

Disaster Risk Reduction Course



Reference Material



**Oficina de Asistencia para Desastres
Agencia para el Desarrollo Internacional de los Estados Unidos
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INTRODUCTION TO DISASTER RISK MANAGEMENT

BASIC CONCEPTS: Hazard, Vulnerability and Risk
MAJOR AREAS: Risk Identification, Risk reduction, Disaster Management,
Recovery

MAIN REFERENCE: *"Risk Management"*, Hemispheric Risk Reduction
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1.1 Introduction

In order to deal with the issue of risk management, it is necessary to understand the evolution of this concept. Traditionally, disaster management has focused on anticipating and responding to natural and man-made hazards. Recently, however, attention has shifted towards gaining a better understanding of the variables that determine the intensity and extent of disaster impacts. Awareness of these underlying conditions has fostered the need to design and implement mechanisms that can eliminate the actual causes of disasters, or, if this is not possible, at least mitigate their impact.

Although some simply pay lip service to the idea of risk management, to others it has become an emerging alternative to break the vicious circle into which disaster management has fallen. The concept of risk management, with its long-term vision, has altered the way in which short-term circumstances are viewed. This new approach is a strategy rather than a discipline, and is the

result of multi-sectoral, inter-disciplinary actions by individuals and institutions. With time, risk management may become a highly-prioritized value among societies.¹

1.2 Defining Risk

Given the broad range of disciplines involved in disaster work, it is important to define the most frequently used terms to facilitate communication and information exchange. The following common terms are taken from the Glossary, which includes a compilation of basic terms and their meanings according to recognized sources.

Hazard: An external risk factor represented by the potential occurrence of a natural or man-made event that can occur in a specific place, with an expected intensity and duration.

Vulnerability: An internal risk factor of a person, object or system exposed to a hazard, which corresponds to how it may be affected.

Risk: The probability of exceeding a specific level of social, environmental and/or economic damages, over a predetermined period of time.

“Acceptable risk” refers to the specific value of damage a community is willing to assume.

Risk is based on quantifying the damage expected to occur from a specific hazard. It depends not only on the hazard, but also on the susceptibility and capacity of the affected to respond.

The equation $R = f(A, V)$ means that risk is a function of the hazard and the level of vulnerability, and is directly proportional to both of these factors. In order to prepare an accurate risk estimate, it is necessary to analyze both the hazard and the level of vulnerability.

1.3 Risk and Disasters

Disasters are the manifestation of existing risk conditions. Risk conditions depend on the occurrence of intense events or phenomena and on the level of vulnerability. The level of vulnerability, in turn, determines the degree to which natural phenomena will become disasters. Vulnerability in its various forms is a development deficit and a negative environmental account towards which development planning efforts should be addressed. The vulnerability of human settlements is closely linked to the social processes within a community and its fragility, susceptibility, and lack of resilience to hazards. Environmental degradation, poverty and the occurrence of disasters, then,

¹ Sarmiento, J.P., 1999.

are intimately linked. Disasters are environmental events that result from social risk building, or increased vulnerability or hazards, or a combination of the two.²

The “disaster” concept refers to severe and exceptional situations that affect the life, health, goods and habitat of human populations (and in some cases of animal and plant stocks) beyond the self-help and resistance thresholds of the systems involved. The concept is not limited to the event itself; it also includes those affected by the event and their intrinsic weaknesses, propensity or “sensitivity” to the hazard that will emerge during a major negative event (vulnerability); and especially, their capacity to face the event (resiliency) and repair and reconstruct the damage. Thus, a disaster signifies a negative collective situation that arises from the conjunction of super-human forces (of natural or anthropogenic origin) and conditions of vulnerability.

It should be noted that these situations go beyond the individual sphere, although they are comprised of many personal calamities. From the systemic point of view, in order for there to be a disaster, the disturbance must affect the cohesion and functionality of a system, either in whole or in part. Disaster, from this standpoint, is synonymous with entropy. In common terms, it signifies a break in the established order.³

A disaster can have direct, indirect and secondary effects.⁴ Direct effects impact immobile assets and stocks (finished and in-process goods), and are represented by the total or partial destruction of physical infrastructure, buildings, equipment, means of transportation and storage, crop lands, irrigation work, and reservoirs, etc. Indirect effects refer to the damage to production capacity and social and economic infrastructure caused by the direct effects in the period between the occurrence of the event and the partial or total recovery of production capacity. Examples include loss of future crops, production losses due to a lack of raw materials, uncollected taxes, higher transportation costs, and the additional costs of facing new situations caused by the emergency or disaster. Occasionally, the reverse situation may occur, whereby new economic opportunities arise, which should be deducted from damage estimates. Finally, secondary effects are manifested in the impact of the disaster on principle macroeconomic variables; therefore, they reflect the repercussions of direct and indirect damages without including them. Examples include the impact on the growth rate of the global and sectoral gross domestic product, the trade balance (changes in exports, tourism, cross-entry of imports, payment for external services), and changes in the debt level, monetary reserves, public finances, and gross investment. It may even be necessary to estimate secondary effects on the inflation process, employment level and family income.⁵

The occurrence of a disaster, or of damages and losses in general, presupposes the prior existence of predetermined “risk” conditions. A society’s level of risk relates to its level of

² Cardona, O.D., 2002.

³ Cardona, O. D., 2002.

⁴ ECLAC, 1991.

⁵ Sarmiento, J.P. in Pan American Health Organization, 2000.

development and capacity to modify its potential risk factors. In this regard, disasters are mismanaged risks. All risks are socially constructed, even if the associated physical event is of a natural origin.⁶

1.4 The Scope of Risk Management

Within the field of risk management, it has gradually become accepted that risk itself is the essential problem and disasters are the byproduct. Risk and risk factors have become the fundamental concepts in the study and practice of disaster management. This paradigm shift has been accompanied by a growing emphasis on the relationship of risk and disasters to development planning and processes and therefore, with environmental issues and sustainable development. Risks and disasters are now seen as components of development and not as autonomous conditions generated by forces external to society.⁷

Risk management is understood as the efficient planning, organization, direction and control process aimed at risk analysis and reduction, disaster management, and post-disