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**Final Evaluation**

**Caribbean Disaster Mitigation Project**

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## **Abbreviations and Acronyms**

CADOAR	Camera de Aseguradoras de la Republica Dominicana
CARICOM	Caribbean Community
CARILEC	Caribbean Electrical Utilities Services Corporation
CDERA	Caribbean Disaster Emergency Response Agency
CDB	Caribbean Development Bank
CDIN	Caribbean Disaster Information Network
CDMP	Caribbean Disaster Mitigation Project
CERO	Central Emergency Response Organization (Barbados)
CIMH	Caribbean Institute of Meteorology and Hydrology
CRS	Catholic Relief Services
CUBiC	Caribbean Uniform Building Code
DDMC	Dominican Disaster Mitigation Committee
EIS	Emergency Information System
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
IDB	Inter American Development Bank
IBRD	International Bank for Reconstruction and Development (World Bank)
JIE	Jamaica Institute of Engineers
MCWH	Ministry of Communications, Works & Housing (Dominica)
MNRE	Ministry of Natural Resources and the Environment (Belize)
MPDE	Ministry of Planning, Development and Environment (Dominica)
NDPO	National Disaster Preparedness Office (Antigua and Barbuda)
NOAA	National Oceanic and Atmospheric Administration
NODS	National Office for Disaster Services (Antigua and Barbuda)
OAS	Organization of American States
ODP	Office of Disaster Preparedness
OECS	Organization of Eastern Caribbean States
ODPEM	Office of Disaster Preparedness and Emergency Management (Jamaica)
OFDA	Office of Foreign Disaster Assistance of USAID

NEMO	National Emergency Management Organization (Belize)
PAHO	Pan American Health Organization
PCDPPP	Pan Caribbean Disaster Preparedness and Prevention Project
SEDUSIDS	Sustainable Economic Development Unit for Small and Island Developing States
RHUDO	Regional Housing and Urban Development Office of USAID
SOW	Scope of Work
SRU	Seismic Research Unit of University of the West Indies
UMCOR	United Methodist Committee on Relief
UNCHS	United Nations Center for Human Settlements (Habitat)
USAID	US Agency for International Development
USG	US Government
UTECH	University of Technology (Jamaica)
UWI	University of the West Indies

## **1 Executive Summary**

### **1.1 How This Report is Structured**

The evaluation begins in this section, the Executive Summary, with a brief description of the project and then presents the evaluation team's major conclusions and recommendations. Section 2 provides a more complete discussion of the context in which the Caribbean Disaster Mitigation Project (CDMP) has been carried out, along with details of the project's budget, management issues, the team's methodology, the purpose of the evaluation and the relationship between CDMP and the Office of Foreign Disaster Assistance's (OFDA) overall strategy. In section 3, the team presents a detailed review of the nine separate subject areas it was asked to examine. Section 4 takes a brief look at the disaster management and mitigation situation in each of the countries which the team visited. The Annexes contain the team's scope of work, list of contacts, responses to questions that the scope of work specifically posed, and the detailed results frameworks of the CDMP and OFDA.

### **1.2 Background of Program**

Over the past two decades the Caribbean region has experienced a dramatic upsurge in the level of destruction caused by hurricanes, tropical storms, flood events and volcanic eruptions.

As a result, and based on the increasing importance accorded disaster preparedness and mitigation in the region in the 80s, the United States Agency for International Development (USAID) Offices of Foreign Disaster Assistance and Regional Housing and Urban Development Office for the Caribbean (RUDO), in conjunction with the Organization of American States (OAS) formulated the Caribbean Disaster Mitigation Project. The OAS was selected as the project implementation agency.

In September 1993, the OAS and USAID signed a \$5 million, OFDA funded, Cooperative Agreement to provide technical assistance for disaster mitigation in selected countries of the wider Caribbean. The RUDO provided initial management oversight until its closure in 1996, after which OFDA/Kingston provided this oversight.

A Technical Advisory Committee (TAC) comprising representatives from OFDA, RUDO, USAID Missions in the project area, and regional organizations involved in disaster management was formed to provide policy guidance, technical direction and periodic review of the project activities.

In 1998, USAID awarded a one year no cost extension to the CDMP to allow the project additional time to focus on the sustainability issues related to the project. This was extended for a further three months because of funding delays. The new Project Assistance Completion Date (PACD) is now December 31, 1999.

The broad purpose of the CDMP is to establish sustainable public/private sector mechanisms which measurably lessen loss of life, reduce the potential for physical and economic damage, and shorten the disaster recovery period in the project area. The project seeks to make development more sustainable by strengthening the linkage between development and disaster mitigation.

The program objective of the CDMP is the adoption of disaster mitigation and preparedness techniques, technologies and practices by the public and private sectors in targeted communities.

To support this objective, CDMP sought to achieve three program results. The first was that pilot activities would be conducted with collaborating public and private sector partners to promote acquisition and application of disaster mitigation skills, techniques, and methodologies. The second program result was an increased pool of public and private sector professionals in the Caribbean region with disaster mitigation skills. The third program result was that mitigation activities would be incorporated in post-disaster reconstruction and recovery programs.

Finally, six project outcomes were posited, achievement of which would lead to the results above and to the program objective - 1) Reduced vulnerability of basic infrastructure and critical public facilities, 2) Improved building standards and practices to reduce natural hazard vulnerability, 3) Increased availability and access to natural hazard/disaster risk information for use by public and private sector developers, investors and insurers, 4) Increased community awareness of and involvement in disaster preparedness and mitigation measures, 5) Improved ability of public sector and private property insurers to link premium structure to risk, and 6) Incorporation of mitigation activities in post-disaster reconstruction/recovery.

For this report, the evaluation team was asked to closely review not only the six outcomes noted above, around which were built corresponding activity streams, but in addition, to look at another three focus areas of interest - mitigation policy and planning, working with development finance institutions, and training and information dissemination.

### **1.3 Findings and Conclusions**

For much of the 1990s, CDMP was the only major region wide disaster mitigation program. This project raised awareness of mitigation issues in the region by carrying out a number of different pilot projects and replication initiatives in eleven different countries. This is a very significant achievement.

In terms of specific activities, summaries of the team's conclusions concerning each of the program subjects that were reviewed are set forth in the table below. The evaluation team was impressed by the collaboration with the CDB, the community development activities in the Dominican Republic, and the storm surge model that was

Summary of Activity Streams

Activity Stream	Description and Remarks
Mitigation Policy and Planning	<p>The major purpose of this stream was to put in place the framework for the development of regional and national level mitigation plans. Principal efforts were in St. Lucia and Jamaica. The team believes both will be sustained and are replicable in other countries. This was a successful activity and should be expanded to include additional government departments and should be supported in future OFDA programs.</p>
Community Based Preparedness and Prevention	<p>This stream supported community based preparedness and prevention initiatives in two countries, Haiti and the Dominican Republic. It was successful in the Dominican Republic, much less so in Haiti, and will be sustained in the Dominican Republic. Well crafted community preparedness programs, appropriate to each country, are replicable in other countries. Community oriented activities should be a major emphasis in future OFDA programs.</p>
Vulnerability and Risk Audits	<p>CDMP worked with governments and associations of electricity power companies and the hotel industry, to develop basic information manuals, and model retrofit options to reduce the vulnerability of key lifeline infrastructure. This stream had useful results and served to raise awareness about the benefits of this type of approach. Its most important lesson is to ensure that potential users are committed to using the audit results. The team believes that the hotel industry will continue to undertake this kind of activity on its own, that CARILEC will not, and that governments, because of absence of resources, may not widely do so in the absence of outside donor support, but will actively seek this support.</p>
Building Standards and Housing Retrofits	<p>This stream concentrated on two activities: encouraging the promulgation of building codes that would contribute to a reduction in vulnerability, and promoting the retrofitting of low cost housing to make them hurricane resistant. There were mixed results and many delays, but the project was able to initiate building code promulgation in 4 countries and test a number of housing retrofit approaches. The team believes that the housing retrofit pilots are unlikely, except for perhaps St. Lucia, to be sustained. Building code efforts are likely, however, to continue. Future code and training efforts in this field should be undertaken as part of comprehensive initiatives that seek to fundamentally alter the building culture.</p>
Hazard Assessments and Risk Mapping	<p>There were several levels of activities in this stream with two major regional activities, the regional seismic mapping project and the development of the TAOS storm surge model. There were also several country hazard mapping projects. This stream successfully demonstrated the TAOS storm surge model, but mapping generally suffered from many delays and has had limited country impact thus far. The team's overall view of this stream is that it is unlikely to be replicated in the various countries in the absence of continuing outside donor assistance. Hazard assessments need to ensure up-front government involvement, coordination, and support. The TAOS model should continue to receive support.</p>
The Insurance Industry	<p>CDMP worked with the insurance industry in the region to promote incentives for measures that would lead to reductions in losses from disasters and would promote hazard mitigation activities. This component faltered because of regional economic realities, but was nevertheless worthwhile and has encouraged a number of private sector initiatives. The team concluded that the initiatives begun are likely to continue, but at a very low level of intensity in the absence of further major disasters which might alter the economic reality picture.</p>

Activity Stream	Description and Remarks
Post-Disaster Recovery Mitigation	This stream was a practical response to aid reconstruction efforts and at the same time expose affected persons to mitigation issues and tools. Integrating mitigation principles into post-disaster recovery efforts provided a number of useful lessons which can generally be used in future OFDA efforts. With continuing education, this component has the potential to become a part of the standard operating procedures of disaster management agencies.
Development Finance Institutions	CDMP worked closely with the Caribbean Development Bank (CDB) on mitigation policy development, and also with the World Bank. The team concluded that these institutions will continue to support the policies adopted. Activities were productive and should be supported in future OFDA programs.
Training and Information Dissemination	Training was a primary ingredient in each of the activity streams and was one of the key CDMP tools aimed at raising awareness and training a corps of Caribbean professionals. The team believes most countries will continue with these activities and that OFDA should continue to support them.

developed and put into use in the region under the project. Several of the vulnerability studies components were also successful. Hazard mapping, building codes, housing retrofits, and the insurance initiative present a mixed picture, but there are valuable lessons in each of them. These are detailed in section 3.

At the present time, the team has identified programs that seem likely to continue on their own: the community preparedness program in the Dominican Republic, the housing retrofit program in St. Lucia, and the mitigation policy work in Jamaica and St. Lucia. Modification of the building codes in several countries will also likely be pursued to a successful conclusion by the countries. The Vulnerability and Risk Audits stream, insofar as its shelter program and collaboration with the hotel association are concerned, will also continue. Issues of sustainability are discussed in detail in sections 3 and 4 of this report. In addition, the team has attached, as annex 2, a CDMP Program Performance Report, prepared by the evaluation and mitigation consultant under contract to the project. This report, which covers the period through March 31, 1999, discusses in detail each of the project's outcomes and results.

The longer term impact of the project is likely to be more positive than is evidenced at this moment, just before the close of the project. For example, the team notes that the June 1999 Jamaica conference on the various mitigation activities that have taken place has provided evidence that, after a number of years, several of the activities are beginning to bear fruit. Also, the Belize insurance activity, begun in 1996, has now been resurrected in 1999 by the private sector following hurricane Mitch. This does demonstrate that mitigation activities have a longer gestation period.

The team believes that CDMP made a valuable contribution toward the achievement of the project objective and the three program results during the 1990s

The fact that the region is comprised of a number of different countries with many of them small island states made the project a difficult one to manage and implement

Efficient implementation in some of the streams was clearly an issue at times, and this complicates the overall substantive evaluation

The project has provided a useful base for carrying forward further work in disaster mitigation in the region

The sharing of pilot experiences through training and workshops undertaken or fostered by the project is an excellent tool and should be supported in the future

The evaluation team was impressed by the range of initiatives undertaken in the CDMP. The design of this project mandated streams of rather small, pilot activities located throughout the region. The total amount of project funds, \$5 million, meant that substantially less than \$1 million was spent each year on these pilots. Spread over a number of countries, this represents a very small amount for each activity. Evaluation of this project reflects this reality.

Government institutions and organizations are almost universally weak. This was recognized in CDMP from the very beginning. For this reason, it seemed to make sense for the project to work to encourage various private sector “drivers” in the region that might lead to broader mitigation pressures. The hotel associations are one example of this. In addition, work to promote better building codes and enforcement might also be considered to be both a public and private sector driver. Looking for pressure points outside the public sector that would influence actions seemed to make sense. The project confirmed that the private sector can be a valuable part of the solution to disaster mitigation issues, but will be more effective if it is supported by and operates within a framework established by the government that actively promotes mitigation programs.

Connected to this issue is the issue of donor coordination. There are an abundance of donors and major NGOs in the region. The coordination of diverse programs makes sense. We did not discern that this kind of coordination is being systematically undertaken. While it is an issue on which everyone seems to agree, making it happen is very difficult. The team found the TAC to be a very useful device for sharing information and would welcome initiatives by its members to find a means to continue as a coordinating/information sharing entity.

The role of local authorities was not emphasized in CDMP. This is quite different from the Asian Urban Disaster Mitigation Project, which was organized around local authorities. This needs to be put in context as well. Asia is not the Caribbean. When the CDMP was being designed the presence or involvement of local authorities was not an

issue. The smaller countries are truly small. They might not merit a local government emphasis, although some of them are tending in this direction. However, the larger countries such as Jamaica need something now and in the future because of the decentralization changes over the past several years. This need not and should not be an automatic emphasis. It is simply something that needs to be examined. Local government may be just as unresponsive as central government. The real answer may be community involvement.

CDMP's design strategy centered on the idea of pilots in a few countries, followed by a sharing of information through visits and workshops and an attempt to interest other countries in replicating and adapting the successful pilots or the lessons of pilots where appropriate in their own countries. The team found that this approach was valid and did indeed work on a limited basis. However, the team believes that the project attempted to do too much with very few resources. The team also concluded that, by itself, this approach will not be sufficient to substantially impact or jump-start similar initiatives in other countries. However, the sharing of information is important and serves to validate fledgling approaches.

Political will is an important element - there did not appear to be a public relations policy in any of the countries that the project attempted to foster and that would elevate this interest. At a certain point in the project, we understand the addition of a project publicist to OAS staff was turned down. The role of such a person in helping to generate political will in support of disaster mitigation may not have been fully appreciated. In the future, this kind of activity, supported through workshops and training, should be a priority.

The project design was correct to attempt to supplement the activities of central governments, which are generally strapped for resources. There is a need to find outside drivers and the project attempted this with the insurance stream and through its work with hotel associations. Local community efforts and local authorities, with all their drawbacks, also are potential avenues to explore and should have been in some countries.

The evaluation team also looked briefly at whether USAID itself incorporates disaster mitigation in its project activities. It is not clear that this has been accomplished, although we were encouraged by our discussions with Jamaica USAID Mission officials and the program design team for the Caribbean Regional Program, which is currently being designed. The project will likely concentrate in three areas - economic development and diversification, improved environmental management, and increased efficiency and fairness of legal systems. We were advised that the project will develop best practices associated with siting and other facility planning issues, and that room for disaster mitigation activities to occur would be left to be developed as part of the annual project planning exercise. The team understands that disaster mitigation is not specifically earmarked in the project at this stage and that, therefore, there is a possibility that as annual plans are made and as resources become more limited, mitigation issues might be lost. This needs to be sharpened up as the project design proceeds.

Coordination and integration of OFDA programs with USAID efforts in countries in which there are Missions is very important. The team found that this had happened in Jamaica and the Dominican Republic, but less so in Haiti.

The presence of an active OAS representative in some of the countries seemed to have had a positive impact on the program effectiveness. This was observed in Belize and Grenada in particular. The location of the Disaster Mitigation NGO in the Dominican Republic within the OAS offices has been an advantage, the team believes.

#### **1.4 Principles Governing Future OFDA Activities**

The activity streams and country profiles discussed in sections 3 and 4 provide details concerning the activities the evaluation team believes should be emphasized in future OFDA mitigation programs. The team recommends that the following principles should guide OFDA's interventions.

The team believes that OFDA's emphasis should clearly be targeted to what has worked in CDMP. This means support throughout the region for training, information sharing, mitigation policy and planning, and community preparedness and prevention.

In general, more technically oriented activities such as hazard mapping should only be undertaken as part of efforts in which the government has committed itself to broad changes in its approach and is willing to put in the resources to see these changes through. The storm surge model has been successfully developed under CDMP, but the same principles should apply in seeking its wider adoption in the region.

Changing the culture of the way building construction is carried out in countries is worthy of pursuit. As a part of an overall effort, that should include training of artisans at the local level, support for building code modifications, and effective enforcement programs. The team found that isolated efforts were unlikely to have significant impact because of the relationship between all elements in the building process. To have an impact in the informal sector requires a different approach than the approach in the formal sector. Overall, both sectors need to be addressed.

Activities that emphasize partnerships between the public and private sectors should also be supported.

Likewise, activities that emphasized a combination of approaches such as vulnerability audits for shelters and community participation may hold promise for achieving results, even in the absence of large government resources.

Collaboration with development finance institutions is clearly justified as long as OFDA is convinced that there will be an effective mechanism in place in the partner institution.

Post-disaster mitigation efforts provide an excellent opportunity for beginning a process, but most mitigation efforts are longer term and there needs to be some assurance of long-term support for the activities being undertaken

Isolated activities with governments that are not a part of a broader mitigation approach that the government commits itself to carrying forward should be minimized

## **1 5 Recommendations**

The most important question presented is what OFDA should now do, in the light of the rich mosaic of experience developed under the CDMP. This evaluation hopes to provide some insight and answers to this question. In order to provide context for the detailed discussion on each of the streams that follows in section 3, the following basic recommendations are made

-An intensive program, in appropriate venues, of regional and country focused workshops and training events should be organized over the next 18 months to concentrate on the lessons of the CDMP and important mitigation issues. The team believes that these should center on the Dominican Republic community participation program, mitigation policy and planning that involves diverse government departments, the storm surge mapping experience, selected vulnerability audit and post-disaster mitigation lessons, and the introduction of comprehensive building and building related regulations and practices. City and community sharing workshops that demonstrate how successful town or communities have done something should be supported. This recommendation is in line with the team's belief that the most important contribution OFDA can make is to keep the issue of mitigation and preparedness in front of central, local government, and community leaders in the region. It is also based on our assessment that training workshops have been successful

-A second set of activities that OFDA should consider funding as a separate thrust would grow naturally from the community preparedness workshops. The team suggests that small grants be available for NGO and community mitigation and preparedness activities. The differing experiences of the Dominican Republic and Haiti need to be kept in mind

-The third set of activities that the team recommends concerns collaboration with financial institutions such as the Caribbean Development Bank (CDB), World Bank (IBRD), and Inter-American Development Bank (IDB) to carry out comprehensive country and city mitigation programs. These institutions have the financial resources needed to undertake this kind of program, which the team believes is the natural successor to the pilot approach undertaken in CDMP. The experience of the CDMP well equips OFDA to work with these institutions. The team suggests a number of qualifications concerning collaboration with the CDB. For OFDA, being a real partner in these collaborative efforts is key to success. This is more likely to happen with the CDB than with the other two institutions

- On the subject of partnering, the evaluation team would also like to recommend that OFDA continue its collaboration with the OAS. The team believes that the OAS has earned the respect of countries and institutions in the region, that it clearly knows and understands how things happen in the region and that it can continue to make a contribution. The team believes that the OAS would be most useful as a part of the training and workshops program that is being recommended. In addition, the team believes that the approach taken in CDMP of involving regional agencies such as CDERA, CIMH, and others should continue.

## **2 Background and Scope**

### **2.1 The Caribbean Context**

The context in which the CDMP took place is important, especially in terms of the economies of the countries in the region. For a number of reasons, the 90s have not been particularly kind to the region. The increasing severity of the natural disasters which have beset many of the countries have been a spur toward increased interest in disaster mitigation, but also, a terrible economic hardship to those countries that were devastated.

Similarly, the economic consequences of disasters and the generally less than robust state of most of the countries' economies have had an impact on the public services in many of the region's countries. These continue to be short-staffed and short of resources in most places.

Another element in the context is the "reality" of the region in the world. Its fragility in terms of what goes on elsewhere is painfully obvious. Examples are immediately at hand. Graduate students at the University of the West Indies (UWI) engaged to work on project related matters in the Department of Geology have gone elsewhere as better opportunities presented themselves. This is the immediate impact of the brain drain, and it is likely to go on as the region becomes more a part of the world economy. The banana situation in the Eastern Caribbean is another example. These small economies are immediately impacted by decisions taken far away in Washington and Geneva. The consequences are also far reaching. Small places, culturally vulnerable, are obliged to seek other forms of income. Tourism is an easy choice. Dominica's eco-tourism may be forced to turn into more of a mass tourism product. The impact on Dominica's environment and culture are likely to be very mixed.

Regional institutions are generally not very strong. A number of them were formed in the 60s and 70s in what some have described as a result of regional nationalism. These institutions are young and still need to be strengthened to be effective. Nevertheless, most are important and need to be worked with in some way to help foster a stronger regional mitigation structure. The approach that CDMP took was a multiple-pole approach. It was correct, albeit difficult to have the right partners all the time. This inclusive approach needs to continue to be emphasized in the future.

Project context also means recalling that there has been genuine progress in the region concerning disaster management and disaster mitigation. Until the late 1970's the traditional approach to disasters in the region was concentrated on post-disaster relief. However, after the devastating hurricanes in 1979 and 1980, a dramatic shift of resources from capital development projects to post disaster reconstruction and rehabilitation led CARICOM to consider that a broader and more fundamental approach to disaster management might be needed. This led eventually to the Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP). The PCDPPP lasted from 1981 to 1991, and when its term expired, a void was left with respect to long-term planning for region-wide disaster preparedness activities. The CDMP was, in part, designed to respond to this need, and this was done within the context of the UN International Decade of Natural Disaster Reduction.

During the design of this project in 1992 and 1993, a number of alternatives were explored. The project's initial emphasis on insurance, vulnerability assessments and hazard risk mapping reflected demands from the region as well as established mitigation approaches.

Technical tools such as the hazard mapping and the TAOS storm surge model were initial emphases. The evaluation believes that USAID needs to place less emphasis on technical solutions in what it supports in the future. Also, there appeared to be interest in and an opening for activities with the insurance industry. This has not yet been a breakthrough component, but a basis has been laid for further activity. Beginning in 1996/97, greater emphasis was placed on mitigation policy and coordination of government departments.

Another influence that the project was required to accommodate was that of the USAID Missions in the region, particularly Jamaica, Dominican Republic, and Haiti. These countries contained large Missions and it was imperative that the project be acceptable to them and fit within their strategic frameworks. In the DR this appears to have happened. In Haiti, the program remained essentially outside the Mission's field of interest.

It is often difficult to gain the attention of leaders in the absence of an emergency. This also goes to the nature of the regional susceptibility to disasters. Disasters come regularly and seemingly with greater frequency over these last 10 years. Nevertheless, they also regularly miss hitting one or another of the countries, in fact most of the countries. There is a certain fatalism induced. We need look no further than Florida to see this happening. Already, just a few years after the devastation of Andrew, the building industry is pushing hard for a relaxation of the stringent building codes that were imposed in the hurricane's wake. Countries do not easily make sensible long-range decisions. Politicians seem to respond to the latest pressures, which may not always include a keen appreciation for disaster mitigation.

The fact of life, we were told in Jamaica, is that mitigation is not very sexy. We believe that this may be changing in the region and different approaches to disaster mitigation, gained through insights gleaned by CDMP, may reinforce this change over the next ten years. Poor people, the majority in most countries in the region, live lives that can be dramatically improved by small mitigation activities. The fusion of mitigation and development should be the goal.

## **2.2 The Caribbean Disaster Mitigation Project**

CDMP is a \$5 million technical assistance project, funded by OFDA and carried out by the OAS. The project began in September 1993 and is now scheduled to be completed on December 31, 1999.

The broad purpose of the CDMP is to establish sustainable public/private sector mechanisms which measurably lessen loss of life, reduce the potential for physical and economic damage and shorten the disaster recovery period in the project area. The project seeks to make development more sustainable by strengthening the linkage between development and disaster mitigation.

The program objective of the CDMP is the adoption of disaster mitigation and preparedness techniques, technologies and practices by the public and private sectors in targeted communities. The program posits three objective indicators as measures of the achievement of this objective. These indicators are detailed in Annex 2.

To support this objective, CDMP sought to achieve three program results:

- 1) pilot activities would be conducted with collaborating public and private sector partners to promote acquisition and application of disaster mitigation skills, techniques, and methodologies,
- 2) an increased pool of public and private sector professionals in the Caribbean region with disaster mitigation skills,
- 3) mitigation activities would be incorporated in post-disaster reconstruction and recovery programs.

Finally, six project outcomes were posited, achievement of which would lead to achievement of the above results and program objective. Again, each of these project outcomes had a number of outcome indicators, which are detailed in annex 2.

- 1) Reduced vulnerability of basic infrastructure and critical public facilities,
- 2) Improved building standards and practices to reduce natural hazard vulnerability,

- 3) Increased availability and access to natural hazard/disaster risk information for use by public and private sector developers, investors and insurers,
- 4) Increased community awareness of and involvement in disaster preparedness and mitigation measures,
- 5) Improved ability of public sector and private property insurers to link premium structure to risk, and
- 6) Incorporation of mitigation activities in post-disaster reconstruction/recovery

CDMP therefore consisted, in terms of actual on the ground activities, of a number of different streams, corresponding to the six project outcomes noted above, each rather small, taking place in a number of different places in the region. These were Jamaica, St Lucia, Dominica, Antigua and Barbuda, Grenada, Belize, Haiti, the Dominican Republic, Barbados, St Kitts and Nevis, and St Vincent and the Grenadines.

In addition to the six streams, the evaluation team was asked to examine three other subject areas. These were mitigation policy and planning, activities with development finance institutions, and training. Each of these nine areas of project activity is described in detail in section 3 of this report.

The project was managed by the OAS. However, the project established a Technical Advisory Committee (TAC) which included representatives of OFDA, USAID Missions in the region, regional agencies involved in disaster management, including CDERA, CDB, and CARICOM, and the past director of the Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP). The TAC was intended to provide policy guidance, technical direction, and a regular review of project activities, and it played a key role during the implementation of the program.

### **2.3 Project Management**

Initially, the evaluation team's sense of these streams and activities was that the sheer numbers of them made it difficult to efficiently manage over a wide range of countries. Clearly, the structure for managing the project became quite important in this scheme.

There are a number of aspects to this management question and it is not clear that the project found the right formula in each of the countries. Initially, OAS coordinators were placed in Kingston, Port-au-Prince, and Santo Domingo. The departure at the end of 1996 of the Kingston Coordinator, who worked closely with the Jamaica and Eastern Caribbean activities necessitated a decision on whether or not to replace him in-country. Because there were less than two years remaining before the conclusion of the project (at that time), OAS took the decision not to replace him. Instead, a person was recruited and placed in OAS headquarters in Washington and given roving responsibilities. In spite of

the strength of this person, the team concluded that in a number of the countries, there would have been great benefits from having a person actually based in the region

The evaluation team believes that because of the sheer volume of activities, there was not sufficient planning in advance for some of the components, planning that would have assured an agreed workplan and goals for each of the participating agencies that could have been monitored and insisted upon. Had these been in place at the time, it is possible that at least some of the delays might have been avoided and that coordination issues would have been spotted earlier.

Management of the project looks far different today than the original project described in document, because of the closure of the RUDO and the increased support/emphasis put in by OFDA. The team commends the efforts made by OFDA Kingston in particular, which it considers key to the successes that the project did enjoy.

There was some indication from TAC members that TAC's role was not always clear, early in the program. Some project documents described the different roles of USAID and OAS. These documents were quite detailed concerning the role of the RUDO. However, the role of OFDA was hardly mentioned. This reflects the genesis of the program and the strong RUDO presence in the region. Because this was a cooperative agreement from USAID to OAS, rather than a contract, USAID's role in directing the management of the project would normally have been less. When RUDO left Kingston, OFDA and its regional representative in Jamaica began to exercise more direction.

Overall, the team believes the TAC was a very useful device because of the guidance it provided to OAS. The TAC permitted USAID to include a number of outside voices in the project management and guidance process. In this sense, it began to include some of the region's customers in the shaping of the project as it evolved. As such, it was a manifestation of the newer AID approach to the formulation and management of programs.

The evaluation team detected a certain amount of concern among the disaster management personnel it interviewed about the overall institutional interest of OFDA in mitigation in the region. This concerns the weight and resources that OFDA gives to mitigation matters in the Caribbean. It was clear to the team that the persons involved at the OFDA office in Jamaica were entirely devoted to mitigation, as was the OAS. It was also clear to the team that this is an approach that continues to deserve strong support in the region from USAID.

## **2.4 Project Budget**

The evaluation team did not have final project costs and therefore was obliged to make a number of estimates based on figures supplied. The team recommends that when the final project report is written, a complete analysis of expenditures is included. Based on the information gathered, through March 1999, approximately \$4.47 million out of the

\$5 million total had been obligated by USAID to the cooperative agreement. Of this amount, \$2.94 million was obligated for grants and consultancies directly connected to project streams.

OAS administration and overhead are 12% of obligations and will amount to \$600,000 when the project concludes at the end of 1999. There are a number of other administrative expenditures that would need to be added to this to come to a true picture of the management costs of the project. The evaluation team estimates that OAS costs for implementing the project are on the order of about \$1.25 million. These include, in addition to the \$600,000 for overhead; \$265,000 for operation of the Kingston office (including salaries) from 1993-1996, and an estimated total of about \$400,000 for OAS travel, per diem, communications, and technical support staff in Washington including the Washington based regional coordinator.

It is noteworthy that the time of the OAS project director was not billed to the project, a considerable contribution by the OAS. In addition to these OAS expenses, the project will have incurred over \$200,000 in expenditures for independent monitoring and evaluation and about \$70,000 for the TAC meetings. This leaves a total of about \$3.5 million that will have been spent on actual project activities. The team considers this to be a very reasonable amount.

Of this \$3.5 million, the team estimates that the largest components are the community based programs in the DR and Haiti - about \$1.1 million, Storm Hazards - \$700,000, Regional Workshops and Conferences - \$450,000, Building Codes and Housing Retrofits - \$375,000, Vulnerability and Infrastructure Lifeline Studies - \$200,000, Insurance - \$150,000, and Planning Support for CDERA and GIS Dominica - \$90,000.

The question was raised at the final TAC meeting whether there might have been a difference in project outcomes had increased funding been available. OAS responded and the team is of a similar opinion that there was no project activity that did not receive as much funding as it could have reasonably absorbed.

## **2.5 Relationship to OFDA Strategy**

OFDA's overall goal is "Lives saved, suffering reduced, and development potential reinforced." Under this broad goal come two strategic objectives. Strategic objective No. 2 states "Increased adoption of mitigation measures in countries at greatest risk of natural and man-made disasters." OFDA's results framework is set forth in annex 3. The evaluation team concluded that CDMP fell squarely within strategic objective No. 2 and made a significant contribution to the intermediate results thereunder, i.e. enhanced institutional capacities, strengthened host country capacities, and improved use of resources to link relief and development.

## **2.6 Evaluation Objectives**

There are five objectives of the evaluation, as set forth in the scope of work contained in annex 1. These are (1) to evaluate the results of each component of the CDMP in comparison with intended results as stated in the project results framework, (2) to assess the relationship and contribution of the project activities to OFDA's Strategic Objectives and expected results, (3) to identify successful CDMP pilot interventions worthy of replication within the institutional reality of the Caribbean, (4) to evaluate the performance and appropriateness of the implementation agency, and (5) to recommend realistic follow-on activities and implementation mechanisms for the OFDA/LAC Strategy for the region.

## **2.7 Evaluation Methodology**

The evaluation was carried out in five distinct phases by a two person independent consultant team which consisted of one person from Trinidad and Tobago and one person from the United States. The team relied for its information on a number of different sources. These included background documents provided by OFDA, OAS, and project participants, interviews with key informants in each of the nine subject areas reviewed and in each of the nine countries visited, site visits to view project activities in Haiti and the Dominican Republic, and a final review meeting with the project technical advisory committee.

The five phases of the evaluation began with briefings in Washington by OFDA and the OAS. The second phase consisted of a three week mission to Jamaica, Barbados, St. Lucia, Dominica, Antigua and Barbuda, and Grenada. The third phase consisted of a five week period, during which further interviews were held in Washington, DC and in Trinidad and during which the team began to prepare its initial findings. The fourth phase consisted of a two and one half week mission to Belize, the Dominican Republic, and Haiti, culminating in a final review meeting with the technical advisory committee, during which the team's initial findings and recommendations were discussed. The fifth and final phase consisted of preparation of the final report. The team considers that this phasing of the evaluation helped to contribute to a better final product.

## **3 Findings and Conclusions - Activity Streams**

### **3.1 Mitigation Policy and Planning**

The major purpose of this stream, which was implemented by CDMP in collaboration with the UNDP/Disaster Emergency and Resources System (DERMS) and CDERA, was to put in place the framework for the development of regional and national level mitigation plans. The activities to support this stream started in 1997, with a workshop held in St. Lucia. Development planners and emergency coordinators were brought together and provided with the basic information and training to prepare hazard

mitigation plans. They were provided a forum for improved coordination and communication between them. The participants were assigned exercises which were used to inform the manual *Planning to Mitigate the Impacts of Natural Hazards*, which was published after the workshop. In March 1999, another workshop was held for the planners and disaster managers on The Integration of Hazard Mapping and Vulnerability Assessment in the Planning Process. This workshop explored the use of hazard mapping and vulnerability assessment in both planning and disaster management and examined mitigation activities being carried out in the BVI, Jamaica, and Barbados.

Given the widely held view that disaster management in the Caribbean is about response, this was the start of a serious coordinated approach to a different kind of disaster management.

### **3.1.1 Project Activities and Events**

As a result of these workshops, and with help from CDMP, two countries - St Lucia and Jamaica - are in the process of developing mitigation policies.

Jamaica saw the need for a comprehensive mitigation and management policy because a number of mitigation activities, including the various CDMP hazard mapping exercises, were taking place in different agencies. It was felt that there was a need for a further step in policy development so that all of these mitigation activities could take place within some overall framework. The policy, which is still in draft, was marked by wide public consultation in the first instance, but is now being supported by a "focus group" consisting of agencies and persons who have responsibility for/interest in emergency management. The draft policy was completed in May 1999 and was discussed at the National Disaster Management Conference held in Kingston in June 1999, where it was favorably received.

St Lucia has completed a draft Hazard Mitigation Plan as part of its National Disaster Management Plan. This mitigation plan was updated in August 1997, and was the subject of discussion during 1998. The output from the discussions/public consultations are now to be incorporated in the plan. The updating and revision of the disaster mitigation aspects of the National Disaster Management Plan was a direct result of the workshop held in St Lucia in 1997 and was aided by inputs from the subsequently published manual.

In addition, the Planning Department in Belize has recently requested assistance from the CDMP to facilitate a program of national dialogue in support of the development of its mitigation policy. This request was a direct result of exposure to mitigation policy planning at the CDMP workshops.

### **3 1 2 Observations and Conclusions**

Although mitigation plans are not being prepared by the other countries which were visited by the team, many of the persons interviewed indicated that training undertaken by the CDMP at the workshops and the manual helped them to better understand mitigation and the need for the development of mitigation policies

The bringing together of the planners and the disaster managers was the strategy for creating linkages between agencies in the development of disaster mitigation policies This was recognized as a significant development by all persons exposed to the training As a result of the workshops, particularly the one held in St Lucia, planners and disaster agencies have now established strong working relationships in many of the countries, particularly in the eastern Caribbean This was especially noticeable in Grenada and Antigua, where informal coordinating mechanisms have been established between the planning and disaster agencies, and in Barbados, where a Disaster Mitigation Committee has been established within the framework of the National Disaster Plan

Although only two policies have been drafted so far, the team believes this has been a good start, especially in view of the low level of support generally given to disaster management agencies in the region There is also much more awareness of the need for development of mitigation plans and policies as well as a better understanding of mitigation itself by both the disaster and the planning agencies

The coordinated approach to the development of mitigation policy is clearly to be encouraged However, there is a need for wider understanding and support for mitigation policy and activity both at agency and at the political level A program such as this can be enhanced in the future by the inclusion of a wider cross section of persons who make major decisions about mitigation policy or activity Implementing agencies (Works Departments), and economic planners should be exposed to training, as they also directly impact on mitigation activities in terms of implementing of projects and disbursement of funds There is less likelihood of mitigation activity if these agencies do not understand why such activities are necessary The team understands this was considered earlier but deferred in favor of continuing to build the relationships between planners and disaster coordinators This was a correct approach, but it is now time to broaden these sets of relationships

This was one of the most successful activities undertaken by the project Given ~~the time~~ taken for training and the cost of two workshops, this was a good low cost investment

### **3 1 3 Lessons Learned**

The major lessons learned from this exercise are (1) that guidelines or manuals need to be developed in collaboration with users if they are to be effective, as they were

here, and (ii) that there are major benefits to be gained from the development of networks with agencies which can aid and support the development of mitigation policies

### **3 1 4 Recommendations**

Training in mitigation policy planning should continue, but should include a wider cross section of participants such as implementation agencies, economic planners, and representatives from local authorities where applicable

The manual which has been prepared under this project can form part of the training materials, but given the other groups suggested for training, additional material will have to be prepared

### **3 2 Community Based Preparedness and Prevention**

CDMP supported community based preparedness and prevention initiatives in two countries, Haiti and the Dominican Republic (DR) These initiatives were intended to focus on local communities rather than governments or the private sector Basically, they were intended to develop models that would attain the overall CDMP objectives beginning at the lowest level, the community

Although neighbors on the island of Hispaniola, the countries are quite different and the approaches taken were also different In the DR, after its first year, CDMP supported the formation of an independent technical support NGO, i e a Technical Support Organization that provided training and support to other, local community based, NGOs This NGO has operated primarily at the community level and has achieved rapid and wide spread impact Its Board of Directors is composed of NGOs and private sector representatives, with government representatives as ex-officio members It is now near to becoming a sustainable organization

In Haiti, at project inception in 1996, a steering committee was established that was composed mostly of government representatives CDMP helped to establish and has provided training and support to local committees in three towns There has been more interaction with the central government and less direct grass-roots involvement with local communities Comprehensive vulnerability studies have been carried out in two of the three towns Progress has been slow This reflects both the approach taken and a more difficult development situation Nearly three years after its inception, the effort in Haiti can only report modest accomplishments and is far from being sustainable

Overall, considerable resources were devoted to this stream By the conclusion of the CDMP, the DR program will have received something on the order of \$700,000 and Haiti on the order of \$300,000

### 3 2 1 Project Activities and Events - The Dominican Republic

The CDMP program in the Dominican Republic aimed to achieve the following impacts

- 1 Reduce the loss of human life and the economic damages associated with natural disasters by reducing vulnerability in high risk areas
- 2 Increase the use of better vulnerability reduction techniques by informed communities
- 3 Establish an efficient inter-institutional coordination mechanism capable of carrying out mitigation and preparedness programs over the long-term
- 4 Organize communities in high-risk areas so that they develop and practice their own Community Emergency Plans
- 5 Facilitate effective coordination and collaboration among the private and public sectors and NGOs for all matters related to disaster management

The evaluation team considers that the program has substantially accomplished these goals. In the process, a sustainable program is near to being created.

In late 1993, the CDMP began activities in the DR. A coordinator was hired in late 1994. In late 1995 the Dominican Disaster Mitigation Committee (DDMC) was legally established with a Board of Directors that included five NGOs and four private companies. Since then the organization has compiled an enviable record of accomplishments, concentrating in several major areas. These include the following:

Community Education - DDMC adapted a Red Cross program on community preparedness called "Es Mejor Prevenir" and used it to train more than 170 local facilitators in its use. DDMC subsequently worked with them and local NGOs in over 600 communities nationwide, holding workshops that reached a total of over 18,000 community leaders. This training had a number of positive outcomes.

Community Initiatives - Following from this training, DDMC received numerous requests for assistance and has helped 17 communities throughout the country with small projects, averaging less than \$10,000 each. The majority of the projects have been drainage channels, which have redirected flood waters away from low lying houses. The evaluation team was able to visit two of these sites and was impressed with the community measures and the upkeep the community was providing to keep the channels clear. We were told that the works had aided greatly to keep the communities safe during Hurricane Georges.

Training - DDMC has also conducted a number of other disaster management training courses for public and private organization in the DR.

Communications - DDMC has used donated television and radio time to inform the Dominican population about its programs, as well as having made well over 300 public presentations to students, teachers, and ordinary citizens about its programs. DDMC has also distributed more than 160,000 brochures nationwide concerning disaster response measures.

### **3 2 2 Project Activities and Events - Haiti**

Haiti's community based mitigation initiative began three years ago, in June 1996, with the employment of a project coordinator, who had previously been an official in the Ministry of Interior and involved with disaster management for that Ministry. Following an initial mission in August 1996 by the new Coordinator, agreement was reached with the Minister that CDMP would concentrate its efforts in three areas in the Southwest peninsula. This region is the area most subject to natural disasters. A central project steering committee was formed, composed mostly of government representatives, but also including the Red Cross.

Agreement was reached with government on three towns to concentrate in - Jacmel, Jeremie, and Les Cayes. The project coordinator then began to work to establish local project committees in each of the three areas. This was accomplished by early 1997 and project training began. Project members included government representatives based in the towns, the local Mayors and their staffs, and NGOs active in the areas.

There were a number of commonalities in the approach taken in the three towns. It was decided that a vulnerability study would be undertaken in each of the towns. To date, two studies have been carried out, although only one, in Jacmel, has been finalized. The experiences with these two studies have not been particularly favorable. Unfortunately, they have entailed lengthy processes. The first study, carried out by the Cooperative Housing Foundation (CHF) in Jacmel, was criticized by the local committee and by CDMP. Nevertheless, there have been some concrete results, including work being undertaken in connection with the local hospital. The second study, in Jeremie, is being carried out by consultants based in Jamaica. It has been underway for nearly one year and is expected to be finalized shortly.

It was also decided early on that CDMP would attempt to interest other donors in financing proposals, rather than financing small projects directly, as in the DR. An effort with the European Union's DIPECHO program was made but was ultimately turned down by DIPECHO in 1998, perhaps due to the large size of the draft proposal. Similarly, CDMP did not provide funding to operate the local committees. Because these committees did not have sources of recurrent income, this was a sensible decision. However, it also meant that staffing to carry out committee desires was not readily available. Rather, it was the project's intention that the committees would have secretariats staffed by one of the stronger NGOs in each area. This was attempted in Jacmel, but did not prove successful. As a result, none of the committees has had a functioning secretariat.

The major efforts of CDMP in Haiti have been on the training of the local committees, government representatives, and communities in the three areas. CDMP indicated that 466 persons have participated in the various exercises. In addition to the training of committee members and government staff, CDMP has also worked with the Ministry of the Environment in the preparation of a national environmental plan. Unlike in the DR, CDMP has not been able to have extensive support from radio and TV.

CDMP has cultivated relations with the United Methodist Committee on Relief (UMCOR) and has reached an informal agreement to work with them to carry out three additional vulnerability studies in other parts of Haiti, for which UMCOR would pay CDMP.

The CDMP Haiti steering committee has not met since about the middle of 1998.

### **3 2 3 General Observations and Conclusions**

#### Dominican Republic

With regard to the program in the Dominican Republic, the team was very satisfied with what it observed. We believe that the project has made great strides in accomplishing its stated goals. Because of time limitations, we were unable to do extensive visits with the local NGOs. However, we did undertake site visits to two small projects and were favorably impressed. Besides carrying out these site visits, the team also met with the Chairman of the DDMC, the Dominican Association of Seismological Engineers, the government secretariat responsible for disaster management, and USAID.

The proof of the success of these efforts is that those communities that had benefited from the community education and community initiatives did measurably better during Hurricane Georges than did other communities which had not participated in the training and initiatives. DDMC undertook a survey following the storm and, although the DR lost 283 persons, not one person from the trained communities was among them.

DDMC appears to be on a solid footing as regards its own future as an organization. CDMP has, properly, promised a \$150,000 contribution to an endowment fund to enable it to continue to meet its operating expenses. In addition, USAID/DR is planning to channel the sum of \$300,000 to DDMA in support of further mitigation activities as a part of USAID's supplemental program for the DR in the aftermath of Georges. DIPECHO, the European Union program has also awarded DDMC a grant of 100,000 ECU. PLAN International is likely to provide grant funding and the U S Department of HUD has also awarded funding for mitigation activities.

## Haiti

During the team's visit, we met with the local committee in Les Cayes, the Mayor of Les Cayes, the Director of UMCOR, the Director of the Disaster Management Office (Protection Civile - PC) in the Ministry of Interior, and USAID

Haiti presents a different approach to the mitigation issue and a different results picture. Because the development context in Haiti is so much more difficult than in the DR and because the program has only been underway for three years as compared to the five in the DR, direct comparisons are not in order. Nevertheless, the evaluation team believes that the approach being followed in Haiti is unlikely to result in a significant impact on either Haiti as a whole or the three towns that have been targeted. The results of the pilot have been disappointing.

There are a number of pluses and minuses in what we observed, which we will briefly discuss.

The project was able to establish local committees in each of the three towns. However, the committees have had little resources and no staff. We were told there is greater awareness at the local level, but, unfortunately there is little indication that this has had much impact in the towns or in the local communities. The members the team met with were well intentioned people who had devoted considerable time to this effort, but appeared to be caught up in a program that was not productive. The committee in Les Cayes seemed quite frustrated. They opined that they needed staff to help them do anything. The CRS representatives indicated that the committee is not "real." Some members had stopped coming. The team was told by the Coordinator that the situation was similar in the other two places.

The government has established an Office of Disaster Management (Protection Civile) within the Minister of Interior. The importance of mitigation appears to be appreciated by the Director, although its main concern is disaster response. PC is also the office that oversees the disaster teams at the departmental level that had been set up by the CDMP coordinator, when he worked for the Ministry of Interior. However, there was little indication of close collaboration or support from CDMP for PC. Unfortunately, the team believed that there may have been some opportunities missed for useful support. DIPECHO has agreed to fund the PC's efforts to strengthen its departmental committees. The USAID Mission itself also indicated that it might work with this office in the future, although not with direct funding.

The project has also worked with the Ministry of Environment in the preparation of a National Environment Plan. Disaster management to improve the environment is included in the Plan and this is a plus, although the overall utility of the document remains to be assessed. While there are references to CDMP and the OAS, there is no reference to community based mitigation as a viable technique.

Two vulnerability studies have been undertaken. However, they have not yet resulted in many concrete development efforts. It appears that some action has been taken in Jacmel based upon the study, although the exact status is unclear to the team since Jacmel was not visited. CDMP commented that when it did agree to undertake small community initiatives such as those carried out in the DR, the proposals that were received were mostly for salaries, with very little devoted to actual community projects.

The study for Jeremie is intended to be a comprehensive vulnerability review and when finished will be a good report. However, in the Jeremie local committee context, it does not appear to the team to have been a very useful exercise. Although a number of small projects were identified and while the team understands that the process of identification of these projects was participatory, the study appears to be more on the order of a study that might be commissioned for a development project being financed by the World Bank or IDB. We were advised that the study might in fact be submitted to these agencies, but it is not the kind of study that a local committee in Haiti could itself use. When the team posed the question to the local committee in Les Cayes about their own priorities, the answer was that a study would not be their first priority.

The intention by UMCOR to move from relief work more into mitigation work is generally a positive development and can be attributed in part to CDMP and partly to UMCOR's own changing emphases. However, the apparent decision to follow the CDMP methodology of preparation of comprehensive vulnerability studies is not such good news if it results in the same delays, inaction, and lack of solid results. The Director of UMCOR was conscious, however, of the need to shape the study terms of reference and to continue with her organization's grassroots approach and timely construction interventions. She said that disasters were viewed by ordinary people in Haiti as God's will and that the studies might be one way of changing this perception, i.e. of demystifying the subject. She stated that UMCOR was ready to engage CDMP Haiti as consultants for these small studies.

The CDMP offices are co-located with the OAS delegate to Haiti, who has been there throughout CDMP's presence in Haiti. The OAS representative stressed the poverty in Haiti and the difficult working conditions. He also confirmed the need to work with government, but at the same time not to expect much from them. OAS, because of the lack of accountability of the government, had decided not to fund new projects in Haiti in 1999.

USAID/Haiti, unlike the DR, had not embraced the activities of the CDMP. This was not part of the Mission portfolio, and while they had agreed the program could be active in Haiti, they had not contributed to it. They were briefed regularly on its activities. What was of more interest was that the Mission had just received \$11.8 million for disaster rehabilitation activities in the aftermath of Georges. Both the Mission Program Officer and the Deputy Director of the Mission indicated that they intended to collaborate with OFDA. However, there appear to be no current plans to meld any of the CDMP structure or lessons with what is being planned.

### **3 2 4 Lessons**

Haiti is one of the poorest countries in the world. In spite of the presence of numerous assistance programs over the years, this has not changed much. A basic lack of resources, overpopulation, a history of and reaction to dependence, poor management, corruption, and bad leadership are just some of the reasons. CDMP need not feel that it is alone in having failed to find the key to development success. Hardly anyone else has

Further to this, the idea of disaster mitigation appeared to the evaluation team to have less explicit place or priority in a country in which the daily lives of most people are so precarious. The most important priorities relate to basic survival. Everything else is somewhat of a luxury.

The complexity of undertaking a program in Haiti was underestimated. This was compounded by the inclusion of three cities in the program, three of the five recognized large urban concentrations in the country.

Nevertheless, there are some lessons to be learned. First a local coordinating committee is probably needed in Haiti, but it probably should not have been thought to be more than that. Given the fact that there were already local government committees in place (albeit largely non-functioning), the project should probably have attempted to use these committees for coordination. Established NGOs, like in the DR, should have been relied on to do actual mitigation work.

The studies approach is appropriate within the context of a total development effort. It does not appear to have been the best choice, as implemented in Haiti, because the local committees were not in a position to make good use of them. The general approach in Haiti was that of a development program, but a development program without any resources and one which was not particularly appropriate in the Haitian context. The community was not directly involved.

Community participation in vulnerability reduction is a very people intensive approach. The lesson from both countries is that it is important not to take on too much in a difficult context. The DR appears to have succeeded. Choosing three difficult to access places in Haiti was probably too many.

### **3 2 5 Recommendations**

CDMP Haiti suggested to the team that the program should either finish up ongoing commitments or should, like the DR, become an NGO with an endowment. However, the team does not see these as attractive solutions at this point. This would continue the same activities in the same ways that the team believes have not been successful in having any great impact.

Training that is currently planned should be carried out. However, the team believes the third vulnerability study that is planned in Les Cayes should be shelved. Rather, the project should reach an accommodation with the current Committee members, including the local administration, and other NGOs in Les Cayes on a close-out plan that would expend before December a similar amount of resources as that planned, in a sensible way that would result in concrete improvements. The Local Committee in Les Cayes, in coordination with the Civil Protection, could assume the role of a technical support group to the official PC Committee. Similar arrangements should be made for the other places. The study in Jeremie should be finalized in the remaining time. An orderly closing should be possible. Commitments for small initiatives should be either undertaken by other NGOs willing to do them or canceled.

Finally, in Haiti, OFDA should explore alternatives with the Haiti USAID Mission concerning the program that the Mission intends to implement. The training that has taken place during the CDMP's three years, particularly the training experience of the current Coordinator could be built upon if there were a proper structure within which to operate. Working through other established NGOs has merit. Perhaps under the purview of OAS, OFDA, and the USAID Mission, a plan can be worked out over the next several months to transfer the CDMP mitigation approach and local initiatives to other resident NGOs that would be interested in carrying on in the future, with limited USAID support.

The team believes that the Dominican Disaster Mitigation Committee needs to begin to think about expanding its management leadership. Among the many reasons for the success of the effort in the Dominican Republic has been the leadership of the DDMC Coordinator. As activities increase, it is important that the leadership keep pace. In addition, it is recommended that the Board of Directors of the NGO also take an expanded role in building the institution.

### **3.3 Natural Hazard Assessments and Risk Mapping**

CDMP addressed a number of different region-wide issues in this stream. These included the limited ability in the region to identify hazard prone areas, the unsafe location and construction of the built environment, and the institutional development required to have an adequate technical base in the region for disaster mitigation. A number of natural hazard assessments and risk mapping projects were undertaken in an effort to address these issues.

There were two different levels of activities in this stream, regional and national. There were two major regional activities. These were the Regional Seismic mapping project, and the development of the storm surge model (the TAOS model).

### 3 3 1 Regional Project Activities and Events

#### The Regional Seismic Mapping Project

The Regional Seismic Hazard Mapping project was a natural hazard assessment and risk mapping exercise which was carried out by the Seismic Research Unit (SRU) of the UWI in Trinidad, with support from the CDMP. This activity was considered to be essential to the increase of the knowledge base in the region and at the same seen as a way to begin to involve the regional scientific community and disaster management agencies in a common endeavor that would lead to more emphasis on mitigation activities. The Caribbean engineering community needed guidelines with respect to susceptibility to earthquakes. The SRU used existing data and has come up with effective accelerations which engineers can use as a guide. To date, seismic hazard maps have been prepared for Surinam, Guyana, Trinidad, The Windward Islands, The Leeward Island and the Virgin Islands, The Dominican Republic, Jamaica, Bahamas and the Turks and Caicos Islands, The Cayman Islands, and Belize.

The maps are to be accompanied by a manual, and it is expected that the maps and the manual will provide information about seismic hazards and will indicate high potential sources of seismic activity. It is hoped that the information will be of use to disaster management agencies as well as planning departments and engineering firms.

#### The TAOS Model

During 1994, CDMP contracted for the development of a number of products from the TAOS model, a computer based numerical storm hazard assessment model, and for the derivation of a Caribbean version of the model. The primary objective of this project component was to develop a methodology for assessing the impact of storm surge and wave action on coastal areas. Critical to the applicability of this methodology is that it can be quickly adapted to new locations while producing high quality predictions. To this end, CDMP has installed the Caribbean derivative in the Caribbean Institute of Meteorology and Hydrology (CIMH), and has provided CIMH staff with the training and support necessary to apply the model within its member countries. With the model, CIMH will have the capacity to produce storm surge and wave action studies throughout the Caribbean, which can be used for emergency evacuation and coastal land use planning.

TAOS/L, a Caribbean version of the TAOS model developed for the CDMP, is now available to assess the risk of storm damage, and to provide valuable inputs to the formation of emergency management plans and design standards for infrastructure. The model has been tested and further refined and used to inform a number of storm surge maps produced for various territories in the region. These are

-The coastal flooding hazard maps for Montego Bay in 1994

-The wind and storm surge hazard maps for all the Saffir-Simpson classes for Hispaniola in 1995. These maps were produced at the request of the Camera de Aseguradoras de la Republica Dominicana (CADOAR). The maps were requested to inform a national level probable maximum loss study.

-The development of storm surge maps for Belize in 1995.

-The prediction of real time surge heights for Antigua and Barbuda and St. Kitts in 1995.

-A draft atlas of Maximum Envelopes of Water (MEOWS) was developed by the CDMP in collaboration with the CIMH for Antigua in 1998. This atlas was discussed with a number of agencies in Antigua and recommendations made for finalizing them. This atlas is to be used as a pilot for development of maps for other countries in the Eastern Caribbean.

-The TAOS model was used to inform the BVI risk hazard mapping exercise.

-The TAOS model is being used by the Emergency Center in Campeche State in Mexico.

The TAOS model has been one of the outstanding successes of the CDMP project. In the case of Belize, the storm surge maps that were produced were instrumental in the government's decision to order an evacuation of coastal areas prior to hurricane Mitch. The Meteorological Office in Belize told the team that the surge atlas produced for Belize was the most useful tool produced for them by the project. It is interesting to note that although the TAOS real time software was installed in Belize, the hard copy maps were used to trigger evacuation procedures for hurricane Mitch. It was not possible to use the Meteorological Office's computer equipment because it had been damaged by lightning. In Mitch's case, the hard copy maps were what was needed because a decision on evacuation had to be made several days before the storm actually arrived.

The model has been installed in Jamaica, Belize, and at the CIMH in Barbados. The CIMH has also conducted training in the use and application of the TAOS, with a regional conference in 1997, and training in the use of the software in Belize for meteorologists and disaster management officials. The model is now licensed to CIMH, which can install it in the meteorological offices in the region.

Although wind and surge maps were prepared for Hispaniola and given to the Camera de Aseguradoras de la Republica Dominicana (CADOAR) in the Dominican Republic, there is no evidence that the maps have been used during recent hurricanes.

### 3 3 2 National Projects and Events

Of the country projects, the major hazard assessments and risk mapping exercises were carried out in Jamaica. These were the Kingston Multi-Hazard Project and the Montego Bay Coastal Hazard Assessment.

#### Montego Bay Storm Hazard Mapping Project

This project was started in 1994. The maps produced were the first produced worldwide by the TAOS model. The public participation in this effort is noteworthy. It included the Mayor of Montego Bay and numerous government agencies. The first maps produced provoked a number of questions from the Jamaica Institute of Engineers (JIE) regarding the accuracy of the data used in the model and the statistical analysis that went into the determination of the 100 year return period. The maps were subsequently presented at a workshop held in November 1995. The JIE still had queries with respect to the application of the model. This led to a period of intensive review and research in order to produce an acceptable model. The model has now been revised and reworked after a period of lengthy negotiations. The result is a new application and a more appropriate product, which is acceptable to all of the users. The process has, however, taken about four years.

The statistical approach to estimating storm surge return periods, which was developed for the Montego Bay Study has been applied to the State of Florida for the estimation of storm surge return periods. In 1998 it was also applied to the Kingston Multi-Hazard Assessment.

#### The Kingston Multi-Hazard Project

The Kingston Multi-Hazard Project was one of the first detailed multi-hazard assessments to be carried out in the region. It was designed to use hazard mapping and vulnerability assessments to inform decision making in existing and planned development.

The objective of this assessment has been to compile accurate information on natural hazards affecting Kingston, for use in developing strategies to mitigate the effects of those hazards. In this assessment, susceptibility to seismic, landslide and coastal storm surge and wind hazards were to be documented through a map series and accompanying reports.

There are several components of this project, which include a seismic hazard assessment, a landslide hazard assessment, and a coastal storm surge and wind hazard assessment. Technically, there have been a number of outputs from the project. These include

For the Seismic Hazard Assessment, an updated earthquake catalog, a preliminary seismic attenuation model and a geologic map series, composed of a digital terrain model

and maps of surface geology, depth to bedrock and groundwater as well as a bibliography of literature related to attenuation models, seismo-tectonic models, stress maps and computer models for calculation of ground motion were produced

For the Landslide Hazard Assessment, maps of geology, slope categories, hydrology and a historical landslide inventory were developed. These factors were combined and analyzed using a geographic information system (GIS) to produce the final landslide susceptibility maps. To promote the use of the landslide hazard maps and information, a number of supporting documents were developed. These include a technical report on the landslide mapping component of the project and guidelines on the use of the hazard maps.

For the Coastal Storm Surge and Wind Hazard Assessment, the Natural Resources Conservation Authority and CDMP conducted the coastal storm surge and wind hazard assessment using the TAOS storm hazard model. A statistical approach, first used for the Montego Bay Coastal Hazard Assessment, was applied to develop maps of storm surge levels for various return periods (e.g. 25, 50, and 100 year returns). A high resolution bathymetric database for Kingston harbor was created and the model runs were completed in December 1998.

Administratively, the project was fraught with a number of problems. While it was coordinated by a Technical Working Group, this group did not function very well. Although most of the participating agencies knew of the existence of this group, there was a great deal of uncertainty about whether it still functioned and whether they were part of the group. The ODPEM, which is the major stakeholder in these types of activities, did not take a leading role in the development of this project. While it may be argued that many of the agencies were operating with limited human and financial resources, if departments are to participate in programs such as these, they need to be committed to and make some resources available to such projects.

Further to the above, the administrative difficulties in this further compounded when the regional OAS project manager was changed at the end of 1996, with the project being coordinated out of Washington.

Subsequent to the team's visit to Jamaica, a national conference was held in June 1999 to present the results of the various activities. ODPEM played a major role in this conference and it is to be hoped that it will now take the leadership role.

### **3.3.3 Observations and Conclusions**

Hazard mapping and technical risk assessments need to be a major component of disaster management. Unfortunately, it is perhaps the least understood, and most complex, of all measures used. Generally, only technical agencies have any real understanding of hazard mapping. Natural hazard and risk mapping are major tools in the development of long term mitigation measures. They are also complex, costly and not

easily justifiable to the general public because they are long term measures against events that may have a 50 or 100 year rate of return. These may not be of importance to decision makers or the general public because the event may or may not happen in the near future.

It is against this background that natural hazard and risk mapping projects must be viewed. The CDMP project carried out a great amount of pioneering work in this area.

The experiences in risk mapping in the Caribbean region are relatively new and in an early stage of development. Nevertheless, many of the products of the risk mapping exercises are useful. The risk mapping exercises carried out have provided or will provide both the region and countries with data bases and techniques which can also inform work in disaster planning, physical planning and the environment.

The danger, in addition to those problems discussed above, is that the difficulties in the implementation of the activities during CDMP may have worked against gaining more general acceptance of this kind of activity. The lesson would appear to be that when these more technical activities are undertaken, an effort needs to be made to begin to produce results for the general public and for the government as soon as is feasible.

The projects have not been completely finalized, and their implementation have shown up two basic problems in the organizational structures which need to carry out this type of work.

First, the government departments with responsibility for implementing such studies either do not have all of the skills or do not have the resources to carry out this type of activity,

Second, these types of projects are multi-disciplinary in nature and need a great amount of coordination. In implementing these projects in Jamaica, this is where the greatest problems were encountered. On the government side, there did not appear to be any one agency that had ownership or was responsible for coordination of the two hazard mapping projects. At the University, which was one of the implementers as well as coordinators, there were also problems with coordination. Finally, on the OAS side, the regional coordinator was changed in the middle of the process. The administrative mechanisms for the coordination of these projects were not clearly worked out in advance of the project.

In order to make hazard assessments and risk mapping sustainable activities, much more attention has to be paid to development of skills to carry out hazard mapping in the region. Short courses can sensitize people and they will generally know what is required. However, without the relevant skills to actually do hazard assessment and risk mapping, the disaster managers will become frustrated and unskilled persons will try to do the hazard mapping themselves, as was noted in Antigua, where a risk mapping exercise is being undertaken without the necessary expertise.

The future development of hazard mapping in the region can rest with a number of different agencies. Where the government has the technical resources to undertake work, as in some departments in Jamaica, and has the resources to do so, these departments can carry forward. There is also a role for educational institutions and to this end the team believes that UWI can play an important role as the relevant faculties and institutions already reside there. The three campuses would seem to be the natural home for the development of a comprehensive and integrated educational and professional program for hazard mapping that may be able to be used by the region's countries. However, the University, like the governments in the region, has not yet made this a priority in terms of its own funding and programs. Until it does so, it is unlikely that initiatives will become more than the outside donor funded efforts they currently are, and will dry up if this funding is discontinued.

### **3 3 4 Recommendations**

In order to make hazard assessments and risk mapping sustainable activities and suitable for OFDA support, there needs to be a home in each country in terms of administrative structure and funding. If this is not worked out in advance, the existence of capacity to undertake these activities will be for naught. If, and only if, the supporting financial, administrative, and technical resources are in place, would it be possible to pursue further work in this area.

The TAOS/L storm surge model and its installation at CIMH and in Belize is an achievement for the project. The team learned that the World Bank has made use of the model in India. However, the use of the model in the rest of the islands is not altogether certain. The World Bank project with the OECS countries will provide considerable support for local meteorological offices but plans for integrating the storm surge model housed at CIMH with these offices were not spelled out in the Bank's project appraisal. Helping to make this bridge would be an extremely useful contribution for OFDA and the CDB.

### **3 4 Building Standards and Practices**

This stream assisted a number of countries in different aspects of the building process, in both the formal and informal sectors. The stream concentrated on two activities, encouraging the promulgation of building codes that would contribute to a reduction in vulnerability, and promoting the retrofitting of low cost housing to make them hurricane resistant. Pilot projects were undertaken in St. Lucia and Dominica. Replication initiatives were carried out in Antigua and Barbuda and in Grenada. Overall, the team concluded that there were a number of positive results from this stream, but that households benefiting from the pilots were relatively few, and that a more comprehensive approach needed to be undertaken, combining each activity element in order to encourage more fundamental changes in the building culture of the collaborating country.

CDMP worked with the United Nations Center for Human Settlement (UNCHS) and the United Nations Development Program (UNDP) regional office in Barbados to develop national building codes for countries in the Eastern Caribbean. In counterpoint to this formal sector approach, the project also supported activities that focused on low income housing retrofits and the training of building artisans in several countries. Here, CDMP's main partner was the Cooperative Housing Foundation (CHF), a U.S. NGO. Partnerships were also forged with local NGOs, primarily the National Development Foundations in each of the three countries (St. Lucia, Dominica, and Antigua and Barbuda) in which most activities took place.

### **3.4.1 Project Activities and Events - Building Codes**

CDMP and UNCHS jointly assisted Antigua and Barbuda, Dominica, and St. Lucia with the development of national building codes. The project is also currently assisting Grenada and Belize. These codes are based on the OECS model that UNCHS developed based on CUBIC, the Caribbean Uniform Building Code.

In Antigua and Barbuda, the building code was completed and submitted to the Government in the summer of 1995. This proved an opportune time as in September, the island was severely impacted by Hurricane Luis, which damaged over seventy percent of the housing stock. The draft building code was used by both the public and private sector in undertaking reconstruction activities. The building code became law in June 1996 and has been enforced ever since. The experience in Antigua since the adoption of the building code has been good, according to the Director of Development Control. The Director said that the code was seismic and hurricane sensitive and that all new construction in Antigua was covered, including new residential construction. The Director indicated that he did not have sufficient staff to undertake compliance checks on this level of construction, but believed that compliance was generally good. However, he could not say that post-building code construction had survived Hurricane Georges better than pre-building code construction.

In St. Lucia, the government is still reviewing the building code modifications. We were advised that the major issue at this point is who will be responsible for implementation and what resources will be available to effectively do this. St. Lucia is in the process of establishing a local authority system and this has also been factored into the considerations.

In Dominica, the promulgation of the new code awaits an amendment by the legislature of the Town and Country Planning Act. This is expected to happen this year, although not guaranteed. In the interim, the new code has been used as guidance over the past 8 months and generally accepted. The physical planning department estimated that there was approximately 75-80% compliance.

With assistance from CDMP, Grenada is in the process of adapting the OECS model building code to their existing legislative and development control frameworks.

Finally, in Belize, CDMP is providing support to a public/private sector initiative to prepare building regulations in each of Belize's six local authorities. This initiative is further discussed under the insurance stream in section 3.6 below.

### **3.4.2 Project Activities and Events - Home Retrofit and Improvement Program**

Through pilot projects and replication efforts in several Eastern Caribbean countries, CDMP trained contractors, artisans, and others working in the formal and informal building sectors in adopting effective natural hazard vulnerability reduction measures. Assistance to the local building sector was provided through training workshops for builders and artisans, safer construction manuals and minimum standards checklists and the provision of revolving loan funds for supporting housing retrofit work. In three countries, CDMP housing activities were coordinated by local non-governmental organizations, with technical assistance from CHF, which also supplemented CDMP resources by providing \$72,000 in credit for revolving home improvement loan programs, an important outside contribution to CDMP efforts.

At the outset of CDMP, an inventory was taken to determine which countries had the NGOs and private institutions that could most effectively promote hurricane vulnerability reduction for low-income housing. After reviewing the results of this inventory, Dominica and Saint Lucia were selected as pilot project countries. Subsequently, this program expanded to include Antigua and Barbuda as a replication activity.

#### St. Lucia

In St. Lucia, two local organizations, the National Research and Development Foundation, and CARITAS undertook home retrofit pilot programs. These pilot retrofit activities suffered from numerous problems. As a result, in 1997, a training course and companion manual *Basic Minimum Standards for Retrofitting* was developed to address the problems that were encountered.

During 1998, CDMP also supported NRDF in organizing a series of local workshops on safer construction techniques. To maximize participation, these workshops were held on weekends in communities throughout St. Lucia. An existing house in the community was retrofitted as a demonstration during the workshop. Seven workshops were held during the year.

In St. Lucia, the original design of the retrofit program did not anticipate the dearth of demand under the conditions proposed. Small loans targeted exclusively for retrofit did not prove popular. The original lending organization, NRDF, undertook surveys which showed that demand for small loans could not be based upon retrofitting alone but had to include other home improvements. This meant that the loans needed to be larger. When agreement could not be reached, NRDF bowed out of the program as designed and advised CHF and OAS that they could not participate. NRDF then went on

to re-design the program to make it more of a home improvement effort with larger loan amounts

The second participating organization, CARITAS, which had originally been the organization identified to handle the community awareness aspects of the program, elected to take over and agreed to maintain the small loan amounts that CHF required. However, the program moved very slowly and resulted in only 45 loans over several years. Furthermore, the program left CARITAS, not well suited or experienced in this type of credit program, in a financially precarious position. As provided for in the CHF/CARITAS agreement, funds remained with CHF until such time as a package of loans was ready for financing. CARITAS found that in order to keep the program moving, it felt obliged to pre-finance some of the loans and was therefore out of pocket until it was reimbursed by CHF. Furthermore, CARITAS administrative expenses were paid for separately by CDMP. They were not a part of the overall loan program financial arrangements with CHF, although the interest rate that CARITAS charged included an element for administrative costs, which if the program had been successful in the long run would have helped to cover administrative expenses. However, the program was small, there were significant repayment problems, and it was ultimately unsuccessful. When CDMP terminated its support for the program in 1997, CARITAS found itself with continuing administrative responsibilities to collect loan repayments and make payments to CHF, but with insufficient income. CARITAS still owes CHF money.

As mentioned, NRDF, largely on its own, but with \$12,000 from Canadian CUSO and \$5,000 from CDMP, revised the program to make it more of a home improvement effort. This revised program then became separate from the CHF activities. Eventually, the maximum loan ceiling was raised to EC \$15,000 (about US \$5,500) from the original EC \$3,000. NRDF was able to raise funds, some EC \$536,000 from its own sources, the St. Lucia Cooperative Bank, the National Commercial Bank, and the National Insurance Scheme. Currently, NRDF is seeking additional funds from the NIS. While in St. Lucia, the team also learned that the St. Lucia Development Bank will lend NRDF US \$100,000 from the line of credit it has with the CDB for shelter programs.

The NRDF home improvement program has been more popular than the retrofit activities and expects to resume this year with new funding from both the SLDB and the NIS. By the end of 1998, 153 loans, valued at EC \$1.4 million had been made, at an average of EC \$9,287. However, NRDF advised the team that repayments became a serious problem during 1998, when NRDF was unable to replace needed staff because of financial constraints. This, in turn, led to lower than projected receipts from borrowers. NRDF told the team that it is taking steps to address this situation.

The NRDF program obviously changed substantially from the original CHF supported program. Loans were given for new houses and home improvements, rather than just for retrofits. The ceiling on maximum loans was increased five fold. The average loan size is now only slightly under EC \$10,000. There is little doubt that this has resulted in higher income beneficiaries. However, the program is not a middle income

program. The housing remains modest and the beneficiaries certainly include very modest households.

### Dominica

In Dominica, the safer construction program was undertaken by the National Development Foundation of Dominica (NDFD). This program focused initially on training building craftsmen in hurricane-resistant housing techniques. In five workshops, 110 builders have been trained in these techniques. Recent work in Dominica has focused on expanding awareness of the need for hurricane retrofitting and the existence of the retrofitting loan program. This awareness campaign has included newspaper and cable TV advertisements and presentations at community schools. The campaign significantly increased interest in the retrofitting program. Additionally, the board of the National Development Foundation of Dominica approved a loan program to supplement the funds available through the Cooperative Housing Foundation.

The Home Retrofit/Improvement program in Dominica has had both pluses and minuses. The pluses include a very thorough training program that was successful in training a number of local builders and that resulted in several houses being built that withstood Luis and Marilyn in 1995. Subsequently, the NDFD went on to do a small number of housing retrofits/home improvements loans with its own funds and with funds borrowed from CHF. The minuses include the fact that this has remained a very small program and that NDFD now seems more interested in making it a program that would appeal to young professionals with higher incomes. The motivation for this is that NDFD needs to have all its programs self-sustaining and believe that the way to do this is to concentrate on higher income households.

### Antigua and Barbuda

In 1997, CDMP finalized an agreement with the National Development Foundation of Antigua and Barbuda to support a Hurricane Resistant Home Improvement Program. This was a replication effort, rather than a pilot project. CDMP assistance included partial support for a director for this program, a training attachment at one of the existing CDMP program sites and access to loan funds through CHF (which were very slow in coming but have now materialized). In December 1998, CDMP supported an NDF national roundtable for the development of a national strategy for safer housing.

The total number of loans, from NDF's own funds, over the past three years have been on the order of 35 to 40, with the average size loan being EC \$15,000 made at the going market interest rate. The Foundation benefited from two types of CDMP training, an attachment to the National Development Foundation in Dominica, and a one week training program in Antigua. The view was expressed that the training in housing retrofit activities helped to raise general awareness of disaster mitigation and groups such as the Red Cross were distributing straps after hurricane Luis and George because of exposure to housing retrofit training. The only criticism of the training was that it should have been

carried out as a part time basis rather than as a one week program as many persons found difficulty in obtaining time off from work to attend the training program

The Foundation, with CDMP support, is currently carrying out additional training which involves reproducing the Retrofit manual and working at the local level

#### Grenada

The Government of Grenada has negotiated a loan with the Caribbean Development Bank to support low-income housing development. The government has formally requested the assistance of CDMP in structuring a program for hurricane-resistant home improvement, which would be able to tap into these funds. This assistance would include the provision of CDMP technical materials on hazard-resistant design and construction. CDMP is investigating the types of assistance that it can provide to Grenada within the context of a lower level replication initiative.

The Grenada Development Bank expressed interest in financing a housing retrofit program and as a result two TV presentations were made using material from the Retrofit manual. Although the GDB did not follow through with the loan program there were benefits from the publicity in that there was increased awareness of the need for safe building practice. As a result the commercial banks now require that loan applicants make provision for retrofitting where necessary, and include provisions for safe building practices in plans submitted to them.

### **3 4 3 Other Related Activities**

#### Lessons Learned Workshop

In October 1996, CDMP hosted a safer construction 'lessons learned' workshop in St. Lucia. Forty participants, representing NGOs and governmental agencies, attended this workshop. The principal objective of the workshop was to give interested organizations from other Caribbean countries the opportunity to review the Housing Retrofit pilot programs in Dominica and St. Lucia, and to discuss successes and constraints. A complementary objective was to develop new or modify existing procedures for ensuring a sustainable continuation of the project in the two countries, and to support its expansion into other countries.

#### Work with Credit Unions

To broaden the awareness and appeal of the housing programs, CDMP carried out a pilot program in 1998 with two credit unions in Jamaica. The goal of this pilot project was to determine how to market safer housing information to credit union members who are borrowing funds to build a new house or improve an existing one. During this activity, CDMP reviewed the lending processes of the selected credit unions to design appropriate

programs, trained credit union staff in the basics of safer housing, developed safer housing training and informational materials, and monitored the use of these materials

#### CDB Low-income Housing Loan Funds

The Caribbean Development Bank has made loan funds available to support low-income housing in the region. These funds supplement standard housing loan funds that were previously available from the CDB. Belize and St. Kitts and Nevis are presently accessing these low-income housing funds. CDB's position and commitment is to include retrofitting activities within this program framework, but not to pursue retrofitting by itself, since it is not considered a viable activity on its own given the nature of mortgage demand and the cost of financing.

### **3.4.4 General Observations**

#### Building Codes

Building codes are an essential part of the equation for an effective mitigation policy. However, building codes require enforcement and well staffed government agencies to be effective. In most of the countries in the region this situation has not yet been achieved. Nevertheless, the assistance provided by the project has been important. The team believes it will become more effective over the next few years. However, in the relatively short project period, only one country out of the targeted four, Antigua and Barbuda, has adopted the new legislation, and is implementing it. In both St. Lucia and Dominica, it is possible that the draft building codes might become law later this year.

More importantly, there is always the question of enforcement of the code, once it is in place. It is generally agreed that an enlightened code can be an important driver for mitigation, but this depends upon the ability to enforce what is on the books.

The issue of enforcement is clearly more than academic. It goes to the fundamental question of institutional capacity. It also raises questions concerning the appropriateness of dedicating resources to an activity that may not result in fundamental changes in the way business is done in the country. The issue is important because it has been suggested that USAID continue to finance building code related activities with the CDB. Given the generally low capacity of the relevant government departments to enforce the building codes, the team believes that enforcement can only become viable if it is combined with a vigorous public awareness campaign and is part of a broader package of measures.

The team also believes that a larger view needs to be taken concerning the overall regulatory framework. Not only will building codes alone not work, but thought needs to be given to basic land use considerations in each of the countries. These seem to be largely ignored in most of the territories in the region. Given that the Town Planning

departments process plans, their role and the political support needed for them to operate efficiently will need to be examined

### Home Retrofit Program

The home retrofit program suffered from a number of deficiencies. As a pilot, this was to have been expected. Nevertheless, the end results were slow in coming and there remain very serious questions about the sustainability of these activities in the individual countries. The numbers of loans made were small, due primarily to the limited amount of funds available for lending. Training under this component was well received in each of the countries.

As a result of problems encountered during the pilot activities, a number of lessons were learned. First, it became clear during the program that greater demand for safer construction would be generated if the program were integrated into broader home improvement programs. Second, there is a clear need for broadening the source of funds which support the revolving loan funds that were established. Only in St. Lucia has this been done. And even in St. Lucia, it is unclear that the program itself could survive financially in the absence of low cost loans being made available. Finally, the base of interested residents can be expanded by increasing the loan ceiling, effectively allowing interested residents of higher income brackets to participate.

While recognizing that this initiative may still bear some fruit in the various countries, the evaluation team is skeptical about the longer-term prospects of the two pilots and the two replication efforts. Although CHF provided a small amount of credit funds for the programs in three countries, this was done without benefit of an agreed plan for the provision of follow-on funding. The amount of CHF investment was small and therefore the risk was probably worth taking, but only if very concentrated efforts were also made to secure further funding. To be on the safe side in this type of program, and depending on the size of the loans being made, anywhere between 200-400 loans need to be made before a program can become financially self-sustaining. While there had been some hope that CDB or other funds would become available, this has not happened to the degree needed. CDB advised that there was never any prior agreement to do so and that in any event, before an NDF could expect to receive loan funds from one of the CDB intermediate financial institutions, there would need to be an institutional analysis undertaken. Even then, it should be noted that if funds are made available to the NDFs through CDB or other national programs, they are likely to be made available at below market rates, not a particularly healthy harbinger for sustainability. The evaluation team's conclusion was that the arrangements for sustaining the efforts have not yet been sufficiently pursued.

On the training of artisans, the team believes that the results have been positive. Anecdotal testimony indicated that builders are making use of their mitigation techniques. CDMP trained over 145 local craftsmen in safer construction techniques in St. Lucia and

Dominica, another 93 builders attended safer construction workshops in Antigua and Barbuda

### **3 4 5 The Role of CHF**

OAS initially contracted CHF to determine how to approach the housing issues that were presented in the region. By then, CDMP had already given small grants in Saint Lucia and Dominica. CHF was contracted to coordinate the technical activities around what was then called the "Safe Roof" program. The agreement also contemplated that CHF would provide its own funds for credit programs under appropriate circumstances. This was an excellent arrangement for the CDMP because it infused outside resources into the program. Another very positive result of this arrangement was the Safer Building Tool kit, which has been distributed to all partners and can be a very useful training device.

The National Development Foundations, CHF's designated partners, were begun in the 1980s with support primarily from USAID, which saw a need for this kind of organization. They were intended to be broad coalitions which would be independent of the governments but would still have good relations. By the mid-1990s the donors were beginning to tell the NDFs that they needed to be able to stand on their own feet. They had to have projects which would cover their costs.

CHF was never able to really convince the NDFs that the interest rate should not be an issue in lending to low income households. The NDFs believed that in the market they were operating in, they had to offer competitive interest rates, i.e. around 9-10%. This meant that funds had to be made available to NDFs at very low rates or they had to charge other fees. CHF had requirements about the use of their loan funds based upon its own sourcing of these funds. They were required to be for lower than median income households. These households could really only afford a small repayment each month, which meant a small loan. CHF's philosophy was to go with small loans, see that those were repaid, and then come back with additional small loans for further work. While this seemed to be a sensible approach, based upon experience elsewhere, it turned out that there was little demand for these small loans and the process could not be started.

Overall, the evaluation team believes that CHF participation in the mitigation efforts in the Eastern Caribbean was positive, although the home retrofit/improvement programs in the various countries have not yet resulted in significant changes.

### **3 4 6 Credit Unions**

In the 1998 Jamaica activity with credit unions, the review of home loans made by the unions showed that a substantial number of loan funds are disbursed by the credit unions each month. Consequently, incorporating safer housing approaches into the projects funded by these loans could have a significant effect on the resilience of the local housing stock. Because of the length of time required from initial loan application to final

construction, none of the loans processed during the project were completed during the four month monitoring period of this project. The credit unions involved in the pilot project were enthusiastic about the program, they viewed the safer housing information as an important service that they could provide their membership. Safer housing materials were distributed both in statements to credit union members and individually at loan meetings. Credit union staff were reluctant, however, to question borrowers when safer housing standards were not met in final house plans. Adoption of minimum construction standards by the local credit unions or the national association of credit unions, the project found, would provide credit union staff with the necessary basis to actively promote safer housing standards. The need for education on safer housing to all groups--lending institutions, homeowners, builders and government agencies--was reinforced by all participants in this project.

### **3 4 7 Conclusions and Recommendations**

Based on accomplishments and sustainability, this stream was not an overall success. Nevertheless, there were a number of accomplishments. More importantly, there were a number of lessons learned in connection with the adoption of better building codes, and in attempting to retrofit lower cost housing.

Home retrofit cum home improvement programs have turned out to be complicated and slow to impact. They are more housing programs than retrofit programs. As such, they may be appropriate for a housing development activity, but not as a main stream mitigation activity. OFDA indicated it was concerned less with the distinction between housing development and mitigation as long as the program's goal of making homes more secure through the safer building practices is incorporated in such a development program. The team recognizes this as a worthwhile objective and would simply state that wherever there is a housing program, efforts should be made to promote the addition of hurricane and other disaster resistant tools/building methods. This is different, however, from OFDA becoming directly involved in the housing development business.

The evaluation team believes that further support for building codes and retrofits should be undertaken in the context of comprehensive programs that aim at fundamentally changing the building practices of a particular town or country. This needs to include code modifications, better enforcement practices, and training of community based builders. In this connection, support for courses at the technical school and community college level is warranted, as is training at the basic community level.

### **3 5 Vulnerability and Risk Audits**

There were four components to this activity stream.

- (i) Assisting electrical utilities in the region in reducing the potential for losses caused by natural hazards in association with the Caribbean Electric Utility Services Corporation (CARILEC),
- (ii) Development of cost effective retrofit options and guidelines for existing shelters,
- (iii) Hurricane risk reduction in the hotel industry,
- (iv) Estimates of the Probable Maximum Loss from Tropical Storms

### **3 5 1 Project Activities and Events - CARILEC**

A Memorandum of Understanding was signed in the first quarter of 1994, under which CDMP and CARILEC (the Caribbean Electric Utility Services Corporation, based in St Lucia as an advocacy organization for electric utilities) agreed to collaborate on a pilot vulnerability assessment of the St Lucia Electricity Services Ltd (LUCELEC), and in the preparation of a manual summarizing methodology and findings of the pilot study for use by CARILEC in training programs for other electrical utilities in the region

In June 1994, CDMP contracted consulting services for a vulnerability audit of the LUCELEC power plant and facilities, and for a vulnerability audit of the hydroelectric power installation in Dominica for the Dominican Electric Service Utility Ltd (DOMLEC) Damage to LUCELEC's installation from hurricane Debbie in September 1994 provided vulnerability data and observations, which were fully incorporated into the ongoing audit In addition, the experiences of the Barbados Light and Power Company were used to inform the manual that was eventually produced

Final reports on the vulnerability audits were submitted to CARILEC in August 1995 LUCELEC and DOMLEC reviewed their respective reports and have implemented selected recommendations for loss reduction, and have integrated other recommendations into plans for preventive maintenance Based on these studies, CDMP prepared a Manual for Electrical Utilities on Mitigation of Damages Caused by Natural Hazards, for use by CARILEC as training material The manual provides guidelines for electrical utilities in ordering capital works and related technical services, in designing and implementing maintenance programs, and in managing natural hazard risks in general The manual will help implementing engineers contracted by the utility companies in ensuring that natural hazard considerations are appropriately incorporated in the design and construction of facilities

Following hurricanes Luis and Marilyn in 1995, CDMP and CARILEC jointly sponsored a diagnostic study of the failures and successes experienced by the electrical utility in Antigua and Barbuda (APUA), in order to expand the vulnerability reduction training materials and to offer APUA concrete recommendations on incorporating mitigation in their reconstruction effort

The manual prepared for CARILEC was a guide to inform utilities of the ways in which disaster mitigation measures and retrofitting could be incorporated in their

operations. It addresses two areas, the mitigation activities required for new construction and retrofitting of existing buildings.

CARILEC has distributed the manual, held two presentations on it for its members, and has made the information available on the website. Other than that, CARILEC does not actively promote the use of the information.

CARILEC also expressed the view that more countries have been using the document because in examining the level of hurricane damage to electrical utilities in Antigua in 1998, the damage was considerably less than in previous years. It was thought that this may have been as a result of raising of standards and retrofitting although CARILEC did not have any means of verifying this.

Apart from the dissemination of the information CARILEC is of the view that it has done all that is required to promote the document, as they see themselves as advisory to the electrical authorities, and could only make the information available to the utilities in the region. There does not appear to be widespread use of the manual by the utilities and the problem here may lie with the managers who have not seen the need for expensive retrofitting of their utility facilities.

If the use of the manual is not actively pursued, the benefits from this pilot project will take a long time to spread beyond St. Lucia, Dominica, and Barbados.

### **3.5.2 Project Activities - School/Shelter Vulnerability Reduction**

In conjunction with the CDB, and the support of European Union, CDMP and the Natural Hazards Project (NHP) of the OAS have been working jointly since September 1997 to strengthen the network of emergency shelters and school buildings which are often used as emergency shelters. The countries involved in the project include Anguilla, Antigua and Barbuda, Dominica, Grenada, and St. Kitts and Nevis.

The project consists of two primary components: a survey of currently designated shelters and training for the education sector in hazard mitigation for schools.

The shelters survey is composed of three stages. A preliminary assessment and screening of 86 properties (20 per country except for 6 for Anguilla) was conducted by local engineers to classify the properties with respect to their retrofit needs. Standards for retrofitting these structures, and for constructing new schools and shelters are currently being developed to guide the future construction. Based on the screening and retrofit guidelines, global estimates of retrofitting costs for each of the classes of property will be developed.

To support the preliminary screening, CDMP prepared a survey form to be used by local engineers in assessing the selected properties. This form has three parts: seismic hazards I, seismic hazards II, and wind hazards. The local engineers were trained in the

use of the survey form. Based on the completed surveys and follow-up site visits, terms of reference were to be developed for engineering work required to retrofit these buildings to a hazard resistant state. The actual retrofit work is to be financed with a line of credit from the CDB for those countries wishing to pursue this.

Recognizing that the majority of the properties identified in the survey component of the project were schools, CDMP joined forces with NHP and implemented a school vulnerability reduction training campaign in countries affected by hurricanes Luis and Marilyn - Antigua and Barbuda, Dominica, and St Kitts & Nevis. As part of this effort, two series of national workshops were held in the three countries in January and March of 1998 for organizations and individuals involved in school building design, construction, reconstruction, retrofitting, and maintenance. Participants included officials from government ministries, NGOs, CBOs, private sector engineers and architects, and volunteer groups.

The workshops focused on those aspects of the planning process related to natural hazard vulnerability and risk mitigation, especially in the pre-feasibility stages. The workshops served as a forum to discuss the draft policies to reduce vulnerability as well as look at preparedness and emergency response activities. These workshops were instrumental in helping the governments of Antigua and Barbuda, Dominica, and St Kitts & Nevis to design national vulnerability reduction plans. It is anticipated that these national plans will be presented for approval before the respective cabinets before the end of 1999. It is also expected that the World Bank will assist in financing some of the activities.

### **3.5.3 Project Activities - Hurricane Risk Reduction in the Hotel Industry**

CDMP and the Caribbean Hotel Association (CHA) have worked together over a period of several years in what appears to be a very fruitful collaboration. CHA had earlier produced a Hurricane Procedures Manual that was in need of updating. In order to strengthen the focus on long term vulnerability reduction, the CDMP drafted a chapter for this manual which describes hazard mitigation through improved hotel construction practices. The manual was jointly released by the CHA and the Caribbean Tourism Organization (CTO) in June 1998. This manual has been prepared for use by hotels throughout the region for hurricane preparedness and response. In order to expand access to the information in the manual, CDMP has supported its translation into Spanish. Furthermore, CAST (Caribbean Action for Sustainable Development), an NGO supported under another USAID project, the Caribbean Environmental Network, is actively promoting the distribution of this manual.

The manual has also been used in the Dominican Republic by hotels for training programs. In December 1998, CDMP and CHA jointly sponsored the first in a series of regional workshops based on the material developed for the manual. This workshop was held in St. Lucia and included hoteliers from St. Lucia, St. Kitts, and Barbados. Three

trainers from CHA Headquarters in Puerto Rico participated, in preparation for future workshops in the DR, Puerto Rico, and Central America

As with much of the training carried out by the CDMP the workshop was well received. This initiative was an important one as the tourism industry is crucial to the economic development of so many of the islands. Another workshop addressing disaster mitigation issues is scheduled to take place in the Bahamas later this year, sponsored by CHA but without additional CDMP support.

### **3 5 4 Project Activities and Events<sup>2</sup>- Estimates of Probable Maximum Loss**

The World Bank and the OAS, through CDMP, assisted the CARICOM Working Party on Insurance and Reinsurance in preparing a strategic plan for disaster loss reduction and improving risk management in the Caribbean, including the feasibility of establishing a regional reinsurance fund. Critical to determining the viability of such a fund is an understanding of the potential loss associated with a major natural hazard in the region. To support this effort, CDMP and the World Bank jointly carried out a study to estimate the probable maximum losses in public infrastructure from a major hurricane event in the Eastern Caribbean. These estimates were carried out in Dominica, St. Kitts & Nevis, and St. Lucia.

In order to carry out this study, CDMP engaged an expert in the field of loss estimation. This expert was assisted by local engineers in each of the targeted countries to collect and analyze field information. Included in the selection of lifeline infrastructure elements were electrical power generation facilities, airports, seaports, road networks, water and sanitation facilities, waste management sites, schools and hospitals.

The study has produced a comprehensive inventory of all facilities and structures, estimated replacement values, summaries of potential retrofitting, protection, or reconstruction needs, and estimated loss potential associated with a maximum likely hurricane event for the three countries. The information produced will be used by the countries as a basis for preparing proposals for construction activities for submission to the World Bank and the CDB.

### **3 5 5 Conclusions**

Each of these activities was useful. They made information available for use by a wide cross section of persons, addressed mitigation issues in the context of events which had recently occurred, and indicated options for development which could be used to mitigate disasters.

The manual developed for use by CARILEC is important for ensuring that damage to electrical infrastructure is minimized. The manual is necessary and will need to be kept current. However, while CARILEC sees the benefits to be gained through use of the document, it does not appear to see itself as taking any proactive role in the matter. The

team understands that the role of CARILEC in promoting and dissemination of the manual was worked out with CDMP at the beginning of the project. CARILEC, however, turned out to be insufficiently proactive.

The School/Shelter Vulnerability Exercise and the training which accompanied it provided information and techniques for assessments of buildings and for preparation of vulnerability assessments. The method of collection of data to inform the assessments in which the Disaster offices, the Ministries of Works and the Ministries of Education were involved helped to foster better understanding of mitigation issues and helped to strengthen interagency collaboration which is important in supporting mitigation activity.

The development of the forms used in the vulnerability assessment ensures that the methodology for data collection is uniform and their continued use should be encouraged.

The exposure of the CHA and CTO to disaster mitigation measures is an important development in making the private sector aware of the need to include mitigation action as part of their planning and development activities. The program of training developed by CHA is a good model for exposing groups of this kind to the requirements for vulnerability assessments and disaster mitigation.

The estimates of probable maximum loss for Dominica, St. Kitts, and St. Lucia have provided concrete information which can be used in making the case for insurance activity and for informing decisions about location and requirements for infrastructure.

### **3.5.6 Recommendations**

The vulnerability assessments were useful exercises and more of these types of studies should be carried out in the region. This might be promoted through the training workshops being recommended by this report.

The type of training to which the CHA was exposed should be made available to other crucial economic sectors in the region.

When manuals are prepared for use by groups, programs for distribution and promotion of the materials should be prepared in collaboration with the group. Assessments of the use of materials should be requested and forms for such assessment should be distributed with the documents. These proposals should be agreed prior to the start of any project.

### **3.6 The Property Insurance Industry**

CDMP engaged and collaborated with the private sector in many of its activities. One of the project's fundamental assumptions is that in order to promote change in the attitudes and actions of people in the region, working only with the public sector was

unlikely to be sufficient. Underlying this assumption is the belief that the private sector drive for profits as well as public relations considerations could be used in support of mitigation efforts. It was evident in project documents that public sector efforts were in many places unlikely to be very productive. For this reason, it seemed to make sense for the project to work to encourage various private sector "drivers" in the region that might lead to broader mitigation pressures. The hotel associations are one example of this. In addition, work to promote better building codes and enforcement might also be considered to be both a public and private sector driver. Looking for pressure points outside the public sector that would influence actions seemed to make sense. However, the lesson from the property insurance component is that a true partnership is needed in order to effect change. The private sector cannot do it on its own. Nor can the public sector. And change does not come quickly.

CDMP, since its inception, has worked with the insurance industry in the Caribbean to promote incentives for measures that would lead to reductions in losses from disasters and would promote hazard mitigation activities. This effort was particularly pronounced during the early years of the project, when most funds were expended. To this end, CDMP organized joint workshops with the insurance industry in Jamaica, the Dominican Republic, the Bahamas, and Belize to encourage the industry to promote disaster mitigation. The project also supported the CARICOM Working Party on Insurance and Reinsurance in the preparation of a policy paper for the CARICOM Heads of Government. In 1998, there were hopes that a groundbreaking step towards realization of CDMP's goal would be achieved when the United Insurance Company of Barbados launched a program aimed at reducing hurricane damage to properties. Unfortunately, results from this effort have been limited to date because of competition from rival companies who have also reduced their rates without demanding that mitigation measures be in place. In Belize, recently, there have been encouraging signs from the private sector and the Atlantic Insurance Company. The various activities and events are described in greater detail below.

### **3.6.1 Project Activities and Events**

#### Support to CARICOM Working Party

In early 1995, CDMP agreed to support the CARICOM Working Party on Insurance and Reinsurance, which had been formed by the Caribbean Heads of Government to study critical insurance issues against the background of increased frequency of destructive hurricanes in the Region. Later that year Luis and Marilyn made the work of the Working Party seem even more urgent and more a part of a general movement to address these issues.

CDMP prepared a working paper on Catastrophe Protection in the Caribbean that guided the deliberations of the CARICOM Working Party. At the invitation of the OAS, the World Bank also joined the effort. In the process, consultants from CDMP and the World Bank visited Trinidad during the Insurance Association of the Caribbean (IAC)

Annual General Meeting, and participated in meetings of the Working Party in Barbados (October 1995) and Jamaica (December 1995). The working paper outlines mechanisms for strengthening the regional insurance industry, for reducing the risk exposure and vulnerability to natural perils as well as for increasing the availability of affordable insurance. This document served as a basis for the final CARICOM Working Party Report adopted by CARICOM in March 1996. Unfortunately, there has been little follow-up since the Report. Nevertheless, the World Bank continues to be interested and is supporting further work on one of the primary recommendations of the Working Party Report, the establishment of a regional reinsurance pool for the Caribbean. Progress has, however, been slow.

### Insurance Association of the Caribbean

Carrying on this general thrust, CDMP participated in the 17<sup>th</sup> annual conference of the Insurance Association of the Caribbean, held in Barbados in June 1997. At this conference, considerable attention was paid to natural hazard mitigation and loss reduction. In his opening address, the Prime Minister of Barbados focused on the findings and recommendations of the CARICOM Working Party report, particularly the need for better information on the Caribbean insurance market and a call for a greater retention of insurance risk within the Caribbean region. In the session entitled "The Caribbean—a Disaster Area", presenters reviewed the natural hazards that threaten the Caribbean region and vigorously promoted loss reduction through appropriate building standards for siting and design. CDMP distributed copies of its publications to conference participants. The international reinsurance market was well represented at this meeting, demonstrating a renewed interest in the Caribbean insurance market, after the disasters of the early 1990s had led to lower interest.

### National Workshops

National workshops were held in Jamaica, the Dominican Republic, Belize, and the Bahamas as early as 1994 to attempt to raise the topic and to keep it before both the public and the insurance companies. Because of the nearly prohibitive costs of insurance at the time, this was of great interest in the region and CDMP pursued and supported this interest.

In Jamaica, local insurance agencies and the Insurance College met with engineers and architects to discuss follow-up activities to the recommendations of a CDMP-sponsored workshop held in the fall of 1994. The Jamaica Association of General Insurance Companies (JAGIC) took the initiative to form a joint subcommittee with membership drawn from the insurance sector, the architects' and engineers' associations and the University of Technology (formerly CAST). Unfortunately, since its formation, in early June 1995, the subcommittee has met twice but has not produced a workplan, or a proposal for support from CDMP. This is unfortunate, given that the head of the CARICOM working party is also the head of one of the largest Jamaican insurance companies.

In the Dominican Republic, CDMP and the Camera de Aseguradoras de la Republica Dominicana (CADOAR) held a two-day workshop in 1995 on Probable Maximum Loss (PML) calculation. Workshop participants included 45 insurance industry representatives, the director of the national meteorological service, a representative of the Caribbean Association of Civil Engineers, and five US-based risk management consulting firms. The US firms participated at their own expense, for the opportunity to present their services to the assembled insurance companies. The workshop resulted in practical guidelines for CADOAR on the organization of and mobilization of resources for a nationwide PML study.

In Belize, a local disaster management seminar was held in 1996 to sensitize senior public and private sector officials on the importance of disaster management and the role their agency/organization could play in the implementation of disaster management activities. This seminar was co-sponsored by USAID, CDMP and ORINCO, the local insurance organization in Belize. Over 70 participants—from the fields of engineering, architecture, planning, banking, insurance and coastal zone management—attended the workshop. In a very encouraging development related to Belize's near-disaster with Mitch, this same group was convened at the initiative of the Chamber of Commerce in May 1999 and, with CDMP assistance, has proposed an ambitious program to modify Belize's building codes.

In the Bahamas in 1997, the Bahamas General Insurance Association hosted a daylong seminar on natural hazard mitigation. Almost one hundred public and private sector personnel participated in the seminar, which addressed the link between building practices, damages from hazards and insurance premiums. Participating insurance agencies were encouraged to promote hazard mitigation by providing lower insurance premiums for appropriately constructed or retrofitted structures. CDMP collaborated with the BGIA on this seminar by providing copies of CDMP reports for the participants and by providing the keynote speaker.

#### United Insurance of Barbados

The United Insurance of Barbados property insurance program provides incentives to policyholders, in the form of substantial premium reductions, to apply measures that would safeguard their properties against the perils of hurricanes. United produced two booklets, *Making your Home Hurricane Resistant* and *Professional Guide to Performance-based Design Upgrade for Hurricane Resistant Construction*, which outline hurricane-resistant construction techniques and serve as checklists for determining insurance premium credits for retrofitting. The expectation is that reduced insurance premiums will encourage property owners to invest in hazard mitigation for their properties, resulting in a decreased overall risk to natural hazards. The CDMP participated in the public launching of the program, and is assisting United with monitoring public acceptance of the program and its expansion to the Eastern Caribbean. Unfortunately, there has been little response from the public to United's program.

### 3 6 2 General Observations and Conclusions

Overall, the design of this activity stream was a reasonable approach. The hurricanes and other disasters in the late 80s and early 90s had resulted in a substantial withdrawal of reinsurance funds from the region. Insurance costs were up. Local companies were seen as the villains for charging high prices. The industry was anxious to escape the opprobrium that enshrouded it. There was a potential economic driver at work. In other parts of the world, the insurance industry paid close attention to building measures against disasters and rewarded these measures in the form of lower premiums. There exist insurance companies which specialize in disasters with very low premiums - provided the insured can comply with very rigorous standards.

However, by the time that the project was up and running and the various activities with CARICOM and the national insurance associations were underway or being completed, the financial picture in the region had changed. Reinsurance companies were awash in funds and were looking to cover risks at the local level. They didn't seem to care that much about the practices of the local companies in differentiating between good risks and bad. In the region, it appeared that most companies, because of competition, have been uninterested or unable to introduce differentials. Rather, they have chosen to continue with the practice of averaging the cost of premiums detailed in the CARICOM Report. In effect, the insurance companies have subsidized their higher risk clients.

One lesson therefore is that the economics of the industry in the region do not yet lend themselves to the kind of interventions that have been proposed. Because of financial forces external to the region, local companies are unable to respond in a positive way to what are logical proposals. This is an important lesson on the limitations of the partnership with the private sector.

Nevertheless, the attention given to this issue has not been in vain. First, there is much more recognition in the region that the insurance industry and the private sector have a role to play in mitigation matters. The project can clearly claim that it has been a force in this. Second, there is a growing recognition among a number of observers that this is a medium to long term problem, precisely because of the complexities of the economic forces involved. Third, there is a very real lesson in this, namely that an overall solution has to involve both the public and private sectors. Finally, there have also been some positive short-term results.

- There are the ongoing experiences of two insurance companies in the region, United Insurance Company of Barbados and Atlantic Insurance Company of Belize, which are discussed in more detail below.
- The CARICOM Report highlighted a number of issues within the insurance industry, and some minor changes recommended by the Report have been instituted. These include the raising of capital requirements for engaging in the business in some

countries. This benefits larger companies, but it also helps to safeguard the public by requiring companies to have a more solid financial base.

- Reporting requirements to regulators have also been increased in some places, according to our information.
- There is continuing work at the level of the World Bank concerning the creation of a regional reinsurance pool.

Nevertheless, the author of the 1996 CARICOM draft Report, Arthur Evans, had the following to say in April 1999, in a memorandum to the OAS:

“My visit findings evidence meager progress since the [1996 Report]. There have been some increased minimum capital requirements as well as some rather limited and optional allowance for pre-event catastrophe reserving being tax deductible. In general, the industry’s infrastructure remains weak. Conspicuous this week was the absence of industry cohesion or industry follow-up to the CARICOM report recommendations. The IAC appears paralyzed. The regulators association appears as the only structure available and motivated towards strengthening the insurance industry infrastructure as well as curbing the companies’ addiction to indifference on vulnerability measures.”

The Report had also recommended that there be certain improvements in the building code structures in the region. These are slowly beginning to happen. This does serve to point up some inherent dilemmas. Politically, there is not great political will to enforce building codes. Economically, there is great pressure to develop the tourism industry near the water. Nevertheless, building codes have progressed in some places and it is likely that over time they will assume more importance in the mitigation effort than at present. As the experience in Belize points up, improvement of local building codes is something that can sometimes take some time to materialize. One of the lessons is that when it does materialize locally, it is important that there be sources of assistance that can step in quickly with assistance.

CARICOM itself is not an institution that can mandate changes in its member countries. Pronouncements at this level are therefore unlikely to lead to immediate action at the country level. Nevertheless, CARICOM is on record and this record can continue to be used and pointed to. Public relations may be a valuable supplement and more effective tool in the short and medium term.

