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**Evaluation of A.I.D.'s Office of Foreign Disaster Assistance's
Grant to the Organization of American States
in Support of its
Natural Hazards Mitigation Project**

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PREFACE

This evaluation was undertaken by Management Systems International, Inc. (MSI) for the Agency for International Development's (A.I.D.) Office of Foreign Disaster Assistance (OFDA) and the Organization of American States' Department of Regional Development and Environment (OAS/DRDE). Field work, interviews and review of documents and activities leading to this report were done during October and November 1991.

The MSI team particularly wishes to express its gratitude to OFDA's Barry Heyman, Paul Krumpe and Joanne Burke for their assistance and guidance, and to Stephen Bender and Jan Vermeiren of OAS/DRDE for time spent in thoroughly orientating the evaluation team. Finally we express our appreciation and gratitude to the dozens of individuals in Trinidad and Tobago, Jamaica, Costa Rica and Ecuador for the time, information and friendship given to the team in the course of this study.

We, of course, take full responsibility for any errors of interpretation or fact in this report - we are hopeful that few of these will remain as a result of the discussions that have been held among the grantor, grantee and the evaluation team. Finally, it is our hope that this report, however minor its effect may be, will contribute to solidifying and sustaining the important, seminal work of the OAS, OFDA and other international and national actors in the field of natural hazards mitigation.

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EXECUTIVE SUMMARY

A.I.D.'s Office of Foreign Disaster Assistance (OFDA) has for some time taken a leading role in developing better approaches to meeting the challenges associated with natural and man-made disasters. OFDA's sterling reputation for providing immediate relief and short-term rehabilitation after disasters has often overshadowed the Office's longer-term investments in supporting initiatives in disaster prevention and mitigation--the development, for example, of forecasting and early warning systems and the launching of major public awareness campaigns and other preparedness activities. Here we evaluate one such initiative: the OFDA-funded Natural Hazards Mitigation Project (NHP) of the Department of Regional Development and Environment of the Organization of American States (OAS/DRDE).

The NHP began in July 1983 as a relatively low-key "pilot" activity with an allocation of US\$95,000 and covering only a few countries in the years 1984 through 1986. In 1987 the NHP was extended through 1991 with further A.I.D. funding in a new grant agreement totalling "up to US\$1.1 million" and covered a wide range of Caribbean, Central and South American countries.

The focus of this evaluation is the 1987 grant, which was divided into two geographic components: "Natural Hazards Assessment for Reduction of Disaster Vulnerability in the Caribbean Basin;" and "Natural Hazard Information Management for Disaster Preparedness: Metropolitan Areas of the Latin America Pacific Region." The evaluation was conducted by two consultants--an institutional development specialist and a development economist--from Management Systems International (MSI) in the fall of 1991.

The basic methodology included archival research, interviews and site visits to ascertain the status of thirteen specific NHP activities in four countries: Trinidad and Tobago, Jamaica, Costa Rica and Ecuador. These sites were chosen as representative of the seventy-nine training and specific mitigation activities undertaken by the NHP through 1991.

The MSI evaluation confirmed that the OAS is a leader in providing technical assistance and training to avoid or reduce the impacts of natural disasters through interventions in the development planning and project formulation processes.

However, the evaluation team was unable to measure quantifiable impacts of the NHP as had been requested in OFDA's Scope of Work. This was due to the relatively short period of NHP activities in the countries included in this evaluation which precluded a rigorous analysis of their economic and financial benefits. Nevertheless, the team states confidently from its research that OFDA's support of the NHP has resulted in the continuing maturation of a project which has established an important base of experience and capability in the field of natural hazards management.

The evaluation demonstrated that the OAS might have done many things differently and, in some cases, considerably better over the past five or more years. For example, the NHP could have been subjected to an initial design effort to identify crucial linkages among project components and means of measuring (and reporting) progress and, hence, the optimal uses of the very limited funds available. Specific shortcomings were found in the financial and institutional follow up to a number of activities the evaluation team studied. Certainly the NHP would have benefitted from being subjected to an interim evaluation some years ago.

These shortcomings notwithstanding, MSI's study of the strengths and weaknesses of a sample of the NHP's overall portfolio of activities showed mainly a record of quiet accomplishment, characterized by many interviewed within and outside of the OAS as "an astonishing record" given the paucity of funds (US\$1,097,000) available over the years and the small staff (4 individuals) devoted full-time to the project. Major accomplishments include:

- a recently published primer on natural hazards management which, among a plethora of other materials developed under the NHP, is seen as the definitive statement on the subject, useful for training, self-study, and reference purposes;
- the sponsorship of 26 training sessions for over 320 individuals covering such topics as information systems and other specific issues of mitigation planning;
- pioneering work in the field of sector-specific hazard vulnerability studies (e.g., tourism in Jamaica, electrical and hydrocarbon energy in Costa Rica, agriculture and livestock in Ecuador) which demonstrated to planners and decision makers, most for the first time, the nature of the complex relationships among components of a given sector;
- the installation in thirteen countries of emergency information systems (EIS) and/or geographical information systems (GIS), comprehensive geo-referenced databases relating natural hazards to natural resources, infrastructure, and population statistics;
- the creation, mainly in the Caribbean, of numerous landslide hazard assessments which deal with the less dramatic but perhaps most important overall disaster with a adverse effect on communications, transportation and commercial and residential property and, increasingly, lives, as people build ever more frequently on terrain at risk; and
- the wide distribution, through papers and presentations to major actors able to take mitigation actions, of the state of the art and lessons learned in the

mitigation field. In this regard, major donors--the Inter-American Development Bank and the International Bank for Reconstruction and Development--now have policy statements for natural disasters said to have been influenced in part by the NHP.

These are but examples of effects of the program--training and consciousness raising and demonstration of practical applications. Such effects can not be quantified in the short-term. Insufficient time has passed to be able to indicate with certainty that the NHP has actually reduced or avoided impacts of disasters. No five-year activity is likely to have accomplished that with the limited resources involved in OFDA's grant to the OAS. Nevertheless, it is the evaluations team's belief that the NHP is quite certain to have a long-term impact on the development community.

Recommendations:

As OFDA and the OAS consider further work in natural hazards mitigation, MSI hopes that the recommendations, summarized below, will strengthen subsequent efforts.

To the Organization of American States, Department of Regional Development and Environment:

1. The NHP should remain a point of emphasis of OAS/DRDE.
2. Future OAS/DRDE activities should be undertaken against more rigorous standards of performance, and more regular reviews and evaluation.
3. Sector-specific hazard vulnerability assessments should be the major focus of future programming. These appear to facilitate the concentrated attention of national government, bilateral donor and multilateral lending agency technicians and decision-makers, and may be the best means of insuring the enactment of mitigation measures. However, regular and coherent follow-up to such specific activities appears to be crucial to the success of such studies.
4. Activities such as the installation of EIS and GIS systems and the sponsorship of expensive, generalized hazard management training unrelated to specific activities should be deemphasized. The effectiveness of such systems and training appears greatly enhanced by having them relevant directly to specific investment projects or sectors. If the OAS is to continue to influence generalized training--as it is well equipped to do--this should probably be done in league with other donors, including A.I.D..

To the Agency for International Development's Office of Foreign Disaster Assistance:

- 1. Careful consideration should be given to continued funding of a further, well-designed OAS/DRDE NHP activity. Acceptance of the importance of natural hazards management is growing and progress to date in encouraging this should not be sacrificed.**
- 2. Measurable, tangible impacts for such activities should not be expected in the short-term. Preparations for this type of activity should include agreement on indicators and means of measurement over the long-term.**
- 3. The feasibility of Mission buy-ins to sector-specific hazard vulnerability assessments should be explored in future grant agreements.**
- 4. OFDA should consider using NHP training materials and experience as a key part of its inspired multi-year training scheme currently underway in Latin America. The scheme has reached a phase where overall hazards management and mitigation considerations will be given concentrated attention.**

EVALUATION METHODOLOGY

The OFDA-sponsored Natural Hazards Mitigation Project of the Department of Regional Development and Environment, Executive Secretariat for Economic and Social Affairs of the Organization of American States involved over 55 discrete activities in two dozen Latin American and Caribbean countries over a period of nearly eight years.

The Scope of Work for this evaluation is included as Appendix C. The evaluation was conducted by two consultants--an institutional development specialist and a development economist--from Management Systems International during the fall of 1991.

For the purposes of this evaluation the consultants reviewed as far as possible the record of OAS/DRDE's program over the past eight years through an extensive sampling of documents made available by OFDA and OAS/DRDE in Washington D.C. These included A.I.D.'s Grant Agreements with the OAS, and a wide range of materials and documents produced by OAS/DRDE such as the Natural Hazards Mitigation Primer and its accompanying synthesis of OAS experience with natural hazards, course outlines used in training on natural hazards for planners preparing development projects and during workshops of hazard mapping, sectoral studies, and quarterly reports to OFDA. To put the Natural Hazards Mitigation Project in context, the team also reviewed the case studies of other OFDA non-refugee activities undertaken during the same period as the OAS' hazard mitigation activities. A list of reference materials reviewed by the team is included as Appendix A.

Field work covering the status of the OAS' hazards project and results was undertaken in four sample countries: Trinidad and Tobago, Jamaica, Costa Rica and Ecuador. Briefing materials on the project's activities in each was provided the team by OAS/DRDE staff. Other country and activity-specific materials were also collected and analyzed as field work was done. Based on various key issues regarding the Natural Hazards Mitigation Project reflected in the evaluation's Scope of Work, the team prepared a series of questions to serve as guidance for the nearly 50 meetings with over 70 people held during the course of the evaluation.

The evaluation team spent six to seven working days in each country. Discussions were held with staff of USAID Missions (in the case of Trinidad and Tobago, with U.S. Embassy officials), and a range of individuals associated with disaster preparedness and prevention: physical and development planners and staff of other private and public sector entities involved in natural hazard mitigation efforts. (A list of individuals and institutions contacted is included as Appendix B.) In each country MSI consultants spent one or more days traveling in areas particularly at risk from natural hazards.

The team also received guidance from OFDA regarding the conduct of evaluations and reviewed A.I.D.'s Evaluation Handbook, incorporating appropriate portions into the methodology ultimately applied in the four sample countries.

Finally, it should be noted that the Scope of Work for the evaluation explicitly specified that the team attempt to measure tangible impacts of the A.I.D grant in each of the sample countries. However, the relatively short period of time that project activities have been ongoing precludes a rigorous analysis of the economic and financial benefits accruing to targeted countries. Nevertheless, the team is confident that a definite sense of the results and impact of the project was gleaned during this evaluation, and this is reflected in the following report.

ACRONYMS

AID	U.S. Agency for International Development
OFDA	AID Office of Foreign Disaster Assistance
OAS	Organization of American States
DRDE	OAS Department of Regional Development and Environment
MSI	Management Systems International
NHP	Natural Hazards Project
NEMA	National Emergency Management Agency of Trinidad and Tobago
GOTT	Government of Trinidad and Tobago
MPM	Trinidad and Tobago Ministry of Planning and Mobilization
TCPD	Town and Country Planning Department of the Ministry of Planning and Mobilization
SLOSH	Sea, Lake and Overland Surges from Hurricanes
UWI	University of the West Indies
USAID	AID Mission to Jamaica, Costa Rica or Ecuador
ODP	Office of Disaster Preparedness of Jamaica
PCDPPP	Pan Caribbean Disaster Preparedness and Prevention Project
GOJ	Government of Jamaica
GDP	Gross Domestic Product
TAP	Tourism Action Plan, Ltd.
IDB	Inter-American Development Bank
UNDP	United Nations Development Programme
EIS	Emergency Information System
GIS	Geographic Information System
GOCCR	Government of Costa Rica
CNE	Costa Rican National Emergency Commission
DSE	Costa Rican Sectoral Energy Directorate of the Ministry of Natural Resources, Energy and Mines
MIRENEM	Costa Rican Ministry of Natural Resources, Energy and Mines
PSP	Plan de Ordenamiento y Manejo de las Cuencas de los Rios San Miguel y Putumayo
SEVyD	Comision del Sector Energia, Vulnerabilidad y Desastres Naturales
RECOPE	Costa Rican Petroleum Refining Company
GOE	Government of Ecuador
MAG	Ecuador Ministry of Agriculture and Livestock
MAG/PRONAREG	Ministry of Agriculture and Livestock's Agrarian Regionalization Program

**IBRD
GTZ**

**International Bank for Reconstruction and Development
Deutsche Gesellschaft fuer Technische Zusammenarbeit, GmbH**

1.0 INTRODUCTION

1.1 OFDA Experience in Hazard Mitigation

A.I.D.'s Office of Foreign Disaster Assistance has long played a leading role in developing more refined approaches to solving problems created by natural and man-made disasters. OFDA's emphasis during the mid-1970s on the stockpiling of supplies and the development of operational plans has been supplemented by more sophisticated efforts to develop forecasting and early warning systems and to launch public awareness campaigns and other preparedness activities. Among these have been the sponsorship of activities aimed at disaster mitigation, an approach to the problem of disasters somewhat removed from the day-to-day exigencies of responding to disasters.

Mitigation involves managing natural hazards to reduce their impact by focusing on actions that lessen vulnerability. Mitigation actions lessen the impact of disasters on the lives and livelihoods of people and on economic assets by such things as calibrating construction techniques, regulating land use, carefully siting important facilities and infrastructure, cultivating crops resistant to seasonal abnormalities, and other actions. Many of these can be integrated at little additional cost into ongoing development planning and implementation. Like environmental analysis, mitigation analysis is common sense. As investments are made in the developing world the application of standards of this nature can have a tremendous impact on poorer governments and their predominantly lower income citizens, who usually bear the greatest losses when disasters strike because their vulnerability is the greatest.

OFDA recently underwent a reorganization, a move particularly motivated by a desire to place greater emphasis on disaster prevention, preparedness and mitigation in order to more closely link OFDA's activities with those of the rest of A.I.D. and other development institutions, and to establish clearer and enhanced relationships between development in disaster-prone areas of the world. OFDA's partnership with the OAS/DRDE in the implementation of the Natural Hazards Mitigation Project, described below, has been one of its activities most directly involving and exploring just such linkages.

1.2 The Organization of American State's Natural Hazard Mitigation Project

1.2.1 Project Background

The countries of Latin America and the Caribbean are prone to frequent recurrences of droughts, earthquakes, floods, hurricanes, landslides, storm surge, tsunami, and volcanic eruptions. Hurricanes are the most devastating natural hazard in the Caribbean region, earthquakes in the Mexico-Central America region. Droughts, earthquakes, floods, and volcanic eruptions are all tremendously destructive in South America.

The United Nations Economic Commission for Latin America and the Caribbean estimates that the damage caused by these devastating regional events in an average year includes

economic losses in excess of US\$1.8 billion, the loss of over 5,600 lives, and more than 3 million people adversely effected. Without a doubt, damage of this magnitude adversely affects the living conditions of the populations of these countries and constrains ongoing efforts to achieve sustainable economic growth. To some extent, the destruction wrought by these natural phenomena can be attributable to human activities which largely disregard the gravity and frequency of these events. To the extent that man's activities can be modified, whereas these natural events cannot, damage can, presumably, be avoided or lessened.

Cognizant of the real possibility of mitigating the results of the forces of nature, the Organization of American States devised a package of actions to assess the risk posed by natural hazards and to modify development activities to avoid or minimize danger from potential natural disasters.

1.2.2 Project Description

In 1983, in response to what the OAS described as..."an increasing number of requests from member states for information about natural hazards management," the OAS's Office of Regional Development approached the Agency for International Development's Office of Foreign Disaster Assistance for support of a program to deal with mitigation activities. The project began in July 1983 as a relatively low-key "pilot" activity with an initial allocation of US\$95,000. Initially, natural hazard project activities were undertaken in only a few countries: Honduras, Paraguay and Saint Lucia during 1984, and the Dominican Republic, Haiti, Saint Kitts and Nevis and Venezuela during 1985-86.

In 1987 the national hazards mitigation project, with further A.I.D. funding in a new grant agreement totalling "up to US\$1.1 million," was extended until the early 1990s and expanded greatly. OFDA's August 1987 grant was to partially support the initiation of a project consisting of two parallel activities to provide OAS member states with information regarding natural hazards management. The project was divided into two geographic activities: the first designated "Natural Hazards Assessment for Reduction of Disaster Vulnerability in the Caribbean Basin," and the second as "Natural Hazard Information Management for Disaster Preparedness: Metropolitan Areas of the Latin America Pacific Region." For the purpose of this evaluation, these activities will be collectively designated as the "Natural Hazards Project" (NHP). The field investigation portion of this evaluation covered exclusively activities undertaken since 1987.

The NHP is administered by the OAS' Department of Regional Development and Environment (OSA/DRDE). Four full-time staff at the OAS' Washington Headquarters have provided primary day-to-day guidance and oversight of the NHP and a major portion of the technical assistance rendered to OAS member states. Since 1987, this small full-time staff has been supplemented by thirty-nine consultants contracted to serve either at OAS headquarters or in the field. (See Appendix E., "Summary Table of Consultancy Inputs," for details.)

By 1991 the NHP had included training and specific mitigation activities in 25 OAS member-states throughout Central and South America and the Caribbean. A review of OAS

records indicates that during the 1983-91 period, the OAS/DRDE completed over 55 distinct country-specific activities in eleven Caribbean countries, four Central American nations and seven countries in South America. Records show training included individuals from 25 countries. (See Appendix D for a list of all activities undertaken by the NHP project.)

During the 1987-91 interval, the focal period of this evaluation, there have been four grant amendments obligating incremental funding and an extension of the period of performance. As of end-September 1991, OFDA had provided OAS/DRDE with grant funding totalling US\$1,097,400. Expenditures during the 1987-91 period can be disaggregated as follows:

	US \$768,632
Staff} Salaries and Benefits Travel and Per Diem	
Consultants	221,549
Non-Staff Travel	36,207
Equipment and Training	40,391
Supplies	30,621
TOTAL	US \$1,097,400

This funding level made possible technical assistance and training with the expressed goal of avoiding or reducing the negative impacts of natural disasters through interventions in the development planning and project formulation processes. This was to be accomplished through a multi-stage process:

- first, through the evaluation of the location, severity and probable occurrence of natural hazards in a particular region;
- second, through an estimation of the degree of loss or damage to existing or planned economic assets that could result from a natural hazard of particular levels of severity;
- third, through the estimation of the probability of expected loss for a given natural hazard; and
- fourth, the incorporation of natural hazard considerations early in the process of integrated development planning and investment project formulation.

The focus of this project is the mitigation of life- threatening and development-retarding natural phenomena while at the same time strengthening the capabilities of development planners through the transfer of hazard assessment and risk reduction and prevention skills.

The grant funding provided by OFDA has resulted in the continuing maturation of a project which has established an important base of experience and capability in the field of natural hazards management.

Specific outputs of the project were largely in the following categories:

- design and implementation of various region-wide and country-specific training courses focusing on the application of natural hazard analyses to development planning;
- participation by public sector administrators and planners in a wide range of conferences, workshops and seminars;
- conduct of landslide and other natural hazard assessments and the production of hazard maps for the purpose of integrating this information into infrastructure expansion and other physical development of selected countries;
- installation in selected countries of an emergency information systems (EIS), geo-referenced databases inventorying resources required in planning for, and responding to, disasters;
- installation in selected countries of a geographical information system (GIS), a system for analyzing cartographic characteristics which relate natural hazards to natural resources, infrastructure, and population statistics;
- development of a definitive technical approach to manage natural hazards to reduce economic losses and the distribution of technical manuals to planning technicians and decision-makers;
- the conduct of sector-specific vulnerability assessments and loss reduction strategies for the agriculture and energy sectors in selected countries; and
- preparation of disaster reduction project proposals for financing by regional development banks.

2.0 SALIENT PROJECT ISSUES

The evaluation team's review of thirteen specific NHP activities (Section 3 below), its field interviews with those directly and indirectly associated with NHP activities, its review of documentation and its interviews with Washington-based individuals regarding the overall impact of the program gave a fairly broad picture of the considerable accomplishments of the project. Naturally, such a study also highlighted discrepancies or shortfalls in the program.

The following sections will first cover project accomplishments and impact in the period 1987 through 1991. This will be followed by a discussion of several key planning and management questions which affected implementation.

2.1 Project Objectives and Accomplishments

2.1.1 Natural Hazard Project Design, Planning and Replanning

The NHP as planned and mutually agreed upon by the OAS/DRDE and OFDA had but a few guidelines and little that specified in detail what the project was to accomplish. The NHP was not designed using A.I.D.'s standard logical framework or an equivalent device that would serve to state hierarchical objectives, means of measuring progress toward these at various levels, assumptions made at each level, etc..

OAS/DRDE's proposals and the subsequent A.I.D. grant agreement of August 1987 for the OAS' two part Natural Hazard Mitigation Project--the Caribbean Basin component and the Metropolitan Areas of the Latin America Pacific region component--provided the following information:

The "*Natural Hazards Assessment for Reduction of Disaster Vulnerability in the Caribbean Basin*" activity was "to complement and build upon proposed as well as recently completed disaster preparedness training activities undertaken with national and local disaster preparedness and planning officials." Inputs were cited only generally, and "Specific Program Activities" were listed as the following:

- 1) Engage in disaster related activities in the first year in Dominica and Saint Lucia to include: "(a) assistance in settlement and lifeline hazard assessment and mitigation measure definition, and (b) technical assistance in establishing a natural hazards and emergency lifeline information system;" and
- 2) Expand the program to additional countries in the Caribbean, depending on the experience gained per item 1 above.

Six activities that the NHP should focus on in the Caribbean were then listed: activities such as preparation of natural hazard assessment maps and reports; identification of mitigation

measures; and provision of technical assistance in preparing manuals and presentations for national and local workshops.

The "*Natural Hazard Information Management for Disaster Preparedness: Metropolitan Areas of Latin America Pacific Region*" activity was "to provide technical assistance to disaster preparedness and sectoral infrastructure agencies...to gather, store, analyze and retrieve mapped natural hazard information to assist in identification of vulnerable portions of lifeline networks and population centers for disaster response and emergency relief actions."

"Specific Program Actions" in the Latin American region were specified as the following:

- the placing in operation of computer based geographical information systems;
- identification of lifeline elements and populations most at risk;
- defining basic mitigation measures;
- identifying linkages between mitigation measures and disaster planning through development planning;
- creation of a Pacific Region GIS including an index of available metropolitan area hazard, risk and vulnerability information; and
- prioritizing metropolitan areas in the region for further technical assistance.

A. Findings

The OAS/DRDE has been involved in natural resource management since 1962. Through the years this involvement consisted largely of formulating development strategies and preparing multisector projects at the prefeasibility level. Disasters often impacted on this work. When OAS/DRDE approached OFDA regarding funding for its activities, its main intention in terms of reducing disaster vulnerability was to do so in the context of its normal role in integrated development planning.

Consideration of natural hazards first became a concerted part of that general function in 1983 when OFDA had certain surplus funds at the end of its fiscal year and provided US\$95,000 to the OAS to experiment with bringing mitigation more directly into the OAS/DRDE portfolio.

Perhaps due to a lack of a traditional project design, it appears that expectations concerning project outputs on the part of OFDA and OAS staff may have existed at the onset of

the program in 1983, and that these were not entirely cleared up in 1987 when the new grant was shaped, or for that matter throughout the implementation of the grant in subsequent years.

Neither the Caribbean or Latin American components spelled out in the initial 1987 grant agreement were ever changed; definitive guidelines for project implementation and reporting were not specified. Subsequent OFDA grant amendments, of which there were four, simply augmented funding or extended the grant but did not alter in any way the program's objectives or "specific program actions".

The role and utility of, for example, the Emergency Information Systems, six of which were installed under the NHP, and how these related to OAS/DRDE's major emphasis on mitigation was never discussed thoroughly. Meanwhile, Geographic Information Systems, more suited to OAS/DRDE's integrated planning role, were installed in seven countries. Some OFDA staff and many host country nationals with whom the evaluation team spoke questioned the GIS technology chosen. To the evaluation team's knowledge, however, the OAS, OFDA and other donors, and lending agencies such as the IBRD and IDB never met to thoroughly analyze the situation to determine how best to proceed.

Quarterly reports prepared for OFDA by the OAS/DRDE, by the terms of the grant agreement, were supposed to describe "current activities, management issues and program recommendations." In practice these remained consistent throughout the life of project, apparently unchallenged by OFDA, and consisted mainly of a recitation of activities underway and those planned. The format of these reports is hard to follow and aggregate numbers of, for example, individuals trained, EIS installations or sector studies undertaken were never presented. Although data and other information regarding Caribbean activities were more carefully presented than those for Latin America, "management issues" *per se* were not covered in these reports.

Financial information as a reflection of activities was likewise presented in an ungainly manner during much of the grant period. Over a two year period, five items from the NHP's financial records were presented verbatim as follows:

1. Staff and support b,c/
2. Staff travel d/
3. Consultants c/
4. Computer equipment and training
5. Documents, materials, etc.

The distinction between the sums associated with item 2. "Staff travel" and footnote c/ after item 1. "Staff and support," for example, is not readily apparent. OFDA appears not to have

-
- b. Includes fringe benefits
 - c. Includes travel and per diem
 - d. Includes travel costs for professionals provided by other institutions

questioned these financial reports. By the latter part of 1991, however, OAS/DRDE's financial reporting format had become more precise.

Though the grant agreement indicated that "A.I.D. and OAS/DRDE will undertake periodic joint evaluations of the program" none were undertaken until the present end-of-project evaluation.

Nor did OAS/DRDE, busy with its small staff, undertake anything other than *ad hoc* or informal and flexible reviews of project status. NHP staff generally followed a pragmatic approach to developing and implementing activities. This consisted of "seeding" project ideas and/or responding to requests from OAS member countries, and then cobbling together implementation arrangements in the most practical manner possible. In order to amplify its portfolio, NHP staff cast widely in the first year of the new grant and responded to requests from 13 countries in 1987, worked in six in 1988, eight in 1989, nine in 1990 and five in 1991.

NHP strategic planning was similarly pragmatic. No grand strategy was put in writing. The reason apparently lies in the OAS/DRDE's general operating style (outside of the NHP and including it) which can be characterized as one of trying to respond equitably to member countries and to spread what is available as widely as possible. Longer term planning was also confounded because funds available were limited and, in any case, by no means assured over the long term as OFDA allocations for the NHP were delayed or under advisement. There was a "hand-to-mouth" aspect to the NHP; for example, the OAS was often able to provide employees only short-term contracts for work on the NHP as OFDA allocations remained uncertain.

Of course, a dearth of longer term plans also affect tactics. The evaluation team found that in the majority of NHP subprojects examined, some sort of logical follow up was necessary but had not been undertaken or, in many cases, ever planned. Many of these follow up actions did not require large sums but were such things as the provision of computer hardware, or funds for another training session. That this was the case suggests that had some greater focus, say, limiting 1988 actions to four or five countries, might have facilitated more consistent NHP involvement including the ability to take follow up action.

B. Conclusions

- The NHP was not subjected to a concentrated initial design effort which may have identified crucial linkages among inputs, outputs and the purpose of the project, means of measuring (and reporting) progress, and the optimal uses of the limited funds available to the program.
- The OAS/DRDE's general operating style, seemingly dictated by the fact that the OAS is a membership organization with DRDE attempting to seek mitigation opportunities and offer its services in

each country, apparently led the NHP to covering a great many countries rather than focussing more intensely on a selected few.

- OFDA did not actively encourage the development of a strategic plan or the discussion of program strategy with its grantee.

2.2 Management

The NHP was administered by a full time staff of four at the OAS Headquarters in Washington. This staff was responsible for coordinating all activities and itself provided a major share of technical assistance for country subprojects.

A. Findings

There are gaps in OAS/DRDE record-keeping concerning project status and trackable data and information. As mentioned earlier, OAS/DRDE staff did not report to its major donor with a clarity designed to highlight specific activities, numbers of people or countries involved in various categories of endeavor in any cumulative sense, or management issues or findings. And this was not for lack of activities worthy of reporting. As will be seen in the next section of this report, the accomplishments of the NHP were considerable and impressive.

The structure of relationships between and among OAS/DRDE Washington-based staff and OAS field staff was relatively informal. OAS field staff often did not, for example, have a long-term mandate to oversee NHP activities. Although contracted to undertake specific NHP activities in a certain time-frame, the degree to which such staff remained responsible for following NHP activity beyond that period was unclear. In some cases there was a serendipitous mix of mutual interests in NHP activities between OAS/DRDE/Washington and its field-based staff. The widely varied arrangements often meant, however, that representation of the NHP in a given country was often not carried out consistently or coherently.

Similarly, communication between and among persons working on NHP activities in various countries was limited to a series of two-way communications between headquarters and field. Reporting from the field regarding NHP activities followed no particular format and was often simply discretionary. No meetings of all OAS personnel involved with the NHP were held. The transmission of the plan and status of the overall NHP was a matter of personal communication between Washington and field staff, at the discretion of the former. It should be made clear, however, that great efforts were made by the small NHP staff to keep communication channels open and to coordinate activities.

Likewise, the OAS/DRDE staff made a point of working closely with A.I.D./Washington and USAID field staff. For reasons that were not clear to the evaluation team, however, relations

to the OAS/DRDE staff. OFDA field staff posted in Costa Rica, likewise, was familiar with the OAS program but had not routinely monitored NHP activities or accomplishments. (The OFDA field staff reported that it had only recently been asked to monitor the project.) USAID Mission staff often were only vaguely aware of NHP activities, and generally seemed to have the impression of these as marginal. Had there been a better atmosphere of confidence and fuller communication between and among OAS and A.I.D. staff at the various levels the considerable achievements of the NHP might have been even broader.

B. Conclusions

- Careful management of the relationship between OAS/DRDE and OFDA and other A.I.D. staff and an increased interagency and intraagency communication could have improved NHP efficiency by having it seen as less "marginal" by agency staff and given important encouragement locally even if the NHP was not seen as central to a given USAID Mission's program.
- More dynamic and coherent NHP record keeping and reporting to OFDA and USAID Missions--as well as other donors and national counterparts--along with more consistent representation by the OAS of the NHP would have likewise improved understanding of and support for NHP activities.

2.3 Project Accomplishments

As noted above, the NHP was not subjected to a design using the logical framework or equivalent methodology. The evaluation team devised a partial logical framework for the NHP which appears below with comments on findings concerning each level, beginning at the input level and continuing up to the goal level.

INPUTS: OFDA contribution for most staff and consultant salaries, funds for travel and equipment and supplies; OAS/DRDE contribution for staff salaries, and as in-kind contributions, some program expenses and office space and equipment, and occasional use of OAS staff in the field.

Comment: The funds available for the project totaled US\$1,097,400 during the March 1, 1987 through December 31, 1990 interval, a period of 3 years 9 months. The OAS contribution totaled US\$246,000, mostly in the form of in-kind contributions.

OUTPUTS:

Output 1: Develop training and technical manuals and design and implement training courses with the aim of incorporating natural hazard vulnerability analysis into integrated development planning and hazard mitigation strategies into project formulation.

Comments: The recently published "Primer on Natural Hazard Management in Integrated Regional Planning", a largely technical reference document directed at planners and development technicians, and DRDE's earlier publication "Disasters, Planning, and Development: Managing Natural Hazards to Reduce Loss", directed at policy-level personnel in the OAS' member states, international development banks, and technical cooperation agencies, are seen by all with whom the evaluation team met as the definitive publications on the subject. These manuals are up-to-date, comprehensive, well-written, and attractive, and useful for training, self-study and reference purposes. Information presented in these texts meets most of the requirements spelled out in the original grant agreement with A.I.D. concerning how to incorporate natural hazard management into planning, tools and techniques for doing so, and the character of specific hazards facing the region. These publications have brought together information and data never before put in such accessible form for both practitioners and technicians as well as policy makers. The text itself includes useful critical assessments of many elements of the OAS/DRDE NHP experience over the past eight years.

The reach of the above material will likely go well beyond Latin America and the Caribbean, as was the case with an excellent OAS paper about the program and how to incorporate mitigation considerations into project preparation published by the Committee of International Development Institutions on the Environment (CIDIE) based in Nairobi, Kenya.

During the grant period, the NHP sponsored 26 training sessions. Eight of these dealt with geographic information systems, six with emergency systems and the remaining twelve with other specific or general issues of mitigation

planning such as natural hazards management in investment projects, energy planning, and landslide mapping. Over 320 persons received training under the NHP.

A small sampling of trainees in various of these venues showed the courses to have been well organized and useful. A study of OAS records of selected sessions indicated appropriate post-study evaluations were being undertaken immediately after the sessions, and that some longer term follow up using questionnaires was initiated.

In most cases where follow-up training seemed essential to insure continuing coverage of the subject be assured for rapidly changing staffs, the NHP has been unable to comply due to a lack of funds. In some cases, for example in Colombia, students trained under the NHP have gone on to administer courses in their own countries.

Output 2: Conduct sector vulnerability studies to demonstrate the methodology and emphasize the need for sector level policy, programs and projects to diminish the economic impact of and human suffering from disasters.

Comments: The NHP has done some pioneering work in the field of sector-specific hazard vulnerability studies. The evaluation analyzed with some intensity four such studies: Tourism in Jamaica (awaiting funding); Energy (both electrical and hydrocarbons) in Costa Rica and two hazard vulnerability assessments in Ecuador, Energy (primarily hydrocarbons) and Agriculture and Livestock in Ecuador.

The sectoral vulnerability studies have allowed both planners and decision-makers, most likely for the first time, to 1) identify a country's most vulnerable sector(s) and 2) view the nature of the complex interrelationships between the numerous components of the sectors analyzed and the risk posed by various natural hazards.

Output 3: Install Geographical Information Systems (GIS) in selected countries. The system involved is a specific geo-referenced data base relating natural hazards to natural resources, infrastructure, and population information.

Comments: Seven installations were completed in Colombia, Costa Rica, Ecuador, Honduras, Nicaragua, Saint Lucia, and Uruguay. In Costa Rica and Ecuador, the evaluation team found that these systems were not being used to anything near full potential.

GIS is a relatively new technology which continues to evolve. OAS/DRDE went to great lengths to demonstrate the use and utility of the system

but unfortunately, these efforts were not always successful. Undoubtedly, the system the OAS/DRDE installed (or others like it) has tremendous future potential. The OAS/DRDE intentionally chose a relatively simple and inexpensive system for use in the NHP. Yet GIS systems, like almost everything in the software market, are evolving rapidly. The systems installed by the OAS/DRDE were used for immediate tasks at hand such as the completion of sector studies but did not seem to be enjoying general acceptance for everyday use by a range of government agencies. The technology may be appropriate but the requisite financial, institutional and political support has yet to coalesce.

Output 4: Install in six countries Emergency Information Systems (EIS), a particular geo-referenced database showing lifelines and resources to be used in planning for and responding to disasters.

Comments: Six systems were installed in Antigua, Costa Rica, Honduras, Jamaica, Saint Lucia, and Trinidad and Tobago. In Costa Rica and Trinidad and Tobago, the evaluation team found the systems to be in disuse for a variety of reasons. In Jamaica, where the initial NHP-installed EIS in the Office of Disaster Preparedness has been linked to 10 other systems by the UNDP, only a few of these systems are operational including that of ODP.

In a period of rapidly changing technology, newly-developed specialized systems are often experimental and are inherently in a state of transformation. Investment decisions based on initial enthusiasm with both hardware and software computer technology are risky because technologies develop so rapidly. Perhaps it is wiser to hold off installing systems that are quite likely to evolve quickly, unless the technology as it stands is sufficient for present needs, is absolutely necessary for an immediate task at hand and has political, institution and financial support.

EIS installations need such support to insure the systems are used. Political support has to be translated early into institutional measures that support the system by:

- 1) providing the financial resources to acquire the necessary hardware and software;
- 2) giving responsibility to appropriately trained staff for operating and managing the system;
- 3) adding additional staff if appropriate;
- 4) making budgetary provisions for covering the costs of data collection, hardware maintenance and software support fees, and other operating expenses; and

- 5) establishing the necessary intra- and inter-institutional cooperation mechanism(s) for data collection and retrieval.

