Jamaica. The RHUDO has been involved in housing and urban development and related training in the Caribbean for many years and is responsible for the conceptualization and design of this project. Thus, the RHUDO is well positioned to provide management oversight and training support for CDMP implementation.
- **USAID Missions** in Barbados (RDO), Belize, the Dominican Republic, and Jamaica have provided inputs into CDMP design and they have expressed willingness to be involved in implementation of appropriate activities within their respective countries.

3.3 OPTIONS FOR IMPLEMENTATION

The project's management structure must be well suited to its geographic scope and its wide range of potential programs.

3.3.1 Option 1 - Contracting by RHUDO/CAR or Missions

Under this option, OFDA would allot all project funds to RHUDO/CAR which would contract or grant funds directly to organizations to carry out regional activities. It would sub-allot funds to the USAID missions in Barbados, Belize, and the Dominican Republic for the execution of country or RDO activities.

Thus, RHUDO/CAR would manage activities carried out under several contracts or grants. Potential executing agencies include:

- The Caribbean Electric Utility Services (CARILEC) which has potential to execute project activities concerned with hazard mitigation for electric utility companies.
- The Council of Caribbean Engineering Organizations and the Engineering Faculty of the University of the West Indies which have the potential to execute project activities concerned with building practices, code improvement, building technology and materials.
- The College of Arts, Science and Technology (CAST) which has the potential to execute project activities concerned with curriculum improvement, public education and training.
- The Insurance Association of the Caribbean (IAC) which has the potential to execute activities concerned with improved insurance underwriting.

The USAID missions would supervise the execution of the following programs:

- The Barbados RDO Mission could manage pilot activities concerned with hospital "lifeline" facilities in the Eastern Caribbean to be carried out by a group such as the Pan American Health Organization (PAHO).
- The Belize Mission could oversee the Belize City risk mapping activities to be executed by a group such as the Centre for Resource Management and Environmental Studies (CER-MES).
- The Mission in the Dominican Republic could oversee mitigation planning and program development involving the Disaster Steering Group of the Instituto Dominicano de Desarrollo Integral (IDDI).

Under this option RHUDO and the USAID missions would be responsible for both technical and contract management oversight. RHUDO would be responsible for preparing a unified work plan and training program for the overall project.

Advantages

- RHUDO and Missions would be able to influence all aspects of the project through their direct involvement and management control.
- Supervision at the local level would result in better integration of development activities.

Disadvantages

- RHUDO and Missions would have the burden of administering a number of individual contracts and grants with local organizations.

CARIBBEAN DISASTER MITIGATION PROJECT

Administrative Structure Option 1

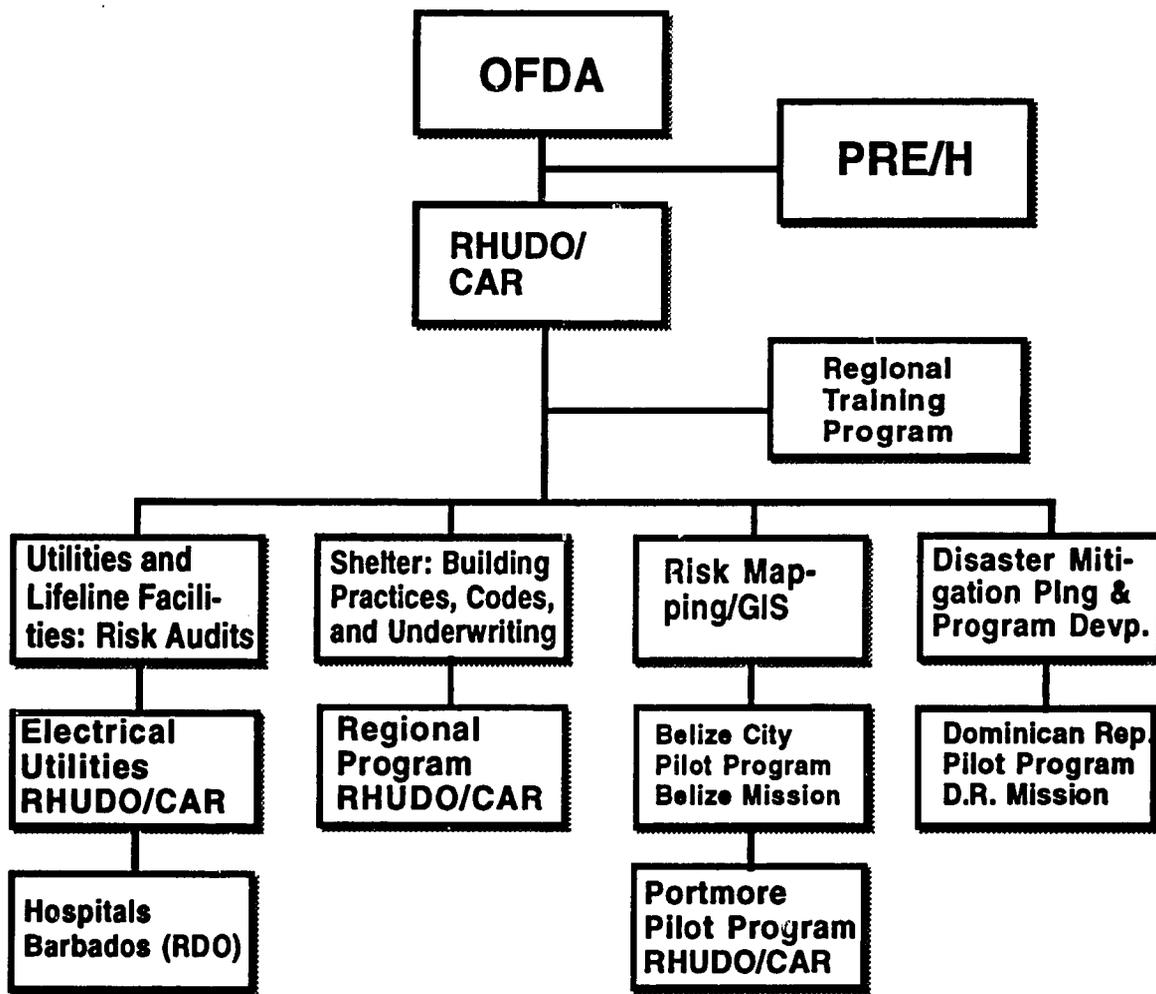


Figure 3.1

3.3.2 Option 2 - Contracting a Project Manager by PRE/H

Under this option a Project Management Unit (PMU) would be utilized to provide:

- Management and monitoring of CDMP components and programs
- Access to regional and foreign information, experience and skills needed to make the project effective
- Institutional strengthening and training across the region, in association with RHUDO/CAR.

Under this alternative, the PMU would be set up as an independent unit under the supervision of PRE/H and RHUDO/CAR.

Under Option 2 the Office of Housing and Urban Programs in AID/Washington would contract with one of the types of organizations discussed later in this chapter and in Annex A. The contractor, in turn, would subcontract and/or provide grants to the US and local Caribbean organizations and other institutions mentioned in Option 1 above to implement various components of the project. The arrangement is shown in the organization chart of **Figure 3.2**.

Primary responsibility for contract administration would reside in PRE/H, with appropriate RHUDO participation and review, while RHUDO, closer to field activities, would provide technical oversight and training support. Individual country Missions would not have a direct role in contracting or administration, but would serve in an advisory capacity for projects in their respective countries.

Advantages

- The PMU/contractor would provide capacity to centrally manage and coordinate all project components.
- The PMU would relieve AID (in Washington and the field) from most operational management concerns without diminishing its necessary supervisory role.

Disadvantages

- It does not provide an easy vehicle for multi-donor support for mitigation activities. If desired, this situation could be improved if a regional organization were selected to manage the unit.
- This option splits the responsibilities for contract and technical management between PRE/H in Washington and RHUDO in the field, reducing RHUDO's effective control over the implementation process.

3.3.3 Option 3 - Contracting by RHUDO

This option combines features of the first two options. **Figure 3.3** illustrates a contract management arrangement divided by types of activities. For example, RHUDO/CAR could

CARIBBEAN DISASTER MITIGATION PROJECT

Administrative Structure Option 2

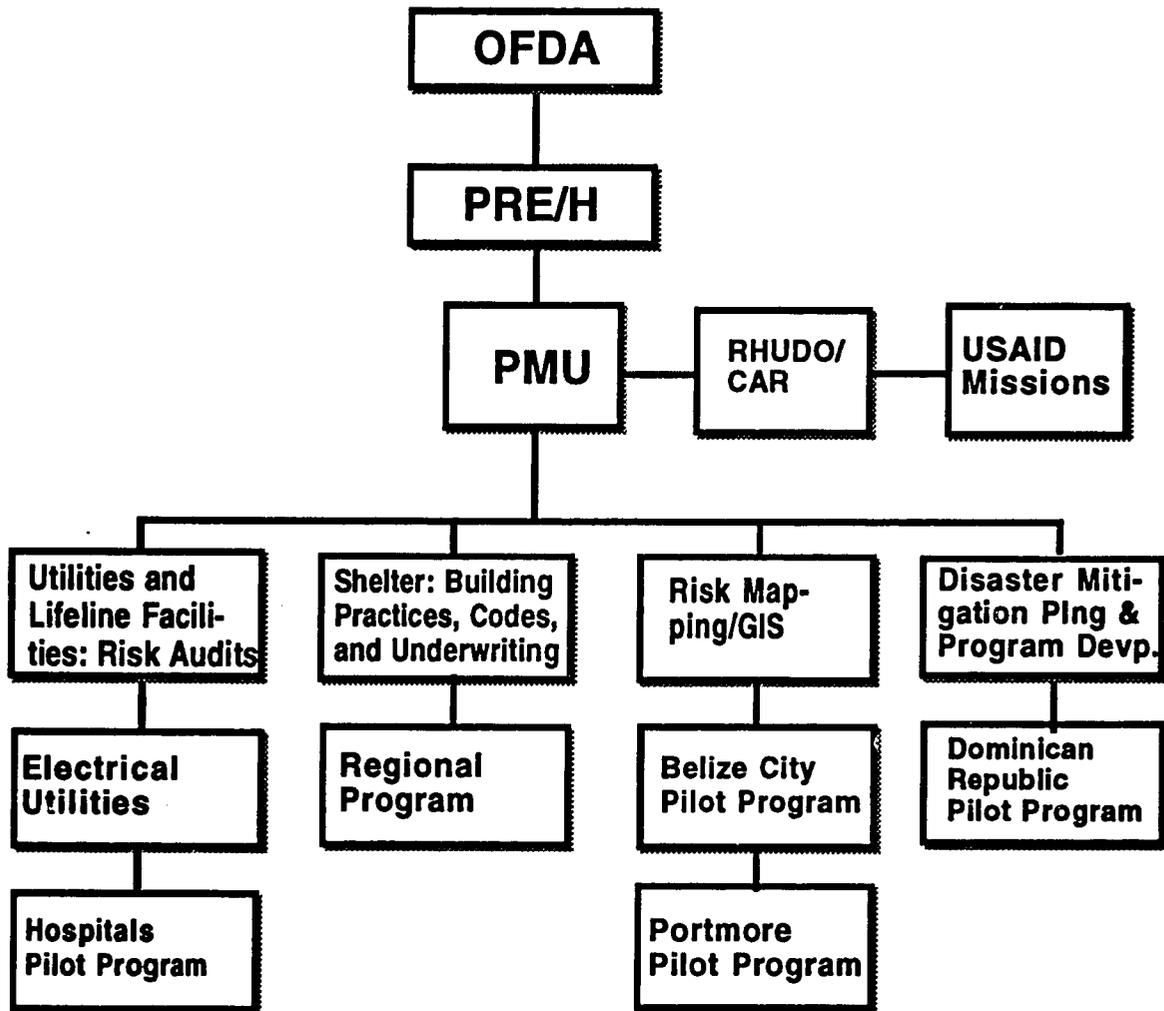


Figure 3.2

contract directly with an organization to perform the functions of a PMU. In this scenario, OFDA would allot funds to RHUDO, as in Option 1.

RHUDO would sub-allot part of these funds to the USAID missions in Barbados, Belize, and Dominican Republic for contracts or grants with the organizations as mentioned in Option 1 for implementing local project elements.

RHUDO would contract one overall project management organization which would, in turn, subcontract with local organizations for program management (e.g. with CARILEC, PAHO, CCEO/UWI, IAC and CERMES).

RHUDO could contract directly with an organization for activities in which it wished to be more directly involved (e.g., CAST for training, curriculum development and education).

Contract administration and technical oversight would be RHUDO's responsibility, but the contract management burden would be considerably less than in Option 1.

RHUDO oversight could be assured through periodic (quarterly) meetings with USAID mission representatives, the PMU, and managers of the various programs to assess progress and identify issues and responsibilities.

The RHUDO project manager would be involved in initial contracting and subsequent review of contractor invoices; preparation of Project Implementation Letters (PILs), and other such functions.

The PMU contractor would subcontract, negotiate, coordinate, develop work plans, undertake implementation planning, monitoring, and detailed supervision of activities for which it is responsible.

The PMU contractor would devise a work plan and provide reports on progress under that work plan which would be designed to be of use to RHUDO, USAID missions and other participating agencies and organizations.

Advantages

- RHUDO would exercise the majority of control over the entire project while shifting a large share of the management of this complex set of activities to a single contractor.
- Project management responsibility and authority are in the field, unlike Option 2.
- Unified project management by a prime project management contractor will help ensure a more coherent, coordinated project and encourage more interaction among local organizations than is likely to be the case under Option 1.

CARIBBEAN DISASTER MITIGATION PROJECT

Administrative Structure Option 3

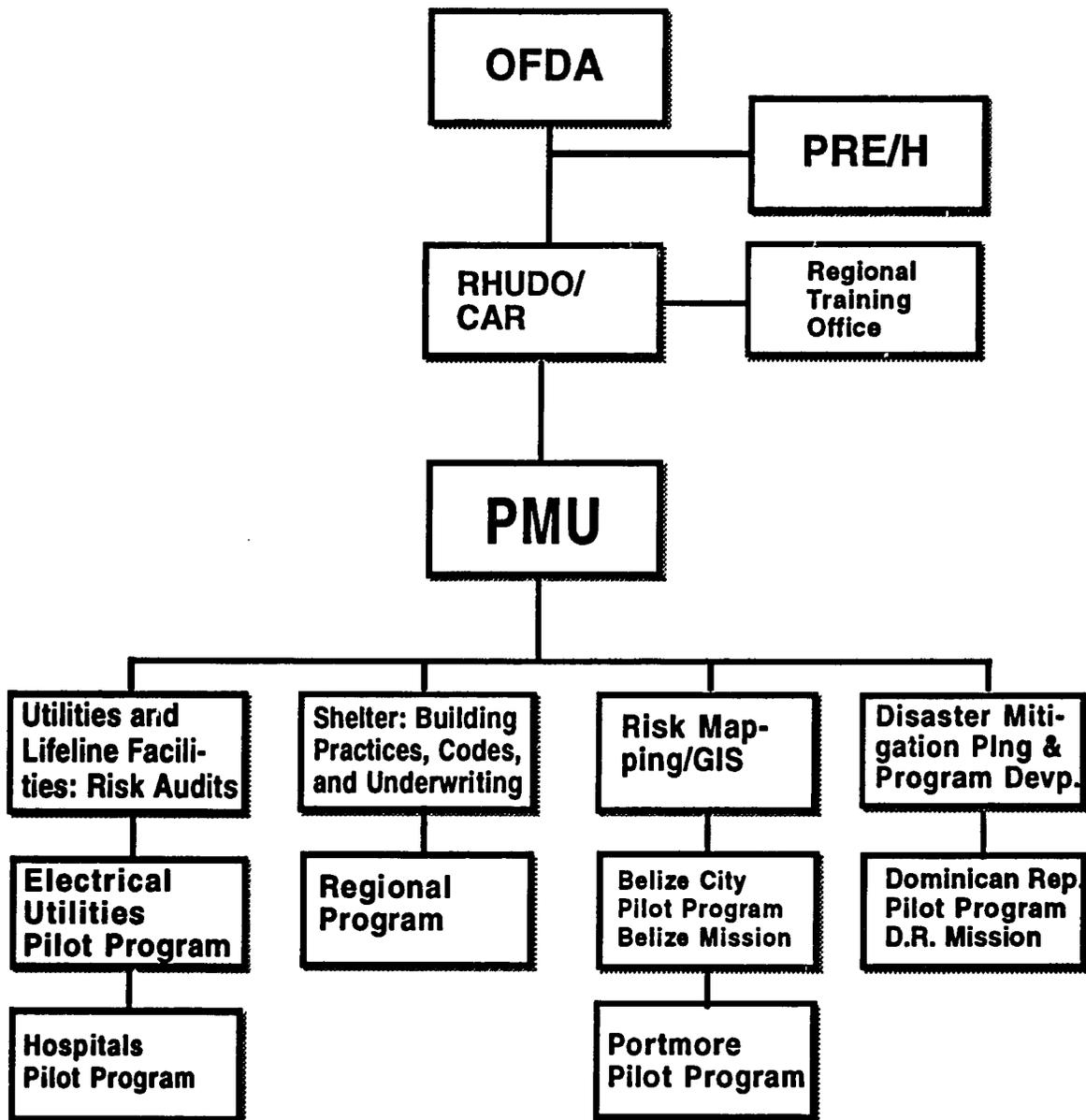


Figure 3.3

Disadvantages

- As in Option 2, multi-donor support for mitigation activities is not guaranteed. If desired, however, this situation could be improved if a regional organization were selected to manage the unit.

3.4 OBSERVATIONS

The appropriate management structure needs to be worked out through discussions with OFDA, RHUDO/CAR, USAID Jamaica and other participating missions. Option 1 provides the RHUDO with strong project oversight while giving the AID missions a vehicle to manage specific project components. Its drawback is that it would require a great deal of operational management by the RHUDO in particular. Option 2 may reduce the contracting and management responsibilities of RHUDO and the Missions too much.

In the view of the consultants, Option 3 is the most suitable variant. It provides an efficient way to accomplish management objectives, offers AID an opportunity to maintain control of project implementation, yet it makes an acceptable claim on RHUDO and Mission management resources. Furthermore, it provides an avenue to easily fund heretofore unidentified project activity proposals which will emerge over the life of the project.

3.4.1 Institutionalization

Institutional development, as it is generally understood, is not a key objective of the project. Rather, the goal is to alter existing development practices so that they are more responsive to mitigation concerns. This will be achieved only when the public and private groups concerned recognize the benefits of such change. Thus, the project will not necessarily seek to strengthen a single coordinating institution to carry on with mitigation initiatives after completion of the CDMP. If such an entity emerges as a result of the project, it will be because of clear cut demand for such a service. This service would have to prove itself by being financially viable and self sustaining.

Opportunities for institutional development will nevertheless be achieved since several regional and local organizations will be provided with an opportunity to execute project components with AID's guidance and support.

3.4.2 Project Manager

If management option 2 or 3 is selected, the PMU contractor must be able to work closely with and manage the work undertaken by those organizations responsible for each program. The PMU contractor must be able to orchestrate the entire project, carry out the planning and coordination required, and actively engage appropriate regional and local institutions to support the project activities. Any potential PMU contractor must meet this test.

A regional entity, or consortium of groups, already engaged in disaster mitigation would be a good candidate for the PMU contractor. Such an entity could manage designated project

programs for AID while mobilizing additional support from other donors. It would need to demonstrate that it has the management and technical expertise to implement the proposed programs effectively without any bureaucratic or political constraints. This would presumably entail setting up an independent project entity for this purpose which would not attempt to satisfy dual organizational interests.

The necessary management and technical attributes required by this innovative project can probably not be found in a single organization. Therefore a consortium of groups with complementary skills is likely desirable.

There are several options that could be used for project management of those components not to be contracted by the RHUDO. Possibilities that have been identified are listed below:

- **U.S. University.** The appropriate department of a U.S. university could be contracted to manage the project. If the university was associated with UWI it would provide for greater involvement of local experts and institutional building.
- **U.S. Consulting Firm.** PRE/H could contract with a U.S. based consulting firm for contract management. A consulting firm could subcontract local firms as well as provide outside expertise as required for implementation of the project.
- **Organization of American States (OAS).** The OAS is actively involved in disaster mitigation programs in the Caribbean. Their current programs are similar and complementary to activities proposed in this project. The OAS has received funding from OFDA for some of their activities and has experience working with USAID as an implementing organization. This work has been done through a "Cooperation Agreement" with the OAS contributing funds to the projects. A "Cooperation Agreement" does not require bidding and selection and is generally less cumbersome to administer. The OAS is interested in working with RHUDO to manage activities under the project.

3.4.3 Contracting Procedures

In selecting a project manager of certain component of the project as recommended above, there are a number of steps to be considered:

- **Establish administrative responsibilities.** Prepare/review preliminary terms of reference with the AID/W contracts office and the interested AID Washington and field offices. Agreement should be reached on the extent of involvement of each office and on the following questions:

Which projects will be managed by the RHUDO and AID Missions?

Will the RHUDO assume responsibility for technical and administrative management of the umbrella contract?

What provisions will be made for some degree of participation and oversight by OFDA/ San Jose and USAID Missions in annual project reviews, periodic monitoring, and the project advisory committee?

- **Prepare Terms of Reference.** Based on agreement on the above questions, a final terms of reference should be prepared as a basis for a Cooperation Agreement (or Request for Proposals if it is decided to contract a firm).

The terms of reference should state explicitly that AID prefers a manager that can provide access to a variety of technical and managerial expertise at the policy, program planning and implementation levels. The team should be able to design and execute an action plan to carry out programs; carry out analysis and monitoring to assess progress; and make policy and program recommendations for future action.

- **Signing of Cooperative Agreement.** If it is decided to work with a development organization, a Cooperative Agreement can be signed once the Terms of Reference has been approved. If a consultant is used, a Request for Proposal must be issued, proposals evaluated and a contractor selected.
- **Subcontract with regional/local agencies.** The project manager will be responsible for the selection, contracting and management of those subprojects that come under their jurisdiction.
- **Evaluation.** A formal evaluation should be undertaken at the end of Year 2 in order to permit necessary changes.
- **Reporting.** To coordinate activities and provide replicability, regular reports should be disseminated to PRE/H, RHUDOs, Regional Disaster Advisers, OFDA, and designated AID missions. Preparation of a detailed CDMP annual report is also recommended as is an annual OFDA review with the RHUDO and other relevant parties. The review should serve as the basis for providing funding increments.

ANNEX A

POTENTIAL PARTICIPATING LOCAL ORGANIZATIONS

There are many regional and local organizations that could serve as implementing bodies for the CDMP. By contracting for their services, the Project will help strengthen them and institutionalize mitigation activities into their normal operations. There are several organizations that can assume responsibility for specific activities.

As discussed in Chapter 2, a project management unit could be established to manage the activities over the life of the project. The PMU would, in turn, subcontract for execution of CDMP components and programs. In doing so, it would help instill mitigation procedures and practices which would continue after the completion of the project. Outlined below are some of the organizations that have been identified as possible candidates for work within the Project.

Disaster Studies Unit, Faculty of Natural Sciences, UWI, Mona Campus - Disaster Mitigation Information Center; Risk Mapping and GIS

The Faculty of Natural Sciences, through the Departments of Geography and Geology, has proposed the establishment of a Disaster Studies Unit (DSU) at the University of West Indies, Mona Campus. The objectives of the DSU include:

- To provide specialized courses, workshops, seminars on specific disaster related topics to specific target groups.
- To be a repository for information on how hazards have affected or may affect the region and disseminate scientific and technical hazard information to the general public and specialized groups.
- To provide technical assistance to governments, the private sector and NGOs wishing to integrate hazard considerations into their programs and activities.
- To coordinate multi-disciplinary rapid damage assessment teams to capture short-lived transient data critical to effective mitigation planning, rehabilitation, and reconstruction.
- To be the focal point for the UWI, Mona Campus collaboration on disaster training and research with the UWI Campuses, regional and international agencies and institutions.

The DSU intends to introduce new course work in the Geography and Geological Departments including an advanced course on Geographical Information Systems and Remote Sensing as well as short training courses including:

- Assessment of Geological Hazards
- Community Risk Assessment
- Remote Sensing Techniques

- Urban Geology and Land Use
- Rehabilitation and Recovery Planning
- GIS Techniques and Applications.

The DSU also intends to initiate research on varied topics including: design and acceptance of warning messages, planning regulations and non-structural mitigation, urbanization and vulnerability, disaster impacts on the productive sectors, disaster preparedness and other related matters.

The DSU intends to establish a positions for programme coordination, teaching and support staff, as well as physical space and equipment.

Centre for Resource Management and Environmental Studies (CERMES) - Risk Mapping and GIS

CERMES is located at the Cave Hill Campus of the University of the West Indies in Barbados. As part of the UWI system, CERMES works in the countries served by UWI. The Centre began offering programs to the public in 1985 in the form of seminars and short training courses. Formal teaching started in 1986 with the Diploma in Resource Management and Environmental studies. The Centre has the following as its particular mission:

- upgrading and widening the knowledge, training and skills of government and private sector decision makers with responsibility for environmental matters
- increasing the region's pool of expertise in resource management and environmental planning
- conducting research relevant to environmental management; acting as a repository for research and information on this subject in the Caribbean
- heightening of public awareness on matters of environmental importance.

These goals are achieved through postgraduate teaching and research programs in Environmental Studies and Resource Management and the organization of workshops and short training courses. CERMES has a strong focus on the environmental management of island and tropical ecosystems which is reflected in its outreach program of public lectures, advisory services and consultancies. The Centre maintains a documentation division on environmental studies and a computer laboratory.

The Centre's experience in coastal zone management, environmental risk and impact assessments make it a useful candidate and/or partner for project execution in siting and land management such as that contemplated for Belize.

CERMES's staff would be able to use their experience and expertise to design the program with a disaster mitigation orientation. They would also be able to draw on specialized exper-

tise within UWI for this purpose. Involvement in the contract would also enable CERMES to incorporate mitigation materials into the teaching and community education curricula.

Caribbean Electric Utility Services Corporation (CARILEC) - Risk Audits of Utility Companies (Power)

In 1981 representatives of the English-speaking islands first met to discuss the needs for cooperation among the utilities. In subsequent meetings it was determined that a formal organization should be established through which cooperative effort and programs could be implemented. In January 1988, USAID decided to underwrite the development of a Common Services Organization among electrical utilities by funding a 5-year program with a value of \$5 million. By August 1989, the Caribbean Electric Utility Services Corporation was incorporated in Barbados with nine member companies from the Eastern Caribbean.

CARILEC is in the process of expanding its area of influence. They have made contact with electricity utilities in other countries outside of the Eastern Caribbean to offer membership.

CARILEC is implementing an extensive training program. Courses in both administrative and technical subjects are given to help improve utility management. From November 1989 to July 1990 at least 1,200 persons attended approximately sixty-five training courses. In the first half of 1991, 27 different training programs were implemented with 449 employees receiving training. A total of 30 courses are planned for 1992 including a seminar on hurricane damage mitigation.

CARILEC has initiated a Disaster Assistance Plan to gather information on the member utilities and procedures for providing assistance to countries following a disaster. Jamaica, Bermuda and Trinidad and Tobago have provided information or expressed interest in being included in the Plan. CARILEC is negotiating a standing contract with an American electrical contractor that can be rapidly activated to provide assistance following a disaster. A manual is also being prepared on the maintenance and upgrading of physical facilities.

While the project would initially focus on power, other organizations similar to CARILEC would need to be identified for programs pertaining to water, telecommunications and other utilities.

Council of Caribbean Engineering Organizations (CCEO) - Building Practices and Codes

The Council of Caribbean Engineering Organizations, which was formed 20 years ago, is an umbrella body whose members are made up of the various professional engineering groups in the English-speaking Caribbean. Professional Associations from 12 countries belong to the Council. Headquarters are located in St. John's, Antigua.

43'

The role of CCEO is to ensure the proper development of the engineering discipline in the region in both the academic and professional forums. They maintain close ties with the Engineering Faculty of the University of the West Indies and chair their Faculty Advisory Council which monitors their undergraduate and graduate programs. CCEO provides seminars and workshops for professional development to its member chapters. Recently, CCEO adopted a resolution approving steps to transform the organization into a full fledged Institute of Engineering.

The CCEO is interested in managing activities concerning building codes and practices. They would be supported by the Engineering Faculty of UWI and by a US building code organization such as the Southern Building Code Congress International. In addition to monitoring and updating building codes, it is anticipated that the parties engaged in this activity will work with other actors in the construction sector, and insurance industry to help change building practices. It is likely that other sub-projects would need to be identified for this purpose.

The Pan American Health Organization - Hospital Risk Audits

The Pan American Health Organization Emergency Preparedness and Disaster Relief Coordination Programme was established in 1977. The program enhances the state of preparedness of the health sector and health institutions through contingency planning, training, public education, and coordination with other sectors. It prepares technical manuals, training material, and a quarterly newsletter and provides technical experts to deal with water supply, sanitation, and other sectors. PAHO works with UNDR0 and through this program assists governments to:

- Assess health needs and disseminate this information to potential donors
- Organize and coordinate international health relief assistance
- Provide expertise in managing temporary settlements, sanitary engineering, water supply, disease surveillance and control, and other public health concerns
- Establish a reliable post-disaster communications network to internationally disseminate information on health needs.

This program is funded through assistance from CIDA, OFDA/USAID, and from PAHO's budget. PAHO operates in 29 countries in the region, assisting with disaster preparation and prevention plans. The regional office located in Barbados is responsible for the coordination of disaster preparedness, relief, and mitigation work in the English-speaking Caribbean region.

PAHO is a potential manager for the life-line facility sub-project. Such a program would conduct risk audits and retro-fitting of health facilities in the Eastern Caribbean. It could be managed by the USAID mission in Barbados.

Insurance Association of the Caribbean (IAC) - Insurance Underwriting

The Insurance Association of the Caribbean, Inc. is a non-profit organization that has approximately seventy-five members in fourteen Caribbean countries. It was founded in Kingston, Jamaica in October 1974. IAC is governed by a board of directors of key insurance executives from countries in the Caribbean. Its broad objectives are promoting and fostering growth of the insurance industry in the Caribbean. Within these objectives, specific priority areas have been selected for action.

- The harmonization of regulatory legislation and the removal of discriminatory legislation.
- The development of educational institutions for the insurance industry.
- The fostering of a regional reinsurance company.
- The provision of a forum for the discussion of regional and international matters affecting insurance.

IAC has been active in training and education. It was directly involved with the establishment of Insurance Colleges in Trinidad and Tobago and in Jamaica. They have also set up education programs in Barbados and St. Lucia. IAC has undertaken studies of the industry and publishes statistical reports.

It is proposed that IAC be the implementing agency for the Insurance Sub-projects. The study, preparation of guidelines, and training activities proposed would fit into the priority objectives of IAC and can help to broaden the scope of their activities to include disaster mitigation.

ANNEX B

COUNTRY REPORTS

COUNTRY REPORT - ST. LUCIA

DISASTER ISSUES

Types of Disasters

Of greatest concern to St. Lucia are hurricanes and associated flooding and wind damage. Most disaster preparation efforts are centered on hurricanes, even though there is the added possibility of earthquakes and flooding from regular storms.

St. Lucia is located along a fault line and faces the risk of earthquakes. There has not been a recent major earthquake, but St. Lucia has experienced tremors that have caused some damage.

Landslides pose an additional problem in St. Lucia. Particularly around Castries, many houses have been constructed on steep slopes. During heavy periods of rain, soils become unstable resulting in damage to structures and relocation of residents.

Impact of Past Disasters

It has been 11 years since St. Lucia was hit by a major hurricane. In 1980, hurricane Alan caused considerable damage to the buildings and infrastructure of the island. The electrical power system was badly damaged and required extensive repairs. The experience of Hurricane Alan showed that most properties with insurance were underinsured. Even though St. Lucia was not hit by Hurricane Gustave in 1990, there were EC\$2.4 million in insurance claims mostly from flood damage.

The bias towards preparation for hurricanes exists in spite of the fact that there have been a number of tremors recently in St. Lucia. During 1990, insurance claims of EC\$580,000 were paid for damage resulting from earth tremors.

Vulnerability of Sectors

Residential construction is most vulnerable in St. Lucia, according to the director for disaster preparedness. There is concern that because of poor construction and lack of hurricane straps and other strengthening attachments, most houses will suffer damage from a hurricane or earthquake. Many residential properties are also vulnerable to landslides because of their location on steep hill sides.

Roads and utility lines that follow the roads are also considered vulnerable to landslides, particularly in the mountainous areas outside of town. Power transmission and distribution lines are also vulnerable to wind damage.

An area of special concern are the police radio towers. They are designed to withstand winds of 75 mph (which hurricane winds typically exceed) and would likely be damaged in a major storm. This would cut off communication when it is most needed.

With recent problems in the re-insurance industry, it has become more difficult for insurance companies in St. Lucia to get reinsurance for their portfolios. None of the local companies are large enough to assume the risk without reinsurance. Local companies have had to assume a larger percentage of the risks, which in turn, has resulted in increased insurance rates for property owners.

MITIGATION ACTIVITIES

The government has an active disaster preparedness program, through only a limited number of activities that are mitigation oriented. A national disaster plan has been prepared and is presently in the final stages of printing. The plan details the responsibilities and relationships between all agencies in times of disaster. The disaster preparedness agency is also developing forms that will be used by all agencies for report damage. This disaster plan is expected to be distributed shortly.

Both the electricity and telecommunications companies have written disaster preparedness plans. These include check lists of activities that are to be carried out in June at the start of each hurricane season. Minor repairs are made to correct problems identified in buildings.

PROJECT OPPORTUNITIES

There are several project possibilities in St. Lucia that were identified by the field visit. CARILEC, the regional organization of electrical companies, is located in St. Lucia and is a possible implementing agency for a regional project. Other activities would be local initiatives.

Regional Mitigation Project with Electrical Companies

The Caribbean Electric Utility Services Corporation (CARILEC), formed with funding by USAID, is an association of electrical companies in the Eastern Caribbean. It provides a variety of services to its members including training, information exchange and assistance to other members in times of disaster. CARILEC has been in contact with electrical companies in other countries and has expressions of interest in membership from Jamaica, Trinidad and Tobago, and Bermuda.

The Executive Manager of CARILEC is very interested in serving as the implementing agency for a regional program to help electrical companies improve their preparedness for

disasters. The basic components of the project would be an assessment of vulnerability of generating and distribution facilities, design of a program to correct deficiencies, staff training and implementation. CARILEC would work with electric utilities that are not members of the association. This program would be an extension of present activities of the organization and could strengthen CARILEC as an effective regional organization.

Local Power and Telecommunication Companies

Meetings with staff of LUCELEC and Cable and Wireless, the companies responsible for electric power supply and telecommunications, found interest in implementing a disaster mitigation program. Both companies presently have disaster plans including check lists of activities to be done at the start of the hurricane season. Since the utility companies suffered extensive damage during the last major hurricane to hit St. Lucia, they would like to expand their activities to include disaster mitigation.

Workshops on Home Building Programs

The National Emergency Advisory Council has proposed a program to train construction workers and technical students in proper construction techniques. Three workshops will be held in different parts of the island with the aim of sensitizing persons involved in the construction of homes to the need for employing maximum safety measures in the construction process.

The program would be implemented by the National Emergency Advisory Council with assistance from the Engineers Association, the Ministry of Planning and the University of the West Indies. The estimated cost of the program is US\$7,470.

Multi-media Program in Public Education and Information

The goal of this program is to sensitize the general public to aspects of disaster preparedness through a series of public education programs. Proposed activities include one-day workshops for specific target groups, public information broadcasts on radio and television, features in major newspapers, a quarterly radio discussion and a poster campaign.

This program would also be administered by the National Emergency Advisory Council. It is programmed over a two year period at a cost of US\$72,560.

COUNTRY REPORT - DOMINICAN REPUBLIC**DISASTER ISSUES****Hurricanes**

The Dominican Republic is situated in a major hurricane zone. In fact, the country has been hit by a hurricane almost every year since recordkeeping began in the late 19th century. Most hurricanes cause some damage, although several can be classified as killer hurricanes. In 1930, the country was devastated by Hurricane San Zenon, which destroyed Santo Domingo and caused about 2,000 deaths. In 1979, two hurricanes, David and Frederick, struck the island within 5 days apart, causing 2,000 deaths and US\$800 million in damages. Hurricanes are considered the major natural disaster risk in the Dominican Republic.

Earthquakes

The entire country lies within the Caribbean earthquake zone, with a number of faults traversing the island. Since the beginning of the century, shallow earthquakes have occurred along these faults. The last major earthquake (8.1 on the Richter scale) occurred in 1946, causing enormous damage in the north and in the Cibao Valley. Since then, seismic activity has decreased, though this may not last for long. Statistical data reveal a 50-year cycle of seismic activity, which may repeat itself once again in 1996.

Floods

Basically, flooding in the Dominican Republic is due to overflowing river banks caused by intense and heavy rains, the invasion of sea water from high waves and overflowing dams. Almost every year there is major flooding which results in wide damage and the loss of life. The main problem caused by floods is the damage to crops growing on the flood plains. The most recent major flood occurred in 1981 when some 20 lives were lost and 150,000 people were affected.

Forest Fires

Fire control is a serious problem for a short period of the year, with the dry southwest and northwest regions being the most vulnerable. Most fires are caused by human carelessness, although lightning is also a factor. A forest fire in the Cordillera Central in February 1983 burned 30 square miles of dry brush, heavily damaging about 50 percent of the area's soil and timber.

While all the disasters listed above are serious problems, hurricanes are by far the most devastating. Nevertheless, if a major earthquake strikes Santo Domingo or one of the larger secondary cities, it could rival a major hurricane in its destruction of property and toll on human life.

MITIGATION ACTIVITIES

Efforts to reduce the effects of disasters in the Dominican Republic are focused on preparedness, not mitigation. After the hurricanes of 1979, a National Disaster Commission was created to develop an National Preparedness Plan. Four of the thirteen institutions on this Commission worked together to prepare the Plan. While the plan is both thorough and comprehensive, the resources needed to implement it are not available. The Civil Defense Office (Defensa Civil) is the national agency responsible for implementing the plan in the event of a disaster. However it lacks an emergency operations center, an organizational structure and communications facilities to support disaster operations. For all practical purposes, Civil Defense is not prepared to cope with the next major disaster. Its mitigation efforts are nil.

During the hurricane disaster of 1979, Civil Defense, the National Police and the Armed Forces cooperated effectively. However, the numerous private and government agencies working in disaster preparedness and relief do not have close relationships with Civil Defense and problems of communication and authority have occurred. It is clear that better communications and cooperation among the various institutions in the disaster field is necessary in order to mitigate disasters in the future.

Hazard insurance does not appear to be a problem. For people and businesses which can afford this type of risk coverage and at the same time wish to carry it, feel that the premiums paid are fair and appropriate. Moreover, payments on losses after the 1979 hurricane and all subsequent hurricanes were made promptly and fully. There were few if no complaints. It would therefore appear that there are minimal opportunities to utilize the insurance industry to promote mitigation activities, although it might very well be useful to explore more fully how the industry can be involved in disaster mitigation.

PROJECT OPPORTUNITIES

The National Disaster Plan does cover the need for pre-disaster planning, but this is usually thought of as a preparedness effort. The field team was unable to identify any specific projects to be financed by the USAID funds. However, nearly everyone with whom the team met mentioned the obvious lack of inter-agency coordination and cooperation and how this would have a negative impact on the country when the next disaster occurs.

Therefore it was decided that the most crucial need was not only to get the various institutions to begin talking and cooperating with each other, but to have the institutions themselves design some mitigation projects. These two objectives could be accomplished jointly by organizing a disaster mitigation workshop to be attended by all the relevant agencies, and then once the coordinating function is underway, the same agencies could identify and design mitigation projects.

The implementing agency for the workshop will be the Instituto Dominicano de Desarrollo Integral (IDDI), acting on behalf of a Steering Group composed of seven key institutions in

the disaster field. The mitigation projects themselves will be implemented by selected institutions which attend the workshops. The total costs of the two-phased project will be US\$343,000, of which US\$43,000 will cover the cost of the workshops, while the remainder will fund up to three mitigation disaster projects.

SUPPORTING DATA

The following statistics on the damage wrought by the 1979 hurricanes are show below:

Number of lives lost	2,000
Number of people left homeless	100,000
Number of people affected	1,200,000
Number of bridges destroyed	57
Km's of road destroyed	2,000
Value of losses	US\$800,000,000
Reduction in GNP	15.5%

Most of the information in this country report was derived from *A Country Profile-Dominican Republic*, which was prepared by the OFDA in 1984. This publication contains a complete bibliography as of the date of publication. In addition, the National Emergency Plan provides additional information on the disaster situation in the country.

COUNTRY REPORT - HAITI**DISASTER ISSUES**

Haiti is a mountainous country, which contributes to a shortage of arable land and dramatic climatic changes by altitude. It is also situated in the heart of the Caribbean, subject to being struck by many of the most devastating hurricanes that come through the area. In fact, Haiti has suffered and will continue to suffer from most of the natural disasters known to man. A summary of these disasters follows:

Hurricanes

The damage caused by hurricanes is staggering. High winds carry off roofs, level homes and knock down power and communications lines. Trees are felled and crops are destroyed, while coastal and low-lying areas are inundated by high seas, storm surges and flooding. In the last twelve years alone, three hurricanes have slammed into Haiti, an average of one every four years. In general, these hurricanes strike the southern peninsula, although some hurricanes sweep across the entire country. Given the magnitude and frequency of hurricanes, they are considered the most dangerous natural disaster confronting Haiti.

Floods

Flooding affects both urban and rural areas. A large part of Port-au-Prince is located on a flood plain and during the rainy season as well as during severe storms and hurricanes, the city suffers from extensive flood damage. This flooding is exacerbated by an inadequate and improperly maintained drainage system and by erosion. Poor families in many slum communities are particularly affected. In rural areas and in the coastal plains, deforestation, overgrazing and improper use and building on steep slopes all tend to magnify flood damage and destruction.

Earthquakes

In the 18th century, two earthquakes devastated Port-au-Prince, with severe loss of life and property. While no earthquakes have occurred since then, the existence of three major fault lines are evidence that earthquakes are still a significant threat to Haiti. Moreover, since buildings in general are not constructed or reinforced to resist earthquakes, it is clear that the next major earthquake will cause terrible losses.

Fires

Fire is a real and growing hazard in urban areas. Large scale fires in slum areas of Port-au-Prince have left thousands of already destitute people homeless. High population densities, the use of flammable materials within the homes of slum dwellers and grossly inadequate fire services to these areas combine to enhance the destructiveness of fires.

Drought

Drought is generally considered as equally destructive in Haiti as hurricanes. While lack of rainfall is part of the problem, stripping the land of forest cover and other vegetation aggravates the situation. In the 1970s, droughts affected large numbers of people, although in recent years, droughts have subsided somewhat. Nevertheless parts of the country are affected by droughts almost annually.

MITIGATION ACTIVITIES

Haiti suffers from extreme poverty and the people and the government have to struggle mightily just to survive in an economy that declines annually. As expected, little emphasis has been placed on disaster mitigation activities. The government agency responsible for disaster mitigation, preparedness and relief is woefully under-financed and under-equipped and has made virtually no efforts in mitigation planning and development. The Haitian Red Cross and the several church based relief agencies still focus on relief and reconstruction also.

The Centre de Développement des Ressources Humaines (CDRH) has done more in this area. For example it has prepared some booklets for contractors and craftsman—written in Creole—which cover how to build houses to withstand better hurricanes and high winds.

PROJECT OPPORTUNITIES

Given financial realities in Haiti, it is imperative to identify a program that not only minimizes the need for the government, communities and families to provide financing but also maximizes the number of people who will be affected by the project. It was also recognized that the ability of government agencies to undertake projects was very limited due to inefficiencies and mismanagement and therefore it was necessary to identify a qualified private sector institution to carry out a project. Finally the magnitude and extent of natural disasters in Haiti are so great and the needs to help the poorest nation in the Hemisphere so overwhelming that only a project that focuses on mitigating the effects of all disasters is really appropriate. Therefore it was decided that a project in Haiti should focus on educating the largest number of people possible about methods and techniques to mitigate disasters.

SUPPORTING DATA

The following statistics on the damage from Hurricane Gilbert in 1988 are as follows:

Number of lives lost	54
Number of people left homeless	8,000
Number of people affected	870,000
Value of losses	\$89,000,000

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COUNTRY REPORT - BARBADOS**OVERVIEW**

The Caribbean nations are all exhibiting significant urbanization at an alarming rate, with cities and towns dominating both the population and economic growth. The United Nations estimates that approximately 47 percent of the Caribbean region's 20.7 million population live in urban areas. This growing urbanization places enormous pressures on the facilities and services of the urban centers, forcing people to settle in marginal areas, use poor construction practices, and reside in insecure houses as they seek employment and a better way of life

The islands of the Caribbean region lie in a well defined zone and are vulnerable to a wide variety of natural and man made disasters. The islands have in the past been subjected to disasters like hurricanes, earthquakes, floods, landslides, and volcanic eruptions. Because of increasing urbanization, the impact of any natural disaster on individual island states could be significant, causing death, destruction to shelter, destruction to infrastructure, and disrupting the lives of thousands of people. The economy of the countries would suffer as those sectors like tourism and agriculture critical to growth and development would be affected. Living through a disaster or being in close proximity to one is enough to start people thinking how this can be prevented or its impact minimized. The most recent experiences of Hurricanes Gilbert and Hugo served as a reminder of the possible devastation of natural disasters and have stimulated the peoples of the Caribbean to begin to focus on prevention and mitigation programs.

The island of Barbados is no different from the rest of the Caribbean: its economy is fragile and contracting; after years of real growth the economy recorded a decline in 1990 of 3.5 percent and for the first quarter of 1991 a decline of 1.5 percent; some critical sectors like tourism, agriculture, and industrial output are declining; unemployment is rising; and the government is strapped for cash as it seeks to restore budget equilibrium, improve government efficiency, and obtain value for money in the delivery of government services. In this economic environment, while recognizing that the threat of a natural disaster is real, the financial support necessary to mitigate against a disaster is unavailable from government sources. The challenge for the private sector, development agencies, and planning authorities is enormous to find innovative ways of addressing the problem.

Barbados, fortunately, has not been affected by any serious disasters in recent times; however, many government and private agencies having seen the effects of Hurricanes Gilbert and Hugo have begun to take steps towards mitigation.

MITIGATION ACTIVITIES

The urgent need for disaster mitigation is borne out by the fact that with the exception of Jamaica and Trinidad and Tobago, most islands of the English-speaking Caribbean range from 85-2,000 square miles in surface area. A large hurricane usually extends over a 10,000 square

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mile area and therefore small islands are bound to be severely affected by any large hurricane passing through the region. Some mitigation measures are:

- Vulnerability analysis
- Land use regulations
- Structural improvement
- Insurance underwriting
- Tax incentives, loans, grants
- Public education & information dissemination.

There are a number of agencies/institutions in Barbados that have started a program to reduce the effects of disasters; these are focused on preparedness, mitigation, and relief. These agencies are:

- Central Emergency Relief Organisation
- Barbados Light & Power Co.
- Barbados Telephone Co.
- Pan American Health Organisation
- Caribbean Disaster Response Agency.

The Central Emergency Relief Organisation (CERO) is a government organization which focuses mainly on preparedness and coordination of relief efforts; limited mitigation activities have been undertaken. The office is understaffed, which limits its effectiveness. In the past CERO has conducted training workshops on sound construction practices and an advertising campaign to increase the awareness of the populace.

The Barbados Light & Power Company has started to implement a planned program to reduce the vulnerability of the company and its facilities to natural disasters. This was prompted after the effects of Hurricanes Gilbert in Jamaica and Hugo in Montserrat. A vulnerability assessment of the facilities was done and retrofitting of buildings has been completed. The company believes that apart from one generating facility that would be subjected to flooding the buildings are now relatively safe. Redrafting of transmission and distribution standards to allow for wind speeds of 150 mph is presently taking place. A long-term program to strengthen transmission facilities involves the introduction of new and higher quality poles, and in some instances the placing of cables to service critical facilities underground. An underground cable to the water pumping station which supplies 40 percent of the water has just been completed. This program is ongoing and is entirely financed by the company.

The Barbados Telephone Co. is presently doing a vulnerability assessment of its critical facilities and implementing a hazard mitigation program. This involves retrofitting of buildings, replacing glass windows with shatter proof windows, strengthening of transmission facilities and placing of some cables underground. Cable & Wireless has controlling interest in both B.E.T. and Bartel and both companies are part of the disaster prevention and

mitigation program which has been developed by Cable & Wireless for BCA region. Cable & Wireless routinely conducts disaster preparedness, mitigation, and prevention seminars for members of staff and constantly evaluates their capabilities. The capability exists for communication to be maintained with the rest of the world in the event of a disaster.

The Pan American Health Organisation Emergency Preparedness and Disaster Relief Coordination Programme was established in 1977. The program enhances the state of preparedness of the health sector and health institutions through contingency planning, training, public education, and coordination with other sectors. It prepares technical manuals, training material, and a quarterly newsletter and provides technical experts to deal with water supply and sanitation, among others. PAHO works with UNDR0 and through this program assists governments to:

- Assess health needs and disseminate this information to potential donors.
- Organize and coordinate international health relief assistance.
- Provide expertise in managing temporary settlements, sanitary engineering, water supply, disease surveillance and control, and other public health concerns.
- Establish a reliable post-disaster communications network to internationally disseminate information on health needs.

This program is funded through assistance from CIDA, OFDA/USAID, and from PAHO's budget. PAHO operates in 29 countries in the region, assisting with disaster preparation and prevention plans. The regional office located in Barbados is responsible for the coordination of disaster preparedness, relief, and mitigation work in the English-speaking Caribbean region.

The Caribbean Disaster Response Agency is a new regional agency which is just being formed to replace the PCDPPP. A Director has been recruited and work is now in progress to secure suitable office accommodation and recruit staff. It is anticipated that this agency when operational will have the capacity to coordinate programs of preparedness, mitigation, and prevention of natural disasters. The capabilities of this agency could be assessed and some technical assistance offered in an attempt to make it operational in the shortest possible time and thus assist in the implementation of the Caribbean Disaster Mitigation Project.

The Town & Country Development Planning Office falls under the Ministry of Finance and Planning. It has the responsibility for monitoring and implementing the approval process and by so doing ensuring the orderly development of the country. The Barbados Physical Development Plan guides the process and ensures that development takes place in prescribed zones. There is an efficient inspection program to ensure that the development standards are not being violated; the financial institutions require building certificates which are issued by the Town Planning Office in order to make funds available for development. The Office also monitors the high water mark and ensures that as far as possible new development takes place outside high risk areas.

The Caribbean Development Bank was one of the institutions that funded the study and formulation of CUBiC and has continued to display an interest in reducing the impact of

natural disasters on island states. It has offered technical assistance, conducted seminars, and funded workshops in the islands affected by Hurricane Hugo. These seminars introduced participants in the communities to correct construction practices, which will make buildings more secure and reduce risk. At present, guidelines are being developed, to be included as part of all projects, on the need for measures to mitigate against the impact of natural disasters.

Rehabilitation work supported by the bank in Jamaica, Montserrat, and Dominica has as part of its objective ensuring that the projects are protected against natural hazards. In Dominica a US\$10 million project for sea defense is now being implemented along with efforts to protect the ports. In Montserrat the port which was damaged by Hurricane Hugo is being rehabilitated and efforts are being made to ensure that it is secured against future disasters; wave action and wave behavior is being studied; structures are constructed on piles; and the shore is being protected with accropodes to break wave action. In Jamaica assistance involves training, rehabilitation of bridges and roadways.

The bank has worked closely with PCDDPP and is willing to work closely with other donor agencies to assist in ensuring that projects that are financed are secure and able to withstand the effects of natural hazards.

PROJECT OPPORTUNITIES

Hurricanes and floods are the principal disaster risks faced by Barbados. The island felt the effects of Hurricane Janet which in September of 1955 passed just south of the island—winds in the region of 90–110 mph caused extensive damage. In August 1980 Hurricane Allen passed just north and caused much damage to houses, agriculture, and utilities. Since then Barbados has suffered from localized flooding in 1984, 1985, and 1986, with extensive damage to houses and roads and agriculture.

The length of time between hurricanes or floods usually dims the collective and institutional memory of countries and people feel a false sense of security until they are hit by another disaster. The ongoing work of national disaster agencies in the development and implementation of mitigation measures to limit the vulnerability of each country is of critical importance.

OBJECTIVES

The objectives of this project are to:

1. assist in developing and implementing a program to reduce the vulnerability of:
 - lifeline facilities such as health care facilities, water supply, sewage
 - utility companies—electricity and communications
 - coastal land management.
2. sensitize policy makers and donor agencies to the importance of including a mitigation component in all projects to be funded.

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3. develop and implement along with the private sector a public education and information dissemination program to increase awareness.
4. develop and implement a training program, both formal and informal to ensure proper construction practices.

PROPOSED ACTIVITY/IMPLEMENTATION

All aspects of the project should involve working with government, private sector agencies, educational institutions, and community groups. The design and implementation must involve the major players and should be formulated to ensure sustainability and accountability.

Lifeline Facilities

The critical lifeline facilities in a country should be reasonably secure against the impact of natural disasters. While PAHO has concentrated on the preparedness of health service responsiveness in the event of a disaster, very little being done to ensure that the building itself is safe and able to offer service. In Montserrat during Hurricane Hugo the only hospital on the island was destroyed and patients had to be evacuated; in Jamaica during Hurricane Gilbert the Morant Bay and Lucea hospitals were destroyed.

Vulnerability Assessment. A program to assess the vulnerability of the health institutions and make them reasonably secure would be implemented through PAHO and with the assistance and cooperation of governments with inputs from the private sector. Hospitals and Health Centres would be identified on the basis of location and type of service offered and their importance prioritized. Following on the vulnerability assessment these facilities would be upgraded to improve the physical structures and to install auxiliary power plants, water, and other services which will be required in an emergency.

Sewage and Potable Water. Presently PAHO as part of its program looks at the availability of potable water supply and treatment and disposal of sewage. This program would be expanded with the support of OFDA/USAID to ensure that in addition to the upgrading of these services they are adequately maintained and able to withstand a disaster or be restored shortly thereafter.

Utility Companies. The PAHO public education campaign on disaster could be modified and expanded to include aspects of mitigation. Training materials, video, films, and literature would be disseminated through the national disaster committee in each country and PAHO's own network.

Utility Companies

In the event of a disaster it is imperative that electricity be available to supply critical facilities. The vulnerability of generating and transmission capabilities should be kept low and there should be the ability to restore power in the shortest possible time. Some of the

electricity companies in the region have begun to implement a program to improve the security of their facilities and make them more resistant to the effects of natural disaster. In Jamaica timber poles are being replaced by concrete poles and measures have been put in place to ensure the safety of generating plants. In Barbados the electric company has completed a program of retrofitting. Through CARILEC these efforts would be complimented and the electric companies in OECS countries assisted to upgrade the security of facilities through the provision of technical assistance and grants where necessary.

Coastal Land Management

Many of the island states are dependent on tourism as a net foreign exchange earner; the industry contributes a large percentage of GDP and the destruction of this sector through natural disaster would have a significant negative impact on the economy.

The critical nature of the sector to the economy dictates that vulnerability assessment and risk mapping be conducted in coastal areas. The result of this exercise would guide the steps that should be implemented to mitigate against the effect of disasters.

National Mitigation Efforts

The program of activities to be implemented by the National Disaster Committee will have a three pronged approach. They will be responsible for:

1. *Private Sector Involvement.* Through a campaign linked with the advertisement of the products of private sector companies. Private sector companies would be encouraged to participate in a program which would, as part of their normal advertising program, include a message on disaster preparedness, prevention, and mitigation. For example, a hardware merchant could have an advertisement like, "Black's hardware offers quality lumber, zinc sheeting, and hurricane straps. Be sure to use hurricane straps when you construct a building: it will make you safe during a hurricane."

Different messages could be associated with different products at no additional cost to the companies. The national disaster committee could supply information which would be used to develop the scripts.

2. *Training.* Over the years the quality of construction and construction practices have declined. New building designs do not adequately take into account hazard mitigation. The apprenticeship program has disappeared with the passage of time and scarcity of resources. The result is that the body of skilled artisans is not being replenished and the trade is being corrupted with persons claiming to be tradesmen. This coupled with the fact that most low income households construct their own shelter adds to the poor quality of housing.

The need therefore exists at both the formal and informal levels for training in proper construction methods and how to construct disaster resistant houses. At the formal level,

a program of curriculum development would be entered into with institutions like CAST, HEART, UWI, and Vocational Training Centres in Jamaica; in St. Lucia, the Sir Arthur Lewis Institute; and in Barbados, the Samuel Prescod Vocational Training Centre. These institutions would include as part of their normal curriculum a program of hazard mitigation. The training materials would be provided by the project along with guest lecturers in the start up phase, and eventually each institution would independently support the program.

At the informal and community levels, NGOs with the required skill and experience would be used to develop shelter clinics in specific communities utilizing the resources of technical experts as trainers and community artisans to perform the actual construction. This would provide actual hands-on experience.

IMPLEMENTATION

In order to limit the demands on the resources of USAID, the project could be managed and coordinated by a project management unit contracted by RHUDO/OFDA. This firm would be responsible for subcontracting with regional entities and national disaster committees for the development and implementation of aspects of the project in individual countries. These regional entities may not necessarily have the in-house resources but these would be acquired on a contractual basis as the need arose (see Management Structure).

PAHO's Emergency Preparedness and Disaster Relief Coordination Program with a regional office in Barbados could play a critical role in coordinating the program for the lifeline facilities. They could be responsible for vulnerability assessment, ensuring the safety of health facilities and developing and disseminating information and training at both the formal and community levels.

CARILEC could coordinate the activities for the electricity companies, in the islands they could oversee vulnerability assessment, and a program for retrofitting of the companies. Through the project technical assistance would be provided.

CERMES would manage the necessary research and assessment for coastal land management. The information received would be made available to governments and planning authorities to be used to guide their developmental process.

The national disaster committees would be responsible for aspects of the program in their individual countries. All segments of the project would carry a training component. RHUDO through its Regional Training Officer would work closely with the various institutions and agencies to identify offshore training courses, organize and hold courses, source information, and in general act as a clearinghouse for training materials related to disaster and disaster mitigation.

COUNTRY REPORT - BELIZE

DISASTER ISSUES

The main disaster threat to Belize is hurricanes and the accompanying flooding and storm surges. Most urban developments are located in low-lying coastal areas that are particularly susceptible to damage from tropical storms.

Belize City was destroyed and 1,500 people killed by a severe storm in 1931. In 1961, Hurricane Hattie with winds of 200 m.p.h. caused extensive damage and flooding. Storm surges of up to 18 feet were caused by this storm. Hurricanes Carmen and Fifi caused extensive damage to the southern coast of Belize in 1974.

Belize City is particularly vulnerable to disasters because of its coastal location and topography. Various estimates have projected that 40 to 60 percent of the city's housing stock could be destroyed by storm surges and flooding from a major hurricane.

In 1970 the capital of Belize was moved from Belize City on the coast to Belmopan, a less hazardous location in the interior. The relocation did not fully resolve the problem since Belmopan is subject to flooding from the Belize River and Roaring Creek.

MITIGATION ACTIVITIES

The GOB has a disaster preparedness plan under the direction of a disaster committee composed of cabinet ministers and high government officials. The Secretary of the Cabinet is head of the committee in addition to his other duties. Some concern was expressed that disaster planning needs a full-time director to receive the attention it deserves.

The Ministry of Works is responsible for the inspection of all buildings to be used as shelters prior to the hurricane season. They do not have formalized procedures for inspections. The Ministry is also responsible for search, clearing and inspection of buildings following a disaster.

The disaster plan calls for the evacuation of coastal towns in the event of a hurricane warning but evacuation plans have not been prepared. This is a potential problem since there are limited roads out of towns and limited facilities to accommodate evacuees in the interior. In the case of Belize City, one must go almost 30 miles to get out of the low-lying marshy areas.

Most efforts of the GOB have been directed at disaster preparedness and relief with little attention to programs for disaster mitigation.

PROJECT OPPORTUNITIES

A number of project opportunities were identified during the discussions with the USAID Mission, government officials and representatives of the private sector. These activities and possible implementing agencies are:

Land Management/Siting

There are several activities taking place in Belize that support the introduction of a pilot project using land use management as a mitigation tool. Some of the complementary activities being carried out include:

- Implementation of a storm surge modeling project by the United Nations. This will provide much needed information on the extent of flooding that can be expected for storms of various intensities.
- Implementation of a major environmental coastal management project by the USAID Belize Mission. The project will address such problems as barrier reef deterioration, deforestation and clearing of mangroves. Environmental monitoring and planning is one component of the US\$8.5 million project. An additional component for coastal resource conservation could also be added. The implementing agency is the Ministry of Natural Resources, Tourism and Environment.
- Preparation of an Urban Development Plan for Belize City. The plan is significant in that it is the first time that the GOB will attempt to establish land-use zones and enforce zoning regulations in an urban area in Belize.
- Implementation of a certificate course in physical and environmental planning at the Technical College for planning technicians and developers.

There is an excellent opportunity to coordinate with these projects to include disaster mitigation activities into their programs. Information generated by the projects can be used in preparing hazard assessments and identifying how and where mitigation can be inserted. Some of the problems that can be addressed through land management and siting include:

- Rapid development in Belize City into high risk and environmentally sensitive areas.
- Rapid destruction of mangrove areas through land reclamation that remove natural protection from storm surges and flooding.

Risk Assessment for the Electric Utility

The Belize Electricity Board is responsible for the generation and distribution of electricity for the entire country. The BEB considers its facilities to be vulnerable to disasters since most of the generating facilities are located in low coastal towns. It is proposed to relocate generating facilities to higher, less vulnerable locations, but this will be a long-term project.

The BEB presently use a mixture of wood and concrete utility poles but would like to eventually convert to concrete. Concrete poles are presently imported but they will soon be locally manufactured.

The Board has not developed a formal disaster mitigation and preparedness program but is very interested in having a plan of activity. The Chief Executive Officer expressed a strong interest in being a participant in the proposed USAID activities. He asked for information and CARILEC and will contact them concerning membership.

Public Education

In Belize there appeared to be some complacency toward disasters on the part of ordinary citizens. This was attributed to the long interval since the last major disaster which has resulted in a false sense of security. It is felt that a public education program would be useful to help overcome this problem.

Disaster awareness and mitigation procedures should be included in courses at technical institutions. The planning course being initiated by local planners is an excellent opportunity to introduce mitigation.

Another possibility is a multi-media program that would provide information to the general public on disaster preparation and mitigation.

COUNTRY REPORT - JAMAICA

DISASTER ISSUES

Types of Disasters

Jamaica has a history of disasters caused by hurricanes, earthquakes, and floods. Jamaica is in one of the most active hurricane regions of the world and has suffered from at least 14 major hurricanes since 1880.

Many areas, particularly the low-lying coastal plains, are subject to flooding. Since most of the population is concentrated in the coastal areas, flooding from hurricanes and tropical storms results in extensive damage and loss of life.

Jamaica is located in an active earthquake zone and has experienced serious earthquakes in the past. The island experiences frequent tremors but has not had a major earthquake in recent times.

Impact of Past Disasters

The latest major disaster to strike Jamaica was Hurricane Gilbert in 1988. It killed 49 people, affected more than 800,000 people, and caused an estimated US\$1 billion in economic loss to the island. Jamaica has still not fully recovered from the effects of Gilbert.

Floods in recent years have also had major impacts on the country. There were major floods along the Rio Cobra earlier this year. In 1986 major flooding killed 54 people and caused an estimated US\$76 million in damage.

Vulnerability of Sectors

The agricultural sector is particularly vulnerable to the impacts of hurricanes and flooding since much of the productive agricultural land is located in the low-lying coastal zones.

Housing is also vulnerable to both hurricanes and flooding. Hurricane Gilbert caused extensive damage to housing, particularly in lower-income neighborhoods.

MITIGATION ACTIVITIES

The Office of Disaster Preparedness (ODP) is the coordinating office for all disaster preparedness and relief operations in Jamaica. In this capacity, its most critical function is not directly providing relief but in developing and mobilizing existing resources to anticipate and plan for disasters.

ODP is developing a comprehensive picture of Jamaica's disaster vulnerability and identifying mitigation measures that can be implemented to reduce the identified risks. ODP has an

ongoing education program to inform the public of the dangers and risks of various disasters and of preparedness and mitigation measures they can take.

Following the devastating effects of Gilbert on their systems, all three utility companies—electricity, telecommunications, and water—have instituted programs of disaster preparedness and mitigation. These activities are being done with their own funds.

PROJECT OPPORTUNITIES

There are several project possibilities in Jamaica that were identified by the project team. Most of these were not unique to Jamaica but were also identified in other countries.

Mitigation Program for Utility Companies

While the utility companies have undertaken certain mitigation activities, their representatives all expressed interest in participating in a comprehensive risk assessment program. They felt that there was more that they could do and were willing to finance additional mitigation activities.

Construction Training

It is a generally held view that the quality of construction in Jamaica has deteriorated considerably in recent years. Much of the damage to structures by Hurricane Gilbert was the result of faulty roof construction. One of the reasons for the lowering of standards is a breakdown in the apprentice system so that traditional sound construction practices are not being passed on to the younger artisans.

It was felt that construction training was very important at both the formal and informal levels. Disaster-resistant construction procedures should be an important component of the curricula of the technical training institutions. A project that reviews curricula and helps to strengthen the mitigation elements was felt to be important.

Shelter Program

Following Hurricane Gilbert, the Association of Development Agencies (ADA) initiated an education program to teach residents of lower-income communities proper residential construction techniques. A one-room model house was built in the community by local artisans under the direction of an architect. Residents were involved during the construction and could visit the completed structure where the various components of proper construction were labeled. ADA has completed the pilot project and is looking for an organization to take over the concept and expand it to other areas.

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Insurance

The head of the Jamaica Association of General Insurance Companies felt that there was a role the insurance companies could play to improve the quality of construction in Jamaica. One approach would be to link premiums to the application of suitable standards or safe construction practices. This would result in preferential premiums for reduced risk and could apply to new construction or upgraded existing structures. Training would be needed to introduce new underwriting procedures.

Insurance groups also expressed interest in risk/hazard maps that could be used in differentiating between rates.

ANNEX C

BUDGETS

C-1

A. REGIONAL SERVICES

A.1. Project Management Information and Management Unit

5 Year Program

Description	Amount
Program Management and technical assistance	\$850,000
Program Manager 60 pm	\$300,000
GIS Information Specialist	\$250,000
Database Specialist 60 pm	\$75,000
Data Entry Specialist	\$60,000
Contracts Manager	\$90,000
/Accountant 60 pm	
Office Manager 60 pm	\$75,000
Training:	\$0
Travel	
International/Regional (30-30)	\$60,000
Local	\$30,000
Allowances	
Per Diem	\$60,000
Housing	\$180,000
Shipping	\$10,000
Non Expendable equipment	\$60,000
Other direct costs	
Operations	\$25,000
Map and Report Production	\$50,000
Executing Agency Fee	\$65,000
Total	\$1,390,000

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A.2. Baseline Data and Indicators

Description	Amount
Program Management and technical assistance	\$150,000
Program Manager 6 pm Indicators Specialist 6 pm Technical Assts. 18 pm	
Training: 5 local workshops	\$15,000
Travel	
International/Regional	\$6,500
Local	\$5,000
Per Diem	\$19,000
Non-expendable equipment	\$10,000
Other direct costs	
Operations	\$2,000
Report Production	\$2,000
Executing Agency Fee	\$10,500
Total	\$220,000

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A.3. RHUDO Training Budget

5 Year Program

Description	Amount
Program Management and technical assistance	\$175,000
Local Training Specialists 30 pm	\$45,000
Experts from U.S. "Twinning" Organizations 15 pm	\$115,000
Training: 15 regional workshops	\$0
Travel	
International	\$15,000
Regional	\$80,000
Per Diem	\$45,000
Non-expendable equipment	\$0
Other direct costs	
Training Materials	\$75,000
Executing Agency Fee	\$0
Total	\$550,000

B. THE BUILT ENVIRONMENT

B.1. Risk Audits: Electrical Utilities

10 Units in Region

Description	Amount
Program Management and technical assistance	\$360,000
Program Manager 24 pm /Engineer Engineers 10 pm Engineering Services 20 pm Technical Assistants 30 pm	
Training: 15 local workshops	\$7,500
Travel	
International	\$6,000
Local	\$6,000
Per Diem	\$15,000
Non-expendable equipment	\$10,000
Other direct costs	
Operations	\$5,000
Map and Report Production	\$5,000
Executing Agency Fee	\$20,500
Total	\$435,000

B.2. Lifeline/Hospital Facilities**St. Lucia Pilot Program/Regional 5 Countries**

Description	Amount
Program Management and technical assistance	\$150,000
Program Manager 10 pm /Engineer Engineering Services 10 pm Assistant Engineers 20 pm	
Training: 20 Delegates	\$25,000
Travel	
5 Regional Trips	\$4,000
Local	\$5,000
Per Diem	\$21,000
Non-expendable equipment	\$5,000
Other direct costs	
Operations	\$2,500
Map and Report Production	\$2,500
Executing Agency Fee	\$10,000
Total	\$225,000

B.3. Shelter: Building Practices and Codes

Regional 5 Year Program

Description	Amount
Program Management and technical assistance	\$558,000
Program Manager 60 pm	\$250,000
Bldg/Materials Specialist 30 pm	\$50,000
Community Housing Specialist 36 pm	\$45,000
Training Curriculum Specialist 14 pm	\$17,000
Training Curriculum Specialist 3 pm	\$30,000
Technical Assts. 120 pm	\$100,000
Marketing Specialist 3 pm	\$33,000
Legal Specialist 3 pm	\$33,000
Training: 30 local workshops	\$180,000
Travel	
International	\$15,000
Local	\$6,000
Per Diem	\$150,000
Non-expendable equipment	\$60,000
Other direct costs	
Operations	\$50,000
Report Production and Training Materials	\$50,000
Executing Agency Fee	\$56,000
Total	\$1,125,000

C.4. Shelter: Insurance Underwriting

Kingston Pilot Program

Description	Amount
Program Management and technical assistance	\$120,000
Program Manager 6 PM	
Technical Assts. 12 PM	
Insurance Underwriting Specialists 3 PM Foreign	
Insurance Underwriting Specialists 6 PM Local	
Training: 15 workshops	\$75,000
Travel	
International/Regional	\$7,500
Local	\$7,500
Per Diem	\$20,000
Non-expendable equipment	\$40,000
Other direct costs	
Data - Images etc	\$9,000
Operations	\$10,000
Map and Report Production	\$25,000
Executing Agency Fee	\$16,000
Total	\$330,000

D. RISK MAPPING/GIS

Belize Pilot Program

Description	Amount
Program Management and technical assistance	\$425,000
Program Manager 18 pm /Planner GIS Specialist 25 pm Cartographer 18 pm Technical Assts. 36 pm	
Training: 15 local workshops	\$30,000
Travel	
International	\$20,000
Local	\$12,000
Per Diem	\$63,000
Non-expendable equipment	\$35,000
Other direct costs	
Operations	\$7,500
Map and Report Production	\$25,000
Executing Agency Fee	\$32,500
Total	\$650,000

D. MITIGATION PLANNING AND PROGRAM DEVELOPMENT**Dominican Republic 2 Years**

Description	Amount
Program Management and technical assistance	\$202,000
Program Manager 8 pm	
Mitigation Expert/Facilitator 6 pm	
Mitigation Specialists 18 pm	
Technical Assistants 24 pm	
Training: 8 local workshops	\$80,000
Travel	
International/Regional	\$15,000
Local	\$3,000
Per Diem	\$18,000
Non-expendable equipment	\$7,500
Other direct costs	
Operations	\$2,000
Report Production	\$5,000
Executing Agency Fee	\$17,500
Total	\$350,000