

*Comprehensive Approach for Disaster Management in
the Caribbean Project*



**Comprehensive Disaster Management in the Caribbean
Baseline Study**

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Table of Contents

Table of Contents.....	2
1.0 Introduction – Purpose and Background	3
1.1 Purpose.....	3
1.2 Context	3
1.3 Events.....	4
1.4 Regional Mandates for Disaster Mitigation.....	5
2.0 Summary of Findings	8
2.1 Disaster Management Capacity in the Caribbean.....	8
2.2 Technologies and Practices	22
2.3 Regulatory Framework – Legal Mandate.....	25
3.0 Ongoing and Prospective Disaster Reduction Programs	25
4.0 Summary Identification of Needs	27
Appendices.....	30
Occurrence of Natural and Technological Hazards and Disasters	31
Conditions of Vulnerability.....	31
Management Mechanisms	32
Vulnerability and Risk Assessment - Existing and Needed Initiatives	35
Seismic Risk – earthquakes and volcanoes.....	35
Geophysical Risk - Landslides and flood.....	36
Climatic risk – meteorological, storm surge, climate change, sea level rise.....	37
Lifeline and key economic sectors.....	39
Technological Risk.....	40
Major Predecessor Projects.....	41
Caribbean Disaster Mitigation Project (CDMP)	41
Disaster Emergency Response Systems Management (DERMS).....	42
FAO – Vulnerability Reduction in the Agricultural sector.....	42
CPACC.....	43
Suggested Activities Identified by the Baseline Study.....	44
References: Persons and Documents Consulted	48
Persons Consulted (Individual Consultations)	48
Stakeholders Working Group Participants (April 4, 2001).....	49
Documents.....	50

Baseline Study

1.0 Introduction – Purpose and Background

1.1 Purpose

This document provides a baseline on which a strategy for Comprehensive Disaster Management (CDM) within the Caribbean will be designed. CDM has been defined under the DERMS project as including integrated management of all natural and human-induced hazards and involving management through all phases of the Disaster Management Cycle viz. Prevention and Mitigation, Preparedness, Response, Recovery and Restoration. CDM engages the public and private sectors, civil society, urban and rural communities, and the general population in hazard prone areas. CDM is therefore multi-hazard, and multi-sectoral in its application and is concerned primarily with integrating vulnerability assessment and risk reduction into development planning and management.

This baseline study is conducted under a project of the UN Development Program (UNDP) in partnership with the US Agency for International Development (USAID) with the Caribbean Emergency Disaster Response Agency (CDERA) as implementing agency. The joint project is intended to support and extend the on-going work of CDERA, to establish an effective framework for disaster management in the region, and to strengthen CDERA to undertake and lead the CDM agenda. The aim is to integrate disaster management into planning and development in all member countries of CDERA, and to elevate CDM on the Caribbean political agenda.

The CDERA member countries include: Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, St Kitts and Nevis, St Lucia, St Vincent, Trinidad & Tobago, Turks and Caicos Islands

1.2 Context

In designing the framework for disaster management it is important to establish the context within which CDM will be implemented. The context involves the hazards, vulnerability, risks, events and disaster experience, as well as the countries, agencies, and initiatives already undertaken or underway. An assessment of what has been achieved to date and the remaining inadequacies will help to inform how the needs can be satisfied to make the required difference. Considerable work has been implemented and much has been achieved in several aspects of disaster management. This baseline report does not attempt to catalogue all the activities in each country, but seeks to assess and interpret gains to date as they relate to level of organization and related initiatives which will form the foundation for full-scale implementation of CDM in the development process.

Extreme hazardous events since 1979 have challenged the region. Several programs and projects have been put in place within the past twenty years in the attempt to increase awareness of the vulnerability of the Caribbean to the impact of natural and technological hazards. The objective has also been to build capacity to prepare and respond, and to

implement institutional mechanisms to reduce the impact of these extreme events. Experiences over the past six years have underscored the need for integration of comprehensive disaster management into the development process. As natural hazards seem to be increasing in frequency, so too, personal, sectoral and national investment decisions have increased disaster vulnerability and risk. There is general recognition that each Caribbean territory needs to place greater emphasis on how to:

- Reduce the need to cope with repeated losses,
- Retain funding for development rather than having to divert into reconstruction,
- Reduce the trauma of social and economic dislocation,
- Achieve incremental growth without increasing vulnerability.

Disaster management within the Caribbean over the past twenty years has emphasized preparedness and response, and it is necessary to continue to strengthen that capability. However, the experience of the region has served to highlight the need to break the cycle of “build – lose – build – lose - ...” through effective prevention and mitigation interventions.

The first structured meeting on disaster management in the Caribbean was held in 1979 following large-scale destruction on several islands by Hurricanes David and Frederick, eruption of the Soufriere volcano in St Vincent, and alternating occurrences of flood and drought in several Caribbean territories. Several initiatives have been made within the region over the past 12 years and these together with the onslaught of extreme events over the past six years have heightened awareness within the region of the need to build capacity to effectively handle the vulnerabilities to which the Caribbean is exposed.

Notwithstanding the several initiatives that have advanced disaster management capability within the region, the need for systemic change in the approach to development planning, livelihoods, design and maintenance of infrastructure, siting of capital projects, and building standards is increasingly urgent. The integrated and holistic approach that is needed to minimize loss and dislocation can be advanced through the CDM process at the national level in each of the 16 CDERA member countries.

1.3 Events

The Caribbean region has within the past two decades experienced repeated losses from hurricanes and associated wind, rain and storm surge damage. Volcanic eruption severely destroyed the economy and social life in Montserrat. Flooding has occurred in several territories and landslides have damaged physical infrastructure. Droughts have reduced agricultural output and water supply. Altogether, events have diverted considerable sums of government budgets from capital investment and recurrent expenditure into reconstruction. Losses in earnings from visible (agriculture) and invisible (tourism) exports have exacerbated the economic hardship experienced. Some territories have experienced multiple losses in close succession (for example, hurricanes in Antigua/Barbuda and St Kitts/Nevis, hurricanes and volcanic eruption in Montserrat).

Events have opened the window of opportunity to foster greater attention to disaster management and specifically mitigation measures. Repeated occurrences and associated losses provide teachable moments and therefore **disaster response, damage assessment and recovery management strategies constitute significant media on which to build**

mitigation and prevention initiatives. In addition, it is significant to note that the impact of the event captures attention, and every advantage should be taken of the moments immediately following to make appropriate interventions. Some territories that were hitherto casual are now more responsive to strengthening their disaster management capability (for example Antigua/Barbuda, Montserrat, St. Lucia). In contrast, Barbados has had a central emergency response center since the last direct hurricane strike that occurred as Janet in 1955. However, the level of complacency among the population is extremely high and it is feared that when a major event occurs the results will be devastating. Barbados is therefore a major candidate for a targeted sensitization program without the “benefit” of an event. St Vincent remains at a relatively low-level of interest in spite of the many hazards to which the island is prone. It is expected that the recently agreed World Bank program will help advance disaster management in the respective countries which have started to implement agreements – Grenada, St Kitts and St Lucia.

1.4 Regional Mandates for Disaster Mitigation

Several meetings and documents recognize the need to implement vulnerability and loss reduction measures in the region. These include:

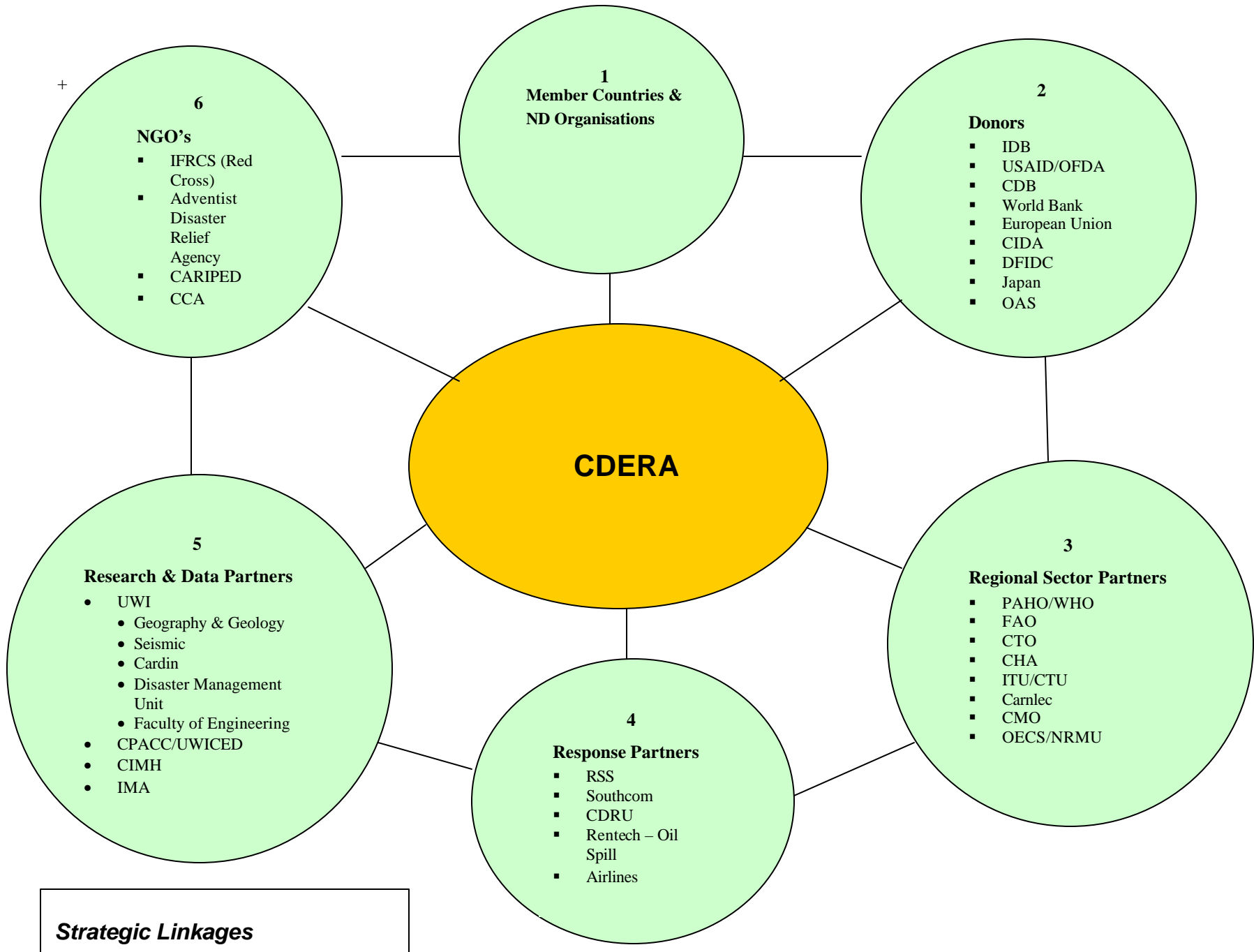
- Plan of Action from the UN Conference on Small Island Developing States (SIDS POA) Barbados, 1994;
- Agreement of the USA/Caribbean Summit, Barbados, 1997 - *Partnership for Prosperity and Security in the Caribbean*;
- Caribbean Ministerial Meeting on SIDS POA, Barbados, 1997 – *The Way Forward*; and
- 3rd Caribbean Conference on Natural Hazards – Caribbean Disaster Management in the 21st, Barbados, 1999.

These mandates have not been effectively translated to national level action and considerable work remains to be done to lift the profile of disaster management in most territories and to get all government agencies to buy in to their roles and responsibilities for disaster mitigation, preparedness and response.

The Eastern Caribbean Donor Coordination Group convened by the UNDP facilitates dialogue and resource allocation to disaster management in the region. This group was formed following Hurricane Hugo in 1989 and comprises membership of donors (UNDP, CDB, DFID, EU, PAHO, UNICEF, USAID/OFDA, US EMBASSY, OXFAM), regional and local (Barbadian) response agencies (CDERA, RSS, BAR MET, BDF, CERO), support agencies (IDB, OAS); and joint disaster response agencies (FAO, ITU).