Discussions with United Insurance Company in Barbados revealed that the program introduced has not yet gained much support from the public. United estimated that not more than 50 insured had opted to apply and carry through the process. Substantial savings, on the order of 25% for basic retrofitting measures and 40% for more complex engineered buildings were possible. However, the public interest in spending for the up front improvement costs had not yet materialized. The team was also able to

confirm this headquarters observation with a supplemental interview with a United Insurance agency in St Lucia

A major reason for United's initiation of its program was a belief that if the response was good in terms of support from the public and if the company was able to secure a substantial number of customers who were less likely to require pay-offs in the event of a disaster, the initial loss of income from lower premiums would have been more than compensated by greater numbers of new insureds and lower reinsurance rates. Their belief was and is that the reinsurance industry would respond. Neither of these has happened. There has been very little demand. There have been no major storms in countries covered by the programs, hence little to analyze in the way of comparisons. Furthermore, there has been a disinclination on the part of independent brokers to aggressively market this insurance because their incomes diminish. Some of this can be laid to marketing deficiencies. The lack of enforced building codes is also a factor in this issue. Nevertheless, United appeared to us to be committed to the program in the long term and has said that they will continue with it.

Thus, the picture presented is one in which the reinsurance industry has not yet rewarded the efforts of United, and the public has also not yet responded. Brokers complicate the situation. Overall the economic incentives have not yet proved fruitful.

Discussions with the World Bank on how it proposes to continue the insurance initiative were instructive. The view of the Bank is that government insurance regulators do not have the powers necessary to adequately shape the insurance industry. If this view is correct, and it does seem to be confirmed by discussions that the team had, the lesson is quite clear. It is that in the absence of a governmental regulatory framework that requires differentiation of risks, it is unlikely that the economic incentives that currently obtain in the region will drive the industry toward instituting these changes on their own.

The World Bank indicated that it stands ready to provide support for restructuring the industry and additional capital requirements. However, the Bank will not act in the absence of requests from its member countries. This may not be easily forthcoming. In the meantime, and as a step that needs to be taken in any event, the Bank is going to go ahead with a study on establishment of a regional reinsurance pool for catastrophe risk coverage. Their belief is that rates for this type of pool would be better than those that the reinsurance industry can provide. Whether this would stand up in the competitive insurance world is unclear at this point, but is certainly an issue that would need to be studied. The Bank indicated that continued USAID interest would certainly be welcomed.

Our conclusion is that the effort was worthwhile. Estimated direct project costs amounted to about \$118,000, through 1998, most of which was spent in 1996 and earlier. In our view, useful seeds have been planted and will be carried forward over the next few years. The World Bank continues to support research on creation of an reinsurance fund in the region. Promotion of this activity is also part of the CDB's new Natural Disaster Management Strategy. As more countries adopt building codes and enforce them, this

will add to the pressure. Further disasters are inevitable and the efforts that have been made on the building code side should bear some fruit and contribute to a better situation. Greater marketing and publicity by United would be helpful. The Atlantic experience should be closely followed and encouraged. With greater public awareness and appreciation, momentum will build and other companies in the insurance industry may be more inclined to respond and persons seeking insurance may be more inclined to respond to the greater availability of programs.

### **3.6.3 The Belize Case**

The Belize experience is worth careful attention. Following the March 1996 insurance industry sponsored workshop, there appeared to be little progress. And yet, in hindsight, that workshop sensitized a number of people and organizations in Belize. Then, a number of events occurred that have changed this. First, there was Belize's brush with disaster when Mitch turned away when less than a day away. Belize City and other coastal areas had been evacuated and people were genuinely face to face with disaster. Second, there was a change of government. Third, the new government sought and has apparently obtained funding for new housing on the order of B\$300 million. Fourth, the new government has also been completely serious about doing something to promote disaster management. Fifth, there is an OAS resident representative who actively supports and encourages this activity. Finally, the private sector, under the auspices of the Chamber of Commerce, took the initiative to re-convene, with CDMP assistance, the 1996 participants in the insurance industry workshop. The 1999 workshop has resulted in a six month program aimed at presenting to government recommendations on changes in the building codes adapted to the different regions in Belize. CDMP has helped to facilitate the process, capitalizing on an opportunity that was presented. The Belize vignette is an example of a number of events coming together and potentially producing a successful mitigation effort. None of these events, by themselves, is a sufficient. Together, they do add up. It is this kind of situation that a future project should seek to catalyze.

Atlantic Insurance Company, a leader in this initiative, also introduced, at the beginning of May, a new program for existing policy holders for retrofitting of both residential and commercial properties. This is being done in conjunction with a local supplier of retrofit equipment. While the premium reductions are relatively modest, this is a significant step.

### **3.6.4 Lessons**

One of the lessons is that diagnosing the intersection between economic forces and public consumption tendencies is very difficult. In this case, events beyond the control of the region were not anticipated and worked to undermine a logical approach that had worked in other parts of the world. The assumption on which this component was based, a continuing scarcity of reinsurance resources in the region, did not hold.

Another key lesson is, however, that this kind of initiative needs a comprehensive approach. There is still very much a need for government action and regulation. The CARICOM report recognized this. The private sector in Belize was slow to respond, although an argument can certainly be made that three years is a relatively short time, but when it did take the initiative, it was because there was a new, more receptive government in office.

A third lesson is drawn from the Belize vignette. It is that the success of any one mitigation effort begins by sensitizing a wide cross section of the public and private sectors in the value of mitigation efforts. This sensitization then needs to be followed up by a number of other events that together can catalyze a program. These other events often will include a disaster situation, availability of funds for capital works, a private sector that is motivated, a government that is responsive to the wishes of the public, and an outside agent that can help at an opportune moment.

Finally, the ability of the project to respond quickly has been demonstrated and the importance of having this ability is another important lesson.

### **3.6.5 Recommendations**

The broader issue of innovative financial mechanisms to counteract the anticipated losses from natural disasters needs to be explored and supported over the next generation of disaster mitigation activities. USAID, including possibly the Global Bureau, could help on this through a collaborative effort with U.S. financial institutions.

Both the CDB and the World Bank are going to continue to pursue activities in this arena. USAID should support these activities through collaboration on training and workshop efforts. In particular, USAID should work with these institutions and with countries that are amenable on an approach that incorporates both the public and private sectors in the solution.

Whatever form new USAID support takes, it is recommended that it continue to have this ability to respond quickly when there is an opening for action as there was in Belize.

### **3.7 Post-Disaster Mitigation**

This stream was a practical response to reconstruction efforts, and at the same time an effort to expose affected persons to tools which would inform mitigation actions. The assumption was that being that in a post disaster situation would encourage greater receptivity to mitigation measures. The projects included in this stream were not in the original design of the project. They were added to the CDMP program activities following the March 1994 meeting of the Technical Advisory Committee. This activity was designed and budgeted prior to the onset of the 1994 hurricane season.

The projects carried out were

- 1 In St Lucia, updating the landslide inventory, preparation of debris flow hazard maps and debris flow run out areas in areas which experienced landslides after hurricane Debbie
- 2 In Dominica, monitoring development of engineering measures to be implemented in the lower Layou River and preparation of a plan for evacuation decision making after two landslides had blocked the upper Layou River
- 3 Also in Dominica, support measures for the Dominica Coastal Infrastructure Rehabilitation Project
- 4 And finally, a training workshop for local builders in safe construction and roof retrofit in Antigua and Barbuda and St Kitts and Nevis

### **3 7 1 Project Activities and Events - St Lucia**

Following tropical storm Debbie, which caused \$37 million in damage to St Lucia, the CDMP obtained the services of a landslide specialist who updated the existing landslide inventory and prepared debris flow and debris flow run out areas maps. The landslide inventory was updated and a landslide hazard map was created for 12 watersheds which comprised some 70% of St Lucia. This mapping was used to inform a World Bank funded watershed management plan.

The landslide hazard mapping was done by a regional consultant with local input being provision of raw data by the Agricultural and Survey departments. The maps generated in St Lucia had to be prepared manually as there was no GIS capability in St Lucia at that time. Since then, the Planning Department, having acquired GIS capability, has digitized some maps using their system. These maps are used by the Office of Disaster Preparedness to inform communities of landslide prone areas and the risks associated with them. The Town Planning Department uses these maps for long-term planning and to inform land use decisions.

### **3 7 2 Project Activities and Events - Dominica Layou River**

Following the blockage of the upper Layou River in 1997 by two landslides, CDMP used the services of a regional consultant to monitor the landslide activity and to recommend engineering measures to avoid damage to communities and to prepare a plan for evacuation decision making.

Flood vulnerability maps and hazard maps were prepared for this area. These maps identified vulnerable zones and were used to determine the areas which were at risk.

They also informed the provision of engineering mitigation measures in the lower reaches of the Layou River

A multi-disciplinary task force with members of the Layou community, chaired by the Minister of Works, was set up to aid in the development and execution of mitigation plans for the area. This committee fostered community participation and as a result monitoring of the dam is still continuing with the involvement of the community

Because no data was available for this site, mapping of the area was informed by interviews with residents of the area. As part of this exercise, civil engineers and the surveyors were trained in the use of GIS

The landslide dam still remains, a rare phenomenon, in the view of landslide experts. However, as a result of the post-disaster mitigation activities, there is an evacuation plan which has been prepared for the Layou River community. Several benefits were derived from this project. The approach to the preparation of the hazard and vulnerability maps as well as the evacuation plans involved a wide cross section of participants including members of the community. This ensured that there was knowledge about the project and that the proposed plans were acceptable to the community. Hazard and vulnerability maps have now been prepared for the affected areas and are being used for decision making in the communities which are affected

### **3.7.3 Project Activities and Events - Dominica Coastal Infrastructure**

Following hurricanes Luis and Marilyn in 1995, the Government of Dominica requested assistance from USAID and CDB for rehabilitation and reconstruction of key sections of the sea defense system. The Caribbean Development Bank (CDB) approved a loan of \$2.3 million and USAID provided \$500,000 under a Limited Scope Grant Agreement. The USAID agreement stipulated that CDB and the Government of Dominica work with the CDMP to assess the storm hazard risk and include storm hazard damage mitigation measures in the engineering designs for infrastructure rehabilitation and reconstruction

The overall objective of this activity was to assist Dominica in setting design standards for the coastal rehabilitation work to be financed under the CDB loan. A long-term objective was also to strengthen local capacity to design, build and maintain cost-effective sea defenses. This project was also intended to serve as a model for the incorporation of storm hazard damage mitigation into the design of large public infrastructure development projects. By incorporating realistic estimates of storm hazard into infrastructure design, it was hoped that would minimize future expenditures on its coastal defenses

Components of this infrastructure rehabilitation project included analysis of storm surge and wave impact under various storm scenarios, a detailed geotechnical investigation of rehabilitation sites, definition of design criteria sufficient to provide

facilities able to withstand storm impacts and engineering design for coastal defense rehabilitation work

A pre-bid workshop for selected engineering firms to present and review the designs for the sea defense rehabilitation was planned, as was a more general workshop for coastal planners and emergency managers to discuss coastal storm hazard assessment, coastal land use and emergency preparedness. Because the need for coastal defense repair work is perennial, an emphasis was to be placed on developing the necessary technical skills in Dominica, where possible.

The initial intention was to assign the nine sites forming part of this project to the three local consulting engineering firms then practicing in Dominica. Recognizing that none of these local firms had the in-house expertise in Dominica to provide all of the functions required for this assignment, the intention was for the CDMP to provide a "supervising" consultant to fill the gaps. This would maximize the use of local resources while maintaining high standards, and would transfer technology and build the local and regional capabilities for similar assignments in the future.

Unfortunately, apparently due to insufficient advance consultation or a simple breakdown in what had been agreed, the procedures described above were not pursued and the selection of consultants was carried out through a competition among all eligible CDB countries. In those circumstances, it was not possible for any one of the local firms to be selected in its own right. The successful consultant team was a joint venture of a US-based firm and a Trinidad and Tobago firm.

Because of the changes in approach, and after discussions with the Government and the Caribbean Development Bank, it was decided to limit the input of the CDMP to

- analyze wave and storm surge hazard at the selected sites,
- develop the soils investigation program,
- determine the design criteria for wave forces and scour depths,
- review the Design Stage I submissions prepared by the joint venture, and
- participate in the pre-bid meeting.

CDMP then undertook the following

- A Preliminary Site Visit to observe site conditions and prepare a soils investigation program. This took place in March 1996.
- A Soils Investigations Program that was submitted by the CDMP to the Government consultants in August 1996. The consultants contended that soils investigations were outside their terms of reference, causing significant delays in project execution. In an attempt to move the project forward, a meeting was convened at the CDB in October 1997. At that meeting a minimum-acceptable

soils investigation program was agreed upon. This was largely completed by the government's consultants by March 1998.

- Storm Surge, Waves, and Off-Shore Bathymetry. This information was developed and submitted to the CDB, the government's consultant, and the OAS in November 1996.
- Design Criteria for Wave Forces and Scour Depths. After receiving the geotechnical and topographic input from the government consultants, the CDMP submitted the design criteria to the consultants and the CDB in May 1998.
- Review the Design Stage I Submission of the GCD consultant. A Design Stage I report was issued by the government consultants in January 1998. Review and comments were sent to the consultants and the CDB in May 1998.

As of the end of 1998, the recommendations contained in the review had not been acted upon by the Government consultants. Since no further contributions could be made by the CDMP, CDMP decided to terminate further input.

The proposal for the use of the review or check consultant was well conceived, but caused the project to be delayed and resulted in frustration of all the involved parties. The system as proposed was not in common use in the region and in Dominica. While the initial reason for using this system made sense, especially as a way to involve local design firms, once the project had gone off on a different track, there needed to have been a thorough agreement reached with all parties on how the legitimate mitigation concerns of USAID would be included.

CDMP remains convinced that peer review is needed for the reduction of the incidence of infrastructure failure as a result of natural hazards and has indicated the type of actions which are necessary in order to ensure that such a system will work. These are

- Hold discussions between the client, the funding agency and other relevant parties at the initiation of the project to examine the intentions of the exercise and to determine the scope of the service.
- Provide the prospective design consultants with the terms of reference of the review consultant as part of the description of the project for which they are proposing their services.
- Hold discussions between the selected design consultant and the review consultant at the start of the assignment of the design consultant. These discussions would be the opportunity to agree on detailed timetables for submissions and reviews and on the modus operandi.
- Do not involve the client in a detailed account of review discussions, but limit formal reports to final conclusions of the reviews.

These suggestions indicate that it is necessary to agree upon the methods for the implementation of projects prior to the commencement, especially if new methods of monitoring or reviewing them are to be introduced. The evaluation team continues to believe that the idea of a review consultant is especially well indicated if there is the additional reason present of assisting in the strengthening of local consultants. In the absence of this additional reason, the team is skeptical that OFDA can use this method.

### **3.7.4 Project Activities and Events - Training Workshops for Local Builders**

Training workshops for local builders in safe construction and roof retrofit were held in Antigua/Barbuda and St. Kitts and Nevis. As with most of the training exercises undertaken by the project, these were very successful in terms of providing techniques and raising awareness. The timing of these workshops after disaster events played a significant role in their success.

As a result, many of the builders and contractors are now aware of the need for safe building practice and now advise their clients at all levels of the need to incorporate such practice in their construction activities. In addition, because of the sensitization to the issues of safe building practice, it was pointed out that in Antigua groups like the Red Cross are now engaged in mitigation activities such as the distribution of hurricane straps.

The NDF, the NGO which organized the training workshop in Antigua, has expressed interest in continuing training in this area.

### **3.7.5 Conclusions**

The above projects were learning experiences for the affected countries, consultants, the OAS, and OFDA. There is merit in carrying out post hazard activities, as it is especially then that there is a real understanding of the need for mitigation measures.

There are problems, however, in finding and implementing immediate solutions in the response effort which will also include longer term mitigation activities. This is because the longer term mitigation measures generally require that the institutional framework be in place to be effective. This perhaps means that mitigation proposals need to be simple and modest in the post disaster stage. Once there is established a good base, more complicated proposals may then be in order. The World Bank project proposes to prepare a hazard and vulnerability map for Dominica utilizing existing material in government ministries and private companies. The information generated from the post hazard exercises will provide useful information for these exercises.

The work carried out on these projects was beset by delays, and although all of the issues have not been resolved, they have provided information as to how to proceed in the future.

The post hazard assessments exposed the lack of systems for recording and storage of data as well as the need for up to date equipment for storage and retrieval of data and map preparation. While these are major problems which could not be addressed by the project, they will need to be addressed in some comprehensive manner if hazard mapping is to be done in an efficient manner.

The use of the review consultants was a very contentious issue, but nonetheless was a learning experience for the funding agency, CDMP, and Dominica. The intention in requesting that such a review system be put in place was a good one, but all of the requirements for implementing this system should have been agreed upon by all the parties at the start of the project. Given that the post disaster exercises were experimental, it was difficult to envisage the problems that arose with the implementation of the review system.

The post hazard training was successful and is an approach which should be continued as the interest in mitigation will always be there immediately after an event.

The use of regional consultants in these projects was important as this means that the knowledge and experience gained in carrying out the hazard mapping will likely remain in the region.

### **3 7 6 Recommendations**

There will always be a need for post hazard assessments. However, projects will have to be carefully selected if reconstruction activity is to be carried out. There is a need to build the hazard mapping and assessment teams prior to events and expose them to the requirements for post hazard mapping before events so that there is a better understanding of the requirements for hazard mitigation. A list of regional consultants with training in hazard mapping should be compiled and these consultants be used as resource persons for pre-event training and post-event hazard assessments.

When new systems, such as that of review consultants, are to be introduced, all parties should agree to the use of those systems prior to the carrying out of any project.

With respect to training in safe building, this activity should continue, but trainers should be selected and targeted for training and frequent updating in techniques for safe building. Emphasis should be placed on training of a core of reconstruction workers.

### **3 8 Development Finance Institutions**

From the earliest moments of the CDMP, it was believed that collaboration with development finance institutions active in the region made sense. As a result, CDMP worked closely with the Caribbean Development Bank (CDB) and with the World Bank (IBRD). The results have been gratifying, although this is not to say that there have not

been implementation issues. Further collaboration with both institutions, post-CDMP, is clearly justified, provided it is well structured.

### **3 8 1 Project Activities and Events**

Shortly after the CDMP started in 1993, it began to work with the CDB to attempt to influence the lending policy of the Bank and to give more consideration to natural hazard considerations in the development of its own lending policies. The CDMP conducted two workshops for the project development staff of the Bank. These workshops, coming at a time of heightened awareness in the region and within the Bank about the impacts of disaster on economic development, resulted in a commitment by the Bank to change its policies to incorporate mitigation considerations, and this, in fact, happened in May 1998 when the CDB Board adopted a new policy on natural disaster management which placed strong emphasis on mitigation measures.

The new CDB policy (Paper BD 35/98) emphasizes a number of important CDB intentions:

- increasing its assistance for disaster preparedness and mitigation,
- strengthening its operational procedures leading up to the disbursement of funds,
- improving its collaboration efforts with NGOs and CBOs,
- preparation of operational guidelines for natural disaster management

CDB approved policy is now to support the preparation of physical standards, institutional strengthening of disaster management offices, the enforcement of construction standards and codes, and cooperate with other International Financial Institutions to improve the insurance industry in the region. CDB has also pledged to consider projects for retrofitting of public buildings and major economic infrastructure facilities. Each of these elements was prominent in CDMP and, if implemented by CDB, will greatly help the mitigation movement in the region.

In addition to the new policy, which has already proved effective in speeding assistance following Hurricane Georges, CDB has been working for several years to make its lending policies more mitigation sensitive. One of the earlier pieces of evidence for this was the collaborative effort that CDMP and CDB carried out in Dominica following Luis and Marilyn in 1995. Unfortunately, as noted above in section 3.7, actual construction has been delayed and is not yet underway.

CDMP has collaborated with the IBRD in a number of ways and communications appear to be good. First, the World Bank has been involved since 1995 in the CDMP insurance initiative and is continuing to pursue this. In addition the CDMP and USG were active participants in the process of consulting and preparing the Bank's recently approved projects in the OECS countries and the Dominican Republic. Finally, the Bank has made active use of the TAOS storm surge model developed under the CDMP in other regions of the world, notably South Asia.

The Inter-American Development Bank has not been generally active in disaster mitigation in the Caribbean region. The IDB has, however, been involved in Belize in the post-Mitch reconstruction efforts. As a part of that, the IDB is collaborating with the CDB in the construction of lifeline facilities and in support for the Belize National Emergency Management Organization.

### **3.8.2 General Observations and Conclusions**

Both CDB and IBRD have expressed interest in collaborating further with USAID. The evaluation team was impressed with the potential for such collaboration but believes that the modalities proposed need careful thought.

In discussions with CDB staff, there was generous acknowledgment of the role that CDMP had played in assisting CDB with the development of its policies. Of course, CDMP could not claim to be the only influence. Hurricane Andrew was mentioned also as having been a major influence and, in general, the increasing frequency and severity of disasters in the region have had an impact on the way that the Bank conducts business.

As a result of these factors, the CDB is much more sensitive to the need to integrate disaster mitigation principles into the design of all projects and into their country strategies and is doing so. CDMP can rightly claim a part of the credit for this.

CDB acknowledged that now that a new policy has been put in place, there remain many challenges to making it a reality. Because of a lack of staff and a lack of internal resources, the CDB has not yet been able to implement some of the activities contemplated. While the process for approving emergency loans has been tested and has proved to be positive in the aftermath of George, the evaluation team concludes that the Bank needs to devote considerably more resources to strengthening its internal structure before the new policy will truly become effective.

The collaboration between CDB and IDB in Belize is potentially a very important model that might be followed in other Caribbean countries as well, depending upon the mutual interests of both institutions. USAID and OAS, through CDMP and the resident OAS representative currently, and through other future arrangements, could be a valuable adjunct in this process.

### **3.8.3 Potential USAID-CDB Disaster Mitigation Program**

USAID is considering making a cooperative grant to CDB. The evaluation team believes this is an excellent next step. The team has provided both OFDA and CDB with its detailed assessment of the proposed implementation mechanism. Generally, the team believes that CDB will need to strengthen its own staffing to support these efforts and closely define the structure and direction that an OFDA supported mechanism should take. The team believes that the direction that should be taken is toward support for

comprehensive country-based disaster management and mitigation efforts, which strengthen capacity as opposed to efforts which emphasize discrete technical solutions. Above all, the Bank could act as a force in the region for raising awareness of the vital interests involved at the community and national level.

### **3 8 4 Recommendations**

In addition to going forward with the CDB, the team also recommends that formal collaboration be pursued with the World Bank. In discussions with Bank staff, a proposal was floated concerning the establishment of a trust fund arrangement by USAID with the Bank. Reference to a specific arrangement was made concerning a USAID/Bank project in the mid-1990s in which a USAID staff member was placed within the Bank and worked as a part of the Bank preparation team on a \$400 million housing project in Russia. There were significant advantages and disadvantages to this arrangement. Other arrangements are of course very possible. The team recommends that OFDA open discussions with the Bank with the goal of reaching an arrangement like that to be pursued with the CDB and which would be specifically tied to training opportunities as well.

USAID should consider ways and means of fostering the Belize CDB/IDB model of collaboration in other parts of the region.

### **3 9 Technical Training and Information Dissemination**

The development of the design of the CDMP project was driven by several principles, two of which were

The provision of a vehicle for training and information dissemination that would help shape behavior among key actors, and,

The development of a consistent and accurate data bank and resources that would relate to all on-going disaster activities and would facilitate information dissemination.

These two principles informed the development of all of the streams in the project and, as a result, all of them had some component of training and information dissemination.

#### **3 9 1 Project Streams**

##### Mitigation Policy and Planning

Two major workshops in support of mitigation policy and planning were held and are discussed in detail under this stream in section 3.1. These workshops played a very important role in establishing linkages between the planning departments and the disaster

agencies and have raised the level of awareness of both sets of agencies to the need for mitigation policy planning

### Community Participation

In both the Dominican Republic and Haiti, training played an important role in each of the CDMP initiatives. In the DR, activities have been very community oriented and have had an important impact. In general, communities have been able to identify their needs, vulnerabilities, and risks and develop programs and carry out activities to benefit the local population. The workshops that the communities participated in strengthened and motivated community self development. Communication between communities and local authorities is more effective and the communities are more unified. The program in Haiti developed in an entirely different manner from that in the Dominican Republic and focused on disaster management training for government officers and key persons in the community. Some 466 persons were trained in Haiti.

### Generation and Use of Natural Hazard Assessments and Risk Mapping

As part of the development of natural hazard assessments and risk mapping, a number of technical workshops and training sessions were carried on throughout the region. In Storm Surge Mapping, CIMH has conducted several training exercises in the use of the TAOS model. As a result, all of the region's meteorological offices are aware of the existence of the model and its application. Other offices such as the Works Department and the Town Planning Department, the police, the army and some community disaster workers have also been privy to information about the model and its use.

### Building Standards and Housing Retrofits

There were two main activities in this stream - promulgation of building codes, and low cost housing retrofit. In the area of housing, a considerable amount of training took place, with over 350 artisans and contractors being exposed to training in housing retrofit. This was one of the most successful training activities under the project because the training programs were practical and seem to be influencing building practices as a whole, as builders are using techniques learned at all levels of their practice.

### Vulnerability Audits

Under this stream, manuals were developed and specialized training events were organized. Activities were carried out with CARILEC and CHA and with country governments concerning shelters. While the team's view is that the activities with CHA and concerning the school shelters were the more successful elements, the team also believes that the training events that were conducted served to raise awareness in general throughout the region on this important aspect of mitigation.

### The Insurance Industry

The insurance industry has been sensitized to the need for hazard mitigation through exposure at workshops in Jamaica, the Dominican Republic, the Bahamas and Belize. While there have been no radical changes in the approach of the industry as a whole, there have been positive results in Barbados, Antigua, and Belize, with two companies providing benefits for retrofitting. Because of the sensitization of the insurance industry to mitigation issues in Belize, the industry has taken a lead role in assisting in the development of building codes.

### Post Disaster Recovery

This was an area where technical agencies participated in the carrying out of exercises. While there were no formal training elements, the fact that they formed part of assessment teams and were required to provide base information served to heighten awareness of the requirements for hazard mapping. In addition, the builders training that took place in Antigua and St. Kitts was deemed particularly effective.

### Development Finance Institutions

Training proved to be an important element of the CDMP collaboration with the CDB. Early in this collaboration, workshops were held with the staff of the CDB to sensitize them to the importance of mitigation issues. This had a positive impact over the years in the development of the new CDB policy on disaster management.

## **3.9.2 Other Training and Dissemination Activities**

### The Regional Documentation Center for the Caribbean

The University of the West Indies is establishing a sub regional Caribbean Disaster Information Center (CARDIN) at the Mona Campus, supported by DIPECHO funding. The CDMP has supported the development of the information content for this center and is making all CDMP information available for use by this center. This is an essential development if the regional capability in hazard mapping and disaster management are to be developed.

### Creation of the CDMP Website

A website has been created by the CDMP. This site is frequently updated and provides information about all of the projects, including reports and publications. Given the limited information about disasters in the region, this has been an important development in making information available.

### **3 9 3 Observations and Conclusions**

A considerable amount of training took place over the duration of the project. It is undoubted that this training raised levels of awareness of the need for mitigation throughout the region. This was a major success of the project. A great deal of effort has been made to disseminate information with a major step being the creation of the website. However, the team believes that the project suffered from a lack of publicity. In many countries, while there was knowledge of individual activities, there was no knowledge of the CDMP itself. Given the complexity of the project and the wide area it served, the project would have benefited from the services of a public relations expert.

The team believes strongly that in terms of moneys spent, the training workshops were very worthwhile investments.

### **3 9.4 Recommendations**

Training is a key area if disaster management is to develop in the region. Many of the disaster agencies are not properly staffed and do not have adequately trained staff. Training in all levels of disaster management need to take place much more intensively if there is to be meaningful development in this area. It is therefore recommended that an integrated multi-disciplinary training program for disaster mitigation be developed.

The development of the regional documentation center at the UWI needs to be supported and information from all the projects should be made available for its use. Similarly, the CDMP website should be maintained in the future or arrangements made for CARDIN to take it over and run it.

## **4 Country Activities**

### **4 1 Jamaica**

#### **4 1 2 Country Overview**

Jamaica is one of the larger Caribbean islands, covering an area of 11,000 sq km. There is a large mountainous ridge which runs from east to west and rises to approximately 7,400 feet, the highest point being in the Blue Mountains. The population of Jamaica is 2.5 million. The natural hazards to which Jamaica is susceptible are hurricanes, landslides, flooding, and earthquakes.

#### **4.2 2 Disaster Management and Mitigation Structure**

Jamaica's disaster management structure is different from that of the other countries in the Caribbean region in that it has a large central office staff (50 persons) and its structure and activities reflect a comprehensive approach to disaster management. The

Office of Disaster Preparedness and Emergency Management (ODPEM) is a statutory body with its own board of directors. Although a statutory body, it is dependent on the government and Civil Service in terms of subventions and salary structure. The ODPEM is located in the Ministry of Water and has four divisions: (i) Public Information and Technology, (ii) Mitigation, Planning, and Research, (iii) Preparedness and Emergency Operations, and, (iv) Corporate Services.

The ODPEM works closely with a National Disaster Committee chaired by the Prime Minister, whose membership includes Permanent Secretaries and private and voluntary organizations. The NDC has a number of subcommittees with responsibilities for various aspects of disaster management, including health, damage assessment, telecommunications, welfare and relief, and public awareness. This system is replicated at the parish level, the local government in Jamaica. Of all of the disaster offices visited in the Caribbean, the ODPEM is the only one which has established a Mitigation Division and has staff assigned to it.

#### **4.1.3 Project Activities**

All CDMP activities in Jamaica were carried out against a background of limited government financial resources, as well as constantly changing public institutions. The projects carried out were largely technical and were mostly carried out by government agencies and the University of the West Indies (UWI), with limited private sector involvement in the projects.

The projects undertaken in Jamaica under the CDMP were hazard mapping and policy development. The hazard mapping projects in Jamaica were the largest hazard mapping exercises undertaken for the entire project, viz. the Kingston Multi-Hazard Assessment and the Montego Bay Hazard Assessment.

##### Kingston Multi-Hazard Assessment Project

Work on the KMHA project started in 1995 and is now being finalized. There are a number of components of this project: landslide hazard mapping, seismic hazard mapping and coastal storm surge mapping.

This was a major technical project. To date, the landslide and seismic hazards mapping and all of the fieldwork have been completed. The maps have been prepared and a landslide users manual has been produced. This project was coordinated by a Technical Working Group.

Several workshops have been held to present the landslide material to all identified user groups, and a final comprehensive conference was held in June 1999. There is general agreement that the project has been useful and can inform mitigation plans and programs. Three departments have indicated that the maps produced are important for the development of plans and policies - these are the Town Planning Department, the ODPEM

and the Natural Resources Conservation Agency (NRCA) The information generated by the project is to be lodged with the NRCA However, although a Committee has been set up, to date no proposals have been developed for use of the information or for the preparation of hazard maps for other areas

This project was fraught with administrative problems from its inception There were problems with coordination of the project The Technical Working Group which coordinated the project did not function as intended, as departments did not allocate sufficient staff or resources to the project In one instance the project was considerably delayed because a department which was responsible for providing maps did not do so, despite the fact that the department was part of the process of the development of the project Further exacerbating these administrative problems was the change at the end of 1996 of the OAS project coordinator, who had assumed a leadership role in the coordination of this project

#### Montego Bay Hazard Assessment

This activity started in 1994 Its aim has been to develop realistic flood level maps for hurricane generated surges for the coastal area of Montego Bay Preliminary maps were produced and presented to local institutions for their comments These discussions continued until May 1995, with the maps being revised and the series being expanded to cover all categories of hurricanes moving along the most likely tracks At that time, the Jamaica Institute of Engineers raised some issues with respect to the study This led, over the next several years, to extensive reviews and the development of a more appropriate product An additional complication concerned the change of the OAS regional manager, who had taken the lead role in overseeing this project When overall responsibility was transferred to Washington, there were problems with the coordination of the activity Although there were delays, the final resolution of the issues has been acceptable to all the potential users The Jamaica Institute of Engineers (JIE) is now assisting in finalizing a manual to be used with the maps and is preparing the final report on this component

As with the Kingston Multi-Hazard Assessment Project, a technical group was set up to propose strategies for the integration of risk maps in the development approval process The committee has not finalized its proposals as yet

#### Jamaica Mitigation Policy

A draft mitigation policy, which was started in 1998, has been prepared for Jamaica with the assistance of the CDMP This draft policy has been the subject of wide public consultation It was finalized in May 1999 with the assistance of a "focus group" of persons, who are interested in disaster management and mitigation matters, and presented and discussed in a national conference in June 1999

### Disaster Information Center

The UWI is proposing to establish a disaster information center with DIPECHO funding. Given the amount of data generated by the CDMP project, this is an excellent development and data from the project should be lodged with the center.

#### **4 1 4 Sustainability**

The expectations of CDMP with respect to hazard mapping were that host countries would assume responsibility for replication of this type of mapping for other areas. While there is genuine interest in carrying forward this type of work many of the agencies in Jamaica that should participate in hazard mapping do not have the necessary resources (human, financial or equipment) to do so.

In addition, while the field work and data gathering were carried out by the UWI, the modeling and mapping were all done in North America. This means that these skills do not reside in Jamaica. If the capability for hazard mapping is to be best developed, these skills must be available in Jamaica.

Further, in spite of the fact that the government's land policy includes proposals for the incorporation of mitigation policies, unless there is commitment and allocation of financial resources by government agencies, risk mapping will not be sustainable.

#### **4 1 5 Issues**

Changes in supervisory staff created problems at times for the continuity of these projects. In addition, in some cases, there did not appear to be sufficient ownership of the projects. This was most noticeable for the KMH project. The role of the ODPEM has not been very clear in the project, and, until recently, ODPEM did not appear to take any major leadership role in the development of the hazard mapping projects. ODPEM was a sponsor of the final conference in June 1999 and it is hoped it will now take a more forceful role.

While it may be argued that the projects were complex and required time to implement, the projects would have been better managed with the appointment of a full time coordinator, particularly on the government side, it being impossible for someone outside of the public services to allocate responsibilities and hold persons responsible for outputs if they have no authority over those persons. The Technical Working Groups, while important to the development of the projects, did not hold together and this was largely a result of the lack of a project coordinator.

While the Jamaica ODPEM is well structured, and has the largest staff of any disaster agency in the region, it too suffers from many of the problems experienced by all of the agencies in the region. In addition, while ODPEM does have links with the parishes, the local government authorities, it was not clear to the evaluation team that

sufficient attention was being paid to the evolving role of local authorities under the decentralization process now underway in Jamaica

The hazard mapping projects carried out in Jamaica were large but, outside of the groups working in them, do not yet appear to have made any great impact. This may change when the exercises are completed, as a number of activities are planned to disseminate information about various aspects of the projects. There also seemed to be some disenchantment with the mapping projects, but this may have been more a result of the organization rather than the project itself. In terms of exposure to techniques, apart from the coming together for discussion of outputs, there did not appear to be much agency exposure, as much of the work was carried out by the UWI, and major components of the project analyses were carried on outside of Jamaica.

#### **4 1 6 Lessons Learned**

The major lessons learned from the projects carried out in Jamaica were that there is a need to ensure that all of the administrative mechanisms for the development of the projects should be detailed prior to the commencement of the project, and that there should be agreement on the provision of resources required to implement the project.

It is also important to determine, insofar as possible, how the products are to be used prior to the start of a project, rather than to address use at the end of the project.

#### **4 1 7 Recommendations**

It is recommended that any multi-disciplinary activity, such as hazard mapping, which will require resources from participating agencies, should obtain general administrative and political sanction at the highest levels possible. Implications for staff and financial resources should be clearly indicated and commitment made to provide these resources upon the conclusion of the project.

It is also recommended that a lead agency be selected to coordinate all project activities and a local project coordinator be appointed to be responsible for ensure that there are timely inputs into all projects.

Future work in Jamaica should draw in the local government authorities to a greater extent as separate entities in their own right with important responsibilities, in view of the decentralization process that is now underway.

Finally, it is recommended that the establishment of the Disaster Information Center at UWI be supported and the data generated by the project be lodged with the center.

## **4 2 Barbados**

### **4.2 1 Country Overview**

Barbados has a population of approximately 260,000 people. It covers an area of 430 square miles. The island is relatively flat with a highland region in the central area. Barbados' most serious disaster vulnerabilities relate to flooding, storm surge, and wind damage as a consequence of hurricanes and heavy rains. However, Barbados has not been hit directly by a hurricane for about forty years.

### **4 2 2 Disaster Management and Mitigation Structure**

Barbados has a relatively small Central Emergency Response Organization (CERO) that, like other similar offices in the region, is responsible for a broad range of preparedness and response activities, including mitigation.

CERO works closely with the Government Community Development Department in helping to manage the disaster process. Parish Emergency Response Teams, voluntary bodies, are in the process of being introduced in the island's eleven parishes. There are currently no formal local government councils.

### **4 2 3 Project Activities**

CDMP has done very little directly with Barbados and CERO. Nevertheless, the country seems to be well aware of a number of the activity streams and seems to be making progress which parallels what has happened elsewhere. For example:

Barbados participated in the 1997 St. Lucia Hazard Mitigation Planning Conference. CERO advised the team that as a result of its participation in this Conference, it began an effort to develop working relationships with the Planning Department, and that the two are now in the process of creating a more official regular relationship.

Concerning building codes, a national advisory committee has been established to look at new legislation and enforcement procedures. Included on this committee are insurance companies and other private sector representatives. A two-tier approach is being considered - engineered structures would be certified by private sector consultants and ordinary houses would be certified by the government. There are numerous aspects, including political aspects, that are being considered in this process.

CERO advised the team that it has gradually been able to have government departments begin to pay greater attention to mitigation issues. This includes the Public Works Department, which is also being considered for a role in enforcement of the new building code structure.

CERO has also worked, in parallel with CDMP, with the United Insurance Company. This support has taken the form of workshops for artisans and interested citizens concerning mitigation techniques in the construction business. CERO is also considering providing training support at the higher technical level, e.g. in secondary school vocational classes.

#### **4 2 4 Results and Lessons Learned**

In the case of Barbados, the question to be posed is whether the approach taken by CDMP here is not an alternative and potentially valid approach to be taken in most countries. Are pilot projects really necessary to achieve results and to make progress on mitigation issues? Barbados, the team has been advised, is different from other places. Nevertheless, it does provide evidence for considering a different approach in the future if circumstances in a particular country warrant.

### **4 3 St Lucia**

#### **4 3 1 Country Overview**

St Lucia has a population of approximately 160,000 people. It covers an area of 238 square miles, about half the size of Barbados. The island is volcanic and mountainous with some broad valleys. Its most serious disaster vulnerabilities relate to flooding, landslides, storm surge, and wind damage as a consequence of hurricanes and heavy rains. There is also a history of fires in the capital, Castries. Since 1980, St Lucia has been hard hit by 2 major storms, Hurricane Allen in 1980 and Tropical Storm Debbie in 1994. Both inflicted extensive damage.

#### **4 3 2 Disaster Management and Mitigation Structure**

St Lucia has a small (3 person) but efficient Office of Disaster Preparedness (ODP). Like other offices in the region, ODP is responsible for a broad range of preparedness, response, and mitigation activities. CDMP has worked closely with ODP.

St Lucia has disaster committees in all 10 governmental districts and 2 rural areas. The head of the disaster committee in each of the districts is also the head of the local district council, which are to become independent local government authorities next year. It is noteworthy that the national consultations that have taken place concerning disaster mitigation policy have involved these local level organizations.

#### **4 3 3 Project Activities**

CDMP has been active in St Lucia, with a wide range of projects. The majority of these activities have been regional Eastern Caribbean activities, i.e. have taken place not only in St Lucia but also in a number of the other countries in the Eastern Caribbean, e.g.

the building code and housing retrofit activities. All activities are discussed in detail under their appropriate component streams. The team believes that the St. Lucia experience has been positive and our sense is that the country is on its way to being both better prepared to handle disasters and more attuned to disaster mitigation.

Regional activities carried out in St. Lucia have served to increase the availability of information about disaster related subjects and have been useful to the government and other organizations. These include the Estimate of Probable Maximum Loss from Tropical Events and the Causes of Building and Infrastructure Failure due to Natural Hazards. Information gathered was made available to the government and the World Bank, among others, and has been presented in workshops.

CDMP undertook more direct collaboration with St. Lucia on several other activities. These included the Risk Assessment for Caribbean Electrical Utilities which, although a regional activity with the Caribbean Electrical Utilities Services Corporation (CARILEC), included a vulnerability assessment carried out in 1994 with LUCELEC, the St. Lucia power company. The impact of Hurricane Debbie in September 1994 was included in the assessment of LUCELEC and the team understands that they have been incorporated in the utility's rebuilding and mitigation efforts.

Also, under the Mitigation Planning Stream, the results in St. Lucia have been excellent. Following the July 1997 Caribbean wide workshop on mitigation planning in St. Lucia, the national disaster coordinator for St. Lucia approached CDMP and requested support and assistance for the preparation of a disaster mitigation policy. This has been carried out and a successful national consultation was held in October 1998 on the draft plan. The draft has not yet been finalized but is expected to be during 1999. CDMP can legitimately claim this as a successful supporting activity in collaboration with a dynamic St. Lucian Office of Disaster Preparedness.

Under the Building Code activity, CDMP has assisted St. Lucia to adapt the OECS model building code to its existing legislative and development control framework. The team found during its visit that the building code had not yet become law. The principal delay is in working out who will be responsible for the increased enforcement responsibilities envisaged by the draft. The Department of Physical Planning, under whose purview this is, has stated that it cannot do this without additional resources. In addition, St. Lucia's plans for local authorities and community participation also impact on this decision. As noted earlier, St. Lucia is in the process of increasing the importance of local authorities and it has yet to be determined which of the disaster preparation and mitigation activities will be assigned to these authorities.

The final activity in St. Lucia, one with a number of pluses and minuses, is the Home Retrofit/Improvement program. The team spent considerable time with the two implementing agencies, the National Research and Development Foundation, NRDF, and CARITAS. The team also discussed future funding for this activity with the St. Lucia Development Bank, and visited a number of the houses that were improved or

constructed. A complete assessment of this activity is included under the discussion of this component. Overall, the team believes that valuable lessons have been learned and observed that a number of families have been helped to have stronger houses.

#### **4.3.4 Issues**

There are two activities, the disaster mitigation policy and the adoption of a building code, that have been started but not yet been concluded. At this point, however, these are issues for the country itself to resolve. If funds are available, the project should consider reviewing with appropriate government authorities and others, limited support that would lead to more rapid realization of these activities.

#### **4.3.5 Results and Lessons Learned**

St. Lucia is an example of relative success of the design theory underlying the CDMP. St. Lucia participated in a number of different activity streams. There is little doubt, in the view of the team, that this participation has helped to increase disaster mitigation awareness in the country and has contributed to concrete improvements in its institutional structure. The comprehensive nature of the CDMP contributed, in St. Lucia's case, to a sense of momentum on the larger issues of disaster awareness and mitigation. The team did not feel that this took place in other small countries, such as Antigua and Barbuda and Dominica, to the extent that it did in St. Lucia.

The team was unable to pinpoint the reasons for this relative "leg-up" by St. Lucia. It is quite likely a combination of factors inherent in the island's receptivity to change and improvement. Leadership and the quality of the institutions and people who are in positions of responsibility are important in this equation. Earlier OAS activity, prior to the CDMP, and an effective ODP have also contributed.

There are lessons to be learned, particularly from the home improvement and building code activities. With regard to the building code, there still remains much for the country to do to make it effective, beginning of course with officially adopting the code. The team is hopeful that because there is a comprehensive array of mitigation activities underway, there will be momentum and a will to ensure that once the code is passed enforcement will become a priority. With regard to the housing retrofit program, the team believes that although the activity has not yet taken off, there is some hope and some likelihood that funds will continue to be made available to NRDF to continue the program.

Finally, the importance of the timing of the project with the conjuncture of Hurricane Debbie should not be underestimated. A number of the activities undertaken in St. Lucia came directly on the heels of this devastating storm. Receptivity to the ideas of mitigation was vastly increased as a result.

#### **4 3 6 Sustainability**

Overall, CDMP initiatives seem likely to be sustained in St Lucia. The team was made to understand that the government has begun to place a higher priority on housing and that a visit made by the Prime Minister to the NRDF housing activity helped in this decision. To the extent that this takes place and to the extent that the good work carried out in the housing program is incorporated in any new initiatives, the disaster mitigation measures may be sustained.

On other issues, if the government carries through with its current plans concerning the building code and concerning the disaster mitigation policy, CDMP efforts will prove to be sustainable.

An important background element to this question concerns the World Bank project. This project is considered elsewhere in this report. In St Lucia, as in the other small countries that the project will cover, it will set the agenda with the government over the next several years. That agenda is favorable to disaster mitigation activities.

#### **4 3 7 Recommendations**

The presence of a comprehensive World Bank program in St Lucia will lessen the need for further OFDA activities here. Nevertheless, linking the TAOS storm surge model, through CIMH, with the strengthened Meteorological Office should be pursued. In addition, St Lucia should be exposed to the community preparedness activities undertaken in the Dominican Republic and should be assisted if it wishes to pursue similar activities.

### **4 4 Dominica**

#### **4 4 1 Country Overview**

Dominica has a population of approximately 80,000 people, located throughout the island, mainly in small settlements. It is about 20% larger than St Lucia, covering an area of 290 square miles. The island is volcanic and mountainous, and is known for its eco-tourism, with many rivers and streams. Its most serious disaster vulnerabilities relate to flooding, landslides, storm surge, and wind damage as a consequence of hurricanes and heavy rains. Many villages are built on flood plains or close to the beach. Since 1979, Dominica has been hard hit by Hurricanes David and Frederic in 1979 and Luis and Marilyn in 1995. Each inflicted major damage.

#### **4 4 2 Disaster Management and Mitigation Structure**

Dominica has a small Office of Disaster Preparedness (ODP) that, like other similar offices in the region, is responsible for a broad range of preparedness, response,

and mitigation activities ODP is part of the Ministry of Communications and Works (MCW)

Dominica, like St Lucia, has local community disaster committees in all 7 districts, encompassing 86 villages The team understands that these committees are active They are under the purview of the Local Government and Community Development Department of the Ministry of Community Development and Women's Affairs ODP works closely with these committees and the Local Government Department

#### **4 4 3 Project Activities**

CDMP has been particularly active in Dominica Projects in Dominica seem to have been more technical in nature than those undertaken in St Lucia, involving both hazard assessments and post-disaster mitigation measures CDMP funds were supplemented with other AID funding for two of the activities All activities are discussed in detail under their appropriate component streams

The team believes that the results in Dominica have been somewhat more mixed than in St Lucia because of the problems that were encountered in implementing one of the activities and also possibly due to the absence of a policy mitigation component Overall, the team did not come away with the same sense of progress However, because of the follow-on World Bank project, the team believes that there will be a continuation of mitigation activities

Regional activities carried out in Dominica have served to increase the availability of information about disaster related subjects and have been useful to the government and other organizations These include the Estimate of Probable Maximum Loss from Tropical Events and the School/Shelter Hazard Vulnerability Reduction activities Information gathered was made available to the government and the World Bank, among others, and was presented in a 1998 workshop, along with a number of technical documents The World Bank will finance the rehabilitation of six school shelters and a regional shelter

CDMP undertook other collaboration with Dominica on several more activities These included the Risk Assessment for Caribbean Electrical Utilities A vulnerability assessment was carried out in 1994 with DOMILEC The team understands that some of the 1995 report's recommendations have been incorporated in the utility's vulnerability and mitigation efforts

Following Luis and Marilyn in 1995, Dominica requested assistance from USAID and CDB for rehabilitation and reconstruction of key sections of the island's sea defense system CDB approved a loan of \$2.3 million and USAID provided \$500,000 under a Limited Scope Grant Agreement The USAID agreement stipulated that CDB and the Government work with CDMP to assess the storm hazard risk, include appropriate

measures for the design of these structures, and include storm hazard damage mitigation measures in the engineering designs for infrastructure rehabilitation and reconstruction. Unfortunately there have been lengthy delays in this component which have contributed to dissatisfaction within the Ministry of Communications and Works and have possibly damaged both CDB and USAID credibility. These delays are detailed elsewhere in this report.

In September 1996, CDMP received another allocation from USAID of \$100,000 to assist with the development of a forward planning capability in the national Physical Planning Unit (PPU), using Geographic Information Systems (GIS). This project supported an integrated approach to development planning, with special attention to susceptibility to natural hazards and environmental impact. The project provided additional GIS equipment and software, expanded the existing digital database, and providing technical assistance in map preparation. Informational meetings, a technical working group and inter-agency dialogue were incorporated to build a broader constituency for the planning process.

In the fall of 1997, a series of landslides blocked the upper portion of the Layou River. This disaster marked a rarity in landslide created dams, as the dam that was created has now lasted nearly two years. Normally these dams last only about 2-3 weeks. Failure of this dam now has the potential to cause disastrous flash flooding in the lower reaches of the Layou valley. To assist the Government in responding to this risk, CDMP organized a technical assistance team, including Dominican government staff. In a January 1998 meeting with the Cabinet of Ministers, it was agreed that the CDMP would assist the Government in the following priority areas: 1) the development of a detailed plan of action for a vulnerability assessment and mitigation actions in the lower Layou River, 2) setting a framework for evacuation decision making, 3) development of a long-term landslide hazard risk assessment and response plan, and 4) evaluation of the suitability of river bed sediments for use as construction materials. Shortly after this meeting, the team assessed proposed emergency vulnerability reduction measures and developed a detailed plan of action for flood vulnerability assessment and mitigation. This work has now been completed. The evaluation team found, nevertheless, that there continue to be concerns within the government that the dam may give way at any moment. The government therefore continues to pursue solutions that may directly address this risk.

Under the Building Code Strengthening Exercise, CDMP has assisted Dominica to adapt the OECS model building code to its existing legislative and development control framework. The team found during its visit that the building code had not yet become law due to delays in the drafting of changes in the Physical Planning Act. In spite of this, the team understands that the building code has been put into effect, has been distributed to local disaster committees, and is being observed. Observers indicated that compliance is high.

The final activity in Dominica, one with a number of pluses and minuses, is the Home Retrofit/Improvement program. The team met with the implementing agency, the

National Development Foundation of Dominica, NDFD, and a local architect who had carried out much of the training of artisans, and was impressed with the capability of the individuals. A more detailed assessment of this activity is included under the discussion of this stream. Very little was actually built and NDFD seems intent on making this a higher income activity, but valuable lessons were learned in the retrofits that were carried out and the houses appear to have well withstood subsequent storms.

#### **4 4 4 Results and Lessons Learned**

Many activities proceeded well and have been completed according to their own terms. The major exception to this is the rehabilitation to a number of the country's sea defense structures. Unfortunately, nearly four years after the hurricanes that caused the damage and for what was intended to be emergency assistance, the project has only gotten to the point of calling for tenders. It is likely that construction will not begin until after the next hurricane season and will only be completed in 2000. The immediate reason of these delays has been the involvement of what has come to be known as a review or check consultant engineer, although the story is quite complicated and is discussed in detail elsewhere. A review engineer was employed by CDMP to check the designs of the design consultants employed by the government. From the team's point of view, it appears that there was an absence of understanding from the beginning over the role and authority of the check consultant. While the government agrees that a number of the consultant's recommendations were worthwhile, the concept was new to them and the absence of an agreed path inevitably led to long delays.

The Layou River activity has resulted in a number of maps and excellent technical analyses, as well as a mitigation plan for the lower river area. However, the evaluation team was advised that the government is still interested in finding ways and means to somehow defuse the actual danger of the landslide dam itself. The danger still remains and, at least from ODP's standpoint, the assistance promised and delivered has not been as useful as they had hoped in the beginning. This may reflect the bias of ODP, which appears to tend more toward disaster preparedness than mitigation, as well as possible misunderstanding concerning the purposes of the original analyses.

With regard to the building code, this remains within the Attorney-General's Chambers, awaiting action. However, the PPU has gone ahead on this and it appears to be working well, according to the reports the team was able to garner. It is to be hoped that the code will eventually be passed and that will result in even greater enforcement and compliance.

The home retrofit/improvement program also presents a mixed picture. On the one hand, it appears that there has been a considerable training effort and that has been positive. On the other hand, there have been very few houses improved and retrofitted. The team understands that this is primarily due to a lack of financial resources on the part of NDFD. In addition, the NDFD has opted to broaden its approach to include higher income beneficiaries.

The team is less satisfied with the results in Dominica than in St. Lucia and has sought to understand what the differences might have been. Dominica essentially followed the same design theory as that in St. Lucia. A large number of activities took place in a relatively small island. It is less easy to conclude that this participation has helped to substantially increase disaster mitigation awareness in the country and has contributed to concrete improvements in its institutional structure. The technical nature of a number of the inputs, including those for the sea defense rehabilitation and for the GIS mapping, and their lack of concrete results perhaps leads to this impression. The absence of a comprehensive disaster mitigation policy is an element as well and may be a key missing element.

#### **4.4.5 Sustainability**

Overall, the team believes, in spite of the comments above concerning some of the delays and disappointments, that CDMP initiatives have a reasonable chance of continuing in one form or another. One of the drivers is of course going to be the continuing annual hurricane season. A second reason concerns the local community disaster preparation committees, which the team understands are strong and active. A third reason for optimism includes the quality and dedication of the NDFD. Local funds for this program have not, apparently, been found and until they are this will act as a brake on the home improvement program.

On other issues, if the government carries through with its current plans concerning the building code and implements effective enforcement practices, CDMP efforts in these areas will prove to be sustainable.

An important background element to this question concerns the World Bank project. This project is considered elsewhere in this report. In Dominica, as in the other small countries that the project will cover, it will set the agenda with the government over the next several years. That agenda is favorable to disaster mitigation activities.

#### **4.4.6 Recommendations**

There are no major recommendations concerning Dominica. The team believes that a certain measure of responsibility for the delays in the CDB funded program must be accepted by CDMP and every effort should be made to facilitate its finalization. Dominica, like St. Lucia, should be encouraged to actively integrate the TAOS model into its strengthened Meteorological Office. Exposure to the CDMP's community preparedness models may also prove useful in Dominica.

## **4 5 Antigua and Barbuda**

### **4 5 1 Country Overview**

Antigua and Barbuda are different geographically from many of the other Caribbean islands in that the landscape is gently undulating with its highest point reaching 400m (1319 ft) at Boggy Peak in the South West of Antigua. These islands are 456 sq km (176 sq miles) and the population is about 65,000, with some 30,000 being located in St John, the capital. The disasters to which these islands are susceptible hurricanes, flooding associated with hurricanes, earthquakes, and volcanoes

### **4 5.2 Disaster Management and Mitigation Structure**

The National Office for Disaster Services (NODS) in Antigua is located in the Ministry of Home Affairs and Labour. It is a small unit, comprised of 8 persons. In spite of this, there is a good understanding of what is required to organize disaster mitigation and preparedness activities. Although there is neither a mitigation plan in place nor proposals to prepare one, the office is engaged in a number of mitigation activities. It is, at present, coordinating a GTZ sponsored hazard mapping exercise for the entire territory which was started in July 1998. The office has also prepared a disaster plan which has recently been updated. It is proposing that it should be amended to include a mitigation sub-committee which would be responsible for carrying forward all mitigation activities for Antigua and Barbuda.

This department has developed a number of Voluntary Disaster Groups. Sixteen of these are in Antigua, of which four are in St John. One is in Barbuda. One special needs group has also been identified and a voluntary group to help with the scattered Spanish speaking community has been formed.

### **4 5 3 Project Activities**

#### **Building Codes**

Based upon work carried out under the joint OAS/UNDP/UNCHS Building Code exercise, the Antigua Building Code has been formally adopted by the government of Antigua and Barbuda. The Regulations for the use of the Code and the Building Guidelines were promulgated in June 1996 and the Building Code has been in use since 1997.

All applications received by the Development Control Authority (DCA) are reviewed against the building code. In terms of applications received by the DCA, we were told that most applicants comply with the code. Although staff is supposed to check these application in the field, this activity is not carried out for all applications, however, if there are likely to be problems with code violations in any area staff is assigned to monitor these areas to ensure that there is compliance with the codes.

Although no figures are available with respect to development carried out to code specifications, the DCA indicated that the standard of construction was now generally higher

#### Storm Surge Hazard Mapping

Antigua was selected as the pilot country for the Eastern Caribbean for the preparation of hazard maps based upon the TAOS model. These maps will show

- Expected effects on a coastline for an individual storm,
- The greatest effect of increase in water levels (storm surge) and wind at specific areas,
- Wind, wave or storm surge levels during a storm in specific areas,
- The maximum effect of a storm using combinations of direction, speed and the intensity of the storm

Because of technical problems with reference to the map base, although many agencies had seen preliminary maps, final copies had not been made available to agencies in Antigua. It was indicated that the maps would aid in mitigation activities, however, the DCA still had concerns about the scale of the maps. It was also indicated by the NODS and the Meteorological Office that the maps would be an invaluable tool for forecasting

The Meteorological Office expressed some concern about the location of CIMH in Barbados because of its vulnerability to hurricanes

#### GTZ Antigua Hazard Mapping

With GTZ funding, the NODS is carrying out a hazard mapping project for Antigua. A workshop is to be held to explain the use of outputs of the maps for district disaster plans. It was indicated that this mapping exercise would be enhanced by seismic information which has been prepared by the Seismic Unit in Trinidad and Tobago under the CDMP project. This project was started in July 1998 and is scheduled for completion in 1999.

#### Housing Retrofit Program

A housing retrofit program is being undertaken by the National Development Foundation, with loans being made available for both retrofitting and rehabilitation of buildings

The total number of loans service over the past three years have been in the order of 35 to 40, with the average size loan being EC \$15,000 with interest at the going market rate

CHF has held discussions with the Foundation about making loan funds available to them. There have been considerable delays, but the team understands that funds have now been made available to the Foundation

The Foundation benefited from two types of training, an attachment to the National Development Foundation in Dominica and a one week training program in Antigua. The CDMP also supported the National Development Foundation in a roundtable meeting held in late 1998, at which a national strategy for safer housing was discussed, and is following this with additional support for training of local level organizers

The view was expressed that the training in housing retrofit activities helped to raise general awareness of disaster mitigation and groups such as the Red Cross were distributing straps after hurricane Luis and George because of exposure to housing retrofit training. The only criticism of the training was that it should have been carried out as a part time basis rather than as a one week program as many persons found difficulty in obtaining time off from work to attend the training program

#### Vulnerability Assessments

A number of vulnerability assessments were carried out in Antigua on public buildings and schools shelters. The Public Works Department and the Board of Education are using the information from these assessments in the retrofitting of the buildings

#### Training

The benefits from exposure to training were emphasized particularly by the NODS. It was felt that the use of regional presenters and examples used in training programs made for a better understanding of mitigation issues

The manuals produced under CDMP were in use and thought to be extremely valuable in giving direction particularly in carrying out vulnerability assessments for public facilities

One benefit of regional training which was noted was the sharing of experiences with persons from similar environments. The building of networks between agencies and countries was seen as an important mechanism for arriving at solutions to common problems

#### **4 5 4 Issues**

With limited staff, the NODS is not as effective as it could be. While there are linkages with other government departments, the Works Departments, government's main implementing agency did not appear to have a full understanding of its role in disaster mitigation.

Although a major hazard mapping exercise is being carried out in Antigua, earthquake hazards have not been included in this exercise. Because of concerns with the island's vulnerability to earthquakes, this aspect of hazard mapping needs to be integrated into this exercise. Work from the regional exercise carried out by the Seismic Research Unit in Trinidad and Tobago will need to be incorporated into the hazard maps being produced for Antigua, although given the inaccuracies in the hazard mapping exercise, there may be the need to review the entire exercise prior to the inclusion of other maps.

The meteorological office in Antigua raised the issue of CIMH being located in Barbados and expressed concern that it would be the one place which would be the repository for the TAOS model for the Eastern Caribbean. The view was expressed that with Barbados' vulnerability to hurricanes this might not be a good sole location for the model. This suggestion may have some merit and some consideration could be given to a second location for the model.

#### **4 5 5 Results and Lessons Learned**

There were some positive results from the CDMP project in that there is an increased awareness of the need for mitigation activities as well as a policy.

The approval of the Building Code and Building Guidelines appeared to be driven by concerns for building safety because of damage from hurricane Luis. However, the fact that the codes had been amended to the needs of Antigua and Barbuda through the joint UNDP/UNCHS/CDMP project made the code readily available for implementation.

Although the National Development Foundation did not receive funding as quickly as desired, the entire territory benefited as a result of training programs carried out for builders and contractors, who were able to apply their knowledge to construction of other buildings.

The major lessons learned are that

Training programs which foster linkages between agencies and departments need to be encouraged in countries which are in the process of building disaster mitigation programs. A clearer understanding of how these departments work together to develop mitigation plans and policies will indicate other agencies which should be brought together for training.

There was little interest in a program focusing solely on housing retrofits, and the NDF believes the only way to introduce such a program is if it is combined with improvements to existing housing

#### **4 5 6 Sustainability**

The exposure of government officers of the NODS, the Physical Planning Unit, and the Meteorological Services has undoubtedly raised the awareness of the need for mitigation activities, however, many of the activities in this area are led only by the NODS

The introduction of the Building Code and the Building Guidelines are major steps in making the public and construction industry aware of the need for mitigation measures in building practice, however, ensuring that standards are met will require a new regime for assessment of and determining building applications. If this is not done then the Building Code may have no great impact

If the project is to be sustainable, both the DCA and NODS need to be strengthened to make gains in ongoing mitigation activities, as well as to introduce new mitigation measures such as policy development and community mitigation programs and projects

#### **4 5 7 Recommendations**

If Antigua is to develop a serious disaster management capability, the National Office for Disaster Services will have to be strengthened. The capability of the agency should be examined and requirements for its efficient functioning be determined. The recent staff changes in the Office provide a suitable occasion for this to be assessed

The Ministry of Works as government's main implementer of projects needs to understand its role in mitigation action and should also be targeted for training in the same manner as the planning agencies were

Training in the use and application of the maps produced using the TAOS model should be carried out for all of the departments that will use the information produced. A train the trainers approach is suggested as there will be need to upgrade and monitor the outputs of the system

### **4 6 Grenada**

#### **4 6 1 Country Overview**

Grenada is comprised of three islands: Grenada, Carriacou and Petite Martinique, with a population of 98,500. It covers an area of 442 sq km. The island is mountainous

and volcanic in nature with steep slopes in the west and with the largest areas of gently sloping land on the eastern side of the island. The island is susceptible to flooding, hurricanes, landslides, and volcanoes in five centers which are located on land, and a submarine one six miles off the north coast of Kick-em-Jenny. This is an active, underwater volcano, which can pose a serious threat to Grenada.

#### **4.6.2 Disaster Management and Mitigation Structure**

The main coordinating agency for Grenada is the National Emergency Relief organization (NERO), which is located in the Prime Minister's Office and became full time in 1996. The organization has a very small staff comprised of two persons, of which only one has experience in disaster management.

NERO is comprised of an Advisory Council, a number of national management committees and several district committees. The existing management structure of the NERO needs to be revised to allow for the inclusion of disaster mitigation, which has not been institutionalized in Grenada.

Although the recipient of only small activities under the CDMP, NERO has attempted to implement techniques learned at the various workshops/training sessions held by the CDMP. As a result, NERO and the Physical Planning Unit in Grenada have a very close working relationship and have been collaborating in the preparation of preliminary work concerning flooding, landslides, and volcanoes, which will inform hazard mapping for Grenada.

Both agencies are aware that if the exercise is to be taken further, there is a need for detailed technical work, for which there is not the capacity within the government departments and maybe in Grenada itself. NERO does not yet have a mitigation policy, although the view was expressed by the National Disaster Coordinator that it was through CDMP training that there was a heightened awareness of the need for mitigation activity.

#### **4.6.3 Project Activities**

##### Building Code

The adoption of a Building Code is being actively pursued with the assistance of the CDMP. The Dominica code is being used as the model for Grenada and a consultant hired by the OAS has carried out a fact finding mission in which copies of the Building Code have been circulated to both the public and private sector, small contractors and builders and non governmental organizations for their comments. There have been delays in receiving replies from the persons consulted which has modified the timetable for the completion of the code. The team was told that all amendments would be made by the end of June and that by July 1999, the Code would be finalized and submitted for government approval. The DCA legislation will need to be amended to incorporate the Building Code. Given the work being carried out, it is expected that the amendments to

the DCA legislation should be made before the end of the year. It is therefore expected that the Building Code will be in effect by the beginning of 2000.

### Housing Retrofit Program

The Grenada Development Bank expressed interest in financing a housing retrofit program and as a result two TV presentations were made using material from the Retrofit Toolkit manual. Although the Bank did not follow through with the loan program, there were benefits from the publicity through an increased awareness of the need for safe building practices. As a result, the commercial banks now require that loan applicants make provision for retrofitting where necessary, and include provisions for safe building practices in plans submitted to them.

### Vulnerability Assessments

NERO, in collaboration with the Physical Planning Unit, and the Community Development Department, coordinated the collection of information to inform vulnerability assessments for schools, community centers, and shelters for the entire territory. In addition, the Ministry of Works, through the CDB, had carried out a study on the status of all bridges in the territory and their requirements for retrofitting.

### Training

Of all of the countries visited, Grenada appears to have maximized its exposure to the workshops and training sessions organized by the CDMP. This is evidenced by the collaboration of NERO with the PPU, the outreach to the Grenada Development Bank with reference to the housing retrofit program, the carrying out of the vulnerability assessments for schools and other social facilities in Grenada, and the start of the inventory work on a hazard mapping assessment for Grenada. All of the above exercises were carried out using information from workshops held by and manuals produced by the CDMP project.

Both NERO and the PPU expressed the view that the training was extremely useful in providing them with tools and identifying important links for carrying forward work in disaster preparedness and mitigation.

### **4 6 4 Issues**

The disaster management structure in Grenada is dependent upon the initiative of one person, the National Disaster Coordinator. This is not in the best interest of either NERO or Grenada. This is a precarious situation as the team understands that the Coordinator will soon be taking a leave of absence. NERO needs to be upgraded and a comprehensive disaster plan needs to be developed for Grenada.

Of note is the comment of the Disaster Coordinator that although the CDMP project was important to the development of Grenada's mitigation program, and the NERO's establishment of links with other agencies, there was no general awareness of the CDMP program

#### **4 6 5 Results and Lessons Learned**

The work carried out by the CDMP in Grenada has considerably enhanced the disaster management capability of the NERO, as there is now a clear understanding of all aspects of disaster management. In addition, as a result of the training workshop in Grenada, the NERO and the Physical Planning Unit now collaborate closely in the development of plans and program

The success of the Grenada project to a large extent depends on the National Disaster Coordinator who, having limited resources in the NERO, has to rely on and utilize the resources in other agencies

The major lessons learned have been

The effectiveness of the education and use of public outreach activities - (the housing retrofit education program) in gaining support for the use of mitigation measures

That there are major benefits to be gained through the inter agency coordination within the public sector

#### **4 6 6 Sustainability**

Provided that NERO is upgraded, some aspects of mitigation activity are sustainable. These are the preparation of a mitigation policy and the gradual introduction of safe building practices through the application of the building code

While there is an appreciation for and understanding of the use of hazard mapping and some preliminary work can be done in this area, there will be the need for assistance in this area. Without this assistance, a hazard mapping program will not be sustainable in Grenada

#### **4 6 7 Recommendations**

The major areas for development in Grenada are in the areas of institutional strengthening and hazard mapping

Although the World Bank Project will be dealing with hazard mapping, the exercises programmed for countries under the Bank financing indicate a more project oriented approach for hazard mapping than institutional strengthening. Given the present

capability of the Physical Planning Unit and the Land Use Agency, there will continue to be a need for institutional strengthening

## **4 7 Belize**

### **4 7 1 Country Overview**

Belize covers an area of 8,867 square miles and has a population of 230,000 people. It is one of the most sparsely populated of the Central American countries. It is generally flat, with a low mountainous interior and a swampy coastline. Approximately half of the population lives in rural areas and a quarter of the population lives in Belize City, the main port, commercial center and former capital. The new capital, Belmopan, has a population of only about 6,000 and is located about 50 miles inland from Belize City. This location was selected as the new capital following hurricane Hattie in 1961. Belize City was considered to be too vulnerable to hurricanes. There are six main towns in Belize, each with its own local authority.

### **4 7 2 Disaster Management and Mitigation Structure**

A disaster agency, the National Emergency Management Organization (NEMO), has recently been established in the Prime Minister's Office, with two members of staff to coordinate the disaster management activities for the territory. This agency is now engaged in reviewing and strengthening its establishment and a consultant has been hired to assist its institutional strengthening. The major focus of this agency at this time is response activity and the department has prepared a response manual as one of its first activities. The small department's preoccupation with response activity is understandable, given that the hurricane season is imminent and given the country's experience with hurricane Mitch in 1998. This experience demonstrated that while the country could mobilize for a coastal evacuation, there were still many improvements that were needed in the response planning. It also highlighted the need for longer term mitigation measures. The department is fully occupied at the present time with its limited staff in preparing for the hurricane season and coordinating the assistance currently being received from the CDB and IDB. This assistance includes a new multi-purpose headquarters building.

### **4 7 3 Project Activities**

#### Building Codes

In 1996, CDMP sponsored an insurance industry disaster mitigation workshop, which helped to sensitize participants to the need for disaster mitigation. However, there were few apparent concrete results from the workshop. It was only after hurricane Mitch, which did not directly hit Belize, but turned south within a day of landfall, that there was a heightening of awareness of the need for better response and mitigation measures. In combination with a number of other factors, spelled out in section 3 6 3 above, this

precipitated action by the Chamber of Commerce, supported by the government, the OAS country representative, and the CDMP, to organize a follow-up workshop in May 1999. With many of the same participants as in 1996, and under the overall impulsion for the private sector to participate in what had become a national preoccupation with disasters, this workshop examined what might be done to improve the situation.

The outcome of this workshop has been a decision to update the building codes for six towns in Belize. This exercise is to be completed in six months and is to be supported by both the CDMP and the Chamber of Commerce. The proposed standards are to be developed with widespread public participation, including lending agencies and homeowners. The Chamber of Commerce also sees that it has a major role to play in public education with reference to the acceptance of the standards.

#### Insurance

The insurance industry is also, as a part of the Chamber of Commerce, beginning to be more active in promoting mitigation activities in Belize. However, in terms of action by the industry itself, like most of the other countries in the region, there has been no differentiation in policies with respect to the location of buildings in hazardous areas. One noteworthy development is that in May 1999, the Atlantic Insurance Company has embarked on a retrofitting campaign for existing policy holders. This program includes a reduction in premiums of 5-10% and a reduction in the cost of retrofitting supplies by a local hardware store.

#### The OAS Office

Of note in Belize was the active participation and support of the OAS representative in project activities. His role in providing information and facilitating activities was important to the development of the project activities.

#### Storm Surge Model and Flood Plain Mapping

The TAOS model has been installed in both the National Meteorological Office and the National Hydrological Office. A storm surge atlas has been lodged with the Meteorological Office. Based upon the information in this atlas, the government ordered an evacuation of coastal areas in advance of hurricane Mitch and the Meteorological Office opined that the atlas had been its most valuable tool for informing action in the event of a hurricane. A flood plain mapping exercise has also been started in Belize. It is noteworthy that other Central American countries have been brought in to observe activities on this project.

#### **4 7 4 Issues**

NEMO is currently preoccupied with response matters as the hurricane season is imminent, it is a small agency and has only recently been established. NEMO needs to become more involved with mitigation matters for the longer term.

Although several pilot activities were undertaken in Belize, with the exception of the knowledge that the TAOS model is lodged in the Meteorological Office, the NEMO is not aware of all of the activities nor did it have information about CDMP. NEMO is therefore not yet very well connected to the wider Caribbean and Central American mitigation networks.

With the renewed emphasis on the development of building codes, sponsored by the Chamber of Commerce with government participation, there is a danger that these codes will be viewed as all that is necessary. The evaluation team was unable to assess the enforcement capacity but assumes that, as in other countries, this will also be an issue at the local level.

At the same time, the initiative of the private sector has been a welcome one and needs to be nurtured and encouraged to expand.

The Belize Planning and Housing Department is responsible for national planning. However, it appeared to the team that, because of a lack of resources, very little planning is currently taking place in Belize. This may well inhibit long term mitigation planning.

Some observers mentioned that the evacuation plans for coastal areas needed to be improved, based upon the 1998 experience.

#### **4 7 5 Lessons Learned**

The major lesson learned in Belize is that the coming together of events- hurricane Mitch, a change in government, a large external housing loan, and the sensitizing of key players can precipitate action in both the public and private sectors. It is at this point that a small amount of funds can be crucial in making dramatic advances.

The use of the TAOS atlas to inform evacuation procedures prior to Mitch indicates that the model is a very useful tool, and highlights the fact that a simple application, based upon the static atlas maps, may be all that is necessary to determine the type of action to be taken.

#### **4 7.6 Recommendations**

Belize is an example of a number of circumstances coming together to create the climate for taking mitigation action. While these events are shaping activities, the overall system for disaster management is not yet fully in place. Although NEMO is revamping its

procedures, there does not yet seem to be an emphasis on disaster mitigation in its programs and policies. NEMO needs to expand both its staff and its scope of emphasis. The Planning Office has requested CDMP assistance on mitigation policy matters and this is an opportunity to involve NEMO as well that should not be missed. NEMO should also be involved in future OFDA activities, if possible.

The private sector effort in Belize should be monitored and supported, both by the current CDMP and in future OFDA initiatives.

Local authorities in Belize are responsible for implementing building codes, the representatives from these authorities should be closely involved in the current building code exercises and should be targeted for training so that there is a better understanding of the need for mitigation actions and a better capacity to implement and enforce the final product.

The joint program by the CDB and the IDB, which the team believes to be unique in disaster management efforts in the region, should be closely monitored and supported where feasible as a model for collaboration in other parts of the region.

Belize emergency evacuation procedures might well benefit from dialogue with similarly situated American coastal cities and areas and an effort should be made to facilitate this dialogue.

## **4.8 Dominican Republic**

### **4.8.1 Country Overview**

The Dominican Republic (DR) is the largest of the countries participating in the CDMP, with a population of nearly 8 million people in 1997 and an area of 48,671 square kilometers. It shares the island of Hispaniola with Haiti, covering about 2/3 of the island. The DR's most serious disaster vulnerabilities come as a result of hurricanes, heavy rains, and, potentially, seismic activity. In 1998, the Dominican Republic was hard hit by Hurricane Georges. Many lives were lost (official estimates are in the range of 200-300) and the government was roundly criticized for its lack of preparedness.

### **4.8.2 Disaster Management and Mitigation Structure**

The DR relied primarily on three agencies to respond to natural disasters, the Civil Defense Office, the National Meteorological Office, and the Red Cross. There was little that was effectively done to forewarn the population about the impending arrival of Georges, in part because of the newness of key staff in these lead agencies. The Office of Civil Defense, in particular, provided no general warnings. There was no formal structure for mitigation activities. As a result of the disaster, the Technical Secretariat of the Office of the President (TSP) has assumed major responsibility for disaster management and will

be the focal point for a combined World Bank / IDB recovery project that is intended to reform and strengthen the disaster management process. USAID will re-program substantial resources in support of disaster recovery and management.

#### **4 8 3 Project Activities**

CDMP has been active in the DR, but in a quite focused way, guided by the USAID Mission, which limited CDMP to working with the non-governmental sector. After an early activity connected with storm surge mapping for the island of Hispaniola, almost all efforts have been directed to the establishment of the Dominican Disaster Management Committee (DDMC or CDMD, its Spanish acronym), an NGO, and the development of a community participation model for disaster mitigation. The evaluation team considers the activity to have been a success, worthy of replicability in the region.

Total funds spent in the DR through 1998 are \$563,647, making it the single largest country recipient of CDMP funds. It is expected that \$700,000 will have been spent by the PACD.

DDMC has become the premier disaster mitigation and preparedness NGO in the DR. DDMC was officially registered as a Dominican NGO in 1995. Its Board of Directors includes 5 other NGOs and 4 private companies. The government is an ex-officio member. Basically, DDMC functions as a technical service organization in support of local community NGOs and other civil sector organizations that are interested in doing something in the disaster management field. Thus, it focuses on coordination, communication, planning and preparedness among NGO sector organizations and private sector businesses, while collaborating with public sector institutions and authorities. DDMC has five major activities - Coordination and Communication concerning the country's natural hazard situation, Information about disaster preparedness and response, Community Education based on the Red Cross program called "Es Mejor Prevenir", Community Initiatives consisting of small construction projects which are undertaken in communities that have successfully completed the Red Cross training program and wish to mobilize to improve their local disaster mitigation situation, and Training for other organizations and companies interested in disaster mitigation.

The numbers achieved are impressive. DDMC has been able to mobilize considerable free television and radio time to deliver its message. It has given well over 300 presentations nationwide on the DR's hazard situation, the majority in an active school campaign for students, teachers and parents, distributed more than 160,000 brochures on disaster preparedness and response, sponsored community education for over 600 local communities, supported 17 local projects benefiting over 56,000 people in such activities as drainage channels, wells, and containment walls, all in poor communities, and given 14 courses since 1994 and facilitated eight hurricane simulations for hotels and others. DDMC's news bulletin is sent out every three months to some 400 offices worldwide by e-mail and is faxed to almost 2,000 offices in the DR, and is often discussed on radio programs and re-printed in the newspapers.

The team considers that DDMC has made a real impact on the lives of people in the DR. It also is perhaps the clearest example of the success of a pilot activity in actually reducing loss of lives and property during a disaster. In the communities that were trained and responded by continuing on with actual projects, there was not one life lost during Hurricane Georges and property damage was minimal. Compared to what happened in the rest of the country, this is a signal achievement. In an interview with the TSP, the team confirmed that government considers DDMC to be a valuable part of the country's efforts.

The team believes that the DDMC is both sustainable and replicable. CDMP has agreed to provide an endowment fund of \$150,000. USAID/DR will likely continue with and support DDMC. It has also secured funds from the European Union's DIPECHO program, and is likely to also receive funding from Canadian PLAN and the U.S. Department of Housing and Urban Development, as part of the USG reconstruction initiative. It is in the process of preparing a business plan and seems to be prudent in its commitments.

This activity is discussed in greater detail in the Community Participation stream.

#### **4 8 4 Issues**

With regard to DDMC, there are few if any real issues at this point. The success of the organization is heavily dependent on the presence and dynamism of the Coordinator, an American who has lived for more than 10 years in the DR. The organization needs to build over the next few years a broader management base. This is not likely to be difficult, given the funding resources that are expected to be available.

A second issue concerns the focus of USAID efforts in the DR. This has rightly been at the community level and should remain there, especially given the comprehensive efforts being planned by the World Bank and the IDB. The reasons for this focus outside the government were undoubtedly valid. Nevertheless, it is arguable that one of the consequences of this focus by the donor community, however unintentional, was a response to Georges that was worse than might otherwise have been the case. While speculative, this focus has now been reviewed and it is expected that USAID/DR will support initiatives in the future that include government departments.

#### **4 8 5 Results and Lessons Learned**

As indicated above, results in the DR are impressive. One of the lessons learned, however, is that it still requires a combined public and private sector approach to address the problems of disaster mitigation and management in a comprehensive manner that will result in minimal losses in the event of a disaster.

## **4 8 6 Recommendations**

The team supports the intention of CDMP to provide DDMC with an endowment fund. The team also recommends that OFDA make the DR example a central piece in future training activities in the region. One way that it can do that is to enter into an agreement with DDMC to provide training workshops on community participation and empowerment. This would enable DDMC to continue on its course toward sustainability and would export a very successful model to the rest of the region.

## **4 9 Haiti**

### **4 9 1 Country Overview**

Haiti is the second largest of the countries participating in the CDMP, with a population of about 7 million people in an area of 27,700 square kilometers. It shares the island of Hispaniola with the Dominican Republic, covering about 1/3 of the island. It is therefore nearly twice as densely populated as the DR. Haiti's most serious natural disaster vulnerabilities come as a result of hurricanes, heavy rains, and drought. In 1998, Haiti was hit by Hurricane Georges, but only after the storm had weakened considerably in its passage across the DR. Haiti is one of the poorest countries in the world and has been heavily affected by war this decade.

### **4 9 2 Disaster Management and Mitigation Structure**

Responsibility at the government level for disaster management is located in the Ministry of Interior, in the Office of Civil Protection. As with the rest of the government, this office is poorly staffed and has few resources. In the mid-1990s, the government established broad-based emergency response committees in each of the country's nine departments under the leadership of the delegates, the chief government representatives. However, these committees have remained largely moribund. The European Union has recently agreed to assist these committees. There is a similar committee in the capital, Port-au-Prince, presided over by the Ministry of Interior. CDMP is represented on this committee.

### **4 9 3 Project Activities**

Haiti's community based mitigation initiative began three years ago, in June 1996, with the employment of a project coordinator, who had previously been an official in the Ministry of Interior and involved with disaster management. Following an initial mission in August 1996 by the new Coordinator, agreement was reached with the Minister that CDMP should concentrate its efforts in three areas in the Southwest peninsula, the region most subject to natural disasters. A central project steering committee was formed, composed mostly of government representatives, but also including the Red Cross.

The project coordinator was able to establish local project committees in each of the three areas, Jacmel, Jeremie, and Les Cayes by early 1997, and project training began. Project members included government representatives based in the towns, the local Mayors and their staffs, and NGOs active in the areas.

There were a number of commonalities in the approach taken in the three towns. It was decided that a vulnerability study would be undertaken in each of the towns. To date, two studies have been carried out, although only one, in Jacmel, has been finalized. The experiences with these two studies have not been particularly favorable. The first study, carried out by CHF in Jacmel, was criticized by the local committee and by CDMP. There have, however, been a few concrete results, including work being undertaken in connection with the local hospital. The second study, in Jeremie, is being carried out by consultants based in Jamaica. It has been underway for nearly one year and is expected to be finalized shortly.

It was also decided early on that CDMP would primarily prepare proposals for financing by other donors, rather than financing small projects directly, as in the DR. An approach to the European Union's DIPECHO program was made, but was ultimately turned down by DIPECHO in 1998. Funding to operate the local committees was also not provided. Rather, it was also the intention that the committees would have secretariats staffed by one of the stronger NGOs in each area. This was attempted in Jacmel, but did not prove successful. Subsequently, funding for small projects was approved, but has been slow in coming. CDMP advised the team that many projects were turned down because they were very lean on proposed concrete improvements at the community level.

The major efforts of CDMP in Haiti have been on the training of the local committees, government representatives, and communities in the three areas. CDMP indicated to us that 466 persons have participated in the various exercises. In addition to the training of committee members and government staff, CDMP has also worked with the Ministry of the Environment in the preparation of a national environmental plan. Unlike in the DR, CDMP has not been able to have extensive support from radio and TV.

CDMP has cultivated relations with the United Methodist Committee on Relief (UMCOR) and has reached an informal agreement to work with them to carry out three additional vulnerability studies in other parts of Haiti, for which UMCOR would pay CDMP.

The CDMP Haiti steering committee has not met since about the middle of 1998. By the end of the project in September, CDMP will likely have spent about \$300,000 in Haiti.

#### **4 9 4 Issues**

The team believes the achievements in Haiti have been modest.

Haiti is one of the poorest countries in the world. In spite of the presence of numerous assistance programs over the years, this has not changed much. A basic lack of resources, overpopulation, a history of and reaction to dependence, poor management, corruption, and bad leadership are just some of the reasons. CDMP need not feel that it is alone in having failed to find the key to development success. Hardly anyone else has

Further to this, the idea of disaster mitigation appeared to the evaluation team to have less explicit place or priority in a country in which the daily lives of most people are so precarious. The most important priorities relate to basic survival. Everything else is somewhat of a luxury.

While the project was able to establish local committees in each of the three towns, the committees have had little resources and no staff. We were told there is greater awareness at the local level, but, unfortunately there is little indication that this has had much impact in the towns or in the local communities.

The project has worked with the Ministry of Environment in the preparation of a National Environment Plan. Disaster management to improve the environment is included in the Plan and this is a definite plus, although the overall utility of the document remains to be assessed. While there are references to CDMP and the OAS, there is no reference to community based mitigation as a viable technique.

Two vulnerability studies have been undertaken. However, they have not resulted in many positive development efforts. It appears that some action has been taken in Jacmel based upon the study, although the exact status is unclear to the team. The study for Jeremie is intended to be a comprehensive vulnerability review and when finished will probably be a good report. However, in the Jeremie local committee context, it does not appear to the team to have been a very useful exercise. It is more on the order of a study that might be commissioned for a development project being financed by the World Bank or IDB. It is not the kind of study that a local committee in Haiti could use. When the team posed the question to the local committee in Les Cayes about their own priorities, the answer was that a study would not be their first priority.

The intention by UMCOR to move from relief work more into mitigation work is a positive development and can be attributed in part to CDMP and partly to UMCOR's own changing emphases. However, the apparent decision to follow the CDMP methodology of preparation of comprehensive vulnerability studies is not such good news if it results in the same delays, inaction, and lack of solid results.

USAID/Haiti, unlike the DR, has provided little support for CDMP activities. This was not part of the Mission portfolio, and while they had agreed the program could be active in Haiti, they have not contributed to it. They were, however, briefed regularly on its activities. What was of more interest was that the Mission had just received \$11.8 million for disaster rehabilitation activities in the aftermath of Georges. Both the Program

Officer and the Deputy Director of the Mission indicated that they intended to collaborate with OFDA, but there appear to be no current plans to meld any of the CDMP structure or lessons with what is being considered

#### **4 9 5 Results and Lessons Learned**

As indicated above, results in Haiti are modest. The team believes that the approach taken in Haiti was structured too much like that of a regular development program, with the establishment of committees and the carrying out of broad studies. Because development is so difficult in Haiti, this was not likely to yield results. Small community initiatives carried out by already established organizations, combined with training at both the committee and community levels, would have been a better approach. Furthermore, the project attempt to work in three different places was too ambitious, given the method and processes chosen and given the difficulty of communications with them.

#### **4.9 6 Recommendations**

CDMP Haiti suggested to the team that the program should either finish up ongoing commitments or should, like the DR, become an NGO with an endowment. However, the team does not see these as attractive solutions at this point. This would continue the same activities in the same ways that the team believes have not been successful in having any great impact. Training that is currently planned should be carried out. However, the team believes the third vulnerability study that is planned in Les Cayes should be shelved. Rather, the project should reach an accommodation with the current Committee members, including the local administration, and other NGOs in Les Cayes on a close-out plan that would expend before December a similar amount of resources in a sensible way that would result in concrete improvements. Perhaps the Local Committee in Les Cayes could assume the role of a technical support group to the official CP Committee. Similar arrangements should be made for the other places. The study in Jeremie should be finalized in the remaining time. An orderly closing should be possible. Commitments for small initiatives should be either undertaken by other NGOs willing to do them or canceled.

Finally, in Haiti, OFDA should explore alternatives with the Haiti USAID Mission concerning the program that the Mission intends to implement. The training that has taken place during the CDMP's three years, particularly the training experience of the current Coordinator could be built upon if there were a proper structure within which to operate. Working through other established NGOs has merit. Perhaps under the purview of OAS, OFDA, and the USAID Mission, a plan can be worked out over the next several months to transfer the CDMP mitigation approach and local initiatives to other resident NGOs that would be interested in carrying on, with limited USAID support, in the future.

## CARIBBEAN DISASTER MITIGATION PROJECT END OF PROJECT EVALUATION

### 1 Background

In February 1990, a Memorandum of Understanding (MOU) was signed between the Office of Foreign Disaster Assistance (OFDA) and the USAID Global Bureau's Environment Center, Office of Urban Programs (G/ENV/UP). The purpose of this MOU was to forge cooperation between OFDA and G/ENV/UP on foreign disaster preparedness, mitigation, relief and rehabilitation activities with specific emphasis on shelter and infrastructure. Since disaster preparedness and mitigation are much more cost effective than disaster response, a major objective of this joint effort was to better integrate preparedness and mitigation measures that address hazard vulnerability into the core development activities of the Agency.

In the context of the MOU, OFDA funded three disaster mitigation projects in the field to be managed by the Regional Housing and Urban Development Offices (RUDO) in the project areas. The Caribbean Disaster Mitigation Project was one of these. With this, came the funding of a Regional Disaster Advisor (RDA) to manage the project and the partial funding of a Regional Training Advisor (RTA) to assist with the implementation of the Caribbean component of the OFDA/LAC Disaster Management Training Program.

When the RUDO/CAR closed-out in 1996 the program was transferred and managed by the Regional Advisor out of the newly formed Caribbean Regional Program (CRP) of USAID/Jamaica. A mid-term evaluation/assessment was conducted for the CDMP in July of 1997. This highlighted the need for OFDA to upgrade the position of the Regional Advisor and provide additional support for the diverse and expanded OFDA Caribbean program. This resulted in OFDA directly supporting one Regional Advisor (RA) and an Assistant Regional Advisor (ARA) and having the Caribbean program implemented out of the Kingston office and supervised by OFDA/San Jose, Costa Rica. More recently in support of the Caribbean training, OFDA has seconded from the Pan American Health Organization (PAHO) a full time Regional Training Advisor (RTA) who is responsible primarily for the implementation of the Caribbean Training Program. Both the ARA and the RTA report to the RA in Jamaica.

### 2 Caribbean Disaster Mitigation Project Summary

Over the past two decades the Caribbean region has experienced a dramatic upsurge in the level of destruction caused by hurricanes, tropical storms, flood events and volcanic eruptions. Events in the Commonwealth of Dominica, the Dominican Republic, St. Lucia, Jamaica and the eastern Caribbean countries served to focus attention on the destabilizing effects of these natural hazards on the Caribbean economies.

Based on this realization and the exploratory work started by the USAID Office of Foreign Disaster Assistance (USAID/OFDA) and the Regional Housing and Urban Development Office of the Caribbean (RUDO/CAR), the Caribbean Disaster Mitigation Project (CDMP) was

formulated. The Organization of American States (OAS) was selected as the lead agency responsible for its implementation with the then RUDO/CAR providing management oversight.

In September of 1993 the General Secretariat of the OAS and the US Agency for International Development (USAID) signed a \$5 million OFDA funded Cooperative Agreement to provide technical assistance for disaster mitigation in selected countries of the wider Caribbean.

A Technical Advisory Committee (TAC) comprising representatives from OFDA, USAID Missions in the project area and regional agencies involved in disaster management was formed to provide policy guidance, technical direction and periodic review of the project activities. In addition to this, the CDMP is being continuously monitored by a monitoring and evaluation consultant and OFDA field staff in Jamaica.

At one of the more recent TAC meetings in Jamaica (April 1998) it was decided to award a one year no cost extension to the CDMP to allow the project implementation unit additional time to focus on the sustainability issues related to the project. The new Project Assistance Completion Date (PACD) is now September of 1999.

The purpose of the CDMP is to establish sustainable public/private sector mechanisms which measurably lessen loss of life, reduce the potential for physical and economic damage and shorten the disaster recovery period in the project area. The project seeks to make development more sustainable by strengthening the linkage between development and disaster mitigation. The CDMP therefore focuses on major issues relating to

- Improving sustainable development by reducing natural hazard vulnerability in existing and planned developments
- Improving public awareness and development decision making, by accurately mapping hazard prone and environmentally fragile areas and by
- The promotion of loss reduction incentives and hazard mitigation in the property insurance industry

## **2.1 Planned Results**

- Pilot activities conducted with collaborating public and private sector partners to promote acquisition and application of disaster mitigation skills, techniques and methodologies
- Increased pool of public and private sector professionals in the Caribbean region with disaster mitigation skills

## **2.2 Program outcomes**

- Reduced vulnerability of basic infrastructure and critical public facilities
- Improved building standards and practices
- Increased availability and access in the region to natural disaster/natural hazard vulnerability information for use by the public sector and private sector developers, investors and insurers
- Increased community awareness of disaster preparedness and mitigation measures
- Improved ability of public sector and private property insurers to link premium structure to risk

**Pilot projects have been established in Belize, the Dominican Republic, Haiti, the Eastern Caribbean and Jamaica and encompass the following areas**

### **2.3 Activity Streams**

#### **(1) Vulnerability and Risk Audits for Loss Reduction in Lifelines and Critical Facilities**

This activity promotes and supports efforts to reduce the vulnerability of basic infrastructure and critical public facilities. Since its inception, the CDMP has worked in close association with the Caribbean Electrical Utilities Services Corporation (CARILEC) on vulnerability reduction in electrical utilities through technical studies, modelling and damage assessments after Hurricanes Luis and Marilyn. These efforts have served as a basis for a manual, "Mitigation of Damage Caused by Natural Hazards" published by the CDMP which is currently being introduced to member utilities as a guide for conducting vulnerability assessments. In addition, the CDMP recently completed an activity which focussed on developing cost-effective retrofit options and guidelines for existing shelters and to develop guidelines and processes to ensure that schools and other buildings which serve as shelters are safe for that use. Engineering designs for building retrofit works and guidelines for hazard resistant new construction were developed to support the long term sustainability of this work activity. The Caribbean Development Bank (CDB) has committed funds to this exercise and extended a line of credit to countries wishing to retrofit existing structures and erect purpose built ones. The recently held regional workshop in St. Kitts\Nevis coincidentally in the wake of hurricane Georges, served to reinforce the need for this kind of approach in the region. Over 90% of all the school buildings on the island of St. Kitts suffered damage from Hurricane Georges. Some of them were totally destroyed. In many areas of the Caribbean, the Hotel and Tourism Industry is central to economic livelihood. Caribbean tourism infrastructure is typically built in the coastal zone which is prone to inundation. Increasing resilience of the tourism building stock to natural hazards will better position the region to recover from the social and economic shocks which accompany hazard events. The CDMP has been working with the Caribbean Hotel Association (CHA) to update its "Hurricane Procedures Manual" and has included a chapter on "Structural Vulnerability and Loss Reduction Techniques". In coordination with CHA, the

CDMP is sponsoring a series of workshops for the hotel industry on hurricane preparedness

### **(ii) Promotion of Natural Hazard -Resistant Building Standards and Practices**

This activity assists countries to establish appropriate safer building standards and practices in both the formal and informal building sectors. The CDMP is working with the UN Center for Human Settlements (UNCHS) to help Antigua\ Barbuda, the Commonwealth of Dominica, St Lucia and Grenada to introduce a building code based on the model code developed by UNCHS for the members of the Organization of Eastern Caribbean States (OECS). Based on the initiative of the CDMP, the Caribbean Development Bank (CDB) in the wake of Hurricanes Luis and Marilyn began requesting on a pilot basis, that countries refer to the Caribbean Uniform Building Code (CUBIC) for developing design standards for large development projects.

A housing retrofit campaign in St Lucia and Dominica is directed at making low-income housing more hurricane resistant and promoting the use of improved building practices by home owners and builders. The campaigns which are led by local NGOs, include the training of artisans, outreach to vulnerable communities and a revolving loan fund to provide individuals with financing for retrofitting. Houses retrofitted under this program in the Commonwealth of Dominica, withstood the ravishes of Hurricane Luis in 1995. A similar activity patterned after the St Lucia and Dominica activities is being implemented by the Antigua National Development Foundation (NDF). This is funded in part by the local organization and receives technical assistance and some funding from the CDMP. The project conducted a highly effective Lessons Learned Workshop in October of 1996 which shared the lessons learned from implementing these activities, solved problems and made recommendations for future improvements. It was also used as a vehicle to encourage the replication of this type of activity among non-beneficiary countries. Coming out of discussions at this workshop was the decision to target low income persons seeking funding for home improvement and to use this as a conditionality vehicle for promoting the low income housing retrofit concept in the pilot areas. This is an activity that has been quite challenging for the project since its inception. It has suffered from low demand due to the inability of the most needy of this group to qualify for credit from the implementing agencies.

### **(iii) Generation and Use of Natural Hazard Assessments and Risk Mapping**

This activity helps countries to develop the capability to map hazard prone areas and encourage national planning and international lending agencies to incorporate disaster mitigation into development projects. CDMP developed a numerical computer-based model for estimating storm-surge, wave action and flooding potential for coastal areas in the Caribbean region. The model has been installed at the Caribbean Meteorological Institute (CMI) in Barbados. Pilot applications are underway and have been completed in Jamaica, Belize, Antigua/ Barbuda and the Commonwealth of Dominica. A multi-hazard mapping project, which includes flooding, landslides and seismic risk of the Kingston Metropolitan Area (KMA) in Jamaica is close to completion in Kingston Jamaica. The Jamaican Government in 1996 made provisions for the use of this information in the National Land Policy of Jamaica.

Under these provisions, government technical agencies will continue the mapping activities started by the project and the government planning agencies will use these maps as input for the development approval process. At the invitation of the CDB, the CDMP organized training seminars for bank staff on "Incorporating Natural Hazard Considerations into the Project Preparation Process". The bank has since made a policy decision to include the recommendations in its project appraisal and lending practices.

#### **(iv) Promotion of Loss Reduction Incentives and Hazard Mitigation in the Property Insurance**

This activity identifies ways in which the industry can encourage sounder development and construction practices. CDMP worked with the Insurance Association of the Caribbean and national Insurance Associations in Jamaica, Belize and the Dominican Republic to promote a more active role within the industry for reducing catastrophic risk. Training workshops have been held to increase awareness of hazards and appropriate mitigation strategies through better use of hazard information and the promotion of incentives for hazard mitigation among property owners. The CDMP has also been working with the CARICOM Working Party on Insurance and Reinsurance. The project prepared for this working group an issues paper on catastrophe protection in the Caribbean and assisted the working party in the preparation of its report for the CARICOM Heads of State. The movement of this at the CARICOM level has been quite slow but the initial document produced is constantly being used as a reference for the advocates within CARICOM and industry personnel in the region. With the slow progress received at the regional policy level, the CDMP decided to change its focus a bit and to concentrate on promoting the use of its wealth of information on hazards and loss reduction among smaller insurance companies in the region with the resident authority to make decisions on premium pricing. The United Insurance Company of Barbados, with branches in St. Lucia and the Commonwealth of Dominica, accepted this challenge and has since embarked on a promotions campaign among its clientele which offers up to a 25% reduction in premiums, to participants of this program.

#### **(v) Mitigation Policy and Planning**

In 1996 the CDMP embarked on an activity to assist Caribbean countries to address the issue of mitigation planning at the regional and national levels. This initiative was necessary to put into perspective and package the use of many of the mitigation interventions made by the project. Many of the countries in the region had not embarked on any mitigation planning and were now being exposed to mitigation tools which can be most usefully applied within the context of a policy and plan at the national level. There was also the need to improve coordination and cooperation between emergency coordinators and development planners. This activity was initiated in collaboration with the Caribbean Disaster Emergency Response Agency (CDERA) and developed with the planners and disaster managers of the region. The outcome was a process oriented mitigation planning guidelines document which was developed to assist countries initiate mitigation planning at the national levels. The CDMP supported the development of two national mitigation planning activities, one in Jamaica and the other in St. Lucia. Both countries have used the guidelines for developing mitigation policies and plans.

The regional group of planners and disaster managers will again meet in March of 1999 to review the hazard maps that have been produced by the project so far and to develop a working methodology for the use of this information in the vulnerability assessment phase. Of significance in this workshop will be a discussion on modalities for the appropriate use and application of this type of information in the development planning process. This is quite a challenge in the region since many of the countries do not have the precedent or policies framework required for the easy application and use of the mitigation tools produced by the project.

Support for a comprehensive approach to hazard mitigation planning was given by ministerial representatives at the UNCHS/Habitat Regional Ministerial Meeting in 1996 in the "Plan of Action for the CARICOM Ministers of Human Settlements" and in the "Partnership for Prosperity and Security in the Caribbean" which was signed at the Caribbean/ United States Summit in May 1997.

#### **(vi) Facilitating Community Based Disaster Preparedness and Prevention**

These activities assist communities in identifying their hazard vulnerability and in organizing and maintaining their preparedness for hazardous events. In the Dominican Republic, the CDMP was instrumental in the establishment of the Dominican Committee for Disaster Mitigation, an NGO with an extensive support network consisting of other NGOs and private companies. The NGO is implementing an action program which includes public education and training which collaborates closely with the OFDA Disaster Management Training Program being implemented in the Dominican Republic. Attention is also placed on the coordination of NGO and private sector preparedness and response efforts and support is given for selected community mitigation initiatives.

A similar program was started in Haiti. Its initial focus was on introducing disaster mitigation in the National Environmental Action Plan under preparation by the Ministry of the Environment, and on strengthening preparedness and response capacity in the most vulnerable areas, including collaboration with a major Red Cross Training Program. The initially proposed coordination with the National Environment Action Plan in Haiti had to be abandoned due to overwhelming political difficulties experienced in Haiti at the time. The program in Haiti now focuses solely on building a capacity within three vulnerable communities for preparedness and mitigation. This activity collaborates closely with the OFDA/LAC training program and use is being made of the methodology, training materials and technical advice from this program.

#### **(vii) Incorporation of Hazard Mitigation into Post-Disaster Recovery Post Disaster Mitigation**

This activity assists eastern Caribbean countries with incorporating mitigation measures into reconstruction efforts. Following tropical storm Debby which affected St Lucia in 1994, the CDMP conducted a landslide damage assessment and prepared debris flow hazard maps to guide a World Bank funded reconstruction program with recommendations on infrastructure design, land-use controls and improved farm practices to increase hillside stability. After

Hurricanes Luis and Marilyn in 1995, CDMP organized training workshops for local builders in safe construction and roof retrofit in Antigua/Barbuda and St Kitts/Nevis. The CDB invited the CDMP to undertake a storm hazard assessment for the Commonwealth of Dominica, as part of a loan for the rehabilitation of the coastal infrastructure damaged by Hurricane Luis. The activity involved a storm surge and wave analysis and the formulation of hazard resistant design criteria for the reconstruction of this sea defense. More recently, the CDMP was involved in defining post disaster mitigation interventions after the Layou River dam disaster in the Commonwealth of Dominica. The project, in the wake of Hurricane Georges in 1998 is making itself available to provide mitigation technical assistance to the donors involved in the reconstruction effort.

#### **(viii) Technical Training and Information Dissemination**

The success of the CDMP requires that disaster mitigation information and technical skills be accurately and effectively transmitted to project participants. Accordingly, each of the CDMP activities described above include, as appropriate, workshops, technology transfer, training sessions, the drafting and distribution of training manuals and other publications and/or the establishment of public information campaigns, as essential components in their implementation.

#### **(ix) The CDMP and the Development Finance Institutions**

In an effort to increase awareness of natural hazards and promote the use of this type of information in development, the CDMP initiated an activity with the Caribbean Development Bank (CDB) shortly after the project's inception in 1993 for the purpose of influencing the lending policy of the bank and encouraged the CDB to include more considerations for natural hazard assessments when developing criteria for loan qualifications. The CDMP has conducted two workshops for the project development staff of the Bank. After the first workshop a policy decision was made at the CDB to amend its existing environmental impact assessment procedures to include considerations for natural hazard reviews. A major impact of this intervention occurred when the CDB demonstrated a commitment to this process, by placing a natural hazard mitigation conditionality on the loan package for the reconstruction of the damaged sea wall, in the Commonwealth of Dominica (referred to in sec vii). This sea defense structure was destroyed by hurricanes Luis and Marilyn during the 1995 hurricane season. The CDB further defined this conditionality by insisting that storm surge maps produced by the CDMP be used by coastal engineers when developing the design parameters for the reconstruction. Since this intervention, the CDB has developed, approved and adopted a Disaster Management Policy for the Bank. This policy embraces the mitigation concept and allows for the provision of disaster response grant funds for the region. The CDMP was asked to review and comment on this policy. The CDMP has also been working with the World Bank on determining the probable maximum loss for public infrastructure and is collaborating closely with the bank on the design of its multi-million dollar disaster management project for the OECS Countries in the Caribbean.

The Caribbean Disaster Mitigation Project is effecting the kinds of impacts the project was

designed to create and is getting the support and attention from the participating governments and regional institutions. Because of the nature of the activities some of these impacts were slow in coming. However there has been progress in the response of the private and public sector to the partnership initiative, especially in the Dominican Republic. There is also some evidence of some of the policy changes and commitment of resources this project needs for success emerging from some of our collaborating institutions. This however represents only the tip of the iceberg. There is a lot of work still to be done in the Caribbean for achieving the desired integration of disasters and development issues on a sustainable basis and for a meaningful reduction in loss of life, property and recovery time from future natural hazard impacts.

### **3 Evaluation Objectives**

(1) To evaluate the results of each component of the CDMP in comparison with intended results as stated in the project results framework, (2) to assess the relationship and contribution of the project activities to OFDA's Strategic Objectives and expected results (3) to identify successful CDMP pilot interventions worthy of replication within the context of the institutional reality of the Caribbean (4) Evaluate the performance and appropriateness of the implementation agency and (5) recommend realistic follow-on activities and implementation mechanisms for the OFDA/LAC Strategy for the region.

### **4 Statement of Work**

This Statement of Work will be performed by two consultants: a US based Urban Environmental Specialist with experience in conducting evaluations for disaster mitigation projects. This person will be appointed Team Leader. The other consultant will preferably be from the Caribbean region with demonstrated experience in disaster mitigation and /or planning. Both consultants will be contracted based on this scope of work.

The work will begin with a familiarization visit to Washington D C where the team will conduct interviews with OFDA Washington personnel, the OAS project team in Washington, the Monitoring and Evaluation Consultant and the World Bank.

The team leader will manage the overall team activities such as determining schedules, timelines and activities and coordinate individual member activities. This person will also be responsible for liaison with the host country officials, PVO's, NGO's and USG personnel (e.g. USAID, Embassy), will ensure the appropriate team focus, be responsible for allocating pre-departure work to the team members as needed, be responsible for the writing of the final report, the debriefing activities on completion of the field work and, will report directly to the OFDA/LAC Regional Advisor for the Caribbean.

- 4 1 The contractors shall become familiar with the project's goals, objectives and activity streams initially through i) reading of all project referenced project documents and any other documents provided by the OAS, OFDA/Washington or the OFDA team in Jamaica and (ii) discussions with project partners, implementing agencies, project beneficiaries, the OAS and OFDA personnel
- 4 2 Contractor personnel shall meet with the project management and participating institutions in each of the project sites detailed in the attached schedule to evaluate the results of each activity compared to the stated objectives, contribution to the overall planned program results and outcomes as described in the CDMP Results Framework and to determine the extent to which these have been achieved
- 4 3 Determine the extent to which the procedures promoted in the CDMP pilot activities are being replicated, adapted by other organizations and communities and countries in the Caribbean and if not, ii) Identify obstacles if any for replicability and make recommendations for future interventions
- 4 4 Evaluate the sustainability of each activity and determine to what extent the target/collaborating institutions are in a position to adopt and continue to successfully implement these or similar type activities after the closure of the CDMP and cessation of funding
- 4 5 Evaluate the performance of the project implementation team in carrying out their tasks in general Important here will be the capability of the project implementation unit to recognize new opportunities and problems and to implement appropriate responses Document the lessons learned from the existing implementation mechanism
- 4 6 In general, determine the project's strengths and successes which represent specific opportunities for support from OFDA for follow-on activities for the Caribbean Particular attention must be placed on lessons learned that will assist in USAID/OFDA in developing criteria for future interventions
- 4 7 Provide an evaluative analysis of the CDMP and its effectiveness in contributing to the OFDA strategic objectives and in meeting the needs of the region

**More specifically the evaluation team should**

- 4 8 Determine the extent to which resources have been allocated by target institutions and plans developed to continue mitigation measures after pilot activities end
- 4 9 Evaluate the extent to which target communities have utilized vulnerability assessments and vulnerability reduction methodologies for development planning
- 4 10 Determine to what extent did the CDMP activities include private sector participation and evaluate the results of this participation

- 4 11 As far as possible examine the extent to which the CDMP workshops, manuals and other types of materials produced by the project are contributing to an increased level of awareness among policy, decision makers and technical persons in the Caribbean
- 4 12 Determine the extent to which building regulations/standards have been adopted, developed or revised by the public and private sectors in the target areas and identify the obstacles and challenges associated with this process
- 4 13 Evaluate the effectiveness of the training conducted and supported by the CDMP in all of the activity streams Determine the extent to which persons exposed to CDMP training have been involved in implementing the results of this training within as well as outside of their institutions or as part of their trade (e g builders/artisans)
- 4 14 Document the progress towards institutionalizing skills training and professional development courses at the national and/or regional level
- 4 15 Assess the role of the CDMP project's contribution to improved access to hazard mitigation information, techniques and methodologies in the region How do persons/ disaster management officials access information about the CDMP? How will this be done after the closure of the project?
- 4 16 Determine to what extent are the many technical manuals produced by the CDMP being used by their target audience to reduce risk and vulnerability in the region u) Identify problems if any associated with their use (eg electrical utilities)
- 4 17 Determine the level of progress achieved towards the integration of the tools produced to the development planning process in the pilot countries
- 4 18 Determine the extent to which the Housing Retrofit component in its present state is reaching the appropriate target group and identify the challenges associated with this activity
- 4 19 For disasters that have occurred in the region ( e g Tropical Storm Gordon, Hurricanes Luis, Marilyn, Georges, Layou River Landslide) determine the extent to which disaster mitigation has been used in the reconstruction effort during the post-disaster mitigation period
- 5 0 Key guide questions to be answered**
- 5 1 Caribbean Development Bank**
- Does the CDB project staff show an appreciation for the issues of hazard mitigation?

- What steps have been taken by the bank since exposure to the CDMP training?
- Has the CDB Environmental Guidelines been revised to include considerations for natural hazard assessments
- Is the newly developed CDB Disaster Management Policy being implemented?
- Does it adequately address the disaster mitigation issue?
- What are some of the challenges faced by this agency when implementing this policy?
- Does this agency see itself as having an important role to play in loss reduction from natural hazards?
- Have the CDB investments been destroyed or damaged by natural hazard events in the past? Is the present policy addressing the mitigation of future losses and hence protecting the productivity of the banks capital?

## 5.2 Building Codes and Standards

- Are the Antigua Building Code and the Commonwealth of Dominica Building Code which was developed by the CDMP in collaboration with the UNCHS in use in any of these countries? If not, are these codes likely to be adopted by September of 1999?
- What are the factors working against this type of intervention in the Caribbean?
- Has the change in focus of the low income retrofitting activity to target home improvement candidates resulted in any significant increase in the participants of this program?
- Did this reduce the level of participation by lower income persons in favor of more middle income participants?
- Is this intervention in its present form capable of reaching the "poorest of the poor"?
- Is there any estimate of how many observers of the retrofitting have copied the techniques in their own home?
- How successful was the United Insurance Company in Barbados, St. Lucia and Antigua in attracting clients to the safe hurricane resistant housing program? How many persons actually participated and received premium reductions?
- Are more insurance companies likely to follow this trend in the Caribbean?

## 5.3 Natural Hazard Information

- Has the CDMP contributed to an improvement of the natural hazard awareness in the region?
- Is there a general understanding among beneficiaries of how this information can be used in mitigation?
- Is there an institutional structure or policies existing or presently being developed within the target countries that would allow for easy adoption and use of this information?
- If countries in the Caribbean require a consultant to conduct a storm surge hazard assessment utilizing the TAOS model, can this person be found in the Caribbean or in a Caribbean Institution like the CMI or NRCA in Jamaica?
- Does the capability lie within the Caribbean Meteorological Institute (CMI) to provide

this service or to conduct the real time applications of this model

- Are procedures and systems in place for this agency to alert countries of potential surge levels for approaching storms? If not, is this something that is being considered for the near future? Is this the appropriate institution to take the lead in providing this service to the Caribbean
- Have the vulnerability studies conducted by the CDMP for the Caribbean Electrical Utilities Association (CARILEC) been utilized by any of its membership? If not, why?
- Is the NRCA or Land Information Council appropriate institutions for housing the products of the Kingston Metropolitan Area Multi- Hazard Assessment Activity? u)
- Are these agencies likely and sufficiently positioned to institutionalize the use of these products?
- Who is responsible for updating these maps and for taking the lead in continuing the adoption process after the closure of the project ?
- Is there any evidence that the Town Planning Department in Jamaica is taking steps to integrate these maps into the development planning process? If not the planning department, are the appropriate agencies involved in this process
- Was the Montego Bay Storm Surge Assessment a worthwhile exercise Has any use been made of these maps by the Jamaica Institute of Engineers (JIE) or any other entities?
- Has the TOAS model been used by any of the beneficiaries or collaborating institutions for recent hurricanes in the region

#### **5 4 Curriculum Development**

- Has there been any progress towards curriculum development at the tertiary level
- Are there definite plans and a target date for full integration of curricula developed, into the degree programs of any of the targeted universities?
- Is there a need to develop curricula in areas other than what is presently being addressed

#### **5 5 Mitigation Planning**

- Have any countries in the region other than the two targeted for follow-on support developed mitigation plans and policies or have definite plans to do so since the workshop on Mitigation Planning in St Lucia?
- Is there evidence of any work in progress in this area? Are the planners and disaster managers doing any follow-up on organizing these activities at the national level?
- Does either St Lucia or Jamaica have at least a draft of a national mitigation policy Is this policy part of a larger disaster management policy for the country ?

#### **5 6 Community Preparedness**

- What is the general awareness at the community level of natural hazards and risk
- Does knowledge of the origin and purpose of the mitigation structures exist among

beneficiaries in the target communities ?

- Is there any evidence of a permanent disaster preparedness/and mitigation organization existing in the communities where the community disaster mitigation projects occurred? If yes, what was the role of these committees during the recent hurricane Georges disaster
- How is the maintenance of the mitigation structures handled? e.g. who conducted repairs to the embankments and containment walls after hurricane Georges?
- Did all or most of these structures survive the hurricane?
- Did any of these community persons who were active in Hurricanes Hortense and Georges receive training from the CDMD?

#### 6.0 Evaluation Methodology

The project team will gather its information through focused interviews with all the participating, implementing, beneficiary and other relevant agencies and personnel including community groups and individuals. Additional information will be gathered through a literature review of all relevant project documents, technical reports and website visits etc. In the event of scheduling conflicts other means of communication e.g. telephone conversations, facsimile and e-mail should be used.

#### 7.0 Timeframe and schedule

The schedule will be divided into three phases. The duration of the Evaluation comprises a total of thirty (38) days of field work in the Caribbean excluding travel days, three (3) days in Washington for both consultants, and five write-up days for the final report preparation for the team-leader only. The second team member will complete work at the completion of field-work. The final report will be submitted to OFDA/ Washington within three weeks (21 days) of the completion of field work. OFDA will authorize a six day work-week for consultants in the field.

##### Phase I

The project team will convene in Washington on March 17, 1999 for the purpose of conducting interviews with Washington personnel and collecting background information from the project staff (3 days)

##### Phase II

The team will begin work in Jamaica on March 29th. Travel to Jamaica for a briefing/interview with the OFDA/LAC Regional Advisor in Jamaica and USAID mission personnel in Jamaica. The evaluation interviews will begin in Jamaica where they will evaluate the Kingston Multi Hazard Assessment Activity, The Montego Bay Storm Surge Mapping Activity and the Mitigation Policy and Planning Activity (6 work days). The team will then proceed to the eastern Caribbean islands of Barbados,

St Lucia, The Commonwealth of Dominica, Antigua and Grenada (11work days) The team splits at the closing of the Antigua meetings and the Caribbean consultant will travel onward on Grenada and the U S based consultant will return to the U S

### **Phase III**

Phase III will begin on May 23 when the team travels to Belize (2 days) From Belize they will travel to the Dominican Republic (3 days) and onwards to Haiti (3 days) On June 3rd The team travels to the Dominican Republic from Haiti engage in write up on June 4-5 The TAC members will arrive on June 7 The TAC meeting will occur on June 8-9 The consultants will present a draft report to the TAC on June 8, receive comments and feedback and present a revised draft on June 9 This will allow OFDA the use of the document from as early as June 9 The consultants return home on June 10

The OFDA/LAC team in Jamaica will assist the team with the identification of project partners and the scheduling It is anticipated that similar assistance will be provided by the OAS project manager in Haiti and the Dominican Republic

### **Deliverables**

- 1 Draft report for review by TAC meeting in the Dominican Republic at the end of field work due by June 7, 1999
- 2 Briefing of major findings and issues to be presented by team at TAC meeting in the Dominican Republic on June 8th 1999
- 3 Ten (10) copies of final report twenty one (21) days after completion of field work, Friday June 30th 1999

# CDMP PROGRAM PERFORMANCE REPORT

September 30, 1998 - March 31, 1999

**COUNTRY:** Caribbean Region

**PROGRAM:** USAID/OAS Caribbean Disaster Mitigation Project

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<b>PROGRAM OBJECTIVE</b> Adoption of disaster mitigation and preparedness techniques, technologies and practices by the public and private sectors in targeted communities					
<p><b>Obj Indicator No 1</b></p> <p>National collaborating institutions develop plans and identify resources to carry out mitigation measures after pilot activities end</p>	<p>Target All pilot activities develop plans, identify resources by the end of their respective pilot activity period</p>	<ul style="list-style-type: none"> <li>● NRDF (St Lucia) incorporated hurricane retrofit/strengthening measures in a permanent housing improvement loan program with local financial support</li> <li>● CARITAS (St Lucia) received a \$5000 contribution from Barclays Bank for hurricane straps and a \$30 000 loan from CHF for the revolving loan fund</li> <li>● NDFD (Dominica) has attracted EC\$8100+ locally in cash/in kind plus EC\$20-25,000 worth of bldg materials from CCC, and qualified for a \$30,000 low-interest loan from CHF</li> <li>● Jamaican ODP, JIE, Realtors Ass n , Town Planning Dept , and St James PC formed committee to identify strategies to institutionalize hazard mapping in land use planning, emergency management</li> <li>● D R ADMD has annual plan with targets, continues to attract non-CDMP support Courses, simulations now financed by participants or their companies Received grant from ECHO (DIPECHO) to fund many of its ongoing activities beginning Oct 1998</li> <li>● World Vision (D R ) has integrated Community Dis Prep Education into its program, assigned resources and staff</li> <li>● Land Policy Unit, NRCA and ODPEM developed plan for data hand off, institutionalization for KMA activities, Jamaica</li> </ul>		<p>NDF/Antigua &amp; Barbuda hosted a Round Table discussion with participants primarily from the private sector (representatives of banks, insurance agencies, engineers, <i>et al</i>) to initiate a dialogue on national efforts to promote safer housing (Dec 1998)</p> <p>St Lucia and Jamaica are developing national mitigation plans [ref Obj Ind No 3]</p> <p>CIMH (formerly CMI) is developing plans for use of TAOS during storm events and production of MEOW maps for E Caribbean</p>	

ANNEX 2

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p><b>Obj Indicator No 2</b></p> <p>Mitigation skills and procedures promoted in CDMP pilot activities are replicated, adapted by other organizations and communities or countries in the Caribbean region</p>	<p>Target At least 5 replications and/or adaptations are initiated in the region during the project period that can be attributed to CDMP pilot activity implementation, promotion</p>	<ul style="list-style-type: none"> <li>● CMI participated in TAOS software installation, training in Belize</li> <li>● Trainers from housing retrofit projects led 11 post-hurricane workshops in Antigua &amp; Barbuda, St Kitts/Nevis</li> <li>● A Disaster Mitigation Workshop, sponsored by CDMP and Org of Ins Companies in Belize (ORINCO) for over 70 people resulted from interest generated by the insurance workshops in Jamaica and the D R</li> <li>● Carib Conf of Churches (CCC) supported 4 builders trained in the CDMP Dominica pilot activity to assist with post-hurricane reconstruction in Antigua</li> <li>● BVI govt and British ODA funded a Hazard &amp; Risk Assess Project to produce risk maps that will be used to generate a hazard loss reduction program for the BVI The project is utilizing the TAOS storm surge modeling software developed in CDMP</li> <li>● Since 1995, NDF/Antigua has made EC\$382,000 in housing loans, many of which included safer repair &amp; construction techniques</li> <li>● The regional housing retrofit workshop, with 40 participants from 11 countries generated interest from Antigua, Grenada and St Vincent</li> <li>● Under a Limited Scope Grant Agreement, CDMP is assisting with integrating hazard and risk analyses in design criteria for post-hurricane rehabilitation, Dominica</li> <li>● Emergency Center, Campeche, Mexico has obtained license to use TAOS, will cover all costs, including expansion of database, installation and training</li> </ul>	<p>Regional PML study, focusing on major infrastructure, to be completed 1st quarter 1999</p>	<p>Collection analysis of info from St Lucia and Dominica completed, St Kitts is in progress St Vincent dropped from study</p>	



PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p><b>Obj Indicator No 3</b></p> <p>Targeted communities use vulnerability assessment and reduction methodologies for development planning</p>	<p>Target At least 4 pilot activities introduce improved hazard assessment technologies and promote their application to assist in vulnerability reduction</p>	<ul style="list-style-type: none"> <li>● Disaster management techniques, approaches, drafted by USAID/OAS CDMP Regional Coordinator, are included in proposed National Land Policy revisions submitted to Cabinet in Jamaica</li> <li>● Following CDMP-CDB workshops on use of hazard information in project formulation, CDB agreed to request that borrowing countries use CUBIC for design &amp; construction of major infrastructure projects CDB included mitigation considerations in the storm rehabilitation loan offered to Dominica</li> <li>● World Bank reconstruction loan agreement with GOSL incorporated CDMP mitigation recommendations</li> <li>● Workshops to promote hazard mapping methodologies, applications have been held for public and private sector planners, investors, insurers, <i>et al</i>, in Jamaica, Dominican Republic Belize</li> <li>● The Development Control Authority (Antigua) used recommendations in the new CDMP/UNCHS-sponsored building code to guide 1995 post-hurricane reconstruction, prepare posters and brochures for hurricane preparedness</li> <li>● Following the July 1997 National Mitigation Planning Workshop in St Lucia, CDERA reports that Grenada used hazard information in design of a major feeder road for the new national stadium, added National Disaster Coordinator to national planning team</li> <li>● Gov t of Barbados established a national disaster mitigation subcommittee</li> <li>● CDB produced a new policy document, "Strategy and Operational Guidelines for Natural Disaster Management"</li> </ul>	<p>Complete school/shelter retrofit recommendations (CDMP/ECHO), hold technical workshop</p> <p>Complete national mitigation planning activities in 2 countries</p> <p>Hold 2nd mitigation planning workshop (follow-up to 1997 workshop)</p>	<p>Regional technical workshop held in St Kitts, Oct 1998, with representatives from the 5 participating countries plus CDB, CDERA Peace Corps, Partners of the Americas</p> <p>With CDMP St Lucia held consultation on the national mitigation plan in development, for representatives of public and private sectors Work in Jamaica also underway</p> <p>Hazard Mapping and Vulnerability Assessment Workshop held March 1999 for over 30 physical planners and disaster coordinators</p>	<p>Target surpassed with main focus now on examples of actual use</p> <p>Dominica St Kitts &amp; Nevis, and Grenada have received World Bank loans for public bldg retrofits, CDB will give priority to Antigua &amp; Barbuda and Anguilla for school retrofit lending</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	

**PROGRAM RESULT #1 Pilot activities conducted with collaborating public and private sector partners to promote acquisition and application of disaster mitigation skills, techniques and methodologies**

<p>Indicator No 1 1</p> <p>Pilot mitigation activities are conducted in at least 7 countries in the Caribbean region during the Program period (1 Oct 1993 - 30 Sept 1998)</p>	<p>Target Included in indicator statement</p>	<p>All governments in the project area have endorsed the CDMP, several outside the project area have expressed interest in the project</p> <p>Pilot activities are underway or completed in 1) Belize, 2) Dominica 3) Dominican Republic, 4) Jamaica 5) St Lucia, 6) Antigua &amp; Barbuda, 7) Haiti, 8) St Vincent Other countries participating in new projects, training/info dissemination, or replication include Anguilla, Bahamas, Barbados, Grenada, St Kitts &amp; Nevis Trinidad, BVI, U S Virgin Islands and Puerto Rico</p>			<p>Target reached and surpassed by mid 1996</p>
<p>Indicator No 1 2</p> <p>At least 80% of the CDMP pilot activities include private sector participation</p>	<p>Target Included in indicator statement</p> <p>(Number contingent on number of pilot activities conducted )</p>	<p>All pilot activities to date have been carried out with private sector and NGO participation</p> <ul style="list-style-type: none"> <li>● The D R CDMP project has documented/quantified private sector investment to establish a collaborative preparedness mechanism and promote natural hazard awareness Board of new NGO consists of 5 private, 5 NGO members (total affiliates 31)</li> <li>● NDFD and SSI have established a collaboration with CCC for building, retrofitting low-income houses in Dominica</li> <li>● Local disaster committee members in Haiti are predominately from NGO and private sectors</li> <li>● Community Initiatives component of ADMD/D R shows resources to date from communities (52 27%), ADMD (34 39%), and others - NGOs, local govt , etc - (13 34%)</li> <li>● Compania Nacional de Seguros underwrote 30-second TV announcement on hurricane prep , worth approx RD\$2,000,000 (US\$133,333)</li> </ul>	<p>Continue to gather information on value of local investment in pilot activities</p>	<p>CDMP-Haiti continues to establish linkages with private, NGO partners, e g , joint activities/cost sharing with Plan Int'l</p> <p>Value of NGO and community group contributions to the 172 Community Disaster Prep Work shops held in 1998 by the ADMD is approx RD\$154 800 (US\$9,987)</p>	<p>Target achieved in pilots to date</p> <p>Local and national investment in CDMP activities is considered a key indicator of the value placed on the benefits of these activities and thus of their continued use/ application and sustainability [see also Obj Ind #1]</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Indicator No 13</p> <p>Methodologies &amp; applications are documented for national and regional dissemination via workshops, presentations, training courses</p>	<p>Target National lead agencies produce informative guidelines or models for each completed pilot activity</p>	<ul style="list-style-type: none"> <li>● Procedural manual for electrical utility assessment Manual for Caribbean Electric Utilities Addressing the Issue of the Mitigation of Damage Caused by Natural Hazards to Civil Works</li> <li>● Video and manual on safer construction techniques ( Make the Right Connections ) produced by NDFD and SSI, Dominica</li> <li>● Training video produced by SALCC and CARITAS, St Lucia</li> <li>● "Estimation of Building Damage as a Result of Hurricanes in the Caribbean " is being used in other insurance workshops in the region</li> <li>● The D R project is videotaping all major projects for use in training and promotion and for a video resource library used by affiliates, and has published over 24,000 EQ and hurricane brochures for community preparedness</li> <li>● 'Hurricane Resistant Home Improvement Program A Toolkit' completed, distributed (includes "Minimum Standards Checklist for Hurricane-Resistance Estimation &amp; Guidance')</li> <li>● Hazard mitigation planning workbook ("Planning to Mitigate the Impacts of Natural Hazards in the Caribbean ) completed</li> <li>● CMI regional workshop held, Dec 1997, on uses &amp; applications of the TAOS storm hazard model</li> <li>● Chapter on structural vulnerability &amp; loss reduction techniques completed for CHA/CTO Hurricane Procedures Manual (available in English and Spanish)</li> <li>● Manual of standards for retrofit/repair and construction of schools/emerg shelters prepared plus maintenance manual for non technical personnel</li> </ul>	<p>Complete user guide for TAOS products</p>		<p>To expand and expedite the dissemination of CDMP technical procedural and training information, selected project documents and reports are posted on the CDMP website Copies of some documents have been downloaded for national mitigation planners in the USAID/ADPC Asian Urban Disaster Mitigation Program</p> <p>ADMD used new Spanish translation of CHA/CTO manual on hurricane procedures for Hurricane Preparedness course given for hotel assn , D R</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<b>PROGRAM RESULT #2 Increased pool of public and private sector professionals in the Caribbean region with disaster mitigation skills</b>					
<p>Indicator No 2 1</p> <p>Number of public and private sector professionals in the region successfully completing CDMP-supported technical short courses</p>	<p>Targets</p> <p>D R dis mgmt training 1000</p> <p>Safer construction techniques 200</p> <p>Hazard mapping 50</p> <p>Vulnerability assessment 50</p> <p>Code administration/enforcement 75</p>	<ul style="list-style-type: none"> <li>● D R project has sponsored 14 disaster admin courses for 329 prof and tech participants from public, private and NGO sectors</li> <li>● Approx 147 local craftsmen have taken safer construction training supported by the CDMP in St Lucia and Dominica 93 builders attended safer construction workshops in Antigua &amp; Barbuda</li> <li>● 4 staff members of ODP, Met Service and JBC, and 2 staff members of CMI trained in operation, applications of TAOS RTFS software in Barbados Additional training for CMI CDERA, and Barbados Met Office</li> <li>● 16 agency staff and students trained during one-week GIS course at CAST Jamaica</li> <li>● Staff of Belize Met and Hydro Offices trained with TAOS software installation</li> <li>● Workshop held for Jamaican Town Planning Dept , NRCA &amp; Water Resources Authority staff (3) on GIS data extraction, analysis, manipulation and output</li> <li>● D R adapted Int'l Red Cross Com Dis Prep program to train 195 local facilitators from NGOs, Civil Defense, Red Cross</li> <li>● CDMP-Haiti sent 5 to a CPI course in the D R</li> <li>● GIS-EP (Dominica) held a workshop for utility engineers on techniques &amp; applications of GIS</li> </ul>	<p>ADMD (D R ) continues disaster management training activities</p> <p>Complete GIS-EP, 2 additional workshops planned on applications of GIS, Dominica</p>	<p>ADMD continues to offer 8 courses for 1999</p> <p>GIS-EP conducted workshops on use of GIS for road alignment and for agricultural planning</p>	<p>5 participants in GIS agri workshop formed cross institutional group to apply computer modeling to banana production</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Indicator No 2 2</p> <p>Skills training and professional development courses institutionalized at the national level</p>	<p>Target At least 5 countries participating in the CDMP will continue to offer CDMP mitigation training courses after project completion</p>	<ul style="list-style-type: none"> <li>● CPI Instructor Training Course training program prepared, co-sponsored by USAID/OAS CDMP, CARE Dominicana and USAID/OFDA Costa Rica</li> <li>● UTECH Regional Summer Course now includes disaster mitigation, with presentations on retrofitting and sessions on economic impact of disasters and structural/non-structural mitigation measures</li> <li>● CDMP-Haiti gave first TFI course</li> <li>● ADMD held 2 courses Emergency Preparedness in the event of a Hurricane (26 participants) and Hurricane Preparedness (19 participants from Playa Dorada Hotel Association D R )</li> </ul>	<p>Training curriculum development completed in 2 institutions</p>	<p>New agreement with UTECH, Jamaica, to develop course outline and materials on disaster mitigation and safer construction both as stand alone course and as modules to be integrated into existing curriculum</p>	
<p>Indicator No 2 3</p> <p>Improved access to natural hazard mitigation information (techniques, methodologies, experience) throughout the region</p>	<p>Target Over the life of the Program CDMP will collaborate with at least 6 regional organizations or networks that will promote continued access to and use of mitigation skills, technologies and information</p>	<p>Collaborating regional organizations are</p> <ol style="list-style-type: none"> <li>1) CARICOM,</li> <li>2) CARILEC, 3) CDERA</li> <li>4) CMI, 5) CDB, 6) IAC</li> </ol> <ul style="list-style-type: none"> <li>● CARILEC has promoted availability of vulnerability assessment manual and technical assistance to all members via engineering conf newsletter, CARILECNET</li> <li>● CARICOM accepted Working Party insurance paper, World Bank has offered support for further risk study in region</li> <li>● CDMP and CDERA are collaborating on a project to facilitate national mitigation planning in CARICOM countries Held a national mitigation planning workshop for national planners and disaster coordinators</li> </ul>	<p>On completion of KMA activities, hold workshop on strategies for use application</p> <p>Prepare cost-benefit paper for CARICOM Secretariat</p>	<p>KMA workshop planned for June 1999</p> <p>As part of the KMA coastal hazard assessment a regional database of storm hazard information is being produced (includes estimates of max surge and wave heights and wind speeds) for the entire Caribbean</p>	

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<b>PROGRAM RESULT #3 Mitigation activities incorporated in post-disaster reconstruction, recovery programs</b>					
<p>Indicator No 3 1</p> <p>Mitigation and preparedness criteria are included in post-disaster reconstruction decision-making</p>	<p>Target Specific mitigation recommendations are made by CDMP following each major natural hazard event in targeted countries</p>	<ul style="list-style-type: none"> <li>Flood and landslide hazard mitigation recommendations by CDMP consultants after Tropical Storm Debbie were incorporated in World Bank reconstruction loan agreement with Govt of St Lucia The GOSL program includes the creation of a National Watershed Management Plan</li> <li>CDB storm rehab loan offered to Dominica included requirement for construction to CUBIC (or other accepted int'l code) standards and incorporation of CDMP hazard mapping &amp; vulnerability assessment methodologies</li> </ul>		<p>CDMP component of work on Dominica Sea Defenses project completed</p>	<p>USAID/OAS CDMP has established a proven mechanism whereby mitigation and preparedness criteria can be included in post disaster reconstruction decision making for the region</p> <p>[See also Outcome Ind 6 1]</p>
<b>Outcome #1 Reduced vulnerability of basic infrastructure and critical public facilities</b>					
<p>Outcome Ind 1 1</p> <p>Vulnerability assessments are performed by national and regional entities responsible for targeted facilities</p>	<p>Target At least 4 utilities participate in CDMP pilot vulnerability assessment activities</p> <p>Baseline Only Barbados Light &amp; Power has conducted (1993) its own vulnerability audit prior to the CDMP project</p>	<ul style="list-style-type: none"> <li>Participating regional utilities association (CARILEC) represents 23 electrical utilities</li> <li>Pilot vulnerability assessment completed for LUCELEC</li> <li>Hydro analysis completed for DOMLEC</li> <li>Procedural manual for Caribbean electric utilities completed, availability announced by CARILEC</li> <li>Lessons learned study completed of hurricane impact on Antigua &amp; Barbuda Elec Utility (APUA) with recommendations for vulnerability reduction, based on the LUCELEC pilot</li> <li>VINLEC T &amp; D study completed</li> </ul>			<p>Four member utilities have participated but to date have not acted on specific recommendations</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 1 2</p> <p>Entities responsible for specific lifeline facilities use vulnerability assessment information to reduce risk</p>	<p>Target At least 50% (11) of CARILEC member electric utilities request procedural manuals and/or training workshops on vulnerability audit/ reduction concepts and techniques after CDMP/CARILEC manual is complete At least 5 will use the information to make improvements in construction maintenance, procurement and/or operating procedures</p>	<p>CARILEC reports 13 requests for the procedural manual</p>		<p>CDMP and Caribbean Hotel Assn co-sponsored workshops on hurricane preparedness for the hotel industry in St Lucia, Antigua CHA will continue to fund in 1999 (next in P R )</p>	<p>Target related to interest generated has been surpassed, target regarding actual use has not been achieved</p> <p>This element has been broadened to include economic lifelines esp the tourist industry</p>
<p><b>Outcome #2 Improved building standards and practices</b></p>					
<p>Outcome Ind 2 1</p> <p>Building regulations/ standards developed or revised and adopted by public, private sectors in target areas</p>	<p>Target Country-specific codes will be prepared for and adopted by 3 countries in the region during the project period</p> <p>Baseline A simplified Model Building Code for the OECS cross referenced to CUBIC, was prepared in a UNCHS/UNDP project but country-specific codes have not been developed</p>	<ul style="list-style-type: none"> <li>● Adoption of new building code, prepared with CDMP and UNCHS/UNDP support is pending in Antigua &amp; Barbuda, Dominica</li> <li>● Study of failed infrastructure completed</li> </ul>	<p>Complete activity in St Lucia [carried forward original completion date was June 1996]</p> <p>Initiate code development, Grenada</p>	<p>St Lucia code completed Jan 1999</p> <p>Work underway in Grenada</p> <p>Discussions held with Belize to assist with national bldg code, and with Barbados to help finalize legislative, administrative structure for a formal Building Authority</p>	<p>National code &amp; guideline preparation for first 3 countries is a joint effort of USAID/OAS CDMP and UNCHS/UNDP to refine and strengthen institutional capacity to implement building codes</p> <p>With departure of UNCHS office new Grenada activity being supported by CDMP</p> <p>CDB interested in funding upgrade of CUBiC (CUBiC2000)</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 2 2</p> <p>No of informal structures incorporating safer building techniques</p>	<p>Target At least 160 houses in the informal sector will be retrofitted or repaired using safer building techniques</p> <p>[Collaborating organizations set their own quarterly targets, also will report structures retrofitted by building craftsmen trained in the CDMP project]</p>	<p><b>Cumulative total 199</b></p> <p><b>St Lucia</b> 5 retrofits completed during CARITAS/NRDF collaboration, 42 retrofits completed by CARITAS under new project structure in Dennery, Anse-la-Raye, Choiseul and Gros Islet Houses retrofitted by trainees outside CARITAS loan structure 42 NRDF added safety measures to approx 52 houses under their program NRDF has retrofitted 7 additional houses as part of their 1998 training activities</p> <p><b>Dominica</b> 7 retrofits completed in Carib Territory (first 5 survived the 1995 hurricanes intact) Survey of builders trained in Dominica project shows 35 additional houses retrofitted for residents not applying for NDFD loan assistance In collaboration with CCC, 4 homes built CCC provides materials SSI uses process to train local craftsmen</p> <p><b>Antigua/Barbuda</b> 1 house built, 4 repaired/retrofitted during post-hurricane workshops</p>			<p>Numerical target surpassed in 1997</p> <p>NDF/Antigua &amp; Barbuda will initiate follow-up activities to the Dec Round Table discussions [ref Obj Ind No 1]</p>
<p>Outcome Ind 2 3</p> <p>No of local builders and artisans trained in improved construction practices by the project</p>	<p>Target At least 100 local building craftsmen will be trained in safer construction practices during the CDMP pilot activities</p>	<p><b>Cumulative total 350</b></p> <p><b>St Lucia</b> 57 trainees in 2 workshops, plus site training for 10 self builders NRDF trained an additional 80 in 7 workshops</p> <p><b>Dominica</b> 110 trainees in five 1-day and three 5-day workshops, with 21 certified for achievement</p> <p><b>Antigua &amp; Barbuda</b> In post-hurricane workshops, 93 (none certified)</p>			<p>Target surpassed in 1996</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 2.4</p> <p>Improved access to credit in vulnerable low income communities to enable resident investment in housing safety retrofit</p>	<p>Target At least 2 pilot activities will establish revolving loan funds to provide small loans for housing safety improvements where these loans have not previously been available</p> <p>Baseline Minimal access if any in target communities The housing sector was not a component of the loan portfolio of NRDF prior to their involvement with the USAID/OAS CDMP NDFD offered some housing loans but none requiring disaster resistant features CARITAS had no housing loan portfolio</p>	<p>St Lucia 5 loans disbursed in initial CARITAS/NRDF project, 45 disbursed in current CARITAS project</p> <p>NRDF reports 52 loans (for a total of EC\$447,273) including safety repair/ retrofit measures as of 9/30/96</p> <p><b>Dominica</b> 49</p> <p><b>Antigua &amp; Barbuda</b> NDF made EC\$382 000 in housing repair loans [replication activity] Will be included in Hurricane Resistant Home Improvement Program with access to CHF line of credit</p> <p>CDB will make available a line of credit to national development banks to support home improvement and retrofit</p> <p>Procedures are in place for promotion of safer construction techniques in home improvement programs of 2 credit unions Jamaica</p>	<p>Complete project on credit union loans for retrofit, Jamaica</p> <p>Initiate replication activity, Grenada</p>	<p>Monitoring and final report submitted</p> <p>Awaiting CDB review approval for loan funds</p> <p>Dominica initiated new home improvement loan program including promotion of safety retrofits</p> <p>CDB approved EC\$1,000,000 low-interest loan to Development Bank St Kitts &amp; Nevis CDMP will assist the National Development Foundation to access these funds for on-lending</p>	<p>Target achieved</p> <p>Need to continue to monitor demand in credit union project interest generated with other credit unions in Jamaica</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<b>Outcome #3 Increased availability and access in the region to natural disaster risk/natural hazard vulnerability information for use by the public sector and by private sector developers, investors and insurers</b>					
<p>Outcome Indicator 3 1</p> <p>Increase in no of hazard maps produced for public and private land use and development planning</p>	<p>Target At least 15 hazard area-specific map sets will be produced during the project period</p>	<ul style="list-style-type: none"> <li>Produced storm hazard maps for the Montego Bay area, Jamaica disseminated as part of a pilot project report produced in camera-ready format</li> <li>3 floodplain hazard maps (Hope River Rio Cobre, Rio Minho) completed and presented at 1995 Floodplain Hazard Mapping Workshop with the Jamaica Hydrological Support Unit, Underground Water Authority</li> <li>Maps produced for Antigua &amp; Barbuda (Parham Harbour coastal flooding), Belize (surge and wind hazards), Dominica (west coast rehabilitation), Hispaniola (national surge and wind hazards)</li> </ul>	<p>Kingston Multi-hazard Assessment</p> <ul style="list-style-type: none"> <li>complete Phase II of seismic study</li> <li>complete coastal storm surge/wind hazard modeling</li> <li>complete multi-hazard database,</li> <li>complete landslide activity [carried forward]</li> </ul> <p>Workshop on Landslide Hazard Mitigation to be held Jan 1999</p> <p>Complete iso-acceleration maps with UWI/SRU</p> <p>Complete Belize riverine assessment model [carried forward]</p> <p>Reissue MoBay maps with guidelines</p>	<p>Draft seismic and coastal hazard assessments distributed for review All to be complete in time for "Mitigation Week" June 1999</p> <p>CMI and CDMP completed draft atlas of MEOW maps for Antigua &amp; Barbuda</p> <p>3-day workshop on landslide hazard mitigation and loss reduction presented findings, applications of the KMA landslide component, Jan 1999</p> <p>Draft maps on ground acceleration, velocity &amp; seismic intensity presented at Haz Map &amp; Vuln Assess Workshop, March 1999</p> <p>JIE component to be completed by June 1999 "Mitigation Week"</p>	<p>KMA activities will culminate in presentation and discussion during "Jamaica Mitigation Week", June 1999</p> <p>Completion of Belize activities delayed to 2nd quarter 1999</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 3 2</p> <p>Requests for hazard maps and risk analyses from the public sector and from private sector developers, investors and insurers</p>	<p>Target At least 3 requests from major user groups in each country where maps are produced and distributed by CDMP</p> <p>Baseline Few requests in the past in light of poor quality of existing maps, high expense of map generation, and low awareness of risk/exposure</p>	<ul style="list-style-type: none"> <li>● Availability of maps has been publicized in workshops for municipal officials, planners, meteorologists, disaster managers, bankers, insurers, developers, <i>et al</i>, in Jamaica, Dominican Republic, Belize</li> <li>● Campeche Emergency Center requested license for use of TAOS model (see Obj Ind #2)</li> </ul>	<p>Encourage local, regional and national counterparts to continue to disseminate maps</p> <p>Expand capacity for natural hazard assessments and mapping to private sector (insurance industry, engineering industry, and other professional fields)</p>	<p>Jamaica Town Planning Dept has requested assistance in incorporating landslide hazard info into Development Orders being revised for Kingston &amp; St Andrew</p>	
<p>Outcome Ind 3 3</p> <p>Number of plans prepared/revised by national disaster office staff using hazard assessment data</p>	<p>Target At least 4 national disaster offices will use improved hazard assessment data produced in CDMP pilot activities to revise or prepare new emergency preparedness and response plans</p>	<ul style="list-style-type: none"> <li>● Installation of CDMP storm modeling system software (TAOS) at Jamaica Office of Disaster Preparedness, and Barbados-based CMI</li> <li>● Installation of TAOS software at Belize Met Office, Nov 1995 Presentation of coastal flood hazard assessment data at public/private sector workshop, including simulation of applications for emergency evacuation planning</li> <li>● Hurricane Luis provided first opportunity to use TAOS in real-time mode for Antigua, St Kitts Possible surge heights communicated by CMI to Antigua Met Service, actual surge data collected in Antigua &amp; Barbuda and Dominica</li> <li>● CDMP and NOAA hosted a Workshop on Hurricane Preparedness in Miami for national disaster coordinators and meteorological officials from 12 Caribbean countries, CMI and CDERA</li> </ul>		<p>Storm Hazard Mapping Workshop held in Antigua &amp; Barbuda Dec 1998, to present maps, discuss storm forecasting and use of hazard maps/ information in development and emergency mgmt planning</p>	

Outcome #4 Increased community awareness of disaster preparedness and mitigation measures

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 4 1</p> <p>Collaboration of private sector and NGOs to define and carry out appropriate preparedness and mitigation projects</p>	<p><b>Target</b> Mechanisms for effective public, private and NGO collaboration for disaster management will be established in two participating countries in the region, and will meet regularly to make plans, allocate resources</p> <p><b>Baseline</b> Several prior attempts have failed to develop a permanent mechanism in the D R based on participation of NGOs and the private sector</p>	<ul style="list-style-type: none"> <li>• <b>Dominican Republic</b> Dominican Committee of Disaster Mitigation (CDMD) legally recognized by Presidential Decree New NGO has high degree of private participation and counterpart investment, continues to conduct or facilitate training, promotion, public information activities with public, private and community organizations The CDMD is the only NGO invited to meetings of the National Emergency Commission</li> </ul> <p>17 community initiative projects were facilitated nationwide with CDMP funding, benefiting 5,598 families</p> <ul style="list-style-type: none"> <li>• <b>Haiti</b> Project office established, linkages established steering committee formed work plan developed Conducted general disaster assessment with Ministries of Envir , Interior, Haitian Red Cross and CRS Completed Jeremie vulnerability assessment to be used as basis for local action plans, drew up agreement with Plan Int 1 on joint activities for training, awareness &amp; education, soil conservation and technical assistance</li> </ul>	<p>ADMD continues to fund Community Initiatives</p> <p>Continue work to establish disaster committees in Jacmel Jeremie and Les Cayes, Haiti</p> <p>Complete vulnerability analysis, Jeremie Haiti [carried forward to Feb 1999]</p> <p>CDERA to complete lessons learned study of D R , Haiti experiences with community dis preparedness activities</p>	<p><b>D R</b> 3 community initiative projects underway (1 with CDMP \$, 2 with \$ from DIPECHO) Also undertaking repair/reconstruction of 2 projects damaged in Hurricane Georges</p> <p>ADMD facilitated delivery of 4000 WFP food rations to 26 communities after Hurricane Georges</p> <p>Held 3-day Emerg Mgmt Coord Workshop March 1999 with 30 participants from 25 govt agencies, private institutions</p> <p><b>Haiti</b> Draft vuln analysis presented to more than 80 workshop participants, Jeremie</p> <p>Guidelines drafted for starting selecting community initiatives</p> <p>CDERA organized Jan 1999 Regional Workshop on Community Disaster Preparedness, project managers in D R and Haiti presented lessons learned</p>	<p>CDMP has responded to a request to assist the Technical Planning Secretariat (STP) of the Presidency in defining an institutional and operational framework for effective disaster management in the D R</p> <p>UMCOR, CRS, Transcomar Inc , PADF contributed to CDMP for post-disaster community rehab in Jacmel and Les Cayes</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<p>Outcome Ind 4 2</p> <p>Increased community participation in preparedness exercises/mock drills</p>		<ul style="list-style-type: none"> <li>● From Oct 1995 through Dec 1998, CDMD co-financed 602 Community Disaster Preparedness Workshops, reaching as many as 18,060 people in the D R</li> <li>● As of 12/96, 8 hurricane simulations were conducted in the D R for over 293 representatives of major hotels free enterprise zones, insurance brokers, businesses and communities</li> <li>● With CMGD/Les Cayes, CDMP-Haiti held Disaster Response Training Exercise Sept 4-6 for more than 50 participants</li> </ul>	<p>Continue D R training activities with private companies, communities</p> <p>Target at least 10 community prep workshops per month</p>	<p>D R 44 Community Dis Preparedness Workshops held in high-risk communities for 870 people</p> <p>Made 11 presentations to businesses, schools communities (to 647 people) and held several public awareness &amp; networking meetings with govt and NGOs Also gave 4 presentations to 395 students in --- schools and provided 2 facilitator training sessions for 90 teachers</p> <p>Completed survey of communities to assess impact of the Community Disaster Prep Workshops</p>	<p>D R survey showed most community initiative projects significantly reduced impact of flooding due to unusually heavy rains and Hurricane Georges</p> <p>Plan International will support ADMD disaster preparedness activities in 125 communities this year</p> <p>Firefighters in Cap Haitien say the TFI training was valuable in Hurricane Georges</p>

PERFORMANCE INDICATORS	TARGET	CUMULATIVE EFFECT PRIOR TO THIS PERIOD	CURRENT PERIOD		OVERALL ASSESSMENT
			TARGET	ACTUAL	
<b>Outcome #5 Improved ability of public sector and private property insurers to link premium structure to risk</b>					
<p>Outcome Ind 5 1</p> <p>Companies incorporate specific hazard mapping data and expected building performance criteria in insurance underwriting practices</p>	<p>Target At least 5 companies take initiatives in this area</p>	<ul style="list-style-type: none"> <li>● CMI made presentation at Workshop on the Need of Met &amp; Hydro Data for the Insurance Industry</li> <li>● CDMP/World Bank paper on catastrophe protection submitted to CARICOM Working Party on Insurance &amp; Reinsurance for inclusion in their study World Bank is supporting a study on risk pooling as a result of this work</li> <li>● ICWI is using flood and storm surge maps to identify areas where insurance coverage will not be available or will be more costly</li> <li>● United Insurance Co of Barbados has launched a program of reduced premiums for structures incorporating mitigation, and expanded the program to St Lucia and Antigua To date, fewer than 75 policies have been written under the program</li> <li>● CDMP collaborated with the Bahamas General Insurance Assn in a seminar for approx 100 people, addressing the links between building practices, hazard damages and insurance premiums</li> </ul>			<p>United Insurance Co initiative is the first in the region They have developed and distributed manuals on hurricane resistance construction and retrofitting</p> <p>CDMP will assist UNI to review program and recommend improvements to generate more widespread interest</p>
<b>Outcome #6 Incorporation of mitigation information in post-disaster reconstruction and recovery planning</b>					
<p>Outcome Ind 6 1</p> <p>Post-disaster field missions include mitigation specialists on teams</p>	<p>Target Mitigation specialists will be included on at least 50% of the field missions undertaken in response to natural disasters in the region during the project period</p>	<ul style="list-style-type: none"> <li>● USAID/OAS CDMP Post-Disaster Mission team, comprised of a US Forest Service landslide specialist and a geotechnical engineering consultant, was dispatched to St Lucia in 1994 following Tropical Storm Debby</li> </ul>		<p>Consultant's report on Layou River landslide dam response submitted to Govt of Dominica</p>	<p>See Program Result #3 for impact</p>

Figure 1. OFDA's Results Framework

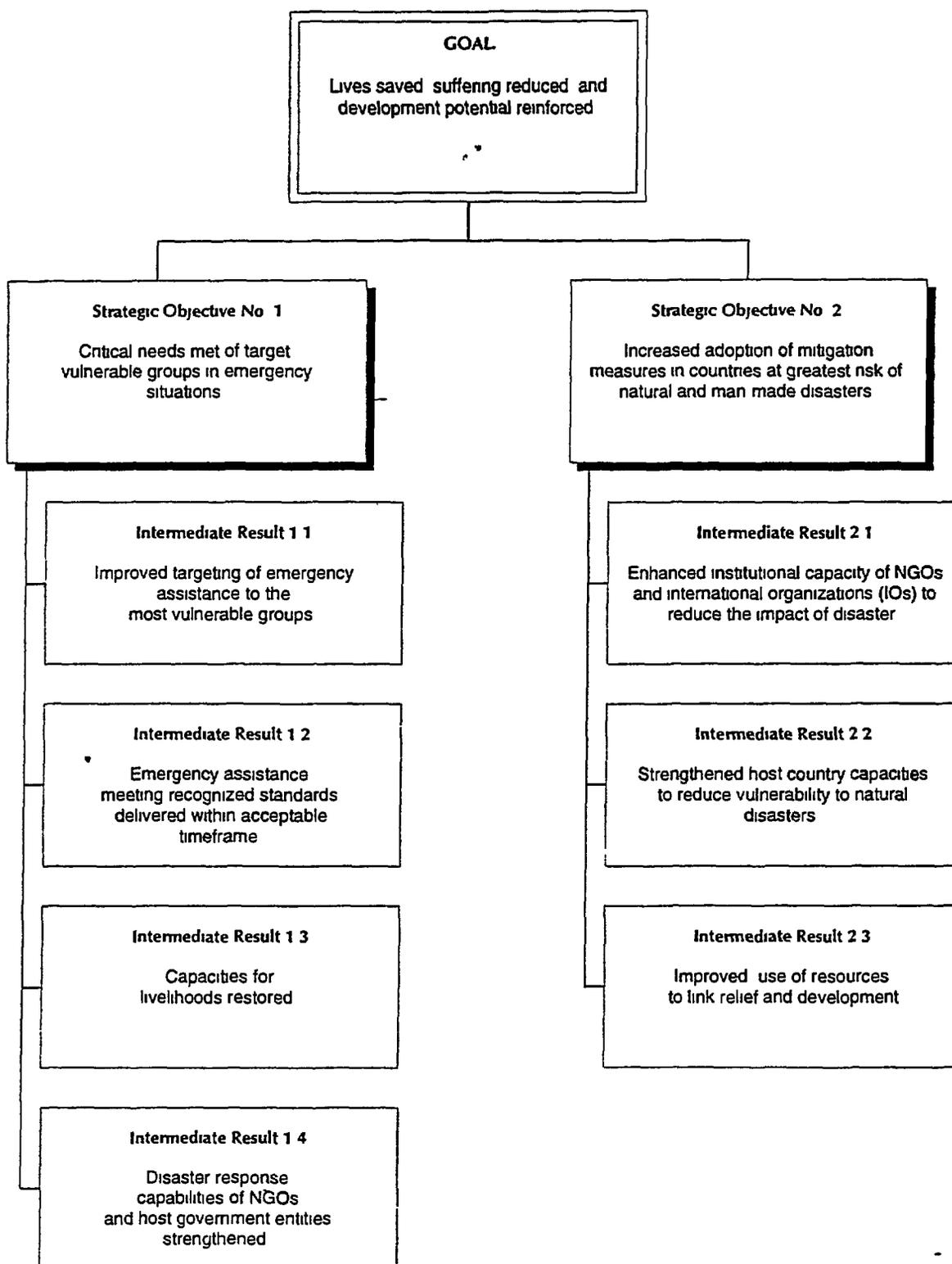


Figure 2 OFDA's Results Framework

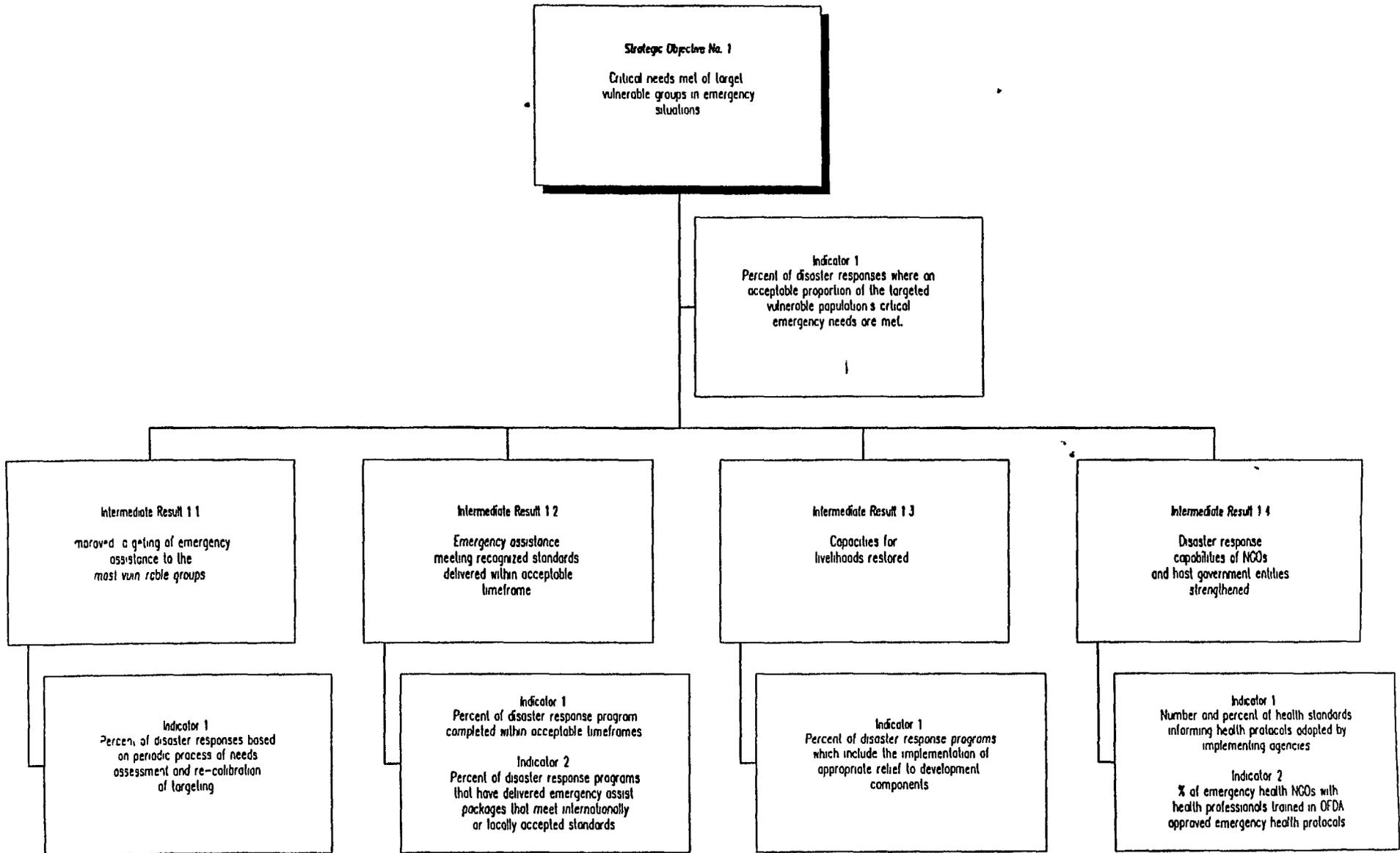
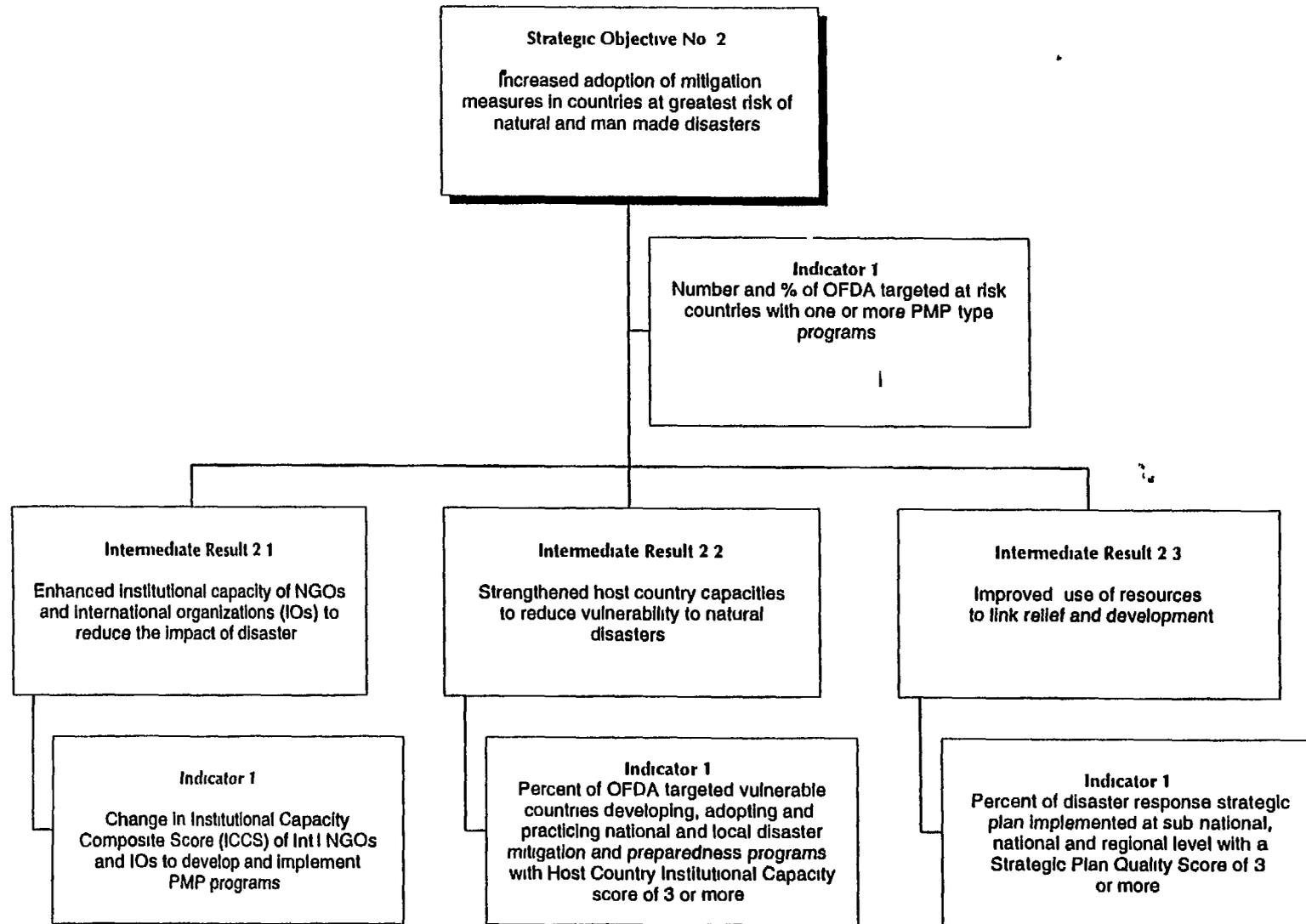


Figure 3. OFDA's Results Framework



**Table 1 SO 1 Performance Indicators**

Statement of Result	Indicators of Progress Toward Achievement of Result
<p><b>Strategic Objective No 1</b></p> <p>Critical needs met of target vulnerable groups in emergency situations</p>	<p>1 Percent of disaster responses where an acceptable proportion of the targeted vulnerable population's critical emergency needs are met</p>
<p><b>Intermediate Result No. 1.1</b></p> <p>Improved targeting of emergency assistance to the most vulnerable groups</p>	<p>1 Percent of disaster responses based on periodic process of needs assessment and re-calibration of targeting</p>
<p><b>Intermediate Result No. 1.2</b></p> <p>Emergency assistance meeting recognized standards delivered to targeted disaster victims within acceptable timeframe</p>	<p>1 Percent of disaster response programs completed within acceptable timeframes</p> <p>2 Percent of disaster response programs that have delivered emergency assistance packages that meet internationally or locally accepted standards</p>
<p><b>Intermediate Result No 1.3</b></p> <p>Capacities for livelihoods restored</p>	<p>1 Percent of disaster response programs which include the implementation of appropriate relief to development components</p>
<p><b>Intermediate Result No. 1 4</b></p> <p>Disaster response capabilities of NGOs and International Organizations (IOs) strengthened specially in emergency health</p>	<p>1 Number and percent of health standards informing health protocols adopted by implementing agencies</p> <p>2 Percent of emergency health NGOs with health professionals trained in OFDA-approved emergency health protocols</p>

**Table 2. SO 2 Performance Indicators**

Statement of Result	Indicators of Progress Toward Achievement of Result
<p><b>Strategic Objective No. 2</b></p> <p>Increased adoption of mitigation measures in countries at greater risk of natural and man-made disasters</p>	<p>1 Number and % of OFDA-targeted at-risk countries with one or more PMP-type programs</p>
<p><b>Intermediate Result No. 2.1</b></p> <p>Enhanced institutional capacity of NGOs and international organizations to reduce the impact of disaster</p>	<p>1 Change in Institutional Capacity Composite Score (ICCS) of Int'l NGOs and IOs to develop and implement PMP programs</p>
<p><b>Intermediate Result No. 2.2</b></p> <p>Strengthened host country capacities to reduce vulnerability to natural disasters</p>	<p>1 Percent of OFDA -targeted vulnerable developing, adopting and practicing national and local disaster mitigation and preparedness programs with Host Country Institutional Capacity (HCIC) score of 3 or more</p>
<p><b>Intermediate Result No. 2.3</b></p> <p>Improved use of resources to link relief and development</p>	<p>1 Percent of disasters response strategic plans implemented at sub-national, national and regional level with a Strategic Plan Quality Score (SPQS) of 3 or more</p>

### Specific Questions

Section 5 of the evaluation scope of work posed a number of specific questions concerning several of the streams of activities. These questions are answered briefly below. Most of these issues are more fully discussed in the activity streams and country sections of the report.

#### 5.1 Caribbean Development Bank

Does the CDB project staff show an appreciation for the issues of hazard mitigation? Yes

What steps have been taken by the bank since exposure to the CDMP training? As discussed in section 3.8 above, the Bank has put in place a new policy on disaster management which includes a prominent role for disaster mitigation issues. The new policy is already being acted upon.

Has the CDB Environmental Guidelines been revised to include considerations for natural hazard assessments? Although the guidelines have not been officially revised as yet, in practice this is being carried out.

Is the newly developed CDB Disaster Management Policy being implemented? Yes

Does it adequately assess disaster mitigation issues? Yes

What are some of the challenges faced by this agency when implementing this policy? The major challenges relate to staffing and financial resources. The CDB is currently limited in its implementation of the new policy due to a lack of professional staff.

Does this agency see itself as having an important role to play in loss reduction from natural hazards? Yes

Have CDB investments been destroyed or damaged by natural hazard events in the past? Not in the recent past. Is the present policy addressing the mitigation of future losses and hence protecting the productivity of the bank's capital? Yes

#### 5.2 Building Codes and Standards

Are the Antigua Building Code and the Commonwealth of Dominica Building Code which was developed by the CDMP in collaboration with UNCHS in use in any of

these countries? Yes, in Antigua and Barbuda. It is unlikely that the Dominica Code will be adopted by September 1999.

What are the factors working against this type of intervention in the Caribbean? There are a number of considerations. The political will to establish stiff building requirements is often difficult to maintain. The wherewithal to adequately enforce building codes is also an impediment in their establishment. Finally, the need to instill a comprehensive appreciation of the reasons for such a code and to begin to change the building culture requires long-term training arrangements.

Has the change in focus of the low income retrofitting activity to target home improvement candidates resulted in any significant increase in the participation in this program? Yes.

Did this reduce the level of participation by lower income persons in favor of more middle income participants? In theory, it is likely the level of income of participants did rise. However, the houses that the team saw in its visits in St. Lucia were very modest. They were not middle income houses. Furthermore, the team understood that demand was very limited, whether from low income or higher income households, when the program was directed toward lower income households with very small loans. Hence the point is somewhat moot.

Is this intervention in its present form capable of reaching the poorest of the poor? No.

Is there any estimate of how many observers of the retrofitting have copied the techniques in their own home? There is no estimate. However, the team was told anecdotally that this has happened.

What impact, if any, have training institutions made in this area? Very little to date.

How successful was the United Insurance Company in Barbados, St. Lucia and Antigua in attracting clients to the safe hurricane resistant housing program? Not very successful. How many persons actually participated in and received premium reductions? United estimated approximately 50 persons.

Are more insurance companies likely to follow this trend in the Caribbean? Yes, but very slowly unless there is a change in the basic economics of the region. In May, the Atlantic Insurance Company of Belize instituted a similar, albeit less ambitious, program. United Insurance is also providing its materials to two other companies in Antigua which have agreed to start similar programs.

What role has training institutions played in this area? Very little, to date

5.3 Natural Hazard Information

Has the CDMP contributed to an improvement of the natural hazard awareness in the region? There has definitely been an increased awareness of natural hazards in the region, and both the disaster agencies as well as the planning agencies recognize the need for the use of such information

Is there a general understanding among beneficiaries of how the information can be used in mitigation? In Barbados and Grenada, some of this information has informed development projects. In Barbados, inter-sectoral committees examined flooding problems in several areas to develop mitigation measures. The disaster agency, the planning agency and the Public Works Department formed these committees

Is there an institutional structure or policies existing or presently being developed within the target countries that would allow for adoption and easy use of this information? The development of mitigation policies in Jamaica and St. Lucia will allow for the use of hazard information in these countries. In Jamaica a committee has been set up to determine how the information from the Kingston multi hazard project is to be used. This may be the first step in the development of systems for the use of hazard information

If countries in the Caribbean require a consultant to conduct the storm surge hazard assessment utilizing the TAOS model, can this person be found in the Caribbean or in a Caribbean institution like the CIMH or NRCA in Jamaica? Yes, consultants can be found to use the model

Does the capability lie with the CIMH to provide this service or to conduct the real time application of this model? The capability rests in the CIMH to provide real time applications of the model

Are procedures or systems in place for this agency to alert countries of potential surge levels for approaching storms? If not, is this something being considered for the near future? Is this the appropriate institution to take the lead in providing this service to the Caribbean? CIMH has the capability to provide information about storms, and proposes to provide information when necessary. However, it is not yet clear that systems are in place to ensure this. CIMH appears to be an appropriate institution for the countries of the Eastern Caribbean to collaborate with in upgrading their meteorological skills and departments. The World Bank project is taking the lead in upgrading of some country capabilities. It remains an important task, however, for CIMH to become a true partner in this process

Have the vulnerability studies conducted by the CDMP for CARILEC been utilized by any of its membership? If not, why not? It does not appear so CARILEC does not actively promote the use of the manual

Is the NRCA or the Land Information Council in Jamaica the appropriate institution for housing the products of the KMHA activity? Are these agencies likely and sufficiently positioned to institutionalize the use of these products? The NRCA is the most appropriate agency to house the products of the Kingston Multi Hazard Assessment, as this is the only agency with adequate GIS capability Further to this the Town Planning Dept and the NRSU are to be merged which makes for a tidy arrangement The Land Information Council does not have the resources to house the information

Who is responsible for updating these maps and for taking the lead in continuing the adoption process after the close of the project? The responsibility for updating the maps is not clear, this matter is now being addressed by a technical committee A project results conference workshop is being held in June 1999 to determine how these matters will be handled

Is there any evidence that the Town Planning Department in Jamaica is taking steps to integrate these maps into the development planning process? If not the Planning Department, are the appropriate agencies involved in the process? It is not clear that the Town Planning Department will have the resources to integrate these results in a timely manner, although it is expected that they will form a part of the Office's information capability

Was the Montego Bay Storm Surge Assessment a worthwhile exercise Has any use been made of these maps by the JIE or other entities? Yes, the Montego Bay Storm Surge Assessment was a worthwhile exercise as it has informed measures that will need to be taken by land use authorities and design engineers The involvement of the local authorities from the beginning of this exercise should be noted Apart from this, the skills for use of the model now reside in Jamaica The final conference on this exercise has provided the JIE with the opportunity to carry forward and present the model results and it is therefore expected that these results will now begin to be integrated into planning and construction activities in the area

Has the TAOS model been used by any of the beneficiaries or collaborating institutions for recent hurricanes in the region? Yes the model was used in Belize to inform evacuation procedures prior to Hurricane Mitch

#### 5.4 Curriculum Development

What progress has been made towards curriculum development at the tertiary level? Apart from UTECH in Jamaica and the Arthur Lewis Community College, there

was no evidence of any move to develop curricula for disaster related activities. The programs being developed by the two colleges are related to building practices. UWI is developing a short course at the undergraduate level, but the extent of integration into a degree program at this stage was unclear to the team.

Is there a need to develop curricula in areas other than what is presently being addressed? The evaluation did believe this to be an area that needs more development. However, the team also believes that outside pressure or even the promise of resources is unlikely to be very effective in making this an important part of curricula development at UWI, in the absence of strong internal demand from University leadership, which does not now appear to be present.

#### 5.5 Mitigation Planning

Have any countries in the region other than the two targeted for follow-on support developed mitigation plans and policies or have definite plans to do so since the workshop on Mitigation Planning in St. Lucia? No other countries have started policy plans. However, work is in progress in this area, as there is coordination between the planners and the disaster agencies. In some instances there is coordination with other agencies, such as Works departments. This was so in Barbados and in Grenada.

Is there evidence of any work in progress in this area? Are the planners and disaster managers doing any follow-up work on organizing these activities at the national level? Yes, both Jamaica and St. Lucia have draft plans. Hazard information was used to inform design of a major feeder road in the Grenada through the intervention of the disaster coordinator as a result of her sensitization at the mitigation and planning workshop.

Does either St. Lucia or Jamaica have at least a draft of a national mitigation policy? Is this part of a larger disaster management policy for the country? Both countries have draft plans which the team expects to be finalized later this year or by next year, following consultations.

#### 5.6 Community Preparedness

What is the general awareness at the community level of natural hazards and risk? Generally, awareness at the community level in many of the countries visited is very high. While there is a belief in some places that not much can be done, this attitude seems to be changing, especially in the places which have been able to organize at the local level.

Does knowledge of the origin and purpose of the mitigation structures exist among beneficiaries in the target communities? In the Dominican Republic, this knowledge is much more widespread than in Haiti.

Is there any evidence of a permanent disaster preparedness/and mitigation organization existing in the communities where the community disaster mitigation projects occurred? If yes, what was the role of these committees during the recent hurricane Georges disaster? Yes, there was such evidence in the DR. There was little evidence in Haiti. In the DR, these committees worked to evacuate persons at risk and to prepare the communities for the storm.

How is the maintenance of the mitigation structures handled? Who conducted repairs to the embankments and containment walls after hurricane George? In the DR, most construction activities withstood the force of the hurricane. In general, maintenance is conducted by the entire village which has supported the project. Did all or most of the structures survive the hurricane? Yes, only two of the structures were seriously damaged.

Did any of these community persons who were active in hurricane Georges and Hortense receive training from CDMD? Yes.

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