In the four countries visited by the evaluation team, one or more of these key institutional elements were missing thus contributing to the underutilization, and in some cases, nonutilization of the system. The team found that in every case, governments allocated insufficient institutional and human resources to the tasks of hazard mitigation and emergency management. Ideally, the introduction of computer-based decision support systems such as the EIS should be seen as part of a strategy to empower existing agencies to deal with the growing complexity of disaster management. Future NHP activities in this area should strive to ensure that the operational and institutional pitfalls of the past do not interfere with this strategy.

Output 5: Create landslide hazard assessments and maps and attempt to integrate this information into the development plans of selected countries, particularly in the Caribbean.

Comments: Landslide hazard assessments were conducted in Dominica, Honduras, Saint Lucia, Saint Vincent, and Trinidad and Tobago; some OAS-inspired work is also underway in Jamaica.

The justification for concentrating on landslide hazards is the fact that landslides were perhaps the most neglected but yet most frequent natural hazards affecting many Caribbean nations. Although less dramatic than many other types of natural disasters, the cumulative effect of landslides in terms of disruption of communications, transportation and other infrastructure, and the loss of productive and residential/commercial property, was said to place an unnecessarily heavy burden on the islands' economy. Consequences are not limited to economic losses: lives are lost with increasing frequency as people increasingly build on terrain at risk.

On the island of Tobago, the evaluation team was told by public works officials that the NHP-inspired landslide mapping exercise was of such a general nature that it could do little to inform anyone planning anything specific. Although this particular pilot activity may not have utilized the optimal scale for the maps developed, landslide maps are, nevertheless, valuable planning tools.

Output 6: Promote awareness in conferences, workshops, seminars or other fora of disaster mitigation activities among development policy-makers and practitioners.

Comments: NHP staff did a superb job of insuring that the natural hazards management message and lessons learned about mitigation were spread widely. Papers and presentations were given in at least ten international venues and in

dozens of countries in Latin America and the Caribbean. A reading of ten such papers and an analysis of the venues in which they were presented--which included among others the IBRD, the IDB, and the Caribbean Conservation Association along with many ministries in member states--indicated the presentations were of high quality and the individuals reached of great importance to the implementation of such programs. Representatives of international institutions uniformly praised the OAS for its efforts in encouraging mitigation planning and the manner in which this message was spread.

PURPOSE:

Insure that natural hazards information is considered in development projects in the region (through training development planners and intervening in the development planning and project formulation process).

Comments: The NHP has served as an important catalyst in initiating the trend towards institutionalization of hazard management and changing attitudes toward risks from natural hazards.

How many have been so affected and to what extent are not matters subject to statistical measurement. Nevertheless, the team can report with certainty:

- That major donors now have policy statements like that of the IDB which was approved by its Board of Directors and issued in July 1991. This "Policy for Natural Disasters", said to have been influenced in part by the OAS/DRDE and its NHP, discusses extensively the need to assess the vulnerability of project to natural hazards and ends with the directive that IDB management assure that hazard assessments and mitigation analysis is incorporated in to the preparation of all projects. The IBRD has a similar policy for its global programs and projects
- That the OAS itself has had a similar policy since 1988 and has incorporated natural hazard considerations into the more than US\$2 billion of project investment undertaken since that time. Although many of these analyses may not as yet become operational, all have considered hazard mitigation.
- That the OAS/DRDE and its NHP have gone further than other donors in working with national governments and state-owned enterprises to demonstrate how hazard mitigation considerations could be framed (see Output 2 above).

- That hundreds of development planners, practitioners and policy makers among in bilateral donor agencies, multilateral lending agencies and government ministries in Latin America and the Caribbean think differently today than they did a mere five years ago about natural hazard management. Some--it is the evaluation team's belief that the magnitude of these is quite sizeable--of the favorable changes that have occurred in these individuals' thoughts and actions vis-a-vis natural hazard management are due to the OFDA-funded Natural Hazards Mitigation Project.
- That nearly 350 persons in OAS member countries have been exposed to specific training experiences and mitigation-oriented perspectives and, even though they may change jobs, they now have the skills and experience that can be used throughout their careers.
- That through NHP publications and the demonstration of information systems, however experimental, more codified information in usable form than ever before is available to thousands of development workers not only in OAS member states but throughout the world.

Training, consciousness raising and demonstration of practical applications in natural hazard assessment and mitigation--these are but a few examples of the effects of the NHP. While such effects cannot be quantified by the evaluation team, we are quite certain of the Natural Hazards Mitigation Project's long-term impact on the development community.

Since we are on the topic of impressions and anecdotal evidence, it should be noted that when the evaluation team asked numerous representatives of bilateral donor organizations and multilateral lending agencies how much they thought NHP activities had cost to date, guesses invariably ranged significantly above the level of funding actually provided by OFDA. When told the actual amount, these individuals expressed astonishment at the extent of the project's impact given such restricted funding.

GOAL: Avoid or reduce negative impacts of disasters.

Comments: Insufficient time has passed to be able to specify with any degree of certainty that the NHP has reduced or avoided the negative impact of disasters. No five-year activity can possibly accomplish such a goal with the limited resources made available by OFDA for the NHP. All of the countries included in the evaluation team's field work have been involved with the NHP for less than 4 years. The evaluation team believes that projects resulting from the sectoral vulnerability assessments that will surely come on line in the next few years,

especially those in Costa Rica and Ecuador, will invariably attain the goal of avoiding or reducing the impact of natural disasters.

3.0 NATURAL HAZARDS MITIGATION PROJECT IMPLEMENTATION AND OUTCOMES

3.1 The Organization of American States' Natural Hazards Mitigation Project in Trinidad and Tobago

3.1.1 The Setting

The dual-island nation of Trinidad and Tobago is the southern most country of the Lesser Antilles chain, located just seven miles off the northeastern coast of Venezuela. The country enjoys a US\$4 billion gross domestic product, a highly educated population of 1.3 million boasting a literacy rate of 97 percent, rich oil and gas deposits, a heavy industrial infrastructure, and ample land for agriculture. Contrary to perceptions, tourism is not a major economic factor in Trinidad's overall economy, but is being promoted to some extent, especially on Tobago.

Trinidad and Tobago are not considered at particularly high risk of large-scale disasters. Such events, particularly hurricanes, are less frequent there than on sister islands to the north. Yet hurricanes have hit the island of Tobago, the Caribbean extension of the San Andreas fault threatens earthquakes and tropical storm surges, and heavy rains and consequent flooding and landslides are regular occurrences on both islands.

Prior to 1987, Trinidad and Tobago had traditionally responded to disasters by focussing on relief and emergency actions at the time of the event. But the Government of Trinidad and Tobago (GOTT), aware of events elsewhere in the Caribbean, became increasingly concerned that the country was inadequately prepared to cope with potential disasters such as hurricanes and earthquakes.

With the encouragement of the Project Manager of the Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP) and after a United Nations Development Programme (UNDP)-financed technical study in April 1987 (Comprehensive Emergency Management for Trinidad and Tobago by Ralph Field Associates), a new disaster preparedness agency was formed. The National Emergency Management Agency (NEMA) was initiated by order of the Cabinet, which also established a Technical Task Force made up of representatives of 14 government entities to devise a program for coordinating all data related to hazards and allocate tasks to appropriate agencies and to ensure that these data are incorporated as part of their annual plans.

Since the 1987 inception of NEMA, a wide range of activities have begun in Trinidad and Tobago among government and private agencies involved in disaster preparedness, prevention and mitigation. In important ways, major efforts in these areas have been supported by the NHP.

3.1.2 OAS Natural Hazards Mitigation Activities in Trinidad and Tobago

The OAS/DRDE's Natural Hazards Project in Trinidad and Tobago has consisted of three principal activities:

- the conduct of a landslide hazard assessment workshop (1989);
- the conduct of a multi-hazard vulnerability assessment on the island of Tobago (1990); and
- the installation of an emergency information system (EIS) in the Town and Country Planning Division of the Ministry of Planning and Mobilization and the training of designated personnel in its use (1990).

ACTIVITY NUMBER 1: Landslide Hazard Assessment Workshop, December 1989

A. Description

The workshop was organized in response to a request to the OAS/DRDE by the Town and Country Planning Division (TCPD) of the Ministry of Planning and Mobilization (MPM) and in collaboration with the University of the West Indies (UWI)-Trinidad.

This first Trinidad and Tobago-specific activity had its origins in NHP work elsewhere in the Caribbean and Central America, specifically OAS/DRDE experience with NHP-sponsored landslide mapping in Dominica, Honduras, Saint Lucia, and Saint Vincent carried out with assistance of a geologist from the U.S. Forest Service. The direct antecedent to the Trinidad workshop was a NHP and Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP)-sponsored workshop on landslide mapping held in Jamaica in early 1989 which was attended, among others, by three Trinidadians (one of whom, Kathleen Deyer-Williams, a lecturer at UWI-Trinidad, acted as assistant workshop coordinator for the Trinidad workshop).

The justification for concentrating on landslide hazards was that landslides were perhaps the most neglected but yet most frequent natural hazard affecting Trinidad and Tobago. Although less dramatic than many other types of natural disasters, the cumulative effect of landslides in terms of disruption of communications, transportation and other infrastructure, and the loss of productive and residential/commercial property, was said to place an unnecessarily heavy burden on the islands' economy. Consequences are not limited to economic losses: lives are lost with increasing frequency as people increasingly build on terrain at risk.

The purpose of the OAS/DRDE workshop was to provide relevant individuals with information relating to landslide phenomena and processes, geological aspects of landslides, and investigation techniques for the eventual preparation of regional landslide zonation maps. Having

done this it was assumed that agencies with planning and project implementation responsibilities would have the requisite tools to understand and respond to the risk posed by landslides to lives, infrastructure and property.

The training session was of two weeks duration, with two days dedicated to field work. Twenty-two professionals participated representing fifteen agencies from among government departments, public utilities and UWI-Trinidad staff.

B. Findings

Interviews with two trainees and six of the approximately ten individuals directly involved in putting together and presenting the course, together with a review of the course syllabus, workshop proceedings and 15 post-course evaluation questionnaires, confirmed the following:

- the subject matter and agenda of the workshop was well devised, suitably "Caribbeanized" and ably presented;
- the trainees who attended the workshop had diverse backgrounds--agriculture, civil engineering, geology, land surveying, soils, town planning--and all but two of fifteen responding to the post-course questionnaire were very satisfied with the workshop experience, and surprisingly the same number answered "yes" to a question asking whether they felt they could execute a landslide investigation independently as a result of the course;
- of trainees responding eight had in the past not been involved with considering landslides in their work and seven had been so involved. Yet, ten responded in the affirmative when asked if they expected their agency to use skills gained from the workshop experience. Eight of the ten listed specific projects that should or would take into account landslide mitigation.

Examples of intended actions of participants included using methods learned in the course in the development of sites for low- cost housing in a project financed by the Inter-American Development Bank (IDB), incorporation of landslide considerations in ongoing environmental impact assessments of the Institute of Marine Affairs, creation of a landslide data base at the Ministry of Energy, applying the techniques in repairing and building new roads in a land and water development project in Santa Flor [?], and undertaking full-scale landslide mapping to be included in regional plans for Tobago and for the Eastern Northern Range of Trinidad.

To the extent possible, the evaluation team attempted to verify how skills acquired in the workshop were put into practice. Two trainees in particular had much to do with a multi-hazards assessment in Tobago which used their landslide mapping skills (see activity number 2 below).

Criticisms of the workshop, none mentioned more than once, included such items as not adequately covering soil types as related to landslides or information on stone failures, insufficient coverage of aerial photo interpretation, and not including enough senior officials with technical responsibilities as participants in the course.

A number of students commented on the fact that the course did not adequately cover, other than in a passing way, actual landslide mitigation techniques. Indeed in the final report on the workshop this was readily acknowledged: "In the absence of relevant data it was not possible to discuss, during the workshop, landslide remedial measures and their performance in the Caribbean. However, participants in Trinidad have expressed keen interest in this area and it is recommended that a regional workshop be organized to cover the following: transferring landslide information to non-technical users for use in formulating land-use plans and related legislation, selecting and employing landslide hazard reduction measures, and evaluating the effectiveness of these measures."

No further workshops have been planned as of the time of this evaluation.

ACTIVITY NUMBER 1: CONCLUSIONS

- The workshop appeared well designed and organized. Participants represented a diverse set of disciplines, positions and entities, all with needs for the information presented.
- To date no further workshops have yet been planned. Given the nature of the subject matter--the NHP process is seeking to be a catalyst for introducing natural hazard considerations at the earliest possible stage in the development process--systematic follow-up is crucial to keep this message in the forefront of planners' minds and expose new ministry staff to the issue and skills.
- Actions related to subject matter of the workshop have been undertaken: On Tobago the technology has since been used (see Activity 2 below), and it was clear that landslide mapping was planned in several development projects moving forward in Trinidad.

ACTIVITY NUMBER 2: MULTI-HAZARD VULNERABILITY ASSESSMENT, TOBAGO ISLAND, MAY 1990

A. Description

During 1990, a ten-year development plan was slated to be undertaken for Tobago, an effort to be led by the TCPD. The idea that a hazard vulnerability assessment be a part of this planning exercise was encouraged by various officials acquainted with the NHP, particularly

Lynette Atwell, Director of Planning, who first learned of the NHP in 1987 at a PCDPPP meeting in Jamaica; and Colonel Mahendra Mathur, the head of the National Emergency Management Agency, who had been Chief of Public Works on Tobago. The OAS was asked to assist with the development of a natural hazard vulnerability assessment for the Tobago Development Plan.

During a two-week visit to Trinidad and Tobago in early 1990, the NHP Caribbean Coordinator assisted MPM staff in the formulation of the assessment's various activities. The product of this visit was a workplan and framework for the coordination and implementation of the assessment, including the creation of three working groups: a steering committee, a coordination unit, and a technical unit. The workplan laid out four phases of the activity:

- 1) an evaluation of the location, severity, and probable occurrence of primary natural hazards endemic to Trinidad and Tobago;
- 2) an inventory of economic assets and human elements at risk;
- 3) a vulnerability assessment estimating the degree of loss or damage that could result from a hazardous event of given severity, including damage to structures, personal injury, and interruption of economic activities and the normal functions of settlements; and
- 4) the formulation of a mitigation strategy and the inclusion of mitigation actions for specific development projects at their prefeasibility stage.

The NHP Caribbean Coordinator also visited Tobago for a five day period to inquire into the attitudes, knowledge, and practices concerning natural hazards among key staff of public agencies, and to inform this same group about the upcoming risk assessment. Eleven persons were included in this process of survey and briefing.

NHP activities on Tobago were to focus on assessing the vulnerability of public sector buildings and infrastructure and of areas throughout the island dedicated to housing and economic activity. Appropriate measures of mitigation were then to be identified. These measure were to be seen both within a comprehensive disaster mitigation strategy for Tobago and shorter term plans for disaster preparedness and response.

The assessment concentrated largely on collecting existing information regarding the intensity, frequency, and areas of impact of natural phenomena including coastal erosion, earthquakes, hurricanes, landborne flooding, and wildfires.

New information was collected on the threat posed by landslides via a mapping exercise that used a methodology taught at the earlier Landslide Hazard Assessment Workshop. An effort was also made to explore the possibility of applying the Sea, Lake and Overland Surges from

Hurricanes (SLOSH) model developed by the National Hurricane Center to analyze the island's storm surge threat.

In June 1990 a one-week workshop was held to provide instruction in the application of the SLOSH model. Twenty participants, primarily engineers but also including a meteorologist, attended. To be fully useful, the model requires extensive data concerning offshore bathymetry and onshore topography. Such information at the required level of detail, it turned out, was not available for Tobago. As a result the SLOSH model was not used and instead only existing historical records were employed.

B. Findings

The Tobago assessment was delayed by the July 1990 coup attempt in Trinidad which forced many of the participating agencies' staff to focus on damage assessment and reconstruction programs in Port of Spain.

At the time of this evaluation, data collection for the Tobago Development Plan was nearing completion. The Plan's various components (including the results of the multi-hazard vulnerability assessment) were not available in a consolidated format. Thus, the evaluation team was unable to assess the weight given in the Plan to natural hazard considerations or intended mitigation measures.

Nevertheless, it was clear that the multi-hazard vulnerability assessment for Tobago presented a unique opportunity to incorporate a full consideration of natural hazards in all phases of the planning process, and to consider mitigation measures in the resulting development guidelines and investment project proposals.

The Tobago Development Plan is regarded by many as a "pilot project" for later use on the island of Trinidad. Evidence of this was the fact that a development plan for the Eastern Northern Range of Trinidad, currently being formulated with OAS/DRDE assistance, incorporates a multi-hazard assessment of the same sort.

Although the output of the hazard vulnerability assessment and its incorporation into the Tobago Development Plan--which, no doubt, will for the first time display and analyze hazard information in a comprehensive manner--were not yet available to the evaluation team or the people being interviewed, considerable skepticism concerning its utility was encountered.

Among those interviewed, the problem of protecting coastal development, as well as beaches, mangrove swamps, reefs and vegetation on the island of Tobago from storm surge and other natural phenomenon appeared to hold little or no priority as compared to aesthetic considerations. To date, the lack of regulation encompassing such activities as beach (sand) mining, water availability and sewerage disposal appeared to have been given little priority by the development community.

One of the reasons this seemed the case was that an enabling framework for all manner of environmental considerations, including those related to natural hazards, simply is not in place.

In addition, the evaluation team was told by public works officials on Tobago that the landslide mapping exercise, the only component of the multi-hazard assessment fully completed, was of such a general nature that it can do little to inform anyone planning anything specific.

This same reservation was expressed concerning the matter of residential housing on unstable slopes, an area of very real concern among many government officials and homeowners interviewed (including one family whose home had been partially destroyed by a landslide the day before the evaluation team arrived). Again, it was pointed out that the landslide map had scant value in judging where specific homeowners or even whole new developments could or could not build.

A number of individuals interviewed focussed on the lack of a legal basis for effective regulation of the use of privately-owned land, for whatever purpose. The Town and Country Planning Act, inherited from the British colonial era and little changed since independence, does not contain an enforcement provision. While building permits are required in order to proceed with construction at a particular site, many developers and individuals largely look upon the TCPD as a nuisance and ignore the permit process. Those that do secure permits cannot be forced to adhere to the provisions specified. The absence of an enforcement provision in the local planning process therefore results in a situation whereby codes and standards and building practices are not yet based on anything firm. Here, still again, the islanders pointed out that the level of detail provided by the initial landslide hazard vulnerability assessment did little to provide local planners with a firm basis to change the status quo in the near-term.

Yet most of the individuals interviewed by the evaluation team, when pressed on the subject, did seem to realize that the type of hazard mapping exercise encouraged by the NHP for Tobago may represent a first step toward assembling intersectoral information that will allow a basis for changing codes, standards, and practices and making these enforceable.

A less complicated criticism of the implementation of the multi-hazard vulnerability was its planning and preparation was done mainly in Port of Spain, leaving Tobago authorities the impression of being excluded from the process of determining priorities.

A key positive result of the multi-hazard assessment was the component that inventoried public buildings in order to develop a catalogue of these structures by type with the ultimate purpose of investigating their structural integrity, particularly of those designated key in times of crisis. At the time of the evaluation, this effort had produced just such a catalogue. Various structures had been designated as shelters in time of crisis, identified on a map prepared by the National Emergency Management Agency and distributed throughout the island.

At the time of the evaluation, no investment decisions based on the hazard and vulnerability analysis had been taken nor had any prefeasibility studies been undertaken for specific projects which incorporated natural hazard considerations.

ACTIVITY NUMBER 2: CONCLUSIONS

- The multi-hazard vulnerability assessment could have been better planned and executed had the Tobago House of Assembly, local MPM and other local GOTT ministry representatives been more thoroughly involved and, hence invested in its initial phases of planning. The exercise was seen as having been imposed by the authorities in Port of Spain.
- This activity may have attempted to accomplish too much in too narrow a time frame. Had a more participatory and thoughtful approach been used other options might have been considered for this "pilot project." Efforts perhaps could have more usefully targeted on one or two mutually agreed upon, in-depth assessments that had the full backing of the Tobago House of Assembly, local MPM and other local GOTT ministry representatives. In addition, a well designed public relations campaign to raise the consciousness of local authorities and private citizens as to the value of incorporating natural hazard considerations into island development planning might have been useful.
- The experience of the assessment has provided greater insights into what can be done, with what specificity, in what time-frame, at what costs, as well as greater insights into stumbling blocks which will have to be overcome if the findings of such assessments are to be implemented.

ACTIVITY NUMBER 3: INSTALLATION OF AN EMERGENCY INFORMATION SYSTEM, OCTOBER 1990

A. Description

The computerized Emergency Management System (EIS) is a tool to collect, organize, analyze and present data related to emergency management such as population distribution and infrastructure and economic activities at risk from natural hazards in order to formulate appropriate prevention, preparedness and response strategies. During the landslide hazard workshop, GOTT authorities expressed interest in acquiring an EIS from OAS/DRDE. The system was subsequently installed in the TCPD. A one week training course on the system's

operation was attended by eleven individuals from six government agencies. A "blind" copy of the system was subsequently installed at the Trinidad and Tobago Defense Force Headquarters. This copy can only be operated by a hardware key loaned by the TCPD.

When the EIS was installed in the Town and Country Planning Department, it was understood that NEMA, which had most logical first claim on such a system, would soon procure computer hardware so that a copy of the system would reside there.

B. Findings

As of the time of this evaluation, NEMA had yet to receive the personal computer that was said to have been ordered many months previously.

Although the OAS/DRDE and the GOTT appear to have had an overall plan for the use of the EIS, the system has yet to reach anything near its full potential.

The Trinidad and Tobago Defense Force appears to be the most enthusiastic user of the EIS, with a high level of support and a full-time staff member responsible for maintaining and operating the system. Whether the Defense Force's interest is focussed on use of the system for disaster management or other types of planning was beyond the scope of this evaluation.

The EIS was used during the landslide mapping exercise on Tobago and to catalogue and display other information related to that study. However, the system shares hardware with many other elements of the department which affords little opportunity for designated EIS operators to access the system to input data. Limited access to the system at the Town and Country Planning Department is largely the reason why no other agencies which were expected to use the EIS, i.e., NEMA, the police, the fire brigade and the meteorology service, have done so.

NEMA, meanwhile, has compiled a series of its own maps of lifelines and critical facilities for most of both islands using non computer-based technology. These were a centerpiece at a seminar held on International Disaster Reduction Day, September 25, chaired by the acting Prime Minister. The seminar enjoyed a large turnout of government employees, interested citizens and the press. A portion of the seminar was devoted to reports by all the key actors involved in NHP-related activities regarding the status of their efforts and certainly would have highlighted the EIS, had NEMA been able to use the technology.

While it is possible that all potential users of the EIS will eventually be provided access to the system at TCPD, experience of all users and potential users up to the time of this evaluation has greatly diminished initial enthusiasm regarding the utility of the system. It is possible that the system will fall into disuse, perhaps excepting the version installed at the Trinidad and Tobago Defense Force.

ACTIVITY NUMBER 3: CONCLUSIONS

- Although OAS/DRDE and the Town and Country Planning Department did develop a plan for the use of the EIS based within the MPM, the foreseeable limitations of installing such a system in a ministry with scarce and overtaxed computer and personnel resources precluded allowing the EIS to reach its full potential from the outset.
- The installation of the EIS within a government entity not specifically charged with emergency management responsibilities obviously inhibited optimal usage of the system for emergency planning purposes.

3.2 The Organization of American States' Natural Hazards Mitigation Project in Jamaica

3.2.1 Setting

Unlike Trinidad and Tobago, Jamaica often has been devastated by natural disasters. The island is situated in one of the world's most active hurricane regions; Jamaica was struck by hurricane Gilbert in 1988 and by hurricane Hugo in 1989. Gilbert accounted for scores of deaths and an estimated US\$1 billion in economic damages in Jamaica alone. During the past 100 years 14 major hurricanes have hit Jamaica. High winds, storm surges and flooding resulting from such storms threaten all coastal development, which includes Jamaica's tourism industry as a highly vulnerable component.

Gilbert precipitated the first of the OAS's NHP activities in Jamaica in the latter part of 1988.

The island's geomorphology, topography and heavy precipitation due to tropical storms and during the area's regular rainy season also constitute a continual threat of landslides and fresh-water flooding. Severe flooding in 1979, for example, devastated the town of New Market and destroyed a large part of the area's agriculture and livestock. The heavy rains endemic to the island also continually expose lifelines and human settlements to frequent landslides. These localized hazards threaten both the country's production facilities and infrastructural elements.

Jamaica, situated as it is on an active seismic area near the northern margin of the Caribbean Plate, also has a significant earthquake risk. Several major geological faults on land are also potential sources of earthquakes. Twice in modern history--in 1692 and 1907--earthquakes have killed thousands. The 1692 event triggered a massive submarine landslide and submerged nine-tenths of Port Royal. Kingston itself is built on alluvium soil which can be expected to intensify seismic waves when earthquakes occur.

Like all other Caribbean islands, Jamaica also suffers from coastal erosion. Sand mining for use in construction along many of the country's beaches, along with the removal of beach vegetation to accommodate structures mainly associated with the tourism industry, contribute to significant beach erosion. Accelerating levels of pollutants in the coastal waters and increasing turbidity from rain water run-off are contributing to the deteriorating health of the reefs and consequent loss of beach protection from wave action.

The geographic and climatic setting of Jamaica and the siting of tourism projects on or near the country's beaches combine to make Jamaican tourism especially vulnerable to disruption from natural disasters. Meanwhile, tourism remains an important sector of the Jamaican economy; it accounts for nearly 40 percent of the country's foreign exchange earnings, 20 percent of all expenditures on gross domestic product (GDP), and over 5 percent of the island's formal-sector payroll. In addition, value-added by firms selling directly to Jamaica's visitors exceeds 6 percent of GDP in real terms. Given the level of Jamaica's external indebtedness and its need for imports in order to realize its investment and operating objectives, the Government of Jamaica (GOJ) has accorded tourism very high priority sector in its current National Development Plan.

Authorities regard the tourism sector as having the greatest potential for growth in the island's economy. Official objectives for the tourism sector include an expansion in the flow of visitors, improvement of the tourism product, diversification of the market, the provision of infrastructure commensurate with those facilities in place and for the planned annual addition of 1,200 rooms island-wide.

3.2.2 OAS Natural Hazards Mitigation Activities in Jamaica

The OAS/DRDE's Natural Hazards Project in Jamaica has consisted of three principal activities:

- the installation of an emergency information system (EIS) in the Office of Disaster Preparedness and the training of designated personnel in its use (1988);
- the conduct of a landslide hazard assessment workshop (1989); and
- the preparation of a request for financial assistance from the Inter-American Development Bank to conduct an analysis of the vulnerability of the tourism sector to natural hazards (1989).

ACTIVITY NUMBER 1: INSTALLATION OF AN EMERGENCY INFORMATION SYSTEM (EIS) IN THE OFFICE OF DISASTER PREPAREDNESS, SEPTEMBER 1988

A. Description

Jamaica's Office of Disaster Preparedness (ODP) was the site of the first EIS installed by OAS/DRDE in the Caribbean. The system had been previously programmed but was installed with enhanced dispatch to facilitate the work of the GOJ and donors involved with damage assessment and reconstruction programming in the aftermath of hurricane Gilbert.

After the installation of the EIS in the ODP, the Office of the Prime Minister requested assistance from the UNDP to expand the system to cover all key governmental agencies involved in the rehabilitation effort. The UNDP reacted favorably and systems were eventually installed in eleven government ministries and agencies involved in the rehabilitation effort. Heads of agencies so involved were instructed to use the EIS for compiling damage assessments and for coordinating implementation of relief and reconstruction. USAID/Jamaica also installed an EIS in its Kingston offices.

B. Findings

An enthusiastic initial effort to use EIS technology was made in Jamaica largely due to the political support for the system after the country had been struck by hurricane Gilbert. This was undoubtedly the most wide ranging use of the system anywhere in the developing world. Although the initial enthusiasm has waned significantly, efforts to use the EIS to good advantage continue to this day.

Many difficulties arose to block the EIS from being optimally utilized, and much time and attention has been spent on attempts to resolve these difficulties.

The EIS in Jamaica was installed when the country was in the midst of responding to extensive damage. As a consequence, its normal use--the creation of a central database replete with a full inventory of maps of resources that may be accessed to respond to disasters--was supplanted by other needs. To a great extent the EIS was used instead as a planning and monitoring tool to track post-disaster reconstruction.

Since the initial flurry of use as above, the ODP has made efforts to maintain an up-to-date record of emergency needs, shelters, human and material resources for responding to disasters. This work is, however, by no means complete. Although maps of the entire island at a scale of 1:50,000 are now available to the ODP, little use are being made of them. Meantime, many of EIS installations in other ministries fell into disuse as the emergency wrought by hurricane Gilbert receded.

Considerable work has been undertaken to ensure that the EIS continues to be used and supported. Even during the rehabilitation phase, the UNDP, in coordination with the ODP and others, had sought commitments from the GOJ to set up a special management unit to plan and coordinate the overall use of the various EIS installations. Politics and a change of government foiled this initiative. During 1990, however, the UNDP in conjunction with the ODP, mounted a data base development project. This pilot activity has the purpose of systematically compiling data on resources of relevance for disaster management in a single Jamaican parish (a political jurisdiction similar to a province).

This pilot exercise for the first time demonstrated the variety of technical problems and manpower constraints impinging on the EIS network including the need for: 1) a full-time system administrator; 2) guidelines for data collection, coding and entry; 3) full-time assignment of staff in each participating ministry or agency where the EIS is installed; 4) provisions for each participating government entity to maintain its own hardware and to pay its own system support fees; and 5) a comprehensive training program to relieve the chronic shortage of trained EIS personnel.

As a result, an EIS users' group was formed. The October session to which the evaluation team was invited was attended by only half of the agencies with access to the EIS. Each agency present reported on the status of its part of the system, and the lead agency--the ODP--summarized the status of the rest. Apparently only six of the 12 systems were fully functional at the time of this evaluation. Asked about agency acceptance of the EIS, several at the users' group meeting complained that EIS software cannot accommodate database needs common to non-emergency agencies. For example, the Ministry of Public Works cannot use the preformatted EIS screens to create a custom data base for tracking equipment to maintain infrastructure and for its other ongoing activities.

The OAS/DRDE staff is aware of these and other system problems. The Jamaica experience along with that of Puerto Rico, Saint Lucia and Trinidad and Tobago was the subject of a workshop session during the Caribbean Hurricane Conference held in April 1991. Existing and future installations of the EIS stand to benefit from the discussions that took place at that workshop session which focused on the political, institutional and management issues that need to be addressed in order to optimize the use of this new tool in emergency management and hazard mitigation.

ACTIVITY NUMBER 1: CONCLUSIONS

- Although the first installation of an EIS in the Caribbean was done more rapidly than originally intended to respond to the Gilbert catastrophe, more attention should have been paid to developing a comprehensive plan, including, *inter alia*, a full-time administrator, the codification of guidelines for data coding and entry,

maintenance and updating, and retrieval, for its use in a post-disaster setting.

- In hindsight, the development of such a plan might have precluded both the technical problems and manpower constraints currently plaguing the day-to-day operation of this important emergency management tool.
- As useful as the system might have been in helping meet immediate post-disaster needs--and the system was useful to some extent--it provided no panacea, and quickly fell into disuse in a number of institutions as a result of weak systems management.
- The complexity of EIS systems management increases dramatically when several agencies are linked to the same network and have to use, and more importantly, contribute to, a common data base.

ACTIVITY NUMBER 2: LANDSLIDE HAZARD ASSESSMENT WORKSHOP, JANUARY 1989

A. Description

Jamaica has a long history of landslide problems which, together with land-borne floods, have caused more economic loss and disruption than any other natural hazard on the island. A small developing country like Jamaica cannot easily sustain losses from the recurrence of such natural disaster-incurred economic losses, annually estimated at several millions of dollars [??].

Recent advances in understanding the nuances of slope failure suggest that landslides are perhaps the hazard most amenable to measures directed toward avoidance, prevention or correction.

But in 1989 landslide hazards in Jamaica had yet to be systematically studied. To begin to rectify this deficiency, ODP and the Department of Geology at UWI-Jamaica formulated a National Landslide Loss Reduction Program with the objectives of providing basic training in landslide hazard assessment and vulnerability assessment and the preparation of landslide hazard zonation maps.

It was against this background that a 10 day workshop on landslide hazards was organized in early 1989 by the ODP and the UWI-Jamaica. The OAS/DRDE provided financial and technical support which provided the course material and sponsored the key workshop lecturer, Jerome De Graff, a geologist with the U.S. Forest Service.

Thirty persons attended the workshop including 23 individuals from Jamaica, 3 from Trinidad and Tobago, 2 from Barbados and one each from Grenada and Puerto Rico. Participants had diverse backgrounds including environmental management, watershed management, agriculture, civil engineering, and geology. The seven non-Jamaican participants were sponsored by the PCDPPP.

B. Findings

Conversations with four participants and two of the workshop's staff members indicated excellent acceptance of the relatively technical material and practicums presented, and high marks for the program's well-organized field trips and field-based exercises.

Two participants from countries other than Jamaica were of the opinion that the workshops concentration on the Jamaican situation lessened its value. One of the two was a planner, not a technician or scientist.

Jamaican participants, it was reported, agreed that the workshop was effective in increasing practical knowledge on the methods and techniques of hazard assessment and mapping.

There is some evidence that various Jamaicans trained at the workshop have taken the initiative to implement landslide hazard vulnerability mapping on a systematic basis. In November 1989 Barbara Carby, head of planning and research at Jamaica's ODP, put together a proposal for a national policy on development in landslide-prone areas. The proposal called for the ODP to work with line ministries and the university community to complete the mapping of selected high-risk landslide hazard areas, undertake public awareness campaigns and to lobby the GOJ to formulate development control policies and regulations for landslide prone areas.

The expenses associated with such a program were reported to be relatively minimal. The need to free up staff to actually undertake the proposed activities remained the main obstacle at the time of this evaluation. Meanwhile, some landslide related activities are underway under the auspices of the aforementioned UNDP-financed parish project.

Other direct outcomes of this OAS/DRDE activity in Jamaica include the landslide hazard assessment workshop held in Trinidad and Tobago in late 1989 and the landslide mapping component of the multi-hazard assessment on Tobago (see 3.1.2 above).

Although the need for follow up workshops or some type of refresher courses was expressed by many interviewed by the evaluation team, resources for these do not appear to be available. None have been planned.

ACTIVITY NUMBER 2: CONCLUSIONS

- As in the case of the Trinidad and Tobago workshop, the Jamaica landslide hazard workshop was well designed and organized. Attendees represented diverse disciplines and positions. Participants reported receiving sufficient skills and knowledge to undertake such assessments in the future.
- The initial OAS/DRDE input concerning landslides had a good effect on having landslide mapping receive systematic consideration in Jamaica, and Trinidad and Tobago. Given that the NHP process is seeking to be a catalyst for introducing natural hazard considerations at the earliest possible stage in the development process, follow-up is crucial to keep this message in the forefront of planners' minds. In addition, given the relatively high rate of staff turnover in government service, regularly scheduled workshops take on further importance.
- The evaluation team was not able to document the extent to which landslide hazards information has been incorporated in development planning. It is our impression, however, that lack of clear demand and encouragement, together with a shortage of funds for the actual

mapping and analysis and for further training for technicians as well as policy makers, places at risk the building of any momentum in tackling the landslide issue.

ACTIVITY NUMBER 3: PREPARATION OF A REQUEST FOR TECHNICAL COOPERATION TO CONDUCT A NATURAL HAZARD VULNERABILITY ANALYSIS AND LOSS REDUCTION STRATEGY FOR THE TOURISM INDUSTRY, SEPTEMBER 1989

A. Description

Hurricane Gilbert, with winds of up to 140 knots, struck Jamaica in early September 1988. The whole island suffered extensive damage. Due to its exposed locations on or near beaches, the country's tourism infrastructure suffered estimated direct damage of US\$85 million to property and equipment. Indirect costs far exceeded this amount--the damage to the tourism industry was not confined to its own capital stock. Damage to airports, harbors, public utilities, roads and shopping facilities also negatively impacted the industry. Foregone foreign exchange revenue from the tourism sector between September and December 1988 was estimated at US\$90 million, a particularly significant loss in light of the requisite foreign exchange needed to finance recovery programs.

It has been noted that, during reconstruction, some of the damage could have been avoided by structural and/or non-structural mitigation measures, e.g., through more attention to detail in building construction and maintenance, particularly in roof construction. As reconstruction progressed, Tourism Action Plan, Limited (TAP), a recently formed private/public sector tourism planning entity with the objective of improving the Jamaican tourism product through coordinating and mobilizing resources, became interested in the idea that future development of the tourism sector should take mitigation actions into account. This would have the effect of reducing risks from natural hazards and would have a high ratio of benefits to cost, especially those relating to building standards and construction practices.

Discussions among TAP, the Planning Institute of Jamaica and OAS/DRDE officials resulted in a proposal to study the tourism sector's vulnerability to natural hazards and to develop a loss reduction strategy. A request for financing of the proposal was submitted to the Inter-American Development Bank in September 1989.

The proposed sectoral vulnerability study was designed to produce material results of many kinds: reports documenting the investigation into the natural hazard risk affecting the tourism industry, maps locating hazard-prone areas, guidelines for the selection and implementation of mitigation measures. Non-material results would include such things as training workshops, awareness campaigns to increase the understanding of professionals and investors concerning hazards, vulnerability, risk and mitigation.

The IDB is said to be favorably disposed to finance this US\$621,000 activity, but recently requested a larger in-kind contribution from the Ministry of Tourism and a financial contribution from the private tourism sector, the ultimate beneficiary of the study. Government and the private sector officials have yet to respond to the IDB's request.

If the project goes forward the OAS/DRDE will provide advisory services to TAP, the Jamaican executing institution, and also training and technology transfer to agencies participating in the study including the Ministry of Tourism, the Jamaica Tourism Board, ODP, UWI-Jamaica, the Jamaican Association of General Insurance Companies and the Insurance College of Jamaica, Ltd.

B. Findings

The logic of such an activity is solid. Sectoral studies of are likely to highlight actions that can be taken to protect tourism and related facilities or reveal previously unrecognized linkages between disasters and development.

Tourism is of primary importance as the country's leading foreign exchange earner, contributing upwards of 40 percent of all receipts from goods and services in Jamaica's current account. The sector has been designated as of high priority to the GOJ which views the tourism industry as an engine to drive economic growth.

The industry itself experienced significant annual growth in both the number of visitors and in tourism expenditures through 1987. Due to hurricane Gilbert, however, the number of tourists declined by 12 percent reducing GDP growth that year to only 0.6 percent, as compared to the projected 4.6 percent.

Some of these adverse effects of the Gilbert calamity could have been avoided had faulty building practices and maintenance deficiencies been detected and corrected ahead of time; in the case of future disasters like that caused by Gilbert, a larger proportion of damage could be avoided if new infrastructure is sited more carefully and construction and maintenance practices are improved, steps which would only marginally increase the cost of new facilities.

The tourism sector's long-standing ability to overcome a variety of internal and external vicissitudes on its own appears to be a key element in its reluctance to comply with the IDB's condition precedent of a financial contribution from the industry. The Jamaican tourism sector recovered rather quickly from damage to its facilities wrought by Gilbert. Most facilities were able to reopen in time for the 1989 tourism season. By the second quarter of 1989, the industry had generated revenue approximately 14 percent above that registered for the same period the previous season.

Evaluation team discussions with representatives of the industry's trade association, the Jamaica Hotel and Tourist Association, confirmed that the industry sees itself as independent and wants to insure a distance from government is maintained. The project planning and design

phase of the proposed study perhaps did not take sufficiently into account the following: 1) the industry was able to rapidly overcome the Gilbert calamity on its own without public assistance; 2) industry officials believe that they had only marginal input into the design of the proposed study, and if undertaken as designed, the study would not necessarily reflect the perceived needs of the industry; 3) as perceived by the industry, major outputs of the study would be recommendations regarding building practices and operation and maintenance procedures which the industry could ill-afford in the current inflationary environment in which financial institutions offer only short-term finance at historically high rates of interest; 4) the same inflationary environment was contributing to reduced profit margins largely due to significantly higher insurance premiums imposed upon the industry in an effort by insurance companies to replenish reserves drained as a result of Gilbert; and 5) if the Ministry of Tourism insists on proceeding with the study, taxes on the industries income together with the room tax and the airport departure tax collected by the Government should be the source of the sector's required contribution to the IDB.

ACTIVITY NUMBER 3: CONCLUSIONS

- The proposal presented to the IDB may have been developed without giving sufficient consideration to bringing aboard all parties important to the project. The proposal lists the Ministry of Tourism as the applicant institution, the Tourism Action Plan as the executing institution and a number of cooperating institutions, but excludes the tourism industry or its trade association, *per se*. Although the Jamaica Hotel and Tourist Association is a TAP shareholder, it is possible that during its discussions with the Ministry of Tourism and with TAP, OAS/DRDE representatives may have underestimated the degree to which the views of the tourism industry, through its spokesman, the Jamaica Hotel and Tourist Association, were actually represented by TAP.
- Whether this hypothesis is correct or not, the major bottleneck to implementation of the hazard vulnerability assessment at the present time is a reluctance on the part of the industry to finance a very small proportion of the costs of this activity. This is largely due to the apparent failure on the part of the industry as a whole, or its trade association, to recognize two factors: 1) that the study is a useful exercise for examining those natural hazards which confront the tourism industry and for analyzing vulnerability reduction issues; and, most importantly, 2) vulnerability reduction measures can be cost-effective, either as discrete stand-alone projects or as an element of overall tourism sector development.

- There are currently scant financial incentives for the tourism industry to place much value in a loss reduction strategy for the sector. The catalyst for changing this attitude lies with the insurance companies. At the present time, insurance companies underwrite property damage policies without regard for attention to detail in construction and maintenance. Until insurance premiums are structured so as to reward those in the industry who employ vulnerability reduction measures, the requisite incentive to employ such measures will fail to materialize.

3.3 The Organization of American States' Natural Hazard Mitigation Project in Costa Rica

3.3.1 The Setting

Costa Rica's economic base depends largely on the production for export of bananas, cocoa, coffee, meat and sugar. The central plateau with its volcanic soil is primarily devoted to coffee-growing and the production of the country's staple crops of beans, corn, potatoes and sugar cane. Here too is found the country's efficient and lucrative dairy industry. Approximately 22 percent of the land area is devoted to crops with 36 percent and 40 percent devoted to pasture and forestry, respectively. The country's timber industry is quite small and its resources have yet to be commercially developed.

High growth in the industrial sector has led to considerable economic diversification with industrial production contributing approximately 20 percent to gross domestic product compared with 21 percent in the case of the agricultural sector. Industrial activity is largely devoted to food processing but chemicals (including fertilizers which are also exported), plastics and tires are also produced. Major industrial projects currently being developed include aluminum processing (significant deposits of bauxite exist but have yet to be developed), petrochemical production, and tuna fish processing. The government is currently involved in the development of additional hydroelectric complexes and is encouraging manufacturing through its state-owned enterprises.

Despite several International Monetary Fund-supported austerity programs, the economy still suffers from considerable public sector deficits, largely owing to government spending on social welfare. Costa Rica is burdened with an enormous external debt affording the country the dubious distinction of having one of the highest per capita external indebtedness rates in the developing world.

Due to its location, topography and physical characteristics, Costa Rica has been subject to extreme events of an atmospheric, hydrologic and/or geologic nature. Recent earthquakes in December 1990 and again in April 1991 resulted in localized flooding, the destruction of crops and livestock, damage to commercial and residential buildings and to the country's social and economic infrastructure, and the disruption of productive processes all posing a threat to the country's pursuit of sustainable economic development.

The Costa Rican National Emergency Commission (CNE) is the entity charged with responding to disasters with emergency actions and relief measures. Its performance during the April earthquake, however, was considered by many in the government to be less than optimal and the CNE is currently in the process of drafting its first National Emergency Plan so as to adequately prepare for and respond to potential disasters such as earthquakes, floods and hurricanes.

Costa Rica's recent seismic events also aroused renewed interest among various public-sector managers and planners in the vulnerability of key sectors of the economy to natural

hazards. This was particularly the case in the energy sector, comprised of both the electrical and hydrocarbon subsectors. Costa Rica possesses one of the most extensive electrical energy networks of any developing country; given the fact that approximately half of all production is consumed by households and retail businesses, the sector's vulnerability to natural hazards is highly correlated with social well-being.

3.3.2 OAS Natural Hazards Mitigation Activities in Costa Rica

The OAS/DRDE's Natural Hazards Project in Costa Rica consisted of four principal activities:

- the installation of a geographic information system in the Sectoral Energy Directorate of the Ministry of Natural Resources, Energy and Mines and the training of designated personnel in its use (1988);
- the installation of an emergency information system in the National Emergency Commission and the training of designated personnel in its use (1988);
- the incorporation of an assessment of natural hazards into a strategy for the management of the Rio Banano watershed located in the province of Limon (1990); and
- the preparation of a case study of the vulnerability of the energy sector to natural hazards and the organization of a workshop to present the results of the study and its recommendations (1989-91).

ACTIVITY NUMBER 1: INSTALLATION OF A GEOGRAPHICAL INFORMATION SYSTEM, [MONTH] 1988

A. Description

In addition to introducing and testing the sectoral vulnerability methodology, the NHP provided the Sectoral Energy Directorate (DSE) of the Ministry of Natural Resources, Energy and Mines (MIRENEM) with a geographical information system (GIS) which was envisaged to serve as an analytical tool in conducting the energy sector natural hazards vulnerability assessment.

The GIS was programmed with maps including those relating to political jurisdictions, energy production, distribution and storage systems and transportation infrastructure as well as hazard maps relating to erosion, flooding, landslides, seismology, and volcanology. In addition, the system was programmed with existing data regarding energy consumption. This specific GIS

enabled DSE and MIRENEM personnel to model the impact of distinctive hazardous events on sectoral investment, personal income and employment, export earnings.

B. Findings

The GIS was installed in 1988 and a training session was conducted to provide instruction in the use of this system for the management of information relating to natural hazards, natural resources, population growth rates, migration patterns and infrastructure. Five individuals from DSE and MIRENEM were trained in the use of the GIS.

With the change of administrations which took place in late 1990, many mid- and senior-level bureaucrats at both DSE and MIRENEM, particularly those that were trained in the use of the GIS, either left of their own accord or were replaced. As a result, the GIS that had been installed at DSE fell into disuse and the personal computer used to run the system is being used for other applications.

Whether the system would have fallen into disuse despite the change of technical personnel is a matter of some discussion. Some individuals interviewed by the evaluation team dispute the appropriateness of the software for developing country conditions. Some claim the system installed by the OAS was not sophisticated enough for the types of applications needed in Costa Rica.

ACTIVITY NUMBER 1: CONCLUSIONS

- OAS pioneered the sectoral natural hazards vulnerability methodology in Costa Rica which incorporated the use of a GIS for generating the excellent graphics which appear in the energy sector case study. Unfortunately, the fact that the system has fallen into disuse suggests that the benefits derived from the system, i.e., the graphic presentations contained in the vulnerability study's final report, may not outweigh the cost of the GIS.
- The inherent sophistication of GIS systems in general begs the question of whether this is indeed an appropriate technology. Given the limited use made of the GIS in Costa Rica, one might question the utility of transferring this type of technology.

ACTIVITY NUMBER 2: INSTALLATION OF AN EMERGENCY INFORMATION SYSTEM, [MONTH] 1988

A. Description

As discussed above, the computerized Emergency Management System (EIS) is simply a tool to collect, organize, analyze and present data related to emergency management such as population distribution, infrastructure and economic activities at risk from natural hazards in order to formulate appropriate prevention, preparedness and response strategies. In 1987 both OFDA/Costa Rica and OAS/DRDE presented proposals to OFDA in Washington regarding the installation of an EIS in Costa Rica (the OAS/DRDE proposal actually included Costa Rica as only one of six proposed recipients of the system). The following year, OFDA/Washington approved only the OAS/DRDE's proposal and Costa Rica was designated as the Central American pilot country for EIS installation, training and utilization.

B. Findings

In mid-1988 an EIS was installed on hardware housed at the Costa Rican National Emergency Commission (CNE), although the actual day-to-day manipulation of data would be done by staff of the computer department of the Ministry of Housing with whom CNA had contracted for management information services. At the same time, an EIS was installed in the Sectoral Energy Directorate of MIRENEM. Funding for the latter system was also provided by OAS/DRDE but with resources from the Regional Energy Development Program. Concurrent with these physical installation of the EIS software, a training session was held in to provide instruction in the use of this system for the management of information relating to natural hazards, natural resources, population growth rates, migration patterns and infrastructure. In attendance were staff from the Ministry of Natural Resources, Energy and Mines and its associated Sectoral Energy Directorate, from the National Emergency Commission and from the Ministry of Housing's computer department.

Shortly thereafter, the computer department of the Ministry of Housing secured a much more memory-intensive CAD-based (computer assisted design) system with a significantly higher level of detail, from a Canadian donor. At the computer department's suggestion, use of the OAS/DRDE-installed system at CNE was discontinued in favor of the new CAD system. A new presidential administration came to power in late 1989 bringing with it a new cadre of personnel which replaced many of the senior level staff at both DSE and MIRENEM. As a result, the OAS-sponsored EIS installed at DSE fell into disuse and its hardware subsequently expropriated for other purposes.

Immediately after the April 1991 earthquake, CNE found the CAD system unable to deliver basic data related to emergency management. As a result, CNE is currently seeking OAS/DRDE assistance to reestablish its own database utilizing the software provided by the NHP in 1988.

ACTIVITY NUMBER 2: CONCLUSIONS

- In a period of rapidly changing technology, newly developed specialized systems are often experimental and are inherently in a state of transformation. When two of these systems come on line in the same agency, competition ensues among users and one system is bound to be favored over another. It is unfortunate that the CAD system, favored by Ministry of Housing personnel, turned out to be inappropriate for CNE's immediated emergency needs.
- Investment decisions based on initial enthusiasm about both hardware and software computer technology are risky because technologies develop so rapidly. Perhaps it is wiser to hold off installing systems that are quite likely to evolve quickly, unless the technology as it stands is sufficient for present needs and absolutely necessary for an immediate task at hand.

ACTIVITY NUMBER 3: INCORPORATION OF AN ASSESSMENT OF NATURAL HAZARDS INTO A STRATEGY FOR THE MANAGEMENT OF THE RIO BANANO WATERSHED [MONTH] 1988 THROUGH [MONTH] 1990

A. Description

As part of the ongoing efforts by the Government of Costa Rica, the Government of Panama, and the Organization of American States' Department of Regional Development and Environment to evolve a strategy for the institutional development of La Amistad Biosphere Reserve, OAS/DRDE was requested to undertake a natural hazards vulnerability assessment of the Rio Banano watershed, one of many which originate in the Talamanca Range of the proposed reserve. Population immigration into the Rio Banano watershed alone is estimated to double by the end of the decade. The strategy is intended to focus on the conflicting forces of change in the region which are endangering not only the quality of life of the indigenous populations on both sides of the Costa Rica-Panama border but also the biological richness and cultural and archaeological heritage of the region.

The objective of the Rio Banano Watershed Management study was to devise a series of options regarding a) the sustainable use and management of natural resources in the watershed and b) the reduction of the area's vulnerability to natural hazards. OAS/DRDE technical assistance in this activity was primarily oriented toward evaluating the location, severity, and probable occurrence of primary natural hazards endemic to the Rio Banano watershed and creating an inventory of existing economic assets and human elements at risk.

B. Findings

During the course of evolving the institutional strategy for the La Amistad Biosphere Reserve, the Ministry of Natural Resources, Energy and Mines had designated the development of the Rio Banano watershed as a national priority. As a result, the Rio Banano Watershed Management Study was undertaken by an impressive array of multisectoral interest groups including the Ministry of National Planning and Economic Policy (MIDEPLAN), the Ministry of Natural Resources, Energy and Mines (MIRENEM) together with its Sectoral Energy Directorate (DSE), the National Water and Sewerage Institute (ICAA), the National Park Service (SPN), the Regional Planning Board (JRP), and the Board for Port Administration and Economic Development for the Atlantic Watershed (JAPDEVA) and with technical assistance in the area of hazard assessment provided by OAS/DRDE. USAID/Costa Rica was asked to finance a series of sectoral feasibility studies but expressed interest only in the cadastral aspects of the study.

The management study developed recommendations on the use of forest, soil and water resources of the watershed, and proposed a series of activities relating to nontraditional energy production and the development of agriculture and livestock, forest products, roads and commercial service centers. In addition, recommendations were made for the relocation of various population centers at risk from natural hazards.

The April 1991 earthquake that struck Costa Rica's Atlantic coast severely damaged the area encompassing the watershed and graphically illustrated the vulnerability of the area's population and natural resources to hazard risk.

ACTIVITY NUMBER 3: CONCLUSIONS

- This activity is an interesting "target of opportunity" undertaken by OAS/DRDE. Given the urban orientation of the NHP, this watershed was specifically chosen for study because of its ultimate impact on Limon, the largest port and population center on the Atlantic coast.
- Given the projected doubling of the population within the watershed by the end of the decade, the possibilities for incorporating hazard mitigation measures into a potentially large number of investment projects associated with the area's growth are indeed considerable.
- The participation of such a large number of national and regional development institutions provided the NHP with a unique opportunity to demonstrate the benefits of incorporating natural hazard mitigation measures into an integrated development planning study.

- The damage sustained by the watershed by as a result of the April 1991 earthquake presents a unique opportunity for the NHP to generate interest among USAID/Costa Rica and other donors in participating in a requisite re-evaluation of the watershed's resource management strategy, particularly as it related to natural hazard management.

ACTIVITY NUMBER 4: PREPARATION OF A CASE STUDY OF THE VULNERABILITY OF THE ENERGY SECTOR TO NATURAL HAZARDS, [MONTH] 1989 THROUGH MARCH 1991

A. Description

The catastrophic damage and resultant economic losses wrought by the 1987 earthquake in Ecuador (see Section 3.5.1 below) led those associated with the energy sector in Costa Rica to focus their attention on the vulnerability of the country's energy production and distribution system. Costa Rica is fortunate to have one of the most extensive electrical energy networks of any developing country; a majority of the country's electrical energy consumers are households and commercial businesses. Given this phenomenon, the potential impact of natural hazards on the energy sector is indeed significant.

The Costa Rican energy sector's infrastructure consists of an electricity network, a petroleum network and the country's roads and railways which are used to transport liquid fuels. The electricity network is comprised of five major hydroelectric power plants with various thermal and diesel auxiliary plants used to handle peak loads and for emergency backup, and the electric transmission and distribution system. The petroleum network consists of a refinery on the Atlantic coast which produces a portion of the country's gasoline, diesel fuel, fuel oil, etc. A pipeline is used to distribute light petroleum products to various storage terminals while fuel oil is transferred to tank trucks and to railroad tanker cars for distribution throughout the country. The potential vulnerability of Costa Rica's energy sector infrastructure to natural hazards can be primarily attributable to two factors: the lack of adequate alternative flow routes; and the geographic agglomeration of individual components of the energy system.

B. Findings

Given the potential danger posed to Costa Rica's energy sector by a variety of natural hazards, including earthquake, erosion, flood, water intake and wind vulnerabilities to the electricity subsector, and earthquake, hurricane and landslide vulnerability to the petroleum subsector, the OAS/DRDE was asked by the Sectoral Energy Directorate (DSE) of the Costa Rican Ministry of Natural Resources, Energy and Mines (MIRENEM) to provide technical assistance in analyzing the energy sector's susceptibility to natural hazards. The case study which emerged from this sectoral hazard assessment was, at the time it was completed, unique

in Latin America, not only from the point of view of a planning and mitigation exercise in general but more importantly, it pioneered sectoral hazard management planning.

The sectoral impact analyses comprising the case study consisted of two separate but interrelated components: 1) an evaluation of each element of the country's energy system, as well as the country's telecommunications system and major economic production systems at risk from specific natural hazards; and 2) an analysis of the socioeconomic impacts resulting from disruption of the country's energy production and transmission system including, *inter alia*, estimated losses to Costa Rica's gross domestic product, and losses of employment and income associated with the export of goods and services. The two components of the case study has allowed the Costa Rican authorities to identify confirmed threats to the sector for which a series of actions might be designed to diminish the vulnerability of specific elements of the energy system to natural disasters through mitigation measures. For example, the case study identified 15 individual substations and 15 specific transmission lines of the electric power subsector as having confirmed threats from earthquakes and landslides, respectively.

One of the recommendations of the Costa Rican study of the vulnerability of the energy sector to natural hazards was the formation of an energy sector commission on vulnerability and disasters charged with maintaining dialogue among the varied public and private entities comprising the energy sector regarding the implementation of mitigation measures. A direct outcome of the technical assistance provided to the DSE was the creation of a "Comision del Sector Energia, Vulnerabilidad y Desastres Naturales" (SEVyD) which is currently operational and meets on a regular basis. At SEVyD's November meeting attended by the evaluation team, participating institutions included the Costa Rican Electrical Institute (ICE), the National Power and Light Company (Fuerza y Luz), the Sectoral Energy Directorate (DSE) of the Ministry of Natural Resources, Energy and Mines (MIRENEM), the Costa Rican Petroleum Refining Company (RECOPE), the National Electrical Service (SNE), various private electric power generating cooperatives, the National Emergency Commission (CNE), and the regional OAS/DRDE representative, who acts in an advisory capacity.

An additional outcome of the technical assistance provided by OAS/DRDE to the DSE and MIRENEM was a seminar-workshop in March of 1991 with the objective of "orient[ing] energy sector institutions to the need of introducing disaster management elements into their work, and the preparation of terms of reference to guide the special commission [SEVyD] set up to lead the implementation of a hazard reduction program in the sector." In addition, further technical assistance needs in the area of prevention and mitigation were discussed, especially as they applied to the agriculture, tourism and transport sectors. This seminar-workshop, jointly funded by CNE and MIRENEM, was attended by numerous representatives of the country's principal energy sector institutions, the CNE, the IDB, the Pan American Health Organization, and the Central American Bank for Economic Integration.

ACTIVITY NUMBER 4: CONCLUSIONS

- As the OAS/DRDE authoritatively points out in the first of its two major NHP publications ¹, the sectoral approach to vulnerability assessment is a cost-effective and functional level of analysis from which devise hazard reduction strategies. Not only are sectors the common basis for data compilation and the programming of resources by international donors and lending agencies and national governments, the expertise of development professionals is largely sectorally oriented.
- However, despite the lengthy discussions that took place during the aforementioned meetings in San Jose regarding the formulation and implementation of an energy sector vulnerability reduction program, to date there is no evidence that tangible mitigation measures have been introduced despite the considerable damage to the country's refinery, the RECOPE product pipeline and portions of the road and rail network wrought by the March 1991 earthquake that severely damaged the Atlantic coast province of Limon.
- Nevertheless, the analysis of Costa Rica's energy sector demonstrated to both planners and decision makers the nature of the complex interrelationships between the numerous components of the electrical and hydrocarbon subsectors and various potential natural hazards.
- The formation of SEVyD and its development of a vulnerability reduction plan was an important first step toward implementing a sector-wide vulnerability reduction program.
- The methodology perfected during the conduct of the Costa Rican energy sector vulnerability analysis was the catalyst in spawning interest in and the actual conduct of other sectoral assessments in Ecuador and Jamaica.

¹ Organization of American States. Disasters, Planning and Development: Managing Natural Hazards to Reduce Loss (Washington, D.C.: OAS, Department of Regional Development and Environment, 1990)

3.4 The Organization of American States' Natural Hazards Mitigation Project in Ecuador

3.4.1 Setting

Ecuador possesses tremendous natural resources. Both the coastal region and the highlands are rich agricultural areas which are fed by ample rainfall. Ecuador is a petroleum exporting country and appears to have extensive, undeveloped mining potential. Besides petroleum, the country exports unprocessed or semi-processed agricultural, fish and forestry products. Ecuador's relatively small industrial sector produces largely for a protected domestic market.

The country has experienced very uneven economic growth due in part to the influences of international economic developments and natural disasters which affect its petroleum and agricultural exports. Volatile petroleum prices and the 1987 earthquake which seriously damaged the Transecuadorian oil pipeline have had a negative impact on the petroleum sector, while recent heavy flooding and blights have reduced exports of traditional crops. The economy's growth rate fell by 6 percent in 1987 after the earthquake severed the pipeline for over six months. Analysis of the country's other principal macroeconomic variables indicates that the 1987 earthquake resulted in an estimated US\$1 billion in direct and indirect losses, the current account deficit increased by approximately US\$900 million and the fiscal deficit rose by about US\$500 million. Notwithstanding these dismal figures, the economy rebounded during 1988 by a healthy 11.2 percent.

During 1989 the economy was flat, registering a mere 0.2 percent rate of growth though it picked up slightly in 1990, expanding by 1.5 percent owing largely to higher oil prices and a larger volume and value of bananas, shrimp and fish products. Since 1988, economic growth has been hampered by the government's stabilization program designed to reduce inflation which peaked at 99 percent in early 1989. Tighter fiscal and monetary policies had the effect of stabilizing inflation at just below 50 percent by end-1990. Economic growth for 1991 should register a similar rate to that experienced during 1990 with the agricultural and livestock sector again leading the economy. Investment, however, continues to be inhibited by weak economic growth and uncertainties surrounding the transition from the current government to its successor, which will take office in August of 1992.

The country's geographic location, various unique climatic conditions and the concentration of both population and economic activity in zones where destructive natural phenomenon have a high probability of occurrence all have determined that Ecuador will be periodically affected by natural disasters of different types and intensities. Every year natural events wreak havoc in Ecuador extracting an average cost of US\$14 million and 80 deaths; an additional 21,000 individuals are estimated to be adversely affected in one way or another as a result of these annual natural phenomenon. Besides the human impact, the economic impact of these natural disasters, reflected principally in reduced growth rates and even negative rates of economic growth, balance of payments deficits and unemployment, inhibit the Government of Ecuador's (GOE) efforts to foster economic growth and development.

3.5.2 OAS Natural Hazards Mitigation Activities in Ecuador

The OAS/DRDE's Natural Hazard Project in Ecuador has consisted of three principal activities:

- an evaluation of natural hazards as part of the initial study to design an integrated development project in the San Miguel watershed of Ecuador and the Putumayo watershed of Colombia (1988);
- the installation of a geographic information system in the Ministry of Agriculture and Livestock (MAG) for the purpose of preparing a case study of the vulnerability of the agriculture and livestock sector to natural hazards (1990-92); and
- the preparation of a case study of the vulnerability of the energy sector to natural hazards (1991).

ACTIVITY NUMBER 1: EVALUATION OF THE NATURAL HAZARDS IN THE SAN MIGUEL AND PUTUMAYO WATERSHEDS, [MONTH] 1987 TO [MONTH] 1988

A. Description

The San Miguel and Putumayo Watersheds Integrated Development Project (Plan de Ordenamiento y Manejo de las Cuencas de los Rios San Miguel y Putumayo, or PSP) is a binational project begun in 1986 which is overseen by a joint Colombian and Ecuadorian commission. The purpose of this project, initiated by the Amazon Region Cooperation Accord signed by the two countries in March 1979, is to "...effect joint efforts and actions to promote the harmonic development of [the countries'] Amazonian territories in such a way that these actions produce equitable and mutually beneficial results both for the preservation of the environment and for the conservation and rational utilization of natural resources in these territories." The natural hazards assessment component of the PSP was carried out in 1987.

The development and management plan that has evolved for the PSP consists of five objectives: 1) incorporate the area into the economic, cultural, social and political activities of Colombia and Ecuador; 2) improve the standard of living of the population of the area by providing productive sources of employment; 3) binational integration of the area with the other parts of the respective countries; 4) effectively occupy virgin territory based on sustained, long-term production models which take into consideration the ecological reality of the Amazon region; and 5) identify potential uses of natural resources in the region in question in order to stimulate the harmonic development of native communities and new colonization.

B. Findings

Since its initiation, the PSP's activities have been supported by various Colombian and Ecuadorian institutions and organizations with technical assistance being provided by OAS/DRDE. At the time of this evaluation, the project has produced general development guidelines, agreements on actions to be taken, a series of basic topical studies, specific regional diagnostic studies (including inventories of population, natural resources, environmental variables, social services, infrastructure, institutions, and productive activities), global and sectoral planning studies, and identification and formulation of priority programs and projects. In addition, the PSP has developed priority policies, strategies and normative instruments which will allow for the execution of these planned actions which, it is hoped, will ultimately lead to in the integrated development of these watershed areas.

To date, several project-specific natural hazard evaluations have been carried out by the Ecuadorian Ministry of Agriculture and Livestock's Agrarian Regionalization Program (MAG/PRONAREG) as part of the series of PSP regional diagnostic studies undertaken to identify and design specific investment subprojects. The evaluations consisted of the compilation, analysis and preparation of maps and related documents relative to atmospheric, geological, and hydrological hazards which affect the watershed areas. The conduct of these evaluations represents the first occasion in which a Latin American binational development project included natural hazard considerations.

A series of seminars have been conducted to disseminate the findings of these natural hazard evaluations and have included participants and attendees from the international development community and the Colombian and Ecuadorian institutions affiliated with the project.

ACTIVITY NUMBER 1: CONCLUSIONS

- This activity can be considered to be an interesting "target of opportunity" for the NHP. However, it lacks conformity with the urban orientation of the project specified by OAS/DRDE as "Natural Hazard Information Management for Disaster Preparedness: Metropolitan Areas of the Latin America Pacific Region."
- Given the enormous development potential of the San Miguel and Putumayo watersheds in terms of their natural resource bases and the population pressures faced by both Colombia and Ecuador, the possibilities for incorporating hazard mitigation measures into a potentially large number of investment projects associated with the area's growth are considerable. However, at the time of this

evaluation, these measures had yet to be manifest in any ongoing projects.

- Nevertheless, this activity is a classic example of the multidisciplinary, multisectoral approach to integrated development planning advocated by OAS/DRDE which has been adopted by the NHP.
- This logical progression of events proceeds from an evaluation of the location, severity, and probable occurrence of primary natural hazards endemic to the San Miguel and Putumayo watersheds; inventories existing or planned economic assets and human elements at risk; assesses vulnerability through the estimation the degree of loss or damage that could result from a hazardous event of given severity, including damage to structures, personal injury, and interruption of economic activities and the normal functions of settlements; and formulates a mitigation strategy and includes mitigation actions for specific development projects at their prefeasibility stage.
- However, tangible benefits from this integrated planning exercise will not be apparent until the watersheds are considerably more developed.

ACTIVITY NUMBER 2: STUDY OF THE VULNERABILITY OF THE AGRICULTURE AND LIVESTOCK SECTOR TO NATURAL HAZARDS, [MONTH] 1990 THROUGH JANUARY 1992

A. Description

Ecuador's agricultural and livestock sector (comprising agriculture, livestock, forestry and fishing), like that of most countries of Central and South America and the Caribbean, plays a predominant role in the country's socioeconomic structure in terms of employment and income generation, foreign exchange earnings, etc. However, this sector is one of the most vulnerable in Ecuador, if not the most vulnerable to natural disasters in terms of the proportion of the population potentially affected. The production generated by this sector (registering nearly 15 percent of GDP in 1990) is among the least protected from natural disasters in terms of infrastructural and institutional support. During the floods which plagued the country in 1982-83, for example, an estimated 48 percent of total economic losses were incurred by the agricultural and livestock sector; sectoral losses resulting from the 1987 earthquake were estimated at US\$12 million. Natural disasters of this nature significantly affect the country's balance of payments

in two ways: by the income foregone (the sector generated approximately 50 percent of 1990 export earnings) and by increases in food imports to offset production shortfalls.

All indications are that earthquakes, floods and other types of natural disasters will continue to affect Ecuador's agricultural and livestock sector in the future. As such, the objective of OAS/DRDE technical assistance to MAG/PRONAREG was to determine the degree of sectoral vulnerability to natural hazards and to identify acceptable, yet adequate, prevention and mitigation measures to reduce that vulnerability. It was envisaged that prevention and mitigation measures would be initiated by educating the agrarian population as to the nature of hazards, adequate sectoral planning and the preparation of the inhabitants of vulnerable zones to cope with emergencies.

B. Findings

The outcome of the agriculture and livestock sector natural hazards vulnerability assessment represents the first step in the development of a program to reduce the sector's vulnerability to hazard risk. The first phase of this program was to produce a case study which delineates natural hazards prone to this sector and to identify appropriate means of mitigation to reduce the sector's vulnerability at acceptable economic and social cost. The case study covered 5 basic topics: 1) the methodology employed; 2) the nature of the agriculture and livestock sector, particularly its economic and social importance to the country; 3) a description of Ecuador's principal natural hazards, their location and the possible impact of each hazard type upon the sector; 4) a demonstration of the location of the various crop types and related infrastructure affected by the numerous hazards existent in the country; and 5) the presentation of the possible mitigation options available to the sector and recommendations to the MAG to undertake the most feasible of these options.

The NHP's impact in this instance has had the effect of upgrading the MAG's sectoral planning process by optimizing the management of information to improve disaster preparedness and response thereby creating an enabling environment for the design of specific mitigation projects. The case study, prepared by personnel from MAG/PRONAREG with assistance from three OAS/DRDE technicians, represents a generalized analysis which is intended to lead to further, more detailed studies and investments in specific mitigation projects.

In addition to introducing the sectoral vulnerability methodology, the NHP provided MAG with a geographical information system, designated IDRISI, developed by Clark University of Massachusetts, which served as an analytical tool in conducting the agriculture and livestock sector vulnerability assessment. Four individuals from MAG were trained in the use of the IDRISI system.

The IDRISI system was programmed with a total of ten maps including those relating to political jurisdictions, cropping systems and transportation infrastructure as well as hazard maps relating to erosion, flooding, landslides, seismology, and volcanology. In addition, the system was programmed with existing data regarding 14 priority crops. This specific GIS enabled MAG

personnel to model the impact of 49 distinctive hazardous events on sectoral investment, personal income and employment, credit and export earnings.

To stimulate the enabling environment for formulating and implementing an agriculture and livestock sector vulnerability reduction program and allow the insights gleaned during the sector's analysis to be used in the design of specific mitigation projects, the GOE has approached multilateral lending agencies and bilateral donors for financing. MAG/PRONAREG developed a proposal for hazard prevention and mitigation financing in as part of the GOE's global Environmental Management Loan application to the International Bank for Reconstruction and Development (IBRD). That loan request is scheduled for review in Washington early in 1992.

On the bilateral side, the Minister of Agriculture and Livestock sent a written request to USAID/Ecuador in April 1991 for the Mission to finance sector-specific hazard prevention and mitigation pilot activities. However, the Mission Director did not react favorably to this request. When queried about this request by the evaluation team, Mission staff from the Office of Agriculture and Natural Resources were aware of the existence of the case study but were largely unversed regarding the details of the vulnerability reduction strategies delineated in the report.

It is possible that the failure to distribute the documentation favoring mitigation measures for the sector may be obstructing public awareness of the threat of natural hazards. An important stimulus for changing public opinion, i.e., the agriculture and livestock sector vulnerability case study itself, has only been distributed to a very select GOE audience for technical review. The numerous maps contained in the report depict Ecuador's eastern border according to the Rio de Janeiro Protocol of 1942 which has been disputed by Peru for decades. As a result of renewed discussions regarding the border issue, the Peruvian authorities have requested that the OAS not publish the document at this time.

Partially as a response to this problem, but more importantly, to stimulate further dialogue among the varied public and private entities comprising Ecuador's agriculture and livestock sector regarding the implementation of mitigation measures, a seminar-workshop was scheduled to take place in late January 1992. The evaluation team understands that the objective of the seminar-workshop is to discuss the merits of the various vulnerability reduction strategies delineated in the case study.

ACTIVITY NUMBER 2: CONCLUSIONS

- As concluded above in Section 3.4.2. vis-a-vis the Costa Rican energy sector case study, the sectoral approach to vulnerability assessment is a cost-effective and functional level of analysis from which devise hazard reduction strategies. Not only are sectors the common basis for data compilation and the programming of resources by international donors and lending agencies and national

governments, the expertise of development professionals is largely sectorally oriented.

- The analysis of Ecuador's agriculture and livestock sector marked the first time that both planners and decision-makers were comprehensively shown the complex nature of the interrelationships between the various components of production and distribution associated with the agriculture and livestock sector.
- This unique document will serve as a model in increasing interest in similar assessments of the inherent vulnerability of the predominant agricultural sector to hazard risks in other OAS member countries.
- It is indeed unfortunate that the MAG could not come to an agreement with USAID/Ecuador regarding funding for agriculture and livestock sector hazard mitigation pilot activities given the predominance of agriculture, natural resources and rural development activities in the Mission's portfolio. Had the results of the case study been more widely known, perhaps more interest could have been generated and political support given to MAG's request.

ACTIVITY NUMBER 3: STUDY OF THE VULNERABILITY OF THE ENERGY SECTOR TO NATURAL HAZARDS

A. Description

The earthquake that struck Ecuador in 1987 resulted in catastrophic damages to the energy sector and economic losses estimated at US\$888 million. The earthquake illustrated that the capital-intensive hydrocarbon subsector is the most vulnerable economic activity vis-a-vis natural disasters in terms of its contribution to GDP and export earnings. Ecuador's petroleum production contributed nearly 16 percent of GDP and was responsible for over 50 percent of the country's export earning in 1990. The fact that the oil pipeline was severed for nearly half a year served as a stimulus for those associated with both the electrical and hydrocarbon subsectors in Ecuador to focus their attention on the vulnerability of the country's energy production and distribution system.

As in the case of Costa Rica, the potential danger posed to Ecuador's energy sector by natural hazards is not limited to seismic events. The sector is at risk from a variety of natural hazards, including erosion, flood, landslide, volcanic, and wind vulnerabilities to the electricity subsector, and landslide, tsunamis, and volcanic vulnerability to the petroleum subsector. As a result, OAS/DRDE received a request from the Environment Subsecretariat of the Ecuadorian

Ministry of Energy and Mines to provide technical assistance in analyzing the energy sector's susceptibility to natural hazards.

B. Findings

The case study which emerged from this sectoral hazard assessment was based on the methodology pioneered in Costa Rica. The result of this OAS/DRDE-GOE joint effort is an energy sector hazard management planning document consisting of two separate but interrelated components: 1) an evaluation of each element of the country's energy infrastructure system at risk from tremors, earthquakes, and tsunamis, drought, erosion, flooding, landslides, river surge [arrastre de rios] and volcanic eruption; and 2) an overview of the impacts resulting from disruption of the country's energy production, distribution and transmission system.

The second component of the energy sector case study did not, however, go into the same level of detail regarding estimated losses to the country's gross domestic product, and losses of employment and income associated with the export of goods and services as did the Costa Rica energy sector and Ecuadorian agriculture and livestock case studies. Nevertheless, the energy sector case study does provide the Ecuadorian authorities with a means to identify confirmed threats to the sector for which a series of actions can be designed to diminish the vulnerability of specific elements of the energy system to natural disasters through mitigation measures.

Despite the devastating losses wrought by the 1987 earthquake and the catalytic role played by OAS/DRDE in prompting discussions at numerous levels regarding the need to formulate and implement an energy sector vulnerability reduction program, there is no evidence that tangible mitigation measures have yet been introduced in the energy sector.

Undoubtedly, the merits of formulating and implementing an energy sector vulnerability reduction program will be more clear once funding for this purpose is available. To this end the Ministry of Energy and Mines recently included specific mitigation and emergency preparedness projects in its Environmental Management Loan request to the IBRD.

ACTIVITY NUMBER 3: CONCLUSIONS

- The sectoral approach to vulnerability assessment is a cost-effective and functional level of analysis from which devise hazard reduction strategies. Sectors are the common basis for data compilation and the basis for resource programming by the international development community and national governments.
- Even without the case study, however, the 1987 earthquake clearly demonstrated the need to formulate and implement an energy sector vulnerability reduction program. To date, there is no evidence that tangible mitigation measures have been introduced although the

GOE has requested the IBRD to fund a follow-up study. Nevertheless, this suggests that vulnerability reduction in the energy sector has not been given the requisite level of political support necessary for attracting institutional and financial support.

- The assessment of the vulnerability of Ecuador's energy sector to natural hazards does, however, demonstrate for the first time to both planners and decision-makers alike the nature of the complex interrelationships between the numerous components of the electrical and petroleum subsectors and various potential natural hazards. This case study should serve as a key point of departure regarding the formulation and implementation of a vulnerability reduction program for the energy sector.

4.0 CONCLUSIONS/RECOMMENDATIONS

A. To the Organization of American States, Department of Regional Development and Environment

- 1) The NHP should remain a point of emphasis of OAS/DRDE.
- 2) Future OAS/DRDE activities should be undertaken against more rigorous standards of performance and include more regular reviews and more frequent evaluations.
- 3) Sector-specific hazard vulnerability assessments should be a major focus of future programming. This is especially true in light of the evaluation team's conviction that these activities appear to facilitate the concentrated attention of national government, bilateral donor and multilateral lending agency technicians and decision-makers. As such, these assessments should be viewed as the most effective means of assuring that host country governments enact mitigation regimes. However, regular and coherent follow up appears to be crucial to the success of such endeavors.
- 4) Technology transfer activities such as EIS/GIS installations, and the

- 3) Preparations for continuing this type of funding for hazard mitigation activities should include agreement on measurement and specific indicators developed for the medium- to long-term.
- 4) The feasibility of Mission buy-ins to sector-specific hazard vulnerability assessments should be explored in future grant agreements.
- 5) OFDA should seriously consider using NHP training materials and experience gained from the project as part of its laudable multiyear training plan currently underway in Latin America. The scheme has reached a phase where hazard management and mitigation considerations will be given concentrated attention.

APPENDIX A.

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APPENDIX B.

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Antonio Razo
Jefe
Programa Energia Geothermica
Organizacion Latio Americano de Energia

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Guillermo Almeida L.
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APPENDIX C.
SCOPE OF WORK

PURPOSE:

The purpose of this evaluation is to determine the extent to which OFDA's support of the OAS' Natural Hazards Management Program has had a substantial impact on reducing the vulnerability of people and economic assets to natural hazards in Latin America and the Caribbean.

The main thrust of the OAS' efforts is aimed at identification and reduction of vulnerability to essential facilities, hazard assessments and management of hazard-related information for prevention, emergency preparedness and response. This has been achieved through the provision of technical assistance and technology transfer to member states in order to sensitize development planners to the importance of incorporating hazard and vulnerability issues into development projects.

Much of the success achieved by the OAS' project has been accomplished by training development planners, through on-the-job training with OAS specialists and national counterparts, to identify hazards and vulnerability and to incorporate these concerns into development projects.

Another aim of the OAS project is the conduct of a series of sector vulnerability studies to emphasize the need for sector-level policy and programs that can lessen the economic impact of disasters.

SCOPE OF WORK:

1. Collect, review and analyze relevant project documentation and reports generated during the project. Meet with appropriate staff of OAS and OFDA, Washington and Costa Rica, to determine concerns and areas of interest to be assessed in the evaluation.
2. Conduct field visits to Costa Rica, Ecuador, Jamaica, and Trinidad and Tobago to meet with appropriate personnel and gather evaluative information.

The evaluation team's documentation and data collection review should look at, but not be limited to, the following: key outcomes proposed and achieved, indicators of successful integration of project outcomes into other areas of development activity being done by the OAS, suggested areas of additional OAS involvement in hazard vulnerability activities, unanticipated outcomes and potential for sustainable long-term impacts resulting from the grant.

As a result of this study, the team should identify and document strengths and weaknesses of the project, and suggest modifications to improve its effectiveness.

3. Specific question which need to be addressed are:
- a. Was the hazard assessment information that was generated incorporated into the planning documents for use throughout the remainder of the planning process?
 - b. Did the natural hazard vulnerability assessments contribute to the identification, form and content of the proposed development strategies and investment projects being undertaken by national and international funding organizations?
 - c. Have proposed vulnerability reduction policies and strategies been incorporated into sectoral development planning documents and operations?
 - d. Have proposed vulnerability reduction actions been carried forward to the next phase in the planning process, particularly to the point where development finance agencies are requested to support further project preparation?
 - e. Have the hazard management techniques continued to be used to support the different phases of the project planning process?
 - f. What is the dollar value of the projects affected by OAS activities irrespective of their state of development?
 - g. What has been the dollar value of projects which have been implemented or have benefitted from OAS technical inputs? Document cases where projects did not proceed or were modified as a result of OAS activities.
 - h. Did the OAS effort bring about a change in the location, structure and content of the project or component, including its deletion from further consideration?
 - i. Has the experience in one area of OAS involvement been generalized to other projects in the same sector or other sectors?
 - j. Does the planning agency now systematically address natural hazard issues as part of its policy?
 - k. Have the projects directly affected by OAS technical cooperation moved forward to the next phase of planning or implementation?
 - l. Assuming the projects prepared by the OAS are ultimately implemented, what impact would they have in protecting life and property from natural hazards?

4. Training has been one of the key vehicles utilized by the OAS to upgrade the skills of development planners to identify hazards and vulnerability, and to incorporate these concerns into development projects. To assess the effectiveness of the OAS' training strategy on the project, the following areas should be reviewed:

- a. Estimated number of people trained by location.
- b. How did training support or enhance the goals and objectives of the project?
 - i. Number of countries by location that receive training.
 - ii. Training design guidelines that the OAS followed, i.e., objectives, participant selection, needs assessment.
 - iii. The OAS' training delivery strategy, i.e., courses/workshops, on-the-job training. Include: frequency of training, numbers trained at one time, extent to which training was a formal or informal activity.
 - iv. How was the application of training monitored? What is the OAS' approach to evaluating its training?
 - v. What direct and/or indirect impact has the training had on individuals trained and their agencies? Consider: trainee performance, policy formulation or revision, changes in planning procedures, personnel changes, quality of plans developed, etc.
 - vi. What were the major constraints that hindered the application or use of the training? How were these identified and handled by grantees?
 - vii. To what extent is there a need for continued outside training or support?
 - viii. What changes or modifications would improve future training?

5. What influence has the OAS Hazards Reduction Project had on the OAS itself, in respect to other OAS programs in the region and in respect to the OAS' overall program policies?

APPENDIX D

List of Natural Hazard Project Activities

APPENDIX E.

Summary Table of Consultancy Inputs

NAME	SPECIALITY	NATIONALITY	COUNTRY/PROJECT
Ferrari	Translator	Argentina	Translate Son Of Primer
Robinson	Editor	USA	Document Editing Primer Editing Son Of Primer Editing
Deyer-Williams	Civil Engineer	Trinidad and Tobago	Tobago Vulnerability Assessment Landslide Hazard Course
McReady	Editor	USA	Document Editing
Volante	GIS Specialist	Uruguay	Primer GIS Work Uruguay Environmental Profile
Ross			Costa Rica
Monge			Costa Rica
Morell	Natural Resouces Management	Dominican Republic	Rio Banano Costa Rica
Noriega	Architect	Colombia	Rio Banano Costa Rica
Soto	Planner	Costa Rica	Costa Rica Energy Sector Vulnerability Study Rio Banano Costa Rica
Cordova	Civil Engineer	Ecuador	Ecuador Energy Sector Vulnerability Study
Bacarreza	Urban Planner	Venezuela	Grenada Small Towns Hazard Assessment
Gibson	Telecom Engineer	Saint Lucia	Caribbean Small Towns Hazard Mitigation Workshop
Theobalds	Civil Engineer	Saint Lucia	Caribbean Small Towns Hazard Mitigation Workshop

NAME	SPECIALITY	NATIONALITY	COUNTRY/PROJECT
Louisy	Mechanical Engineer	Saint Lucia	Caribbean Small Towns Hazard Mitigation Workshop
York	Sanitary Engineer	Saint Lucia	Caribbean Small Towns Hazard Mitigation Workshop
Polius	Agronomist	Saint Lucia	Caribbean Small Towns Hazards Mitigation Workshop
Amad	Geologist	Jamaica	Trinidad and Tobago Landslide Hazard Workshop
Cessti	Engineer	Peru	Primer
Meszaros	Geographer	Argentina	GIS Primer Work
Garcia-Spatz	Economist-Geologist	Bolivia	Son Of Primer Nicaragua Volcanic Hazard Assessment
Alvarado		Costa Rica	ICAP Costa Rica Training Course
M. Laporte		Costa Rica	ICAP Costa Rica Training Course
S. Laporte	Meteorologist	Costa Rica	ICAP Costa Rica Training Course Nicaragua Meteorological Hazard Assessment
Monteiro	Seismologist	Costa Rica	Nicaragua Seismic Hazard Assessment
Ranirez	Geologist	Venezuela	ICAP Costa Rica GIS Installation and Training
International Institute for Aerospace Survey and Earth Sciences		Holland	INETER Nicaragua GIS Installation and Training

NAME	SPECIALITY	NATIONALITY	COUNTRY/PROJECT
Mora	Geologist	Costa Rica	Hazard Assessment for Haiti ICAP Costa Rica Training Course Dominican Republic Provincial Capital Hazard Assessment
Hermelin	Geologist	Colombia	Colombia IGAC Hazard Assessment Course
Smith	Planner	Colombia	Colombia IGAC Hazard Assessment Course
Gargett	Emergency Specialist	USA	Jamaica, Honduras, Costa Rica, Saint Lucia, Trinidad and Tobago EIS Installations
Gautt	Computer Systems	USA	Jamaica, Costa Rica EIS Installations
Nanita-Kennet	Architect-Planner	USA	Primer
Garawick	Geo Sciences	USA	Primer
Thames	Hydrologist	USA	Primer
Bolin	Economist	USA	Technical Report
Siff	Planner	USA	Primer
Bello	Agricultural Economist	Peru	GIS Activities Primer
Filderman	Editor	USA	Primer
Hardy	Agricultural Economist	USA	Primer

**ORGANIZATION OF AMERICAN STATES
DEPARTMENT OF REGIONAL DEVELOPMENT
AND ENVIRONMENT**

**NATURAL HAZARD
MANAGEMENT ACTIVITIES**

September 1991

User/Public/1636-002.W51
February 17, 1992

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**ORGANIZATION OF AMERICAN STATES
DEPARTMENT OF REGIONAL DEVELOPMENT AND ENVIRONMENT**

NATURAL HAZARD MANAGEMENT ACTIVITIES

The Department of Regional Development and Environment (DRDE) provides cooperation in natural hazard management to OAS member states through technical assistance, training and technology transfer. The activities are supported through funding from the Office of Foreign Disaster Assistance (OFDA) of the United States Agency for International Development and collaborative efforts with national and other international development assistance agencies, including UNDP, UNDRO, and IDB. The DRDE, based at OAS headquarters in Washington, D.C., has been involved in natural hazards risk assessment and disaster mitigation activities in Latin America and the Caribbean basin since 1983. Its initial scope has expanded to include activities involving participants from 25 OAS countries in the Caribbean Central, and South America.

On October 10, 1990, the International Day for Natural Disaster Reduction, the Permanent Council of the Organization of American States passed, by consensus, a resolution declaring that the activities of the General Secretariat of the OAS in the area of natural hazard management and disaster mitigation are a contribution to the international Decade for Natural Disaster Reduction, and calling on the Secretary General of the OAS to make known to the Secretary General of the United Nations the past and programmed activities of the OAS in this area.

The resolution further encourages OAS member states to include natural hazard management and disaster mitigation in their socio-economic development, and to share through the OAS General Secretariat their experience and knowledge in this area.

A copy of the text of the resolution is attached in Annex 1.

The objective of DRDE's technical cooperation in this area is to avoid or reduce the impact of disasters through intervention in the development planning and project formulation processes. Specifically, the project focuses on:

- a. Assessing natural hazard risk as part of ongoing natural resource evaluations and development strategy formulations;
- b. Identifying and formulating mitigation measures for development investment projects;
- c. Making information on natural hazards more accessible to emergency response and development planning entities; and

- d. Training planning technicians and decision-makers in hazard assessment and disaster mitigation techniques.

Activities are generally carried out as part of ongoing technical cooperative programs of the DRDE at a national or regional level. When opportune, DRDE collaborates with national or regional institutions. With their focus on long-term prevention and mitigation, DRDE activities in this area are clearly complementary to the disaster assistance provided by the General Secretariat through its Emergency Committee and Emergency Fund (FONDEM).

Annex 2 highlights main issues and arguments for lessening the economic impact of natural disasters in OAS member states.

Most recently, the DRDE has undertaken a series of sector specific vulnerability reduction studies at a national level for agriculture, transportation, tourism and energy. The objective is to prepare disaster reduction investment projects to protect the sector as well as identify vulnerable portions of the sector's infrastructure whose probable damage in case of a natural event will necessitate disaster response measures.

A host of natural hazard management activities carried out by DRDE in OAS member countries is attached in Annex 3.

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**PARTICIPATION BY THE ORGANIZATION OF AMERICAN STATES IN
THE INTERNATIONAL DECADE FOR NATURAL DISASTERS
REDUCTION**

THE PERMANENT COUNCIL OF THE ORGANIZATION OF AMERICAN STATES.

CONSIDERING:

That since 1983 the Organization of American States has provided technical assistance to member States in the area of natural hazard management;

That by resolution 44/236 of December 22, 1989, the United Nations General Assembly proclaimed the International Decade for Natural Disasters Reduction as from January 1, 1990;

That this proclamation encourages national and international organizations to participate in the Decade by identifying and carrying appropriate activities;

That, according to document CIES/4462 of the Twenty-fourth Regular Meeting of CIES at the Ministerial Level, held from 23 to 25 October 1989, natural hazard management and measure to mitigate the adverse impact of natural disasters are to become an important component of the technical assistance provided by the Organization of American States;

That, according to resolution CIES/RES. 417 (XXIII-0/88), activities in the area of natural resource and infrastructure development will be originate to the rational use of natural resources and environmental management with a view to sustainable development and natural hazards are an aspect of the environment;

That the Agreement on coordination of disaster relief signed in October 1977 by the United National Disaster Relief Coordinator and the Secretary General of the OAS establishes a system for cooperation between UNDRO and the OAS "without prejudice to future agreement regarding predisaster planning;;

That pursuant to the mandate given in AG/RES. 777 (XV-0/85), the Permanent Council is studying the draft Inter-American Convention to Facilitate Assistance in Cases of Disaster on the basis of the draft submitted by the Inter-american Juridical Committee and the views of the member States, and

That the activities of the Organization of American States in the eighties and those programmed for 1990-91 in the area of natural hazard management are in keeping with the objectives of the Decade and complement others of its activities.

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RESOLVES:

1. To declare that the activities of the Organization of American States in the area of natural hazard management make a contribution to the International Decade for Natural Disasters Reduction.
2. To instruct the Secretary General of the Organization of American States to inform the Secretary-General of the United Nations on the past activities of the OAS and the program to be carried out in the area of natural hazard management and disaster relief.
3. To encourage member states to make natural hazard management and disaster relief integral components of their socioeconomic development activities.
4. To request member States to inform the Secretary General on the activities they are engaged in under United Nations General Assembly resolution 44/236, and to share their experience and know-how in natural hazard management and disaster relief through the General Secretariat.
5. To request the Secretary General to consult with member States on the possibility of coordinating regional projects on the basis of national projects with similar purposes.
6. To encourage continued cooperation by the General Secretariat with the activities of the United Nations in this field.
7. To request the Secretary General to undertake a study for the institutionalization of a mechanism for effective coordination within the Organization, between organizations and with donor agencies, of emergency assistance to member States struck by natural disasters, and to present that study, together with an estimate of the financial implications, if any, to the Permanent Council for consideration.
8. To recommend that, as the budgetary situation permits surplus resources of the Regular Fund be assigned to the Inter-American Emergency Aid Fund (FONDEM), and that external resources be sought for this Fund in order to strengthen the Organization's capability of responding to requests for emergency aid.
9. To commit itself to an early conclusion of its work on the Draft Inter-American Convention to Facilitate Assistance in Cases of Disaster so that it may be adopted as soon as possible by the General Assembly.

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ANNEX 2

Organization of American States Department of Regional Development and Environment

Lessening Economic Impact of Natural Disaster in OAS Member States

Managing natural hazards to reduce the impact of disasters caused by hurricanes, floods, drought, landslides, earthquakes and tsunami must be addressed by focusing on actions that lessen vulnerability where it counts: decisions to build new structures, to rebuild following disasters, and to mitigate vulnerability of existing structures -- all in relation to the building site.

Given the vulnerability reduction resources available and the characteristics of the development activities in Latin America and the Caribbean that result in capital investments in production facilities, infrastructure and settlements, a primary way to lessen the economic impact of disasters is through influencing development decisions early on in the planning process. Site vulnerability issues, whether at a large or small scale, must be examined before mitigation measures for individual structures, whether existing or programmed, are selected and implemented. This applies to activities in the private and public sectors alike.

When a disaster strikes, commercial facilities, human settlements and supporting infrastructure are damaged or destroyed, investments in capital expenditures are lost, and the poor, whether poor governments or poor citizens, usually bear the greatest losses because their vulnerability is the greatest.

Lessening economic impact takes time because a capital investment project, whether a house, business or road, takes time to plan and build. Whether a sufficient measure of vulnerability reduction has been included in the project may not be known until enough time passes for the next event to occur, making "field tested" case studies difficult to come by in the short term. And knowledge of the results of certain events, such as tsunami, landslides and floods, dictate that staying out of harm's way is the best policy; structurally withstanding the event is an improbable if not inefficient use of resources.

Strategies for lessening the impact on what exists are strikingly similar to those for lessening the impact on what is to be built. First and foremost, there are similarities in the type of information needed to make the most effective use of available mitigation resources. There exists a private use of public interest. The former is the use of free information to make the best decisions possible concerning the investment of capital.

Selection of a site for an investment or the understanding of the nature of the vulnerability that affects an existing investment is critical to compete in a marketplace where the consequences are born if all risks are not properly addressed. The latter is the interest in the health and safety

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of the country's citizens, and thus the preparation and dissemination of pertinent information about that is vulnerable to natural hazards and why.

Lessening the vulnerability of what exists, whether a house, factory or road, is the most difficult. To begin with, 90% of all investments expected to be in place at the end of the century already exist. Vulnerability reduction usually entails retrofitting (reinforcing) structures, if such an action is economically and physically, as well as socially, feasible. It also implies that there exists sufficient hazard information about the site, which there seldom is, to specify the type and quantity of retrofitting action needed, or to indicate that relocation measures are necessary.

Since the house, factory or road already exists, the point of departure on the long road to lessening economic impact is to identify the hazards that threaten what is built and what is vulnerable and why.

Lessening the vulnerability of what is to be built is the easier task. This is true, not because it will amount to no more than ten percent of the total in place capital investment in the region at the end of the century, but because it is much more efficient, when the vulnerability posed by natural hazards is known, to move the project to an alternative site (since there are almost always alternatives), selecting the site with full acceptance of the mitigation measures necessary to achieve a desired level of risk.

There is ample available technical knowledge about how to build once the vulnerability is known for the chosen building site. For the poor country or the poor individual, the issue is the private and public sectors using that knowledge to design and implement construction projects. As an example, there is more than enough technical information available--free of charge to the public and private sectors alike--concerning safe housing construction for any number of natural hazards if it would only be used by international and national development assistance agencies and NGOs, national and local lending institutions, and local professionals and tradespeople. The problem is that quite often this building construction information is never used because these same organizations or individuals seldom pay any attention to the hazards that threaten the site, which means, logically, they perceive little need for acquiring and using knowledge concerning safe building practices.¹

¹ For every thousand urban inhabitants of the region, it is estimated that 17 households are building new housing units through formal market mechanisms, 33 low income households are building new (permanent) structures through informal means, and 17 low to middle income households are enlarging their dwellings outside formal building approval channels. Because of the disparities in dwelling size and use of more elaborate materials, housing built through formal market mechanisms represents 80% of all housing square footage built each year and 90% of the value of housing construction. Most skilled labor used in informal permanent housing construction is actively involved in the formal construction sector.



The lessons learned from three decades of disasters and development in the region, including recent insights into the damage caused by earthquakes in Mexico City and Loma Prieta, point to the fact that serious efforts to lessen the economic impact of natural disasters for what exists or what is to be built, and particularly lessening the economic impact of disasters in poor countries and for poor people, must begin with planning. It makes little sense to expend scarce resources to train workmen or press for construction standards when ample information is already free of charge and in the hands of those who make individual structure design and construction decisions, while planning decisions involving billions of dollars of housing, factories and roads have been made and continue to be made with unnecessary vulnerability to natural hazards as a result.

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ANNEX 3

DEPARTMENT OF REGIONAL DEVELOPMENT AND
ENVIRONMENT
Organization OF AMERICAN STATES

SUMMARY OF NATURAL HAZARDS MANAGEMENT ACTIVITIES
1983-1991

Technical Assistance

Regional

- 1991: Prepared and presented, as a Regional Collaborating Agency, the technical content and organization of regional and national workshops in Latin America and the Caribbean, for the Disaster Management Training Program of the United Nations Development Programme for UNDP mission and counterpart personnel.

*Caribbean
Antigua and Barbuaa*

- 1990: Installation of emergency information system and training of users in support of hazard mitigation and emergency management (in collaboration with PCDPPP).

Barbados

- 1990: Proposal prepared for institutional and operational strengthen in related to natural disaster management in Barbados. This project is DOW under consideration for funding by the InterAmerican Development Bank.

Dominica

- 1990: Follow-up landslide assessment ana mitigation action plan following hurricane Hugo.

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1987: Landslide hazard assessment and vulnerability reduction priorities for integrated development project.

Dominican Republic

1989: Natural hazard assessment and vulnerability reduction measures as part of 5 province capitals' urban development plans.

1987: Landslide assessment and identification of disaster mitigation measures for selected settlements in the frontier region.

1986: Natural hazard assessment overview of the frontier region for integrated development planning project.

Grenada

1987-1988: Settlement infrastructure and lifeline natural hazards vulnerability assessment, mitigation measure identification, assessment manual for local officials, and workshop for vulnerability identification and reduction.

Haiti

1986: Natural hazard assessment overview of the frontier region for integrated development planning project.

Jamaica

1989-1990 A proposal was prepared to reduce the vulnerability of the Tourism Sector of Jamaica. This project is under consideration to be financed by the Interamerican Development Bank.

1989: Landslide hazard assessment course and initiation of mapping program (in collaboration with UWI and PCDPPP).

1988: Use of emergency information management system in post-disaster rehabilitation and reconstruction activities following hurricane Gilbert.

St. Kitts and Nevis

1986: Settlement and lifeline hazard assessment and identification of mitigation measures (island of St. Kitts).

Trinidad and Tobago

1990: Installation of emergency information system and training of users in support of hazard mitigation and emergency management.

1990-1991: Natural hazard assessment and vulnerability reduction program for Tobago which is GOT&T's Pilot Program for the IDNDR.

1989: Landslide hazard assessment course and mapping program initiation.

Saint Lucia

1990: Installation of emergency information system and training of users in support of hazard mitigation and emergency management (in collaboration with PCDPPP).

1989: Geographic information system (GIS) for natural hazard, natural resource, population and infrastructure analysis.

1989: Hazard awareness and mitigation practices, recommendations for small farmer banana growers (in collaboration with PCDPPP).

1988: Identification of risk perception of small farmers and criteria for disaster mitigation programs.

1986-1987: Coastal settlement and lifeline natural hazard assessment, identification of mitigation measures, and assessment manual for local officials, and workshop for vulnerability identification and reduction.

1985: Landslide hazard assessment and vulnerability reduction priorities.

1985: Coastal zone natural hazards assessment.

1984: General natural hazards information assessment for integrated development planning project.

St. Vincent and The Grenadines

1987: Landslide hazard assessment and vulnerability reduction priorities for integrated development project.

*Central America
Multinational*

1987: Trifinio Area (El Salvador, Honduras, and Guatemala): General natural hazards assessment and vulnerability reduction for integrated development planning project.

Costa Rica

1989-1991: Energy sector vulnerability reduction to natural hazards study with definition of investment projects for mitigating disaster impact and implementation of reduction strategy.

1989-1991; Rio Banano Settlement Vulnerability Reduction and Natural Resource Management Program with identification of multisectoral investment projects.

1988: Emergency information management system installation and training with National Emergency Committee and Ministry of Natural Resources, Energy and Mines (MIRENEM).

1988: Use of geographic information systems (GIS) for national, subnational, and metropolitan level analysis of natural hazard, natural resource, population, and infrastructure information by MIRENEM.

Honduras

1988-1990: Planning strategy for urban watershed management to include natural hazard, natural resource, population, and infrastructure information for Tegucigalpa metropolitan zone under low-income settlement development pressure as part of integrated development project.

1989: Installation of an emergency information system and training of users from the Ministry of Planning (SECPLAN), National Emergency Council (COPLN) and Metropolitan Planning Agency (METROPLAN).

1988: Use of GIS in Tegucigalpa metropolitan area, natural hazard management, urban planning, settlement development, and the construction permission process.

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- 1988: Integration of fuel-wood plantation activities in flood and landslide hazard zones in the Tegucigalpa metropolitan area as part of integrated development project.
- 1987: Landslide hazard assessment for the Tegucigalpa metropolitan area as part of integrated development project.
- 1985: Flood hazard assessment for the Department of Atlántida as part of integrated development project.
- 1985: Landslide hazard assessment for the Department of Atlántida and Islas de la Bahía as part of integrated development project.
- 1985: Lifeline natural hazards assessment for the Department of Atlántida as part of integrated development project.
- 1985: General natural hazard information assessment overview for integrated development planning.

Nicaragua

- 1990-1991: Vulnerability analysis of meteorological and seismic hazards, vulnerability reduction strategies for volcanic eruptions and landslides, and geographic information system (GIS) installation and training.

*South America
Multinational*

- 1987-1988: San Miguel-Putumayo River valleys (Colombia and Ecuador): General natural hazards assessment and hazard impact on integrated projects as part of integrated development study.

Bolivia

- 1987: Flood hazard assessment and early flood alert system definition in the Mamore River valley as part of an integrated development project.
- 1987: Flood hazard assessment and erosion control definition in the Parapetí River valley as part of an integrated development project.

Brazil

- 1989-1990: Flood disaster reconstruction, flood alert, and water resource management for Alagoas.
- 1987: Decertification hazard assessment for the San Francisco River valley as part of an integrated development planning project.

Colombia

- 1989: Installation of emergency information system and training of users in support of the system for natural hazard management and development planning.

Ecuador

- 1990-1991: Agricultural and energy sectors vulnerability reduction to natural hazards studies and identification of investment projects for mitigation of disasters; installation and user training in geographic information systems (GIS).

Paraguay

- 1984: General natural hazards information assessment of the Chaco region for integrated development planning.
- 1984: Flood hazard assessment, Program Area 4, Chaco region for integrated development project.
- 1984: Decertification hazard assessment, Program Area 4, Chaco region for integrated development project.

Uruguay

- 1990: Natural hazards assessment, including ENSO and global climate change impact, as part of national environmental study for natural resource management and environmental project investment; installation and user training in geographic information systems (GIS).

Venezuela

1987: Seismic vulnerability and public building retrofitting evaluation.

Training

1990: National Institute for Territorial Studies (INETER): Installation and user training in geographic information systems (GIS) applied to natural hazard's assessment, management, and development planning (Managua, Nicaragua).

1990: Ministry of Agriculture: Installation and user training in geographic information systems (GIS) applied to natural hazards management and development planning, as part of the agricultural sector vulnerability study (Quito, Ecuador).

1990: Budget and Planning Office (OPP): Installation and user training in geographic information systems (GIS) applied to natural hazards and environmental management, as part of the national environmental study (Montevideo, Uruguay).

1989: Geographic Institute "Agustín Codazzi" (IGAC): Course on the use of natural hazard information in investment project formulation, with 18 participants from Colombia (Bogota, Colombia).

1989: Government of Trinidad and Tobago, Eastern Northern Range Project: Two week training workshop in landslide hazard assessment and preparation of landslide susceptibility maps. Total of 20 participants from different planning and infrastructure agencies (in collaboration with UWI and PCPPP).

1989: Government of Saint Lucia: two workshop sessions completed to improve hazard awareness and mitigation practices among banana growers. 80 farmers and 30 extension officers participated (Castries, Saint Lucia) (in collaboration with UWI and PCPPP).

1989: Government of Saint Lucia: Installation and user training in geographic information systems (GIS) applied to natural hazard and natural resource management (Castries, Saint Lucia).

1989: National Emergency Commission (COPEN): Installation and user training in an emergency information management system (EIMS). Participants from COPEN, The National Planning Secretariat (SECPLAN) and the Tegucigalpa Municipality (Tegucigalpa, Honduras).

1989: Regional Autonomous Corporation (CAR) Installation and user training in geographic information systems (GIS) applied to natural hazards management and

development planning. Total of participants from 4 different institutions (Bogota, Colombia).

- 1989: National Emergency Commission (CNE) and Ministry of Natural Resources, Energy and Mines (MIRENEM) Installation and user training in emergency information management systems (EIMS). (San Jose, Costa Rica).
- 1989: Office of Disaster Preparedness (ODP): Landslide hazard assessment and landslide susceptibility mapping workshop. Twenty three local participants and seven from other countries (Kingston, Jamaica).
- 1989: Ministry of Natural Resources, Energy and Mines, (MIRENEM): Installation and training of an upgraded geographic information systems (GIS) applied to hazards management in the fields of natural resources and energy (San Jose, Costa Rica).
- 1988: Office of Disaster Preparedness (ODP): Installation and training of ODP staff and representatives from planning and service agencies in the use of an emergency information management system (EIMS). (Kingston, Jamaica).
- 1988: National Planning Secretariat (SECPLAN): Installation and training in geographic information systems for natural hazards management and development planning. Other participants from the Municipality of Tegucigalpa (Tegucigalpa, Honduras).
- 1988: Ministry of Natural Resources, Energy and Mines (MIRENEM): Installation and training in geographic information systems (GIS) applied to natural hazards management and development planning (San Jose, Costa Rica).
- 1988: Asian Institute of Technology (AIT): Presentations on natural hazards and development planning at the 5th Disaster Management Course (Bangkok, Thailand).
- 1988: Government of Saint Lucia: Workshop on settlement infrastructure vulnerability to natural hazards, With 24 participants from five countries (Castries, Saint Lucia) (in collaboration with PCDPPP).
- 1988: Central American Institute for Public Administration (ICAP): Course on the use of natural hazard information in investment project formulation, with 22 participants from six countries (San Jose, Costa Rica).
- 1987: Government of Grenada: Workshop on hazard risk assessment and energy planning with parish representatives (Saint George's, Grenada).

- 1987: Government of Saint Lucia Workshop on hazard risk assessment, lifeline facility hazard analysis, and emergency planning information for town and village clerks (Castries, Saint Lucia).
- 1987: National Planning Secretariat (SECPLAN): Training workshop on Geographic Information Systems (GIS) applied to natural hazards management (lifeline network mapping) and development planning. Total of ten participants from SECPLAN and the Municipality of Tegucigalpa (Tegucigalpa, Honduras).
- 1987: National Forestry Corporation (CONAF): Workshop on natural hazard assessments and integrated development planning (Pto. Montt, Chile).
- 1986: Inter-American Institute for Integral Development of Land and Water (CIDIAT): Design and execution of two pilot courses on the use of natural hazard information in investment project formulation, with 42 participants from eighteen countries (Merida, Venezuela).
- 1986: Oxford Polytechnic: Co-direction of workshop on housing and reconstruction planning (Oxford, England).