Disaster planning is an on-going exercise and the time to prepare is long before the event. Logistics and an organizational framework need to be defined, and mitigation requires education, awareness, and political will. The constraints are many; disaster management is most often the *poor cousin* of government and corporate policy. Public servants and disaster leaders need to develop negotiating and advocacy skills to sell the importance of the issue in the language of decision-makers. They must identify mechanisms to lobby based on the circumstances within the particular territory – earnings, cost containment, self interest, political timing are a few considerations – and identify highly placed champions within the public and corporate sectors.

Many Caribbean decision-makers and citizens live in denial – *“if you do not think about it, it will not happen,”* or they are fatalistic – *“it’s God’s will.”* Yet damage data has shown multibillion-dollar impact on economies of the region. And while the natural hazards may not be subject to human control, there is clearly much that can be done to avoid or reduce the risk to human life and property. There is an urgent need to build a culture of safety and gain commitments to implementation of CDM at the highest level of government.



2.0 Summary of Findings

2.1 Disaster Management Capacity in the Caribbean

2.1.1 Regional and International Agencies

CDERA is the central disaster management organization within the Caribbean, and the strategy focuses especially on strengthening CDERA to fulfill a broadened CDM mandate. Several other agencies also have specific disaster management mandates and programs at the regional level. PAHO, USAID/OFDA, World Bank/OECS, OAS, CPACC, DFID, are some examples. Figure 2.1 illustrates some of the strategic linkages with CDERA as the coordinating body.

CDERA, since it was established in 1991, has taken on several aspects of disaster management within the region. The disaster management institutional framework within the territories has remained relatively weak especially after the closure of the PCDPPP. Although CDERA's primary mandate was to coordinate regional response, the Agency recognized the need to continue to build disaster management capability within the region. Of further significance is the fact that response management provides a significant point of entry for CDM. This has been clearly demonstrated in the case of Belize following Hurricane Keith, where development control issues were exposed and the recovery strategy has taken development control on board, putting in place standards *inter alia*.

Constrained by the availability of funding, CDERA operated with a core staff and delivered funded projects with project officers brought on for the relevant intervention. Over the past ten years CDERA has developed considerable disaster experience in the region and is at present upgrading the documentation center, which has good potential waiting to be fully realized for information dissemination on a structured basis.

CDERA has functioned as the manager of stakeholders in the regional disaster management process and as broker for accessing emergency resources. One of the specialized agencies of CARICOM, CDERA falls under the umbrella of COTED (Council for Trade and Economic Development), one of the seven protocols of CARICOM.

CDERA is well positioned to be the driver for CDM in the region. Through its coordinating function, the agency can determine skills necessary to meet the needs of the respective country and relevant agencies. CDERA should play a major role in lobbying for resources to enhance CDM resource capacity within each territory, and within the region as a whole. CDERA needs to be strengthened with human and financial resources to meet the challenge as hub for a regional service. Structures for professional advancement, management training and human resource development are needed for CDERA to perform an all hazards function. **Appendix I** elaborates further on the CDERA mechanism.

PAHO – The Pan American Health Organization (PAHO) has a strong disaster mandate particularly as it relates to the health sector and is a key partner with CDERA. PAHO, an international agency, is the Latin American and Caribbean arm of the World Health Organization. The agency has been heavily engaged in mitigation activities with respect

to health and sanitation infrastructure, and the preparedness and response mechanisms. Training has included contingency planning for the health sector, mass casualty management, stress management during and after disasters, incident command systems and the Humanitarian Supply Management System (SUMA). SUMA a system for management and distribution of relief supplies was developed by PAHO.

USAID/OFDA – USAID/OFDA has engaged in several and varied preparedness, response, mitigation and reconstruction activities including public education, disaster management training, community level disaster preparedness, institutional strengthening of disaster offices and emergency response and disaster recovery programs, all designed toward vulnerability reduction. The CDMP activity implemented in association with the OAS is described below.

More recently USAID/OFDA has instituted support for development of a Disaster Mitigation Facility for the Caribbean (DMFC) at the Caribbean Development Bank, and USAID has included mitigation as a serious component of the post Georges and post Lenny reconstruction program.

OAS – The Organization of American States (OAS) has partnered with USAID/OFDA funding to execute the Caribbean Disaster Mitigation Project (CDMP). CDMP activities were in six major streams:

- Community-based preparedness,
- Hazard assessment and mapping,
- Hazard-resistant building practices,
- Vulnerability and risk audits for lifeline facilities,
- Promotion of hazard mitigation within the property insurance industry, and
- Incorporation of hazard mitigation into post-disaster recovery.

The outputs from these activity streams have provided a significant body of technical products, which should be effectively utilized within each territory. **Appendix II** elaborates on the outputs of the CDMP project.

The OAS has also been the implementing agency for the Caribbean Planning for Adaptation to Climate Change (CPACC) project, an initiative funded by the Global Environmental Facility and executed through the UWI Centre for Environment and Development. The CPACC project and the issues of Climate change and sea level rise are discussed in **Appendix II**.

Association of Caribbean States (ACS) – The ACS comprising some 28 states “bordering” the Caribbean Sea was established by Convention signed in Colombia in 1994. In the Dominican Republic in 1999 an Agreement for Regional Cooperation on Natural Disasters was signed between the member states and the Associate members of the ACS.

This agreement was in keeping with the role of the ACS as an organization which seeks to establish cooperative agreements which respond to the developmental needs and regulatory systems of the region. Within the work program for the first phase of the organization natural disasters was identified as one of the priorities for ACS. A Special Group on Natural Disasters was formed and the purpose as articulated was to promote cooperation among the member states and associate members, as well as to promote the

interaction of the ACS membership with relevant organizations at the regional and internal levels (e.g. CDERA, UN, Red Cross). Two working groups were formed at the meeting in El Salvador in October 2000 to deal with 1) Early Warning Systems, Floods and Earthquakes, and 2) Training Programme, Education, Awareness and Strengthening of DEMOs. Three projects emanated from the discussions:

1. Strengthen Response Capabilities of the Disaster Relief Systems of ACS members
2. Utilise existing disaster information centres to create information related to the activities of the priority areas of the work programme identified, and
3. Develop the exchange of technical cooperation in emergency relief among members in order to strengthen Disaster Management Organisations.

The ACS is also spearheading a study on wind and earthquake codes for the Greater Caribbean Basin to be undertaken through the University of the West Indies in collaboration with Universities of Costa Rica and Pavia (Italy).

The CDM strategy should take account of the ACS mandate and seek to collaborate with respect to furthering the CDM agenda for the CDERA member states.

UNDP – Besides this Comprehensive Disaster Management Strategy initiative, UNDP has a substantial role in coordinating the activities of the many agencies engaged in assistance to the region. Of specific relevance, UNDP chairs the Eastern Caribbean Donors Group, which supports CDERA in coordinating disaster response assistance.

UNDP funded the Disaster Emergency Response and Management System (DERMS) Project which, with CDMP provided the immediate antecedents to this CDM Strategy initiative.

European Community – The European Union through the European Community Humanitarian Office (ECHO) has implemented a program in disaster preparedness (DIPECHO) which has supported successful community-based initiatives and training through CDERA, PAHO, the International Federation of Red Cross Societies (IFRC), and the National Disaster Organisation (NDO) in Jamaica. DIPECHO has supported establishment of the sub-regional Caribbean Disaster Information Network (CARDIN) at the University of the West Indies, which is intended to strengthen the capacity within the Caribbean to collect, index and disseminate disaster relevant material.

DFID – The Department for International Development (DFID) of the UK Government engaged in an assessment of disaster management within the Caribbean to determine points of intervention which could best support on-going initiatives and advance sustainable development. The recommendation has been for DFID-C to support disaster management within the Independent Commonwealth Caribbean, to assist targeted countries to achieve sustainable national disaster management systems by 2010, and to treat vulnerability reduction as a major contribution to poverty alleviation.

JICA – The Japan International Cooperation Agency (JICA) supports CARICOM with the Caribbean Disaster Management Planning Project. The project has provided experts in Disaster Management, Volcanic Planning and Earthquake Planning and includes initiatives in hazard mapping, application of GIS technology to planning, and enhancing emergency communications.

FAO – The UN Food and Agriculture Organisation (FAO) recently completed its “Emergency Assistance for the Formulation of National Hurricane Disaster Preparedness and Impact Mitigation Plan for the Agriculture, Forestry and Fisheries Sector.” Research and national consultations produced significant information sharing and recommended approaches. The activity highlighted the need for more sector specific content – especially with regard to the economic and food security aspects of agricultural production – in national disaster management plans. **Appendix III** presents further information the FAO project findings.

CHA and CTO - The Caribbean Hotel Association (CHA) and the Caribbean Tourism Organization (CTO) are long-established regional industry organizations that have taken an active role in disaster management. They have developed hurricane procedures and provided training for hotel operators. Under its Sustainable Tourism strategy, CTO has begun a series of integrated planning workshops and is developing a cadre of trainers. CTO already exchanges information with CDERA and is well positioned to be an effective partner for CDM. An immediate opportunity exists for insertion of a CDM module in the planning and training workshops presently conducted by CHA and CTO. Training material needs to be upgraded/ revised to include more attention to the principles of risk reduction and the planning process.

CIMH – The Caribbean Institute of Meteorology and Hydrology (CIMH) provides the main training for meteorologists in the region with two programs. It has been suggested that the prediction and forecasting capability needs to be enhanced in the region and CIMH should be the vehicle for this initiative.

CIMH has the TAOS/L storm surge model software, which was installed under the CDMP project. Modeling which is more specific to the Caribbean can be developed as a refinement of this initial program, but the necessary financing is required.

Under the CDMP project CIMH prepared storm surge vulnerability maps for the OECS states. This mapping should be extended to all CDERA member states, and vulnerability and risk data integrated into CDM training programs.

CIMH also has portfolio responsibility for hydrology, and as water availability and management is a major issue for the Caribbean this area of research and data development needs to be strengthened. Floodplain mapping, for example, is required in each member state. There appears to be at present a disproportionate focus on the meteorology component of the Institute’s mandate.

CIDA – The Canadian International Development Agency (CIDA) supports a Disaster Response and Preparedness Program in the Eastern Caribbean through bilateral and multilateral activities. The latter includes CIDA's International Humanitarian Assistance (IHA) division, which supports disaster preparedness projects implemented by specialized agencies such as the IFRCS and PAHO. CIDA's bilateral support also includes an ongoing Disaster Preparedness Program in the Eastern Caribbean. Recent initiatives included a 1998 disaster preparedness survey of airports in Antigua, St. Kitts, Nevis and Dominica.

CDB – In May 1998 the Caribbean Development Bank (CDB) adopted a new Strategy and Operational Guidelines for Natural Disaster Management. Embracing the entire

disaster management cycle from mitigation and preparedness through to restoration, the strategy aims to assist borrowing member countries (BMCs) in disaster management, fully integrate disaster management into the banks own operations, and improve collaboration and coordination with other development institutions working in the region on this issue.

The CDB has established a disaster mitigation facility with support from USAID/OFDA. The two principal objectives are 1) to assist BMCs to adopt and institutionalize disaster mitigation policies and practices and 2) to strengthen CDB's institutional capacity to implement the 1998 strategy and integrate its provisions into CDB's work program.

World Bank – The World Bank is supporting the Organization of Eastern Caribbean States (OECS) Emergency Recovery and Disaster Management Program. The program of individual lending operations in five countries supports physical investments, capacity building, institutional strengthening, and community preparedness. Currently St Kitts/Nevis, St Lucia, Dominica, Grenada and St Vincent and the Grenadines have loan agreements and are developing implementation plans.

Reports from one territory highlight difficulty of implementation, perhaps due in part to non-participatory program design, but also to lack of capacity to meet the Bank's stringent project design and management requirements.

IDB – The Inter-American Development Bank (IDB) has placed disaster mitigation and risk reduction high on its agenda and is supporting technical capacity building through Geographic Information Systems (GIS) systems such as in Jamaica. The IDB funded a reconstruction program in Belize following Hurricane Keith, and development control considerations are being integrated.

An institutional strengthening program has also been funded in Belize, but the outcomes need further enhancement.

ITU – The International Telecommunications Union (ITU) has collaborated closely with CDERA in preparation of telecommunications manuals, coordination of frequencies, and provision of equipment and training. In response to the recognized need of the maritime aspect of disaster prevention and response, ITU has been working with the International Maritime Organization in a series of seminars and development of national plans. A regional plan for participation in the Global Maritime Distress and Safety System (GMDSS) is being developed.

UWI & U Tech – The University of the West Indies (UWI) provides training relevant to CDM, including building design and structural mitigation through the Engineering Faculty and courses in disaster planning and environmental management through the Department of Geography and Geology. The CPACC project is implemented through the UWI Centre for Environment and Development, with the Centre for Marine Sciences and Institute for Marine Affairs as effective partners. The sub-regional Caribbean Disaster Information Network (CARDIN) at UWI is being established with DIPECHO support as mentioned below.

The Faculty of the Built Environment, which includes the School of Architecture and the Department of Planning at the University of Technology (U Tech), also, offers relevant

courses. Relevant aspects of CDM should be integrated into the curriculum of these programs

Summary Observation

It is important that interventions by all agencies be coordinated so as to optimize the overall effort. At present agencies are carrying out their identified mandates and the mandates appear to be overlapping in some instances. IDB collaboration with CDB in assistance to Belize following Hurricane Keith provides a recent and useful model for coordination in incorporating mitigation and prevention into recovery assistance.

Another concern is the continued isolation of disaster management in international assistance programs. For example, evaluation of the DIPECHO program noted

They [other actors] welcome DIPECHO's contribution but see the real benefit of DIPECHO's presence to be the potential it carries to influence the policies and development strategies of the European Commission. Unfortunately examples of the Commission incorporating risk reduction or promoting it at a policy level are few and far between.

Similar questions can be raised about the extent to which most donors integrate risk reduction into the full range of their assistance programs. This is a major issue for donors can exercise considerable influence through their program and financing interventions in each country. The CDM strategy must seek to bring donor programs on to the CDM agenda. Hazard vulnerability and risk in the Caribbean are discussed in **Appendix II**.

Of additional concern are the many regional agencies operating without adequate resources for staffing and delivery of their mandates. This results in an underutilized knowledge base. Rationalization of agencies should be considered as part of the institutional review for CDM implementation, and resources should be made available to agencies to enable them to manage the required partnership function with CDERA.

2.1.2 National Agencies

NDOs and NDCs – Each of the member states has a National Disaster Organization (NDO) and a National Disaster Coordinator (NDC), but the level of organization and effectiveness of disaster management capacity varies from state to state. The most effective organizations have developed where there has been a “champion” at a high level of government, where resources have been allocated, and more recently where events have triggered realization of the need. The NDO includes not only the national disaster office, but the committees and linkages which are necessary for effective multi hazard management through all phases of the disaster cycle as described above.

In reviewing the status of National Disaster Organizations with respect to readiness for implementation of Comprehensive Disaster Management the following criteria were used for evaluation:

- An established organizational structure with highly trained professional staff
- Well-established and functioning linkages/partnerships for disaster management (agencies, Government, private sector, NGOs/CBOs)
- Research and data management capability
- Fully functional Emergency Operations Centre

- Operational outreach program
- Public Education, Public Information and Training capability
- Operational Multi-hazard Disaster Plan
- Legislative Framework

Criteria were evaluated on the basis of structured interviews with relevant stakeholders, review of documents, and some country visits. None of the territories could be considered as completely satisfying all criteria, but some countries have made considerable progress in disaster management capability particularly as it relates to preparedness and response.

Jamaica has a well-developed organizational structure and has a decentralized committee structure through parish organizations. The BVI also has a sound organizational structure and well-established planning procedures and outreach linkages.

A preparedness audit has been undertaken by CDERA, and the completed questionnaires from member states were reviewed. Questions for the audit related to legal framework, institutional capacity, disaster planning, emergency management skills inventory, hazard mitigation, and identification of needs to improve efficiency and effectiveness.

The results of institutional capacity revealed considerable variation in staffing, office space and planning. Only two (2) countries have more than 6 full time professional staff and five countries have only 1. Jamaica stands in contrast to other territories with 28 full-time professionals. Belize is next with 7. Countries have expressed the need for an average increase of 72% in staff and 52% in full-time professional and clerical.

With respect to hazard mitigation 6 countries have completed studies on natural hazards affecting their country and 5 have identified the vulnerable geographical areas. 4 other countries have indicated that the respective studies are underway.

Project activities and achievements in various countries are indicated below where current and predecessor projects are described.

The National Disaster Coordinators are also at varying stages of development with respect to disaster management and administrative expertise. Several have come from the fields of communications and education rather than technical fields associated with disaster management. They understand communication, education and development and timing of disaster communication messages, but the scientific grounding as well as

Table 2. National Disaster Offices - Assignment within Government					
OPM/ C.MIN	GOVERNOR	MIN. WORKS	Min. Water & Housing	Min. Home Affairs/Labor	Min. Nat'l. Security
Bahamas Belize Grenada St Kitts/ Nevis St Lucia Turks & Caicos	BVI Anguilla Montserrat	Dominica	Jamaica St Vincent	Antigua/ Barbuda Barbados	Trinidad & Tobago Guyana (Civil Defense)

strategic planning needs to be strengthened in many NDOs. NDOs also generally lack expertise in program and proposal development, mitigation planning and advocacy.

In most instances NDOs and NDCs occupy “relatively low priority” in the government hierarchy and have difficulty competing for funds from the national budget. Placement of the National Disaster offices within the Ministerial structure is instructive, in that a significant number are located within the lead government agency (Prime/Chief Minister Governor) as shown above in **Table 2**.

Budget submissions should clearly reflect the realities of the expected functions of the agencies and should include a line item for the required contribution to CDERA. Effective participation in the regional organization can be beneficial to the respective territory.

The significance of this rudimentary evaluation lies in illustrating the need for significant capacity building of NDOs to implement CDM in each of the territories. Resources, planning, training and policies are the major areas identified by the countries for priority attention. Most of the requests relate to preparedness and response, but both these areas can serve as important planks on which to build CDM.

The NDCs must “catch the vision of CDM”, and then be able to interact with the leadership of public and private sectors to effectively negotiate participation and resources.

In summary, the level of technical expertise is inadequate to meet the needs of the territories. Capacity building is therefore of critical importance to development and implementation of CDM. Some NDCs have pursued training programs in disaster management offered in the U.K. and to a lesser extent the US and Canada. A recent assessment by DFID-C suggests that the short workshop/courses offered regionally have been of benefit, while some of the international courses may fall short with respect to developing world experience. All NDCs have participated in the USAID/OFDA management program. It is important however, that relevant tertiary education be the base on which CDM leadership and implementation capacity is built. It is unfair and unwise to throw persons into assignments without the necessary preparation.

Repeated declarations of emergency and accompanying requests for event response from some territories could lead to a degree of “dependency” emerging from the process. It suggests an inadequate application of “lessons learnt” and the need for systems to record the impact of events, response and relief, rehabilitation needs, and recovery mechanisms – in other words, fundamentals of response management need to be strengthened at the country level.

It is worth noting that CDERA members include both independent states and overseas territories of the UK. Overseas territories receive assistance from the U.K. and are led by a Governor whereas the independent countries are fully responsible for their own policies. The overseas territories were seeking to form a sub-group within CDERA, but no meetings have yet been held. The British Virgin Islands has achieved significant progress in disaster management and, following the volcanic eruption, Montserrat has implemented an improved structure albeit with a much smaller population and geographic area of settlement.

Other National Agencies – CDM is virtually non-existent in most government agencies other than NDOs. In many instances disaster plans are limited to procedures for securing furnishings and assets, and disasters are perceived as the purview of the NDO. Where the new disaster legislation has been introduced cooperation has improved. Legislation needs to be promulgated in all the territories and the necessary collaboration among the agencies monitored and enforced.

The Development Control Authority has a critical role to play and needs to be placed squarely on the CDM agenda. At present, much development ignores provisions of development control and considerable losses have resulted. Peter Island Resort in the BVI, for example, was destroyed twice by hurricane after having been sited against planning advice. The Four Seasons Hotel in Nevis has suffered a similar fate.

Ministries of Works and other agencies that are generally responsible for public infrastructure require targeted sensitization. At present these agencies operate mainly in an emergency mode responding to clearing after an event. Planning needs to include hazard analysis and provision for the appropriate mitigation measures. Recurrent flooding, landslides, and other damage to roads and other physical infrastructure are often related to inadequate siting and maintenance. Works Ministries and Development Control authorities must be bought into the CDM process.

2.1.3 Communities

Communities play a vital role in preparing for natural disasters and mitigating their effects. The impact of disasters on the community requires that the community be first to respond when disaster strikes. The community approach may be the most effective way of selling integration of disaster mitigation to the population, for it can be applied at the local level on a scale which can be easily recognized. In addition, community initiatives can be more readily implemented as they are not necessarily constrained by the procedures and timing of national budget requests and allocations.

A USAID/OFDA supported pilot project in Dominican Republic executed under the CDMP resulted in creation of the first private/NGO collaborative mechanism for disaster preparedness and mitigation – the Dominican Association for Disaster Mitigation (ADMD). ADMD has been legally constituted as an NGO and supports a program of mitigation sub-projects with communities and local NGOs. This is a useful model which bears replication. The new training strategy of USAID/OFDA described below promotes preparedness for communities at risk and the recent APS emphasizes community-based risk reduction in the region.

The DIPECHO project has supported community level projects that have directly resulted in heightened disaster awareness, community mobilization and the introduction of locally managed hazard monitoring and response procedures. Community preparedness activities were carried out through partnership with CDERA, and through CDERA with IFRC, CARIPEDA (Caribbean Peoples Economic Development Agency) and ADRA (Adventist Disaster Relief Agency). Structures and methodologies that facilitate vulnerable communities to introduce their own risk reduction measures were tried and tested.

The IFRC has been executing these programs successfully in Guyana, Grenada, St. Kitts and Nevis, Belize and the Dominican Republic. ODPEM in Jamaica has been implementing a successful project in the Rio Grande valley that can serve as a model for replication.

Each of the initiatives described above provides a foundation on which to build an integrated approach to community risk reduction through effective community participation. The projects may be considered “pilot” in terms of regional application, and the CDM strategy should provide for interaction with the respective agencies to foster replication of methodologies and to share best practices and lessons learnt.

2.1.4 Non Governmental Organizations

Non governmental organizations (NGOs) stand as a crucial third leg with government and private sector in serving communities’ needs. They frequently take the role of intermediaries between the community and national and international agencies. Public and private sector resources are often channeled through NGOs, in part because of their perceived fairness and credibility. At the same time, NGOs often represent the interests of the community in seeking national and international support, including, for example, on environmental issues. They are important partners for the CDM process.

A number of NGOs are active in the Caribbean, although most of their disaster related activities are addressed to preparedness and response rather than mitigation. Three have formal agreements with CDERA:

IFRC – The International Federation of Red Cross and Red Crescent Societies (IFRC), besides being pre-eminent in disaster response, is one of CDERA’s key partners in promoting community level disaster preparedness and mitigation in the Caribbean and an implementing entity under the DIPECHO project. The CDERA partnership with IFRC is spelled out in a formal memorandum of understanding.

ADRA – The Adventist Development and Relief Agency (ADRA), one of the more prominent faith-based organizations engaged in development and relief in the Caribbean, is also a partner with CDERA under formal memorandum of understanding. ADRA’s activities are focused on local community level relief, training and education and disaster management programs.

CARIPEDA – The Caribbean People’s Development Agency (CARIPEDA), a regional development-focused NGO based in St. Vincent & the Grenadines, also has a formal agreement with CDERA focused on local community preparedness and insuring that concerns of the poor are taken into account.

2.1.5 Tertiary Institutions

CDM training does not now occur in the tertiary institutions, but the University of the West Indies through the different faculties provides courses relevant to the scientific basis of hazards and in the case of the Engineering Faculty building design and structural mitigation is included. The USAID/OAS CDMP project supported several of these initiatives. The Faculty of the Built Environment at the University of Technology, which includes the Schools of Architecture and Planning, also offers relevant courses. The CPACC project is implemented through the UWI Centre for Environment and

Development (UWICED) and the Centre for Marine Sciences and Institute for Marine Affairs are effective partners.

The Department of Geography and Geology houses the Unit for Disaster Studies, and courses in geohazards, disaster management, and environmental management are offered. CDM training can be built upon the existing programs and institutionalized within the Universities of the West Indies, Technology, Guyana, and the Northern Caribbean.

In addition, institutions which offer continuing education and vocational programs for development within the public and private sectors in all territories, should be encouraged and assisted to incorporate principles of CDM in the relevant course curricula.

There is at present no direct link between disaster vulnerability and the degradation of ecosystems. The St George's Declaration of 2000, embodies Environmental Principles for the OECS states, and one of the guiding principles seeks to integrate environmental management with vulnerability reduction. The OECS Environmental Strategy which follows from the St Georges Declaration includes reference to such a link.

There is a general lack of data specific to the vulnerability of natural resources to natural and technological hazards, and to the protective role provided by these resources. Integration within the University programs could facilitate institutionalization of research and documentation of the relationship.

The OECS Natural Resources Management Unit (NRMU) executes several programs in natural resources management for the OECS states and it should therefore be possible to generate and use the data necessary for ecological considerations in CDM.

2.1.6 Financial Institutions

National financial institutions – banks, credit unions, insurance companies – do not now generally consider natural hazard risk in investment/loan analysis. Some banks have introduced Environmental Impact Assessments (EIA) as part of the review process, but the EIAs usually do not include hazard vulnerability analysis. Hazard vulnerability assessment should be integrated in the EIA process.

It is important that environmental assessment be incorporated in the project cycle. Hazard vulnerability and the environmental resource base can thus inform project design. Risk reduction and sustainable development are the objectives.

The opportunity to drive mitigation should be developed within these institutions through sensitization of policy makers and training of relevant personnel. The inclusion of environment and natural hazards in the risk analysis system should be institutionalized as is *rates of return*. The proposed USAID CDB project includes provision to implement such a program.

The Eastern Caribbean Central Bank (ECCB) has a critical role to play also, as they are central to investment decisions in the OECS. At the seminar of 2000 the Bank recognized the need for consideration of disaster mitigation and the subject was included on the agenda. The ECCB needs to be brought on board as partners in the CDM process.

It is generally believed that insurance companies can play a major role as agents of change through premium structures, and at least one company has begun the process in

the region. However, the high rate and cost of reinsurance required from outside the region is a limiting factor in that premium reductions reduce income to insurance companies which have to pay a fixed rate to the re-insurers for aggregate sum insured. Tying premium structure to good construction and mitigation practices is a long-term investment which can be of benefit to the company and to the region over time when the cumulative impact of savings from loss reduction can be discerned and documented.

Recent repeated losses however, have underscored the need for risk reduction and the risk-based premium initiative needs to be fostered for further development. The case of Fiji is instructive in that following the major storm disaster in the mid-1980s, re-insurers pulled out and returned only on condition that building codes and standards were institutionalized and property certification was undertaken by qualified persons. . In the case of Montserrat insurance disappeared shortly following the volcanic eruption! One insurance company has introduced a system for certification of properties by qualified professionals and this certification can generate as much as a 40% premium reduction.

Ministries of Finance have a major role to play, in that vulnerability and risk assessments and appropriate mitigation measures should be used to protect public investments and budgetary expenditure. Sensitization of Ministries of Finance on the link between development investment, recurrent budgets, GDP, and disaster loss and reconstruction is urgently required.

2.1.7 Vulnerability Reduction in Key Economic Sectors

Private investments have suffered considerable losses and this is especially, though not exclusively, so in the tourism sector. A few large internationally based companies, as well as some national entities in some territories have engaged in corporate disaster planning. For the most part such planning has been driven by disaster experience. Public-private partnership for disaster risk management has been developed to a limited extent, but this is an area that needs to be developed. The private sector is the engine of economic growth in all the territories, and government policy and ability to function is critical to the operations of the business community.

Increasing information technology being used by companies requires a comprehensive approach to planning, that is, for all phases of the disaster management cycle, and for the necessary internal and external linkages - all to facilitate prompt restoration of business activities. Loss reduction and prompt restoration of livelihoods and income should be the motivating force for disaster mitigation and preparedness planning in all sectors.

Sector specific planning allows for consideration of the detailed issues and needs related to the viability of each sector, and at the same time allows for the identification and implementation of necessary linkages with other sectors and with local, national and regional institutions. CDM should be pursued in each of the key sectors, as specific interventions are required for each. At present there is no integrated program at the country level to reduce vulnerability and losses within each of the key economic sectors. Sector organizations or donors function at the regional level to deal with aspects of preparedness and response, but a strategy for CDM needs to be developed for each.

Tourism is the key economic sector in terms of foreign exchange earnings for several territories, and the tourism infrastructure is located in vulnerable coastal locations for the most part. Tourism infrastructure planning ought to be an integrated process, but as stated above the required planning has not occurred. Hotel damage has dealt severe economic blows to Nevis, Antigua, Anguilla, St Lucia, and the BVI, for example, as losses wiped out significant investments, contribution to GDP, and jobs.

Tourism infrastructure is often the focus, but disaster mitigation for the industry must take account of the workers in the industry and condition of homes, roads, water and sanitation. Housing infrastructure has suffered considerably over the past six years in St Kitts, for example, and flooding has cut off road access repeatedly in St Lucia. It is also important to consider transport routes to medical facilities.

The two regional industry organizations, the Caribbean Hotel Association (CHA) and the Caribbean Tourism Organization (CTO), have produced training materials and conducted training courses in hurricane procedures for hotel associations. The countries targeted were Antigua/Barbuda, St Lucia, Bahamas, Barbados and St Kitts/Nevis under the Caribbean Alliance for Sustainable Tourism (CAST), the environment and sustainable development arm of the CHA.

Training materials need to be updated regularly to take account of events and changes occurring within the industry. The emphasis on hotel associations needs to be expanded to include other stakeholders in the industry, and a multi-hazard approach is necessary. The existing Hurricane Procedures Manual (2nd Ed.1998) should be revised and other hazards treated. Fire and seismic risk are particularly important.

The CTO, with a 50-year history of regional tourism development, is engaged in marketing, research, database development and external liaison through offices in the marketplace. Currently engaged with a Sustainable Tourism strategy, CTO also hosts a Council for Sustainable Tourism Development. Developing a policy and regulatory framework, CTO has begun a series of integrated planning workshops, and is developing a cadre of trainers.

CTO provides information to CDERA and acts as a clearinghouse for information on disaster impact in member territories after an event. CTO is well positioned through the Sustainable Tourism strategy and integrated planning workshops to be an effective partner for CDM. It is important that resources be optimized to avoid duplication and to get the best results for this vital industry. CDERA should play the role of coordination with both CHA/CAST and CTO to rationalize training initiatives and policy interventions at the level of government decision-makers.

Search and Rescue, aircraft and ship accidents and fire also need to be placed on the CDM agenda. At present the systems are weak at both the regional and national levels. The yachting industry is an important and growing aspect of the tourism industry and there is no targeted attention to that sector. The Bahamas, BVI, St Lucia and St Vincent and the Grenadines are cases in point.

Agriculture, Forestry and Fisheries – These sectors are major employers and contributors to GDP, and have suffered repeated and considerable losses over the past two decades. Repeated requests for rehabilitation support led the FAO to develop a

project for the Eastern Caribbean states entitled *Emergency Assistance for the Formulation of National Hurricane Disaster Preparedness and Impact Mitigation Plan for the Agriculture, Forestry and Fisheries Sector*. The objective of the project was to develop national preparedness and mitigation strategies and action plans that include appropriate institutional mechanisms, early warning systems, vulnerability and risk assessments and public education and training, disseminated to reduce losses in each of the agricultural, forestry and fisheries sectors following a climatic event. The research was conducted and national consultations produced significant information sharing and recommended approaches. The participating countries were Antigua and Barbuda, Barbados, the Commonwealth of Dominica, Grenada, St Lucia, St Kitts and Nevis, St Vincent and the Grenadines, and Trinidad and Tobago. While most states refer to the existence of National Disaster Management Plans, they make no specific reference to the agriculture, forestry and fisheries sectors. Where there is reference, treatment is not comprehensive and tends to deal with matters related to security of offices and equipment.

The FAO project produced a framework action plan, a damage assessment format, GIS evaluation and preparation of vulnerability maps. It also sensitized key professionals in the respective ministries and communication strategies. Emphasis of the FAO is on small farmers and artisanal fisherfolk, and on food security. The FAO provides technical assistance and not funding, but recognizes that effective change is often donor-driven, where conditionalities are placed on technical and funding assistance.

CDM within the larger agricultural sector is required. No evidence of disaster planning within that component of the sector was found. Crop insurance is a major consideration, and because of the difficulties more attention needs to be paid to mitigation measures. Building standards for farm structures, small-scale irrigation to combat drought and improve productivity are some of the needs identified.

The European Union is supporting some small-scale irrigation projects and watershed management is being undertaken by NGOs in some territories under a program administered by the OECS/Natural Resources Management Unit (NRMU). A fisheries Management strategy has also been produced by the NRMU. Comprehensive studies have been completed in the area of forestry, but the funds have not been identified for implementation. Watershed degradation is a major problem throughout the region and flooding and siltation results from accelerated runoff and soil erosion. Mitigation must address this issue and the best approach is through partnering with the several initiatives that are taking place on different islands. The EU has embarked on integrated improvement in Eastern Jamaica, and USAID is implementing The “Ridge to Reef Project” also in Jamaica. These projects are examples of some that have useful input for comprehensive disaster management.

Other Industry and Technological Hazards – Technological hazards are associated with industrial developments, but attention to these risks is recognized as a weak area in the disaster management system. It is important to develop a plan of action to deal with oil spills, hazardous materials handling and accidents, industrial explosions and fires, chemical accidents, aircraft accidents (tied in with PAHO’s mass casualty capability program) and ship related hazards

The petroleum industry in Trinidad has associated with the CPACC project to begin contingency planning for the impact of climate change.

2.2 Technologies and Practices

2.2.1 Hazard Mapping and Vulnerability Assessment

Vulnerability assessment has been recognized as fundamental to damage and loss reduction. Therefore hazard and risk mapping has been initiated at a regional and national scale primarily under the Caribbean Disaster Mitigation Project (CDMP) and the Caribbean Planning for Adaptation to Climate Change (CPACC) project.

CDMP produced a regional database of storm hazard information, including information and maps of estimated maximum surge, wave heights and wind speeds for the entire Caribbean. The TAOS/L storm surge model was successfully demonstrated and the software installed in the Caribbean Institute of Meteorology and Hydrology (CIMH) and in Jamaica and Belize. Atlases of maps of maximum envelopes of water (MEOW) were produced for the Eastern Caribbean, and the Kingston Multi-Hazard Assessment pilot established a process for compiling separate hazard mapping activities into a comprehensive assessment and planning tool.

Coastal storm hazard assessments were carried out in Antigua & Barbuda, Belize, Jamaica, and the Eastern Caribbean. A multi-hazard assessment (landslides, earthquakes and coastal storms) was undertaken in Jamaica.

CPACC has undertaken vulnerability assessments in Barbados, Grenada and Guyana, following the International Panel for Climate Change (IPCC) guidelines for assessing vulnerability to sea level rise. The indicators include physical condition, ecological function, environmental condition, socioeconomic variables, land use, land values and natural habitats. An automated inventory based on the findings will be developed covering the physical and biological resources in coastal areas, flooding and erosion. Risk mapping forms an important component of this project. The data gathered will allow for the development and application of different vulnerability assessment models for predicting climate change impacts.

Linkages with the CPACC database and mapping initiatives could optimize the resources and avoid duplication of effort. CPACC has been gathering data on tidal levels and sea level changes and proposes to map near shore bathymetry for the CPACC territories. In addition CPACC is working with experts in the UK to refine/adapt sea level change models for the small scale of the Caribbean. These data could be useful inputs for the storm surge modeling and hazard mapping exercises. The sea-level monitoring network, executed by CPACC, will be maintained by CIMH.

2.2.2 Building Practices and Standards/Codes

It has been clearly established that mitigation and retrofitting are far more cost-effective than replacement, and the social dislocation that also occurs is often not costed. Roof loss has been widespread in the housing sector and training for artisans as well as professionals in disaster-resistant design and construction has been introduced in some

territories. Under the CDMP project builders and planners were brought together in 1996, and Draft Guidelines for Mitigation Planning were produced.

The Caribbean Uniform Building Code (CUBiC) was drafted in the mid-1980s and will be updated with support from the CDB. The UN Center for Human Settlement (UNCHS) in association with CDMP developed a model building code and guidelines for small structures, based on CUBiC, for the Organization of Eastern Caribbean States (OECS). Some countries have adopted new national codes based on CUBiC and the OECS model.

Development of manuals and training is being implemented in the health, shelter, school, and hotel sectors. PAHO has been driving a process of improvement for health facilities through retrofitting, redesign and standards enforcement, and the CDMP project has played a major role in documenting disaster-resistant building procedures through development of manuals. A school shelter mitigation project was implemented under these CDMP initiatives

Still, planning and zoning regulations continue to be flouted and the consequent loss becomes a loss to investment and to the national treasury. Recent losses to major hotels and to infrastructure from hurricanes Georges and Lenny are cases in point. Building standards and practices remain inadequate throughout much of the region, as there is no effective enforcement in any of the CDERA member territories. The body of inspectors/enforcers is small and levels of skill are inappropriate to the task. Standards need to be promulgated into law and a plan of action for enforcement drafted in each territory.

The French model has withstood the test of hazards that have devastated other islands. The French Bureau de Controle provides an effective level of professional review and enforcement through certified private firms. The system is built on a more demanding system of liability under the Napoleonic Code than that which prevails under British Common Law traditions. Nevertheless, the success of the model warrants consideration of emulation.

Funding agencies have suggested that they are unable to force governments to adopt standards, but it is well established that funding agencies have been effective drivers for change. Every funding agency should require compliance with standards as conditions precedent to disbursement.

2.2.3 Lifeline Infrastructure

Health – PAHO implements the Emergency Preparedness and Disaster Relief Coordination Program (PED) and is the designated regional body for preparedness, response, mitigation and recovery within the Caribbean health sector. The work of PAHO has been of great significance in improving the safety of critical health facilities in the region. The organization interacts with national Health Ministries, providing services in the areas of capacity building, structural mitigation advice, training of health workers and first response agencies, technical support, water and sanitation systems mitigation, and contingency planning support for medical facilities

PAHO has been recently involved with training trainers in stress management, for the loss of social assets and livelihood create trauma and disabling conditions. Recovery and

restoration should include planning for counseling and personal service, an issue which has to date been generally ignored in national disaster planning.

Utilities – Electric power, water and sewage, communications, fuel and transport are important lifeline systems. Repeated strikes from hurricanes have helped sensitize the utility companies within the region to improve maintenance and other prevention activities. Barbados Light and Power conducted a vulnerability audit in 1993. CDMP supported utility risk audits in Dominica, St. Lucia, St. Vincent and Antigua & Barbuda and compiled a manual for similar audits and retrofit procedures. Use of higher-grade poles that are more deeply buried has been one step to reduce vulnerability in Antigua, for example. Output from the work of the CDMP project with Caribbean utilities should be built upon as part of risk reduction measures in each territory.

The regional electric utility organization, CARILEC, also provides coordinated response support, mobilizing skilled volunteers to help restore power after destructive events.

Telecommunications - International and regional telecommunications capability is essential to disaster management. The ITU has collaborated with CDERA in preparation of telecommunications manuals, coordination of frequencies, provision of equipment and training.

2.2.4 Public Awareness, Training and Education

The region is replete with training programs, but these have been executed by topic rather than by a systematized approach to CDM. Although several workshops have helped to raise consciousness and provide some skills and knowledge base, the critical mass required is not yet present. The observation has been made that with all the training that has occurred it is difficult to find skilled persons for related programs. In addition it has been observed that training has not been effectively transferred at the national level.

Professionals who understand the science of hazards are now entering the public service and this should help to increase the cadre of professionals to help foster CDM. However, training is still inadequate and remains a high priority. An important component of the CDM strategy must be a carefully designed training strategy. Targeted sensitization programs by stakeholder group and by CDM component need to be designed and implemented on a wide scale throughout each territory and the region as a whole, and training needs to be institutionalized so as to realize some sustainability.

2.2.5 Database development and Dissemination

With some exceptions, record keeping on value of losses due to damage and dislocation is for the most part unsystematic and incomplete. Reliance on oral history and anecdotes is often the source of information on damage and loss. This is a limiting factor, as without adequate documentation of the event as well as the impact, lessons cannot be taken into consideration for development planning. An information system that captures data in a time sensitive and systematic fashion is urgently needed on each island, if the planning process is to be informed by the impact of events. There are records of loss resident at CDERA and in some NDOs and government agencies but data is not now in a form that can be effectively utilized for CDM.

The capacity of national meteorological services must be enhanced to provide accurate and timely information on an on-going basis for climatic hazards. Early warning systems are vital to timely preparedness and response. National bodies should be able to link with regional institutions that are generating weather and climate data for planning and monitoring purposes and with the electronic and print media for dissemination.

The capacity to generate agro-meteorological data that can be readily used should be built in each territory, and a phased program of implementation will help to match capacity building with absorptive capacity.

The Seismic Research Unit has played a major role in the development of seismic data for the region and should be an important resource for integration of scientific information into planning and training. The Geography and Geology Department, the Unit for Disaster Studies, the Caribbean Disaster Information Network (CARDIN) the Faculty of Engineering, and the CPACC project within the University of the West Indies are all important contributors to the data base.

Current inventory of assets, produce, and all items subject to potential loss is lacking so that damage assessment is hampered, and the data needed to underscore the value of loss due to vulnerability is either non-existent or incomplete. Developing the inventory and keeping it current is important to the business of loss reduction.

2.3 Regulatory Framework – Legal Mandate

Model disaster legislation has been drafted under the auspices of CDERA and the DERMS project. Belize, Montserrat, St Kitts, and St. Lucia have adopted legislation. Jamaica had pioneered disaster legislation, but with the new model there are some amendments that will probably be made. Six countries have indicated that disaster legislation is being drafted for presentation to the respective Parliament.

Countries that have adopted the legislation have indicated that it has helped to spur action particularly with respect to collaboration from within the public sector. Legislation is also urgently required for building codes and enforcement.

3.0 *Ongoing and Prospective Disaster Reduction Programs*

CDB

The Caribbean Development Bank (CDB) adopted a new Natural Disaster Management Strategy in 1998 and seeks to have disaster management policies and programs integrated into all its development interventions over the next 5-10 years. CDB has enunciated as one of its objectives, increase in funding for natural disaster preparedness and mitigation and incorporation of natural disaster mitigation issues in project design as an extension to environmental impact assessment. CDB's program is being executed within the context of poverty alleviation and sustainable development.

The recently signed agreement between USAID and CDB provides up to US\$3 million dollars for a technical cooperation initiative in disaster mitigation. The project, to be executed between 2001 and 2005, is designed to achieve the goal of sustainable

development in Caribbean member territories through reduced risk and losses from natural hazards. Two principal objectives obtain: to assist CDB's borrowing countries to adopt and institutionalize disaster mitigation policies and practices; and to strengthen CDB's institutional capacity to implement the 1998 strategy, and to integrate provisions of the mitigation strategy into all CDB policies.

World Bank

The World Bank is making substantial resources available through its support for the Organization of Eastern Caribbean States (OECS) Emergency Recovery and Disaster Management Program. The program of individual lending operations in five countries supports physical investments, capacity building, institutional strengthening, and community preparedness. Currently St Kitts/Nevis, St Lucia, Dominica and Grenada have loan agreements totaling nearly US\$20 million and are developing implementation plans.

USAID/OFDA

USAID/OFDA are supporting a number of initiatives to improve disaster management in the region. The 2001-2005 strategic plan for Latin America and the Caribbean outline two specific objectives: 1) Meet needs of vulnerable groups during crisis 2) Increase adoption of mitigation measures in countries at risk (Caribbean Disaster Mitigation Strategy).

The first objectives will be facilitated by a new Caribbean training strategy which includes new courses, a small grants program for community preparedness and response, and a grant agreement with the Seismic Research Unit for developing improved hazard monitoring and early warning systems. An information specialist has been hired to assist NDCs to design and implement public information and education programs. This activity will link with the tsunami warning system project recently funded by the CDB. A Damage Assessment and Needs Analysis course has been developed and was piloted in Antigua and Trinidad. This course is designed to build the capacity within Caribbean countries to identify needs and capacities of affected populations. A training program in shelter management will also be implemented.

The second objective is designed to reduce the level of OFDA assistance required for relief assistance in the region through a) integration of disaster management into development planning b) integration of disaster mitigation into post-disaster reconstruction activities and c) stronger regional and national disaster management institutions. The agreement negotiated with the CDB to develop a Disaster Management Facility for the Caribbean (DMFC) falls within this objective, and is built on the activity of the CDMP project which assisted countries – St Lucia, Jamaica, Belize - to develop mitigation policies and plans. The special objective activities following hurricanes Georges and Lenny are building further on the tools and methodologies for mitigation developed under the CDMP.

This special objective is being implemented in Antigua/Barbuda and St Kitts/Nevis and takes its cue from the damage assessment in the housing, public buildings and physical infrastructure, the hospital and airport in St Kitts, the tourism, agriculture and fisheries

sectors, and the utilities. The targeted outcome includes hospital services restored, economic activities reactivated and local disaster mitigation capacity enhanced.

In the case of hurricane Lenny storm surge was the most destructive agent, but damage to housing stock and to the economic sectors was also severe. The rehabilitation and recovery program for Lenny was coordinated by the UNDP and the OECS was the executing Agency. USAID and other members of the donor community contributed to the budget for specific interventions.

Strengthening of regional and disaster management institutions is embodied in the agreement between USAID/OFDA and the UNDP to develop a Comprehensive Disaster Management Strategy for the region and to strengthen CDERA. This baseline study is integral to that project.

DFID

The DFID initiative has been described above and DFID proposes to support the CDM strategy as developed by the UNDP/USAID initiative.

DIPECHO

The general objective of the three-year DIPECHO project is to strengthen disaster management within the Caribbean by facilitating development of a school disaster preparedness program, relief supplies management, emergency broadcast and telecommunications, and community disaster preparedness. Year I of the project was successfully implemented with preparation of training, educational and policy materials and training of instructors at the regional level. During Year 2 the emphasis has been on transfer of knowledge and materials developed in Year I to the national level.

The project delivered its objectives through collaborative arrangements with agencies that had the required expertise, and this approach helped to build networks and relationships among agencies and between agencies and participants. Areas of activity included: school disaster preparedness training and materials; developing an emergency broadcast manual and training; training in relief supply management, disaster information management and telecommunications; and community disaster preparedness and disaster awareness programs.

Activities in Year III of the project will be determined by needs identified as a result of Year II activities.

CPACC

The CPACC project, which has been described above and in Appendix III, is on going, but comes to an end in its present form during this year (2001). CPACC is therefore included as a predecessor project.

4.0 Summary Identification of Needs

The baseline assessment for development of a CDM strategy for the region suggests several areas of intervention. These relate to:

1. CDERA's development as a coordinating Unit;
2. strengthening of the NDOs and needs of the territories;

3. collaboration and cooperation of all stakeholders;
4. sector specific programs;
5. research and database development and information dissemination;
6. utilization of technical products produced by the CDMP project;
7. building on the training and mitigation initiatives already undertaken by CDERA and its partner agencies;
8. sharing of best practices;
9. collaboration of funding agencies beyond the response mode;
10. strengthen legislation and regulatory framework;
11. targeted sensitization and awareness for policy makers; and
12. use of financial and economic costing of losses as the rationale for CDM integration into the development process.

Several initiatives are underway, but the required culture change and political motivation must be driven by a central agency which has access to the government machinery of the region. The strategy and results packages will address these issues.

CDM BASELINE STUDY

Table 3. CDM STATUS BY TERRITORY – SELECTED PARAMETERS

	CDM STATUS								
	<i>National Disaster Management Plan</i>	Hazard Mitigation Plan	Fully Staffed Office	Links with Planning	Community Preparedness	Political Support	Local Level Planning/ Code	Legislation	Equipment /EOC
Anguilla									
Antigua & Barbuda	Y	N	Y	Y	Y	Y	Y		
Barbados	Y	Y	N	N	N	Y	N	Y	Y
Belize		N		Y		Y	Y		N
British Virgin Islands	Y	Y	Y	Y	Y	Y	Y		
Dominica		N	N	N	Y	Y	N		N
Grenada	N	N	N	Y	N	N	Y	Y	N
Guyana		N	Y			Y			N
Jamaica	Y	Y	Y	Y	Y	Y	Y	Y	Y
Montserrat	Y	Y	Y	Y	Y	Y	Y	N	Y
St. Kitts /Nevis		Y		N	N	?	N	Y	
St. Lucia	N	Y	N	Y	Y	Y	Y	Y	N
St. Vincent	N	N			N	N			N
Trinidad & Tobago	Y	Y		N	N	?			
Turks & Caicos Islands	Y	N		N	N	?			

*Comprehensive Approach for Disaster Management in the
Caribbean Project*

**Comprehensive Disaster Management in the Caribbean
Baseline Study**

Appendices

Occurrence of Natural and Technological Hazards and Disasters

The Caribbean is prone to several natural and human-induced hazards by virtue of absolute and relative geographic location, geology, land use practices and systems of livelihood. Hazards by themselves do not constitute disasters; disasters occur when the hazardous events cause major losses and dislocation to human populations, settlements, livelihoods, and economic systems. The interaction between human activity and hazards is therefore strongly linked to the occurrence of disasters.

Hazards within the Caribbean are regional, national and local; management requires attention at the respective levels. For the purposes of this CDM strategy, natural hazards are taken to include hurricanes, tropical storms, storm surge and extreme rainfall events, floods, droughts, landslides, earthquakes, volcanic eruptions and tsunamis. Technological or “man-made” hazards include oil spills, aircraft and shipping accidents, fire and hazardous materials accidents.

Hurricanes as single events have multi-country impact within the region and have caused the greatest dislocation on a regional scale. Because of the frequency within the past two decades, disaster management structures within the region have placed the greatest emphasis on response to hurricanes. Other natural events such as earthquakes, volcanoes, and floods are more national in impact, although also of major significance to the respective country. Some countries have had multi-hazard impact (more than one hazard type in a single year) or more than one of the same hazard in a single year or in consecutive years.

Technological or human-induced events have received less focus in Caribbean disaster management initiatives perhaps because the scale of loss experienced within the past two decades has been less than that due to hurricanes and meteorological events. However localized events such as the Omai gold mine accident in Guyana, oil refinery fire in Jamaica, periodic oil spills on various islands point to the need to assess and reduce the risk. Vulnerability is high given increasing industrialization, growing shipping and aircraft movements, trans-Caribbean movement of hazardous material, and the generally casual attitude to safety within the region.

Conditions of Vulnerability

The Plan of Action for Small Island Developing States (SIDS) emphasizes that:

“In small island developing states vulnerability is accentuated by smallness of size to the extent that a single disaster event may cripple an economy and society for a considerable period. Natural environmental processes and infrastructure may be interrupted or damaged forcing the diversion of scarce resources into repairs or replacements of assets rather than the creation of new wealth.”

The occurrence of hazards on vulnerable populations creates disasters and therefore any attempt to reduce the impact of events must be based on an assessment of vulnerability. As indicated above location and geology have created the Caribbean’s fundamental vulnerability, and livelihoods and settlements have added the human dimension.

Settlements in coastal locations, on steep slopes, in river valleys, on floodplains and volcanic slopes predispose these populations to disaster. Natural environmental systems that provide protective services have been degraded or destroyed, reducing the natural resilience to extreme events, further exacerbating vulnerability. There is no redundancy in physical and social systems, so for most islands there is a major lifeline/main road, one major hospital, one international airport and so on. Appropriate building standards have not been adopted in many islands and where they may exist they are not enforced.

Vulnerability levels are high throughout the region and Comprehensive Disaster Management must therefore be underpinned by a commitment to vulnerability reduction in all sectors of the economy and society.

Management Mechanisms

The Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP) was the first attempt to create a regional mechanism to deal with disaster management in the Caribbean. Born out of the experiences of 1979 and 1980, as indicated above, the PCDPPP existed from 1981-1991. During that time National disaster offices and coordinators were established in the member territories, issues related to disaster risk and prevention and preparedness were highlighted and awareness was raised through training and public education programs. Efforts to strengthen building standards were undertaken and when the project ended it was expected that the national governments would have strengthened the initiatives started. However, it was subsequently realized that a regional mechanism to coordinate disaster response management was essential and the Caribbean Disaster Emergency Response Agency (CDERA) was created. CDERA was established by agreement of member states in 1991 to:

- a. mobilize and coordinate emergency disaster relief for member states;
- b. secure, coordinate, and channel reliable and comprehensive information on disasters;
- c. mitigate the immediate consequences of disaster;
- d. promote a sustainable disaster response capability among members.

Annual funding available to CDERA is basically composed of:

- a. member state assessments which fund chiefly core staff and administrative functions, and
- b. grants, special appeals, and donor funds usually earmarked for program activities.

Since the first year of operations (September 1991 to August 1992), which was the mobilization year, CDERA has increased its total funding available for operations and programs from a base of EC\$945,415 to EC\$3,335,878 (the latter being for fiscal year 1999). The significant increase in total budget from 1991 to 1999 demonstrates the success of CDERA in garnering resources for its cause from diverse resources. As a result, while member state funding has not increased significantly (excluding the mobilization year), and significant arrears exist for paid in amounts ranging up to almost a full year's assessment at certain points in time, the resources available to achieve organizational objectives have grown significantly.

CDERA has built on its programmatic efforts in early years to progressively strengthen the regional response capability of partner organizations and member states. Early years required the development of a single disaster management mechanism for the region, an inventory of regional response capabilities, development of an emergency telecommunications network, training of a cadre of emergency response personnel, and the creation of emergency operational response procedures. A perennial objective has been the strengthening of national disaster management offices. Because of these and other achievements, the region through CDERA and its partners, is positioned, if the will is there, to make the move to comprehensive disaster management. The existing response capability of CDERA must be maintained and even strengthened, and a larger funding requirement – driving the inclusion of sufficient organizational resources to obtain and manage this increased funding -- will be needed to meet the broader CDM function of the Agency.

CDERA's main function is to respond to requests from member states for immediate and coordinated assistance in any disastrous event. Three levels of response have been defined:

1. Local incident – no in-country intervention, but receive from national coordinator information on the event for entry into disaster record.
2. National disasters, but where local capacity is able to cope CDERA will provide technical expertise to the National Disaster Organizations or facilitate access to specialized resources.
3. National or regional disasters where capacity overwhelmed. CDERA activates the regional response mechanism through the Caribbean Disaster Relief Unit (CDRU). The CDRU comprises regional military representatives who in turn provide logistical support to the affected territory(ies). In addition to its primary response function, CDERA has acted as the major documentation and clearing house for information on disasters in the region, has conducted training in the several aspects of prevention, preparedness and response, and developed response capabilities within the member states.

CDERA collaborates with several organizations to implement its mandate, and attempts to optimize resources through this approach. The several partners are illustrated in Figure 1 in Section 2.1 of the main text.

There is an urgent need to build a sustainable development culture within each state. The challenge is to generate the political will to create sustainable, long-term approaches to disaster reduction in all sectors of the economy. Important to this consideration is identification of the respective drivers and determination of how policies are made. What is the routing for decision-making? How can disaster preparedness and mitigation be institutionalized in the corporate work plan of each Ministry so that the process can be accompanied by a budget? What are the sequential steps to realization of such an objective and what is the strategy for implementation?

The governance structure of CDERA at present includes a Council that comprises Heads of State or their representatives, a Board of Directors chaired by the Regional Coordinator and comprising the National Disaster Coordinators, and the Regional

Coordinating Unit which functions as the implementing body for the Agency. This structure will need to be revised to meet the need for a deepened and sustained involvement of policy makers at the national level, and enhanced institutional accountability to its stakeholders.

Appendix II

Vulnerability and Risk Assessment - Existing and Needed Initiatives

Reducing loss and social dislocation from natural and technological hazards is central to Caribbean development, as repeated reconstruction diverts limited resources from development initiatives, and psychological trauma retards productivity. Natural hazards are a part of the Caribbean reality, but the extent of the disaster is often conditioned by the vulnerability aggravated by settlement and by human activity and negligence.

The major hazards fall into the categories of seismic, climatic, geophysical and technological and for each the vulnerability and risk can be identified, and mitigation measures developed and implemented according to an identified program of action. Initiatives have been undertaken in several of the categories and there are ongoing and predecessor projects (as described in Section 3 and Appendix III) that can be replicated throughout the region given the appropriate resources and receiving environment. There is a reasonably high knowledge and skill base within the region; what is lacking is the political will to effectively utilize the skills to enable implementation of appropriate mitigation and sustainable approaches to development.

Seismic Risk – earthquakes and volcanoes

Seismicity has been the active agent in formation of several of the islands of the Caribbean, and volcanoes and earthquakes are regular features of the natural environment. The most recent major event has been the eruption of the Soufriere Hills volcano, which began in 1995 in Montserrat. The island has been devastated by pyroclastic flows, lava flows, mudflows and gas explosions, all experienced over the past five years causing death, destruction of the economy and the physical and social infrastructure, and mass migration of population. Caution expressed against planned development in the town of Plymouth went unheeded and regrettably the losses were as predicted.

Although Montserrat is the most active at this time, seismic monitoring has indicated a high probability of an imminent eruption in Dominica. To date no significant response plans have been developed in spite of the recent experience of Montserrat. Furthermore, *Kick 'em Jenny*, the submarine volcano 8 km north of Grenada has been the most active in the Caribbean this century, having erupted 11 times since it was first discovered in 1939. There is no evidence of contingency planning for tsunamis or other potential impacts of a major eruption.

The Soufriere volcano in St Vincent has erupted twice in this century: 1902-3 and 1979. In the 1902-3 eruption 1565 persons were killed, and in both 1902 and 1979 extensive damage occurred to agriculture.

Recent earthquake devastation is less striking, but Jamaica has a long history of earthquakes and major devastation has occurred in 1692 (Port Royal), and in 1907 (Kingston). More recent damaging events have occurred in 1958 (Montego Bay and Kingston) and 1993 (Kingston). The Kingston Metropolitan Region, which is the most populous, is also the most active seismic zone.

The largest recorded earthquake to have affected the eastern Caribbean occurred in 1843 on all the islands between St Kitts and Dominica. English Harbour in Antigua sank, and Guadeloupe lost several buildings. The number of deaths included more than 5,000 in Guadeloupe, 30 in Antigua, 6 in Montserrat and 1 in Dominica. This historic incident is instructive in terms of the geologic vulnerability of the region.

A series of earthquakes affected the southern Caribbean in 1997 and the effect was felt particularly in Trinidad and Tobago. Extensive damage to property was recorded in Tobago, and some 200 people were affected. Heavy earthquakes have also occurred recently in Antigua and Dominica.

The Seismic Research Unit (SRU) at the University of the West Indies (UWI) has an efficient monitoring system providing data on seismic events as they occur or as they are expected throughout the Caribbean. However mitigation and preparedness for seismic events is still rudimentary in most affected territories. The most significant initiatives have been through development of educational materials, school preparedness planning and teacher training.

Data generated by the SRU is not now integrated into the planning process and there is urgent need for mechanisms to facilitate such integration particularly in areas where new development is taking place. Contingency planning is critical in areas such as Dominica where scientific evidence suggests a possible eruption in the not too distant future. Very little attention is paid to the tsunami risk, which is real. Scenarios for the impact of Kick 'em Jenny should be worked into public awareness programs and into planning and response initiatives.

Geomorphic Risk - Landslides and flood

Flooding causes annual losses and dislocation in almost all CDERA member states. Some territories have repeated events and the occurrence is often more a function of poor siting, land use, watershed degradation, and maintenance of drainage infrastructure, than it is of the actual rainfall event. Flood plain mapping projects have been undertaken in Jamaica, and early warning systems have been implemented in some communities. These initiatives are significant as substantial numbers of persons live in flood prone areas. Where relocation is not possible the emphasis has to be on preparedness and response to minimize loss of life and property, but the medium term objective must be to develop vulnerability risk maps which can be integrated into CDM programs in all territories.

Extreme rainfall events occur in the flood- drought cycle that characterizes the Caribbean's rainfall regime. Heavy rainfall can produce flooding where land conditions exacerbate runoff and ponding and where drainage channels have become inadequate to carry off the excessive discharge.

The sloping topography of several territories coupled with tropical weathering, soil types and land use practices exacerbates slope instability and landslides which block or break roads and water mains are common. Landslide mapping has been undertaken for the Kingston Metropolitan Area as part of the Caribbean Disaster Mitigation Project (CDMP), the Geography and Geology Departments and Unit for Disaster Studies. This is an initiative that needs to be replicated throughout the region using areas of high

population and natural risk factors to prioritize mapping. Vulnerability assessment and risk mapping are significant foundations on which to build CDM.

Hazard mapping has taken place in the BVI, Jamaica, and Barbados under the CDMP project, and is currently underway in Antigua and Barbuda, Belize and St Lucia.

The pilot initiatives described above need to be implemented throughout all territories where the respective hazard poses a threat to sustainable development.

Climatic risk – meteorological, storm surge, climate change, sea level rise

Meteorological

Over the past two decades several hurricanes and tropical storms have wreaked havoc on several islands. David, Frederick, Allen, Gilbert, Hugo, Luis, Marilyn, Debbie, Georges, Floyd, Jose, Keith, and Lenny are among the major events, and St Kitts and Nevis, Antigua and Barbuda, Montserrat and the British Virgin Islands have had multi-year impact. Damage has occurred from wind, rainfall, storm surge and landslides and the impact on social systems and physical infrastructure has been severe in terms of financial losses and social dislocation. Repeated losses in several islands speak to inadequate building standards, poor siting and design of structures and settlements, inadequate maintenance, and poor land use practices.

Hurricanes have received the most attention in disaster planning because of the increasing incidence and impact throughout the region. Hurricane preparedness has improved considerably, and there is now concerted effort to improve building standards so as to reduce the severe structural damage to housing, health, and industrial stock. Meteorological offices need to be strengthened in each of the territories to improve hurricane forecast reporting. Links with the radio and television media are fairly well developed, but several territories report that competition from Cable networks reduces the attention of the population during the critical times. A program to enhance attention to local hurricane reporting must be designed and implemented.

The seasonal rainfall pattern described above also leads to low rainfall periods when commercial and domestic agricultural production are again seriously affected. The flood-drought cycle raises the specter of food security and sustained yields of export agricultural produce. Several islands become unable to meet export market requirements, thus jeopardizing market positions. As agriculture is the mainstay for much of the population of several CDERA member states, mitigation of rainfall related risk must be factored into the CDM strategy.

The Climate Outlook Forum, which was initiated in 1998, has brought together scientists from within the region to examine climate patterns and issues of forecasting so as to share information and to attempt to refine skills and the knowledge base, which will in turn inform policy. This initiative has been spearheaded under the National Oceanic and Atmospheric Administration (NOAA) of the United States, and has involved the University of the West Indies and other tertiary institutions within and outside the region. Precipitation patterns, flood-drought occurrences, and hurricane/tropical storm conditions have received particular attention. The proceedings of the Climate Outlook Forum

should be integrated into the hazard database, and a linkage developed between CDERA and the Forum.

Storm surge

Storm surge has dealt severe economic blows to several islands as port and tourism infrastructure has sustained considerable losses. Storm surge modeling has been introduced into the portfolio of the Caribbean Institute of Meteorology and Hydrology, and as the system is refined and baseline data expanded several islands will be able to better prepare for the impact of hurricanes with identified characteristics. Storm surge hazard maps have been prepared for some of the OECS states and these need to be used to inform policy and planning in the respective territories.

Vulnerability of the coastal zone to storm surge is a major challenge for the CDERA states as centers of economic life, settlements and major lifelines are all concentrated within the zone. Storm surge vulnerability mapping should be expanded to include all CDERA member states.

Climate change and sea level rise

Climate change is a global issue, but the local implications for the Caribbean are stark. The coastal zone is the center piece of Caribbean life and concentration of economic activity and settlements in low lying coastal areas leaves the region highly vulnerable to flooding and saline intrusion from sea level rise which is one of the major consequences of global warming and climate change.

For the Wider Caribbean, sea level rise has been predicted at 10cm by 2025. There is expected to be wide variation within the region and site specific values will be required for impact assessment. However a rise of 0.5cm/year is expected to place great stress on coastal ecosystems that are already stressed by human activity. These systems provide services in coastal protection and are important to fisheries, another major means of livelihood for Caribbean populations.

In response to the needs of member countries to address climate change issues, CARICOM with support from the Organization of American States (OAS) and the Global Environment Facility (GEF) established in 1997 the Caribbean Planning for Adaptation to Global Climate Change (CPACC) Project. A four-year project, CPACC is designed to assist twelve participating Caribbean countries to cope with the adverse effects of global climate change, particularly sea level rise in coastal and marine areas. Its key areas of focus are:

- Vulnerability Assessment
- Adaptation Planning, and
- Capacity Building linked to adaptation planning

Working in close collaboration with national governments and the University of the West Indies Centre for Environment and Development (UWICED), the CPACC project is expected to strengthen the regional capability for

a) monitoring and analyzing climate trends and sea level dynamics; and

- b) identifying and assessing policy options and instruments that may help governments initiate a long-term program of adaptation to global climate change.

In effect, CPACC seeks to advance public understanding of climatic and environmental issues, act as a communication link among scientists, educators, decision-makers and the public in general, and advocate informed action based on exchange of information. CPACC works through national focal points in each territory – all CDERA territories except BVI, Montserrat, Anguilla and Turks and Caicos.

The strength of CPACC lies in its data generation and database building through scientific institutions. For example, the Institute of Marine Sciences and the Institute of Marine Affairs of the University of the West Indies are institutional partners for marine data records.

There appears to be some overlapping functions as CPACC reaches out into the area of implementation. For example, national consultations, partnership building and training seem to be duplicating the approach of CDERA and the CDMP project, albeit with a different slant. Furthermore, CPACC is seeking funding through the Canadian Climate Change Development fund for national consultations toward climate change policy, and through the GEF for IMPACC (Implementation of Adaptation to Climate Change). In addition CPACC is seeking to establish an institutional mechanism which will assist access to multilateral funding, and is establishing private sector partnerships toward development of a Trust Fund. The project has achieved some success with Petrotrin in Trinidad for establishment of a Climate Change Institute.

Proceedings of the meeting held recently (February 2001) in Havana, Cuba to discuss varying roles of the several stakeholders involved with risk management particularly as it relates to climate change in the region will be instructive to the CDM strategy with CDERA as lead player. A report of this meeting is presented in Appendix III under discussion of CPACC.

Minimizing existing vulnerabilities and avoiding new risks are the two key considerations; each territory must explore these options. Several initiatives are considered beneficial to the islands with or without climate change and these, described as “**no regrets**” options, need to be included in the CDM strategy. Rationalization and optimization of resources is a key consideration for the Caribbean that so often duplicates effort without furthering the cause. There are many agencies involved with the several aspects of environmental and disaster management and sustainable development. Many are not as strong as they could be due to inadequate human and financial resources, and therefore the CDM strategy should seek to use what is already available to the best advantage of each of the territories.

Lifeline and key economic sectors

As indicated above Caribbean population and economic life is centered on the coast and tourism, agriculture and fisheries, which constitute major income generators for the region are highly vulnerable to hazards. The CDM strategy must therefore seek to address ways of reducing the vulnerability of these sectors, while at the same time minimizing loss of life and property. Linking with the works, health, agriculture, fisheries, industrial and tourism sectors is key.

Government responsibility for lifeline and economic sectors varies from territory to territory, but the responsibilities for housing, water supply, sanitation and roads must integrate comprehensive disaster management procedures. PAHO, USAID/OFDA CDMP and subsequent OFDA initiatives are assisting the region with updating and enforcing building codes for the health and housing sectors. The UN Food and Agriculture Organization (FAO) initiated a disaster management assessment of the agriculture and fisheries sectors, and the Caribbean Hotel Association and Caribbean Tourism Organization have been working to reduce vulnerability to hurricanes. Details of projects which have been implemented and which are of key consideration to the CDM strategy have been described above.

Technological Risk

Increasing industrialization as well as the shipping patterns within the region expose the Caribbean to oil spills, hazardous materials accidents (Omai gold mine in Guyana for example) industrial explosions and fires. In addition aircraft and shipping accidents are a real possibility given the increase in aircraft and ship traffic entering the region. Search and Rescue initiatives together with other contingency planning for oil spills and hazmat accidents are of increasing concern, and represent new areas for focused attention.

Major Predecessor Projects

Caribbean Disaster Mitigation Project (CDMP)

The six year Caribbean Disaster Mitigation project (CDMP) was established in 1993 under a cooperative agreement between USAID and the OAS funded by OFDA to provide technical joint technical assistance for disaster mitigation in selected countries of the Caribbean. The project sought to establish linkages between the public and private sectors in targeted communities to facilitate adoption of disaster preparedness and mitigation techniques, technologies, and practices with the ultimate objective of reducing loss of life, and physical and economic damage, as well as shortening the recovery period.

The program objectives were to be realized through the following six **activity streams**:

1. Mitigation policy and planning,
2. Community based preparedness and prevention;
3. Vulnerability and risk audits;
4. Building standards and housing retrofits;
5. Hazard assessments and risk mapping; and
6. Premium and risk relationship in the insurance industry.

Three **program results** were defined:

1. Pilot projects for acquisition and application of disaster mitigation skills, techniques and methodologies.
2. Increased pool of professionals with skills in disaster mitigation
3. Incorporation of disaster mitigation activities in post-disaster reconstruction and recovery programs.

Five related **project outcomes** were defined as:

1. reduced vulnerability of infrastructure and critical public facilities;
2. improved building standards and practices to reduce hazard vulnerability;
3. increased availability and access to risk information by developers, investors, insurers;
4. increased community awareness and involvement;
5. improved ability to link premium structure to risk.

A wide range of initiatives was undertaken by CDMP and the project has provided a useful base on which to build CDM in the region. Training proved successful and the use of pilot projects and information sharing served not only to build the knowledge base, but also networks that are useful for strategic alliances.

Disaster Emergency Response Systems Management (DERMS)

The Disaster Emergency Response Management System Project (DERMS) was funded by UNDP and implemented by CDERA. The project included all the CDERA countries as well as Suriname and was intended to carry on the work initiated by the PCDFPP in terms of disaster prevention and holistic planning. However, according to the evaluation of the project manager, the project's success was hampered by an inadequate base in the countries with which to work. Staffing and leadership were weak and there were no significant programs on which to build the strategic interventions for CDM. However DERMS made some valuable contributions which are useful building blocks for the CDM project.

1. Course development and Training. Two courses in Emergency Operations Centre Operations and Management and Community disaster Planning. Train the trainer methodologies were developed and the trainers in the respective areas have been added to the resource pool of trainers for continuing work through CDERA, and by the respective National disaster Organizations.
2. Contingency Planning Training was conducted for the Barbados National disaster Organization (CERO), and disaster management liaison officers of the public and tourism sectors.
3. An institutional assessment for CDERA's direction was conducted and the Comprehensive Disaster Management Strategy defined.
4. The project supported the Regional Exchange Program where on-the job training exchanges were implemented for disaster coordinators in the region.
5. A National disaster coordinators' forum was implemented to facilitate networking and information exchange. Institutionalization of this process has been recommended.

Some of the lessons learnt have been described as follows:

- National and regional institutional and human capacity in disaster management can be enhanced by well-planned projects.
- Regional resource persons using relevant training and experience can have great impact in cost effective manner.
- Regional disaster Management audit is a useful tool
- Effective collaboration with existing partners is a useful implementing strategy to avoid duplication.
- Resources should be provided in projects for public awareness and public relations.

FAO – Vulnerability Reduction in the Agricultural Sector

The FAO project was described above and the findings indicate a glaring need for comprehensive planning in each of the sectors at both large scale and artisanal level. Repeated losses create economic and financial losses to individuals, communities and national incomes. Mitigation strategies have been defined, but need to be implemented throughout the system of government agencies and private enterprise, and rehabilitation planning should take cognizance of existing inventory levels and contingencies for export crop demands. As territories in the OECS seek to change from the sugar and banana

regimes the time is appropriate to target thinking on integrated planning to minimize loss and dislocation in the new ventures.

CPACC

CPACC has been described above and the significance of data being generated by the project for informing CDM has been emphasized. The project in its present form ends in 2001, and there are some initiatives being negotiated for continuation. These include IMPACC (Implementation of Planning for Adaptation to Climate Change) and establishment of a Climate Change Center as well as a Climate Change Trust Fund to support on-going adaptation strategies.

A meeting of institutions and stakeholder initiatives involved with risk management particularly as it relates to climate change in the Caribbean, was convened by the UNDP in Havana, Cuba in March 2001 in order to exchange information on work being undertaken and needs. The governments of Haiti, Dominican Republic, Cuba, Barbados and Jamaica were also invited to participate.

The findings of the meeting underscored the objectives of the approach to the CDM program currently being implemented by the joint UNDP/USAID OFDA/CDERA initiative, and the need to explore modalities for building closer links and collaboration. It was proposed that an informal network be established as *The Havana 2001 Risk Management Network*, with a website to facilitate communication and information exchange.

Suggested Activities Identified by the Baseline Study

1. Systemic change in the approach to development planning, livelihoods, design and maintenance of infrastructure, siting of capital projects, and building standards
2. Build a culture of sustainable development and gain commitments to implementation of CDM at the highest level of government.
3. Lift the profile of disaster management in most territories and to get government agencies to buy in to their roles and responsibilities for disaster mitigation, preparedness and response.
4. The impact of the event captures attention, and every advantage should be taken of the moments immediately following to make appropriate interventions.
5. Disaster leaders need to develop negotiating and advocacy skills to sell the importance of the issue in the language of decision-makers.
6. Identify mechanisms to lobby based on the circumstances within the particular territory – earnings, cost containment, self interest, political timing are a few considerations
7. Identify highly placed champions within the public and corporate sectors.
8. CDERA is positioned to determine skills necessary to meet the needs of the respective country and relevant agencies. CDERA should work with local NDOs to build capacity.
9. CDERA should play a major role in lobbying for resources to enhance CDM resource capacity within each territory, and within the region as a whole.
10. CDERA needs to be strengthened with human and financial resources to meet the challenge as hub for a regional service.
11. Structures for professional advancement, management training and human resource development are needed for CDERA to perform an all hazards function.
12. CIMH has the TAOS/L storm surge model software and is interested in access to modeling which is more specific to the Caribbean. This initiative requires financing.
13. Storm surge vulnerability mapping for OECS under the CDMP project should be replicated throughout the Caribbean
14. The “hydrology” function of CIMH should be more integrated into regional research and planning for CDM. Emphasis appears to be placed more on meteorology and the “water management” requirements are dire in the region.
15. Research and data development and management in hydrology of CDERA member states needs to be strengthened. Floodplain mapping is required for several territories.
16. Prediction and forecasting capability needs to be enhanced for climatic hazards, and data on seismic hazards should be seriously integrated into planning.

17. There is a general lack of data specific to the vulnerability of natural resources to natural and technological hazards, and to the protective role provided by these resources. Integration within the University programs could facilitate institutionalization of research and documentation of the relationship.
18. The OECS Natural Resources Management Unit (NRMU) executes several programs in natural resources management for the OECS states and it should therefore be possible to generate and use the data necessary for ecological considerations in CDM.
19. CDM should be pursued in each of the key sectors, as specific interventions are required for each. At present there is no integrated program at the country level to reduce vulnerability and losses within each of the key economic sectors.
20. For example, in agriculture attention needs to be paid in national disaster management plans to the economic and food security aspects of agricultural production. CDM within the larger agricultural sector is required. No evidence of disaster planning within that component of the sector was found. Crop insurance is a major consideration, and because of the difficulties more attention needs to be paid to mitigation measures. Building standards for farm structures, small-scale irrigation to combat drought and improve productivity are some of the needs identified.
21. Regarding tourism: Under its Sustainable Tourism strategy, CTO has begun a series of integrated planning workshops and is developing a cadre of trainers. CTO already exchanges information with CDERA and is well positioned to be an effective partner for CDM.
22. An immediate opportunity is insertion of a CDM module in workshops conducted by CHA and CTO.
23. Search and Rescue, aircraft and ship accidents and fire also need to be placed on the CDM agenda. The systems are currently weak.
24. Develop a plan of action to deal with oil spills, hazardous materials handling and accidents, industrial explosions and fires, chemical accidents, aircraft accidents (tied in with PAHO's mass casualty capability program) and ship related hazards
25. Donors should integrate risk reduction into the full range of their assistance programs.
26. Every funding agency should require compliance with standards as conditions precedent to disbursement.
27. Many regional agencies are operating without adequate resources for staffing and delivery of their mandates. Effective partnership with CDERA for CDM strengthening requires that resources be found.
28. Scientific grounding as well as strategic planning needs to be strengthened among the cadre of NDCs.
29. NDCs should develop expertise in program and proposal development, mitigation planning and advocacy.
30. Budget submissions should clearly reflect the realities of the expected functions of the agencies and should include a line item for the required contribution to CDERA.

31. The NDCs must catch the vision of CDM, and then be able to interact with the leadership of public and private sectors and effectively negotiate participation and resources.
32. CDM is virtually non-existent in most government agencies. Disaster plans need to be expanded beyond procedures for securing furnishings and assets. A Multi hazard management approach is required.
33. Legislation needs to be promulgated in all the territories and the necessary collaboration among the agencies monitored and enforced.
34. The Development Control Authority or its equivalent in each territory needs to be included as integral to the CDM agenda
35. Ministries of Works and other agencies that are generally responsible for public infrastructure require targeted sensitization. At present these agencies operate mainly in an emergency mode.
36. Provide for interaction with all agencies (donor and implementing) involved with community risk reduction. The objective is to foster replication of methodologies and to share best practices and lessons learnt.
37. Targeted sensitization programs by stakeholder group and by CDM component need to be designed and implemented on a wide scale throughout each territory and the region as a whole.
38. Training needs to be institutionalized so as to engender sustainability.
39. Build CDM training upon the existing programs and institutionalize within the Universities of the West Indies, Technology, Guyana, and the Northern Caribbean.
40. Relevant aspects of CDM should be integrated into the curriculum of the relevant programs in the tertiary institutions identified
41. Institutions which offer continuing and vocational education programs for development within the public and private sectors should be encouraged to incorporate principles of CDM in the relevant course curricula.
42. Link disaster vulnerability and the degradation of ecosystems. Integration within the University programs could facilitate institutionalization of the relationship.
43. Link the CDM strategy with the OECS environmental strategy and St George's Declaration
44. Hazard vulnerability assessment should now be added to the EIA process. The opportunity to drive mitigation should be developed within regulatory agencies through sensitization of policy makers and training of relevant personnel.
45. The inclusion of environment and natural hazards in the risk analysis system should be institutionalized within financial institutions as is *rates of return*
46. Risk-based premium considerations need to be fostered for risk reduction over the medium- to long-term in the region.
47. Sensitization of Ministries of Finance on the link between development investment, recurrent budgets, GDP, and disaster loss and reconstruction is urgently required.

48. Public- private partnership for disaster risk management has been developed to a limited extent, but this is an area that needs to be further enhanced.
49. An information system that captures data in a time sensitive and systematic fashion is urgently needed on each island, if the planning process is to be informed by the impact of events.
50. The capacity of national meteorological services must be enhanced to provide accurate and timely information on an on-going basis for climatic hazards.
51. Early warning systems are vital to timely preparedness and response.
52. National bodies should be able to link with regional institutions that are generating weather and climate data for planning and monitoring purposes and with the electronic and print media for dissemination.
53. Build capacity in each territory to generate agro- meteorological data that can be readily used by the agricultural sector.
54. Implement an information system to record respective inventories of assets, produce, and all items subject to potential loss. Keep it current so as to facilitate damage and loss assessment for financial and economic loss valuation.
55. Given the importance of power supply some initiative should be made to begin implementation of risk reduction in the electrical utilities. A proposal developed under the CDMP project needs to be implemented.
56. All territories should work toward improving telecommunications capability, and achievements to date should be implemented throughout all member states
57. Building standards need to be promulgated into law and a plan of action for effective enforcement drafted in each territory.

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DERMS Project Technical Working Group on Legal and Institutional Framework for Comprehensive Disaster Management – Savannah Hotel, December 13 – 15, 1999

DERMS Project Performance Report, 16 June 1998

Administrative Manual of the Coordinating Unit of the Caribbean Disaster Emergency Response Agency

Internal Contingency Plan (for CDERA)

Regional Coordination Plan

Treaty Establishing the Regional Security System (no date)

Ninth Meeting of the Council of the CDERA

Tenth Meeting of the Board of Directors of the Caribbean Emergency Response Agency (CDERA)
Financial Statements for the Year Ended August 31, 1999
Administrative Budget for the Financial Year 2000 – 2001
Report on the Activities of the Coordinating Unit of the CDERA (May 1999 – April 2000)
Report on Tenth Meeting of the CDERA, May 18 – 19, 2000

Eastern Caribbean Donor Group for Disaster Management – Operations Order (UNDP)

Terms of Reference for Consulting Team to Develop a Comprehensive Disaster Management Strategy for the Caribbean

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Draft Institutional Framework for an Appropriate Regional Disaster Management Organization

(DERMS)

Volume I (Body of Report)

Volume II - Outline Institutional Framework and the Way Forward

Volume II - Medium Term (3-5 Years) Expansion/Development Job Mandates

CDM Project - Program of Action for Small Island States - Global Conference on the Sustainable Development of Small Island Developing States, Bridgetown Barbados (26 April - 6 May 94)

CDM Project - Partnership for Prosperity and Security in the Caribbean, Caribbean/United States Summit, Bridgetown Barbados, 10 May 1997

CDM Project - Caribbean Disaster Mitigation Project (CDMP) Final Report

CDM Project - Final Program Performance Report

CDM Project - Final Evaluation of the CDMP: Executive Summary

USAID Grant Agreement 532-G-00-00-00250-00 re Development of CDM Strategy and CDERA Institutional Change Recommendations

USAID Caribbean Regional Program Results Package

CDERA Operations Manuals

Standing Operating Procedures - Guidelines for National Emergency Operating Centres

Emergency Telecommunications Procedures Manual

Guidelines for a National Disaster Telecommunications Plan

CDERA - Emergency Telecommunications Procedures Manual

CDERA - Guidelines for a National Disaster Telecommunications Plan

CDERA Accounts Manual

Caribbean Disaster Emergency Response Agency - DIPECHO Project for the Period Ending 31 May 2000

Summary Report on Information and Communications Systems Advisory Committee Meeting

2000 Meeting

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1997 Meeting

Strategy and Operational Guidelines of the Caribbean Development Bank (CDB) Applicable to Assistance from CDB for Natural Disaster Management in its Borrowing Member Countries (BMCs)

European Commission, Document No. 4, Narrative Quarterly Report Form (June - August 2000), Enhancing Disaster Preparedness in the Caribbean

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An Evaluation of Tropical Storm "Debby", Its Impact on St. Lucia and the Resultant Response, Prepared by Eldon Mathurim

Study of Disaster Management Capability in the United Kingdom Caribbean Overseas Territories

Annual Program Statement (APS), Community-based Reduction of Vulnerability to Natural Hazards in the Caribbean

Annex 1, Project Evaluations (a number of ECHO projects)

Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean, Special Objective Document

OFDA Caribbean Training Program Strategic Plan, 2000 - 20005

Compendium Document

Selected Facts About Natural Disasters in Latin America and the Caribbean
Disaster Emergency Response and Management Systems Policy Document, Comprehensive Disaster Management for Participating States of the Caribbean Disaster Emergency Response Agency (CDERA)
A Matter of Development: How to Reduce Vulnerability in the Face of Natural Disasters (Economic Commission for Latin America and the Caribbean)

Final Evaluation, Caribbean Disaster Mitigation Project (f/ OFDA)

Evaluation of the DIPECHO Action Plans Implemented in the Caribbean

Diagnostic Study for the DIPECHO Action Plan for Central America and the Caribbean (f/ CIFEG)

Notes of a Meeting Held, UNDP Conference Room, Monday, 8 January 2001 - How UNDP and IDB Could Assist CPACC to Mobilize Resources

Risk Management and Adaptation to Climate Change, Report of Meeting 19-20 February 2001 in Havana, Cuba, sponsored by UNDP/RBLAC

Status of Disaster Preparedness of CDERA Participating States, prepared by Arturo Lopez-Portillo for CDERA, May 2001