DISASTER MITIGATION AS PART OF INTEGRATED REGIONAL DEVELOPMENT PLANNING

Stephen O. Bender

Department of Regional Development
Organization of American States*

PART I

INTRODUCTION

In the past, disaster management in Lesser Developed Countries (LCDs) has concentrated on reacting to the damage caused by natural phenomena. The reduction of the vulnerability levels of production facilities, infrastructure, and human settlements to natural hazard risks was frequently not explored. As a consequence, the need for massive local and foreign assistance for post-disaster relief and reconstruction has increased dramatically as ever larger segments of LDCs' population—particularly the poor—and ever greater portions of their productive capacity are affected each year by disasters. While disaster prevention is widely recognized as the most efficient and effective means of reducing damage and loss of life, mitigation measures have proved extremely difficult to implement. Mitigation implementation ought to be part of development activities and the development planning process must include natural hazard risk assessment and mitigation measure identification if significant reductions in the damage caused by natural phenomena are to be achieved.

1.1 The OAS/Department of Regional Development Natural Hazards Pilot Project.

The Organization of American States through its Department of Regional Development (OAS/DRD), with the support of the United States Agency for International Development and its Office of Foreign Disaster Assistance (USAID/OFDA), has undertaken an initiative to incorporate natural hazard risk assessment and mitigation measure identification into the integrated regional development planning process through the "Natural Hazard Risk Assessment and Disaster Mitigation Pilot Project in Latin America and the Caribbean Basin" (NHP).

With the intention of modifying development activities so that potential disaster can be avoided, the NHP seeks to:

(1) assess natural hazard risk as part of natural resource evaluation and development strategy formulation;
(2) identify and formulate mitigation measures for development investment projects,
(3) improve information interchange; and
(4) train planning technicians and decision makers in risk assessment and disaster mitigation techniques.

The NHP is bringing to the disaster management area a decidedly focused approach, as will be quickly observed in this case study. It is an effort in researching, field testing and implementing disaster mitigation measures through integrating appropriate technical information into real technical assistance activities. The NHP, recognizing the special role that integrated regional development planning plays in LDCs, is attempting to expand that role in the short term using the resources at hand while collaborating in drawing up an agenda for intermediate and long term mitigation research and implementation activities.

*(The views expressed in this case study are those of the author, and do not necessarily represent those of the Organization of American States.)

1.2 The Three Pilot Country Integrated Regional Development Planning Studies

To reach these objectives, the NHP is acting as a technical component in three ongoing integrated regional development planning studies already underway where the national government has requested OAS/DRD technical assistance. The countries are Honduras, Paraguay and Saint Lucia. In Honduras, the planning study covers the Caribbean Departments of Las Islas de Bahia and Atlantida with an emphasis on restructuring the agricultural production sector and developing the fishing and tourism industries. In Paraguay, the study covers the Paraguayan Chaco and focuses on structuring agricultural, industrial and colonization activities. In St. Lucia, the study covers the entire island and focuses on natural resource management, land use planning and settlement development.

These three planning studies offer a rich diversity of geographical settings, natural resource endowment, and population density, as well as a mix and predominance of different natural hazards– earthquakes, volcanoes, hurricanes, major flood events and incipient desertification. The experiences gained through these three planning studies as well as knowledge of planning activites and disaster mitigation implementation issues in other OAS Member States form the basis for this case study.

PART 2

MITIGATION AND THE INTEGRATED REGIONAL DEVELOPMENT PLANNING PROCESS

2.1 The Stages of the Planning Process

The OAS/DRD development planning process is comprised of four stages: The Preliminary Mission, Execution: Phases I and II, and the Implementation Phase (see Figure 1).

The purpose of the Preliminary Mission is to collect available information, diagnose problems and potentials, and define a preliminary set of objectives for the planning study. This preliminary diagnosis involves creating a profile of the natural resources base and the economic development potential, and identifying in a preliminary manner those areas most apt for sustaining development activity. In Phase I a detailed analysis of development potentials and problems with emphasis on natural resource management issues is prepared. From this detailed analysis, a multisectoral development strategy is proposed and a series of sectoral investment ideas are formulated for government review. Based on its decision, Phase II is undertaken to prepare detailed studies of packages of investment projects, usually at the prefeasibility stage, and an action plan. The role of the production sectors, support infrastructure, and human settlements is defined for each package of projects. The final stage deals with the implementation of investment projects. During this stage, support is given to final project design preparation and institutional, financial and technical activities to implement the projects.

2.2 Risk Assessment and Mitigation Measure Information Needs

To address mitigation needs, specific information must be incorporated into the various stages of the regional development planning process. This information can be divided into four groupings.

(1) *Natural phenomena.* As part of natural resource investigation, the presence and effect of natural phenomena on the goods and services that natural resources provide must be determined.

(2) *Natural risk assessment:* As part of natural resource evaluation, risk assessment information qualifies the impact natural phenomena have on natural resource potential and possible development activities.

(3) *Post disaster investigations:* Following the occurrence of natural events which result in disaster, be they major or not, post-disaster investigations further describe the qualitative and quantitative aspects of natural hazards, often supplanting the lack of historical observation and scientific research.

(4) *Lifeline network identification and vulnerability analysis:* Lifeline networks for production facilities, infrastructure networks and support systems to settlements define those critical segments or components which should have the lowest damage vulnerability or which should be recognized as priority elements for rehabilitation following a disaster.

In accordance with these groupings, the NHP has identified key information pieces that are required for effective mitigation to take place through the planning process (see Figure 2):

(a) In the Preliminary Mission, information concerning natural phenomena, the presence or absence of hazards, and post-disaster damage evaluation of the study area should be collected. The presence of hazards will indicate the need for further qualitative assessment as it affects natural resource management and economic development potential.
(b) In Phase I an assessment of the risks that natural hazards present to the study area should be prepared. Existing critical segments or portions of production facilities, infrastructure and settlements in high risk areas should be identified through examining risk and lifeline network maps. The vulnerability of those segments or portions should also be determined. The development strategy is affected by the presence of hazards, and hazard mitigation is a consideration in the identification of sectoral development projects.
(c) In Phase II specific mitigation measures for selected investment projects should be determined as well as vulnerable lifeline network elements for disaster preparedness activities. The presence of hazards should affect specific site selection, project engineering design and economic feasibility of development investment projects.
(d) In the Implementation Phase, the monitoring of mitigation implementation and disaster preparedness activities provides information for evaluation of development studies in execution and the formulation of new development studies and disaster management activities.

The information pertaining to these four stages is presently generated by three principal networks: international and national, natural phenomena research and monitoring centers and universities, disaster management entities, and multisectoral and sectoral planning agencies and operational secretariats and ministries. The source of financial support, staff training, subject areas of responsibility, and role in mitigation program implementation of these networks varies greatly from country to country, as does their interrelationship. The situation can be generally characterized, however, by an emerging disaster management program, resource constraints in the area of natural phenomena research and monitoring, and a planning process that is under tremendous pressure to design and implement economic development programs in the absence of natural hazard risk information.

2.3 Information Provided by and to Disaster Management Programs

Most national disaster management programs are beginning to establish linkages with research and monitoring activities, and development planning programs. These linkages attempt to cover the four above-mentioned information groupings. The role played by disaster management programs varies from country to country and in respect to each of the groupings.

The generation of natural phenomena and risk assessment information has been and is primarily an activity carried out by research and monitoring centers and universities as well as by operational entities such as the ministries of agriculture, transportation, public works, and defense. Disaster management programs are pointing out the need for inter-institutional coordination in the selection of subjects to be carried out, and the collection, dissemination and use of the information generated. When presented with a need for further natural

resource information, development planning studies are fulfilling a role not unlike the one just described, and by doing so, they support the efforts of the incipient mitigation program.

Following a catastrophic event, disaster management programs usually take the lead in generating damage assessments and relief need analysis, supported by sectoral studies for funding and executing rehabilitation activities. These individual investigations can be quite detailed, and when considered as a group, they are quite comprehensive. Overall analysis of the disaster and its impact are sometimes undertaken by research groups and universities. But often their usefulness in formulating reconstruction programs in the context of development planning is overlooked. Moreover, development planning studies, lacking a comprehensive view of the results of the disaster, may not consider sectoral reports and the implications of rehabilitation efforts.

As far as identifying lifeline networks, little has been done in this area by any group although disaster management programs recognize its importance. Likewise, assessing the vulnerability of the networks to natural hazards is rarely done given the lack of risk assessment information availability.

2.4 General Impact to Date of Natural Disasters on Mitigation Program Implementation

It would have to be said that the principal driving force behind mitigation program implementation has been the increased incidence of damage caused by natural hazards and the occurrence of major natural events in Latin America and the Caribbean in the past twenty-five years. The impact of these occurrences has stimulated support, particularly from international funding sources, for basic natural phenomena study and risk assessment and some ill-fated event prediction efforts. Increased support, both national and international, has been given to disaster management activities. The primary focus of these activities has been the creation of a national disaster relief organization, and the assignment of specific responsibilities for disaster preparedness, relief and rehabilitation actions.

The greatest impact on national, regional and local development planning processes has been the formulation of reconstruction programs following major disasters. The degree to which these programs have been integrated into existing planning processes varies considerably from country to country and occurrence to occurrence. The most typical response has been the creation of a reconstruction planning process in parallel with existing planning processes. Reconstruction programs are often supported by major international technical assistance and funding programs, and the preference has been to implement reconstruction programs outside of the mainstream of development activities in the hopes of expediting execution and avoiding existing bureaucratic delays.

The result of this dual development planning approach has often led to sectoral reconstruction efforts taking place without an assessment of the post-disaster reality of the particular affected area. The natural event may have altered substantially the conformation of the natural resource potential, if by nothing other than making clearly evident the natural hazard risk and the vulnerability of pre-disaster development activities. The resultant damage from the event has almost always necessitated a reevaluation of existing development policies and sectoral projects. In many cases, such policies and projects are no longer appropriate to the needs of the area, nor do they coincide with the best use of its natural resources. Reconstructing damaged production facilities, infrastructure and settlements without formulating a comprehensive development strategy based on the post-disaster situation has often lead to missed opportunities for incorporating disaster mitigation measures and recognizing the influence natural hazard risks have on development planning decisions.

PART 3

EXPERIENCES TO DATE OF THE NATURAL HAZARDS PROJECT

To date, NHP has participated with the OAS/DRD planning studies serving as pilot projects in the three countries in the preliminary mission and natural resources eva[illegible]on stages. While the actual *timing* [illegible] NHP activities has varied, several gen[illegible]rvations can be made from the experi[illegible] gained thus far. These experiences h[illegible]wed the NHP to further refine th[illegible]n and content of programmed [illegible]tivities for its future activities as well as influence those of the planning studies.

3.1 Initial Information Collection and Analysis

It should be noted again that the OAS/DRD technical assistance activities are taking place in the context of the individual country's development planning process. As such, natural hazard risk assessment and mitigation measure identification activities are taking place in parallel with the two other main activity areas related to natural hazards: disaster management and basic research concerning natural phenomena. The presence of NHP activities has promoted a recognition of these three areas of activities and has set in motion, to varying degrees, a dialogue between the participants of the three areas.

The majority of the activities carried out by the NHP to date are related to the preliminary mission stage, that is, the collection of existing information concerning natural hazards, associated risk assessment information, identification of existing mitigation measures, and the review of specific catastrophic natural hazard events. In addition to this information, which focuses on the study area (national or sub-national), the NHP has also inventoried international programs and projects related to natural hazard risk assessment which are, or may be of use to the individual country given the type of integrated regional development planning study that is being undertaken.

The types of information collected to date cover geological and meteorological events including earthquakes, volcanoes, hurricanes, floods and drought. The origin of this information is from diverse sources since in most cases there does not exist a designated entity with the responsibility to collect and analyze natural phenomena, risk, and post-disaster evaluation information. Thus, visits were made to sectoral development agencies, universities and research centers, national disaster relief offices, and international development, financing, and relief agencies to collect available information.

The information collected also varied in detail and scale. In the case of Paraguay and St. Lucia, base maps and natural resource information had been prepared as part of work previously undertaken by the OAS/DRD and the national counterpart. Thematic maps at a common scale covering precipitation, geology, soil classification, vegetation, land capability and land use were prepared by the OAS/DRD project team drawing on previously completed natural resource studies studies and project field work. In the case of Honduras, the preparation of these maps is programmed as part of the activities to be carried out during the initial stages of the planning study. In all three cases, this natural resource information will form the basic reference for subsequent natural hazard risk analysis.

Other types of information collected included maps and studies covering specific natural event occurrences, location of geologic faults and volcanoes, and deforestation, as well as inventories of agencies assigning responsibility for disaster relief activities. International programs covering agroclimate forecasting, seismic monitoring networks and tsunami research were also identified.

In no case were there found already-prepared individual or aggregate natural hazards risk maps or lifeline network maps. For example, in Honduras there is a lack of historical information, monitoring equipment, and technical data to determine possible hurricane surge tide levels and seismic risk. For St. Lucia, information is lacking to identify significant differ-

ences in hurricane risk for different areas of the island. In Paraguay, basic flood plain definition information is lacking.

3.2 Use of Available Information by the Development Planning Process

The development planning process used by the OAS/DRD in its technical assistance activities in each of the pilot countries is, in general, expanding the focus of the existing process in that country. This is manifested in two important ways. The OAS/DRD development planning process is generating an understanding of the natural resource base upon which economically sustainable development activities should be identified. The NHP, in turn, is introducing into this process an evaluation of natural events and the risks, as well as the benefits, they present in order to have a better understanding of that resource base. Second, the process will generate a group or package of sectoral development investment projects which are interrelated. These projects are explained in terms of their use of the natural resource base and justified by their relationship to each other in space and in time. Thus these projects should contain those mitigation measures necessary to assure that the vulnerability of those projects is within social and economic parameters acceptable to the country.

The natural resource and hazard risk information available, while limited at the present time, can influence the development strategy proposed by the development planning study and the corresponding investment projects that are prepared for eventual financing and execution. The NHP is assisting the planning team in reviewing the available information so that the maximum use of its risk assessment information can be achieved.

To begin with, the NHP is identifying areas for natural phenomena research and risk assessment for use during the execution of the planning study and as part of longer term investigations. Particular emphasis is being placed on:

(1) Reviewing post-disaster damage reports and interviewing sectoral agencies and local populations about vulnerable areas and reoccurring repair and reconstruction needs of particular portions or segments of production facilities, infrastructure and settlements;
(2) Preparing initial single hazard risk assessment maps based on existing information while realizing that additional information will be needed to refine such maps;
(3) Preparing lifeline network maps for the production, infrastructure, and service sectors; and
(4) Making an initial determination of the most vulnerable portions of those lifelines to be identified as risks and the susceptibility of those critical portions to mitigation measures within the context of on-going development planning activities.

The available natural resource and risk assessment information has also permitted a determination, albeit at a very preliminary level, of the effect of existing natural hazards on possible development strategies for the planning areas. Such a determination has led the NHP to propose increased investigation of alternative cropping and irrigation patterns, soil conservation and reforestation techniques, farm to market road patterns, and new settlement location and existing settlement expansion programs. These programs have been identified previously as possible development activities given the natural resource potential and proposed public and private sector programs. Thus sectoral development planners such as water resource, agricultural, transportation and agricultural economic specialists have become aware in the resource evaluation stage that natural hazards may pose constraints to certain development activities and that mitigation measures will have to be part of overall development project design.

A third use of the available information is a further examination of the information itself to identify additional risk assessment information contained within it and to determine methodological development needs. For example, the methods used in preparing precipitation, geological, soil classification and land capability

maps are being reexamined to determine the specific natural hazard risk assessment content of the maps produced.

On the basis of this examination and the general lack of particular risk assesement information available, several areas for development of methods have been identified. These areas were selected for their compatibility with traditional natural resource information collection and evaluation; their perceived cost effectiveness; and the ability to develop, test and introduce the methods into the three planning studies, thus affecting the development planning process in the short term. These areas are:

(1) *Flood plain mapping*: Additional remote sensing information will be used with available post-disaster evaluation studies and topographic information to prepare preliminary flood plain maps.

(2) *Landslide area identification*. Additional remote sensing information will be used with existing soil classification and geologic maps to identify landslide prone areas.

(3) *Incipient desertification mapping*: Additional remote sensing information with mapped precipitation, soil classification, water resource, vegetation and land use information will be utilized to identify the impact of cyclical and prolonged periods of drought, land use change and incipient desertification conditions.

(4) *Land use capability mapping*: Traditional methods for land use capability mapping will be examined for possible modification to more fully and clearly describe the constraints and opportunities that natural events present when defining different levels of possible agricultural production involving intensity of natural resource use and labor and capital investments.

The role individual specialists from the national counterpart technical teams, the OAS/DRD staff and natural hazard management consultants are playing should be noted at this point. Their initiative in questioning existing risk assessment methodologies and proposing new areas for investigation is critical to the development of the NHP. Their approach is pragmatic and firmly rooted in a desire to incorporate to the extent possible, risk assessment information in the natural resource evaluation and development strategy formulation stages.

3.3 Relationship of the Three OAS/DRD Planning Studies to National Mitigation Programs

The institutional, technical and financial support for the NHP at this time is due to the growing realization of the economic and social costs of natural disasters to development activities in the OAS Member States. The interest in this subject reached a level of critical concern in 1983 after reviewing the destruction caused by the flooding, drought and earthquake events in several countries. These events made more apparent than ever the need for preventive measures to lessen the vulnerability of large and small scale development activities.

Because of the circumstances, the NHP, which is primarily focused on prevention measures through the development planning process, has become a clearing house for varying types of disaster management activity information, requests and dissemination. The three OAS/DRD planning studies are assisting in the identification of resources and dissemination of information concerning research programs, training opportunities and disaster management publications while the individual national networks responsible for disaster management are organizing and strengthening their own efforts.

In respect to the overall activities being carried out by the OAS/DRD planning studies, national institutions and individual professionals who form part of the national counterpart are also the key players in the country's evolving national disaster management network. This is particularly true of the national planning agencies which often serve as the lead counterpart agency to the OAS/DRD planning study. The involved professionals, while working primarily in development planning activities, have also been named as participants in commissions and

working groups to address disaster preparedness and disaster mitigation issues at the national, regional and local level. The planning study itself and the specific NHP activities are providing information to, and requesting information from, planning agencies and sectoral development entities, thus demonstrating in a practical, operational sense, the needed linkages between development planning and disaster management.

3.4 Programmed Activities of the NHP in the Three Planning Studies

To reiterate, the NHP has dual roles of developing methods for natural hazard risk assessment and mitigation measure selection in the development planning process and providing technical information to the three ongoing OAS/DRD planning studies that are serving as pilot projects to test those methods.

A variety of activities have been programmed, each usually containing methods development and field testing-planning study of technical product components.

Some activities related to the natural resource evaluation and development strategy formulation stages have already been mentioned. These are flood plain mapping, landslide area identification, incipient desertification identification and land use capability determination. Throughout the development and testing of methods for these subject areas, the use of remote sensing information, and computer analysis and map printing will be examined.

These two elements are of particular interest because of their perceived cost effectiveness. As a target, it has been posed by the NHP that natural hazard risk assessment thematic maps such as those of flood plain definition can be generated at a cost of US 4 cents to 20 cents per square kilometer of area examined. If such costs can be achieved, one can realistically assume that such thematic maps can be included in the standard set of natural resource evaluation maps produced for development planning studies.

In addition to these thematic maps, methods for preparing a composite natural hazard risk assessment map will also be developed. Such a map will obviously draw heavily on the thematic maps as well as the synthesis land capability map. Another activity will include development of a methodology for preparing an initial lifeline network map. This map will include identification of critical production areas, infrastructure segments, and settlement facilities. All of these foregoing maps will contribute to the natural resource evaluation, development strategy formulation and investment project identification stages of the development planning process.

For the project formulation stage, methods will be examined for including the cost of possible natural disasters and the cost and benefits of mitigation measure in the justification of specific sectoral development investment projects. Special emphasis will be given to non-structural mitigation measures. It is hoped that increased damage information, particularly to the agricultural sector, will be available at that time to further justify the introduction of appropriate mitigation measures.

In addition to these activities, the NHP will continue to serve as best it can as a clearing house for information related to the development planning process and disaster management. The NHP has been promoting and will continue to identify and collaborate in the design and implementation of training courses aimed at introducing planning professionals and policy makers to the need and mechanisms for introducing natural hazard risk assessment and mitigation measure identification into larger scale development planning activities. A proposal for regional courses for South America, Central America, and the eastern Caribbean is in preparation. Near the end of the NHP, a workshop will be held to present and discuss the developed method and examples of technical information provided to the three pilot projects. This information will constitute a natural hazard risk assessment primer for development planners and will be prepared for international dissemination in English and Spanish. An initial version of the primer containing an orientation to basic natural hazard risk assessment techniques and

information needs will be distributed on a limited basis. Development planners receiving this initial version will be encouraged to comment on its contents and incorporate its findings into the respective development planning processes.

PART 4

CONCLUSIONS

As can be determined from the preceeding discussion, the NHP has before it the completion of the majority of its activities. The experiences to date, however, provide some insights into the problems and opportunities for including disaster mitigation in the development planning process. By definition, disaster mitigation programs which are part of such a process stand the best chance of implementation. Economically sustainable development is the basic activity of the public and private sectors alike. To the degree that their planning decisions and the implementation of their development investment projects embody disaster mitigation measures, prevention of death and destruction will be enhanced, and the quality of life and the distribution of the benefits from development activities will be the highest obtainable.

4.1 Institutional Organization of Risk Assessment and Mitigation Measure Information

The NHP is attempting to work with the resources at hand—the development planning process, scientific research endeavors and incipient disaster management groups in a bottom up approach, learning by doing to effect change within the involved organizations. The development planning process is not formally charged with comprehensive disaster mitigation responsibilities. It must, however, expand its role. Beyond reacting to the challenges presented by post-disaster reconstruction situations the development planning process must act effectively in the area of disaster prevention. To do so, development planners must become completely familiar with the different elements of disaster mitigation, particularly in the way in which natural hazard risk assessment and mitigation measure identification should influence development activities.

The development planning process, particularly as carried out by the OAS/DRD, has to be extremely pragmatic given temporal, financial and technical constraints. The NHP and the three planning studies serving as pilot projects are highly focused on preparing development investment projects for the highest potential areas of the planning area. As such, they seek and prepare information directly related to those areas. This implies a challenge to scientific investigation and disaster management groups to prepare for, and receive from, planning groups, on a priority basis, information which is most directly applicable to making better planning decisions.

The NHP, in collaboration with these two groups, is attempting to identify information as to the vulnerability of existing and proposed development activities. Where such information does not exist, it seeks natural hazard risk information, and lacking this, it looks for descriptions of natural events that help define the natural resources of the country. The NHP activities described above focus on the need for increased information at all three of these levels. In carrying out these activities, it is requesting specific information from the other two groups. This creates an agenda for further investigation and evaluation without creating or imposing an organizational structure for natural science investigation or disaster preparedness, an issue which is outside the scope of the NHP and the planning studies. By creating the need and opportunity to generate this information, it is forging concrete, operational linkages which will produce results while strengthening the national institutional structures of all three groups.

4.2 Relationship of Mitigation Programs to National, Regional, and Local Development Planning Processes

The first issue is one of geographical focus. The NHP is involved in a planning process that is directed at the national and regional scales and it seeks information at the corresponding level.

Natural hazard risk and development activity vulnerability information collected to date varies widely in geographical focus. Post-disaster studies may indicate areas where no, or extremely limited, development activities should take place regardless of the natural resource potential. More general natural phenomena and hazard studies identify potentially hazardous areas, but may lack adequate definition to evaluate existing or proposed development activities. In general, what is needed is further study of those most promising areas in terms of their natural resource potential in order to understand the limitations and opportunities the related natural events pose.

The second issue concerns the context and content of development policies, programs and projects. Development planning processes, in general, are more highly evolved and have more influence than disaster management processes at the present time in the three pilot countries, as elsewhere in Latin America and the Caribbean. Notwithstanding the risks posed by natural hazards, national governments will continue to make decisions concerning major investment projects with or without appropriate risk assessment and mitigation measure information. The NHP recognizes this situation and is attempting, through the planning studies, to make disaster mitigation part of policy, program and project issues.

At a policy level, it is requesting that the national counterpart strengthen efforts to include disaster prevention as a development policy issue. This is in recognition of the vulnerability of existing development activities, development capital needs, dependency on international investments, and disaster relief assistance, and anticipated increased risk assessment requirements from international lending and insurance institutions. At the development program level, the NHP will be discussing with sectoral agencies the impact of disaster-related damage and repair costs on yearly operating budgets and specific development programs. Besides identifying contingency funds for disaster relief and rehabilitation needs, the identification of prevention criteria and their cost, and the form of implementation will also be discussed. At the project level, the appropriate national counterpart institutions will be encouraged to include mitigation measures as part of project design and to identify those segments or portions of their development activities which are most vulnerable to natural hazards so that disaster preparedness actions may anticipate the location, type, and magnitude of possible damage.

A third issue is the identification of specific information that should be provided to and from the development planning process. Planning studies will continue to collaborate in the preparation of natural resource description and evaluation. They will also participate in initial natural hazard identification and risk assessment, hoping that these resource evaluation activities become on-going activities shared by sectoral development agencies and research entities. The NHP will collaborate in the preparation of initial lifeline network maps and vulnerability analysis, again hoping that this process will become an on-going activity. This information will be particularly valuable to disaster preparedness and relief activities.

On the basis of this diagnostic information, the development planning process will be more able to inform research institutions and disaster management groups as to the types and locations of natural hazard risks and the resulting vulnerability of production facilities, infrastructure networks and settlements. Obviously not all development activities can be freed from vulnerability. In some cases the social, economic and political costs involved in substantially reducing vulnerability to existing or proposed development activities will be too great to bear. In such cases, disaster preparedness activities must take the lead in mitigating against loss of life and property. But in the majority of cases, it is hoped that the mitigation measures built into the design of individual development projects will carry the brunt of mitigation responsibility.

In preparing such projects, the planning studies will use available non-structural and structural mitigation techniques including land use zoning, performance standards, building codes, material

specifications, and taxation and insurance programs. When these are absent or inappropriate, the planning studies will collaborate in their creation or modification to fit national, regional and local needs. The cost of mitigation measures will also be included in the economic analysis of the projects at the prefeasilibity stage.

4.3 Critical Areas for Information Generation

In summary, these are specific elements of basic planning documentaion that should more clearly highlight natural hazard risks and development activity vulnerability to guide the identification, formulation, and implementation of mitigation measures in development projects. The NHP, through the planning studies serving as pilot projects, is attempting to prepare such documentation in collaboration with the national counterparts drawn from the countries' development planning groups and with linkages to natural science research and disaster management groups. Some necessary natural hazard risk assessment activities such as comprehensive seismic mapping, and tsunami and hurricane surge tide investigation are outside the scope of the NHP because of historical information, technical, financial and time considerations.

Other critical areas of information, however, can be investigated. To the extent possible natural science investigation efforts and disaster management activities, together with planning study efforts, are to be focused on the following areas:

(a) Natural event occurrence definition, and review and synthesis of existing natural resource and natural hazard information;
(b) Flood plain, landslide, and incipient desertification identification and risk assessment;
(c) Lifeline network mapping on a sector by sector basis;
(d) Review and synthesis of existing post-disaster damage assessment, including local interviews and oral histories;
(e) Initial lifeline network vulnerability mapping;
(f) Review and synthesis of existing structural and non-structural mitigaton programs; and
(g) Modification of land capability mapping methodologies to more clearly manifest natural hazard information.

FIGURE 1

OAS/DRD NATURAL HAZARDS PROJECT
SYNTHESIS OF THE DRD DEVELOPMENT PLANNING PROCESS

COMPONENTS	STUDY DESIGN	STUDY EXECUTION		IMPLEMENTATION OF RECOMMENDATIONS
		PHASE I DEVELOPMENT DIAGNOSIS	PHASE II PROJECT FORMULATION AND PREPARATION OF ACTION PLAN	
Activities:	Receipt and analysis of request for cooperation Preliminary Mission - pre-diagnosis - preparation of cooperation agreement	Diagnosis of region - sectoral analysis - spatial analysis - institutional analysis - environmental analysis - synthesis: needs, problems, potentials, constraints Relation to national plans, strategies, priorities Development strategies - formulation and analysis of alternatives - identification of project ideas	Project formulation (profile or prefeasibility) and evaluation - production sectors (agriculture, forestry, agroindustry, industry, fishing, mining) - support services (marketing, credit, extension) - social development (housing, education, labor training, health) - infrastructure (energy, transportation, communications) - urban services - natural resources management Action plan preparation - formulation of packages of projects - policies for priority areas and sectors - enabling and incentive actions - investment timetable - evaluation of funding sources - institutional development and training - promotion	Assistance for specific programs and projects Assistance in incorporating proposed investments into national budget Advisory services for private sector actions Support to executing agencies Support in inter-institutional coordination
Products:	Signed cooperation agreement - definition of products of study - financial commitments of participants - preliminary workplan	Interim Report (Phase I Report) - diagnosis of region - preliminary development strategy - identified projects	Final Report - development strategy - action plan - formulated projects - supporting actions	Government execution of - feasibility and final design studies - implementation of projects - changes in legislation and regulations Improved operational capability of institutions
Time Frame:	3 to 6 months	9 to 12 months	12 to 18 months	Variable

OAS/DRD NATURAL HAZARDS PROJECT

GENERAL COMMENTS ON THE RELATIONSHIP OF NATURAL HAZARDS EVENTS AND DEVELOPMENT PLANNING PROCESS COMPONENTS

		EARTHQUAKE	VOLCANO	MAJOR FLOOD EVENT	HURRICANE	DROUGHT
Preliminary Mission	Objective:	Collection of information to establish the presence of hazards in the integrated regional development study area and the limits of risks posed.				
	Affect on development patterns:	Presence of hazards indicates the need for further qualitative and quantitative assessment as they affect natural resource and economic development potential.				
Development Diagnosis, Strategy Formulation, and Project Identification	Objective:	For those hazards present in the study area, assessment of the risk (risk hazard map) and identification of existing criterial segments or elements of production facilities, infrastructure and settlements (lifetime network map).				
		Inclusion of risk and vulnerability aspects in defining development potential and strategy (for example, flood plain, landslide area, incipient desertification identification, and land capability maps).				
		Identification of alternative non-structural and structural mitigation measures in initial development project identification.				
	Affect on development patterns:	Presence of hazard will affect the formulation of the development strategy and the type and location of investment projects and suggest modification of the lifeline network.				
				Presence of hazard will affect overall strategy formulation and hazard mitigation should dominate identification of production sector projects, particularly agriculture.		
Action Plan Preparation and Project Formulation	Objective:	Determination of specific mitigation measures for selected investment projects and determination of critical lifeline network elements for disaster preparedness activities.				
	Affect on development patterns:	Presence of hazard will affect the action plan for project implementation and the specific site selection of investment projects at the local level, project engineering design and economic feasibility.				
Implementation	Objective:	Follow-through on implementation of mitigation measures and disaster preparedness.				
	Affect on development patterns:	Monitoring of natural phenomena for early warning against possible damage, and formulation of future risk assessment and disaster preparedness activities.				

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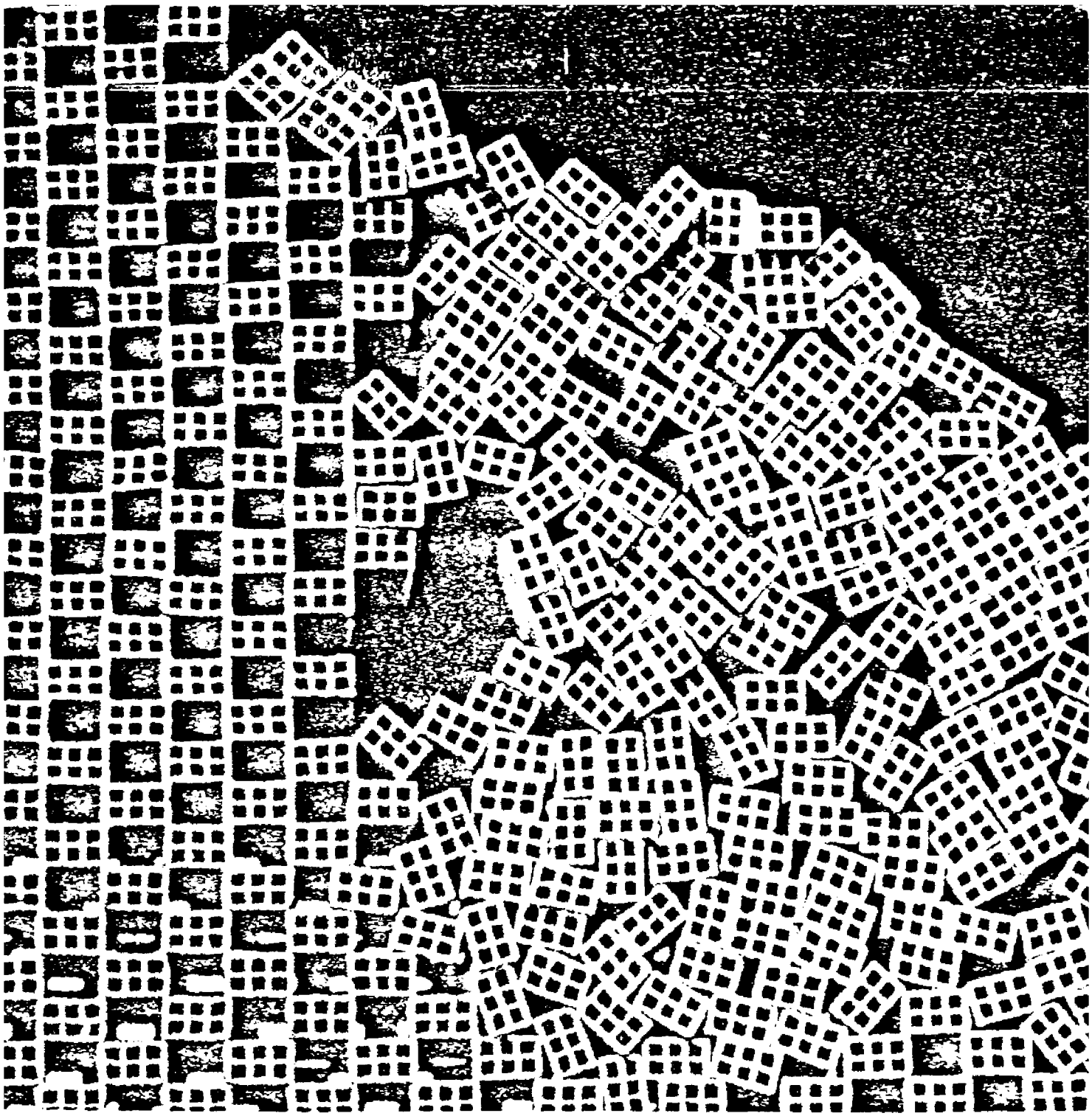

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON DISASTER MITIGATION PROGRAM IMPLEMENTATION

OCHO RIOS, JAMAICA, NOVEMBER 12-16, 1984

Berke

CENTER FOR INTERNATIONAL DEVELOPMENT PLANNING AND BUILDING, COLLEGE OF ARCHITECTURE AND URBAN STUDIES
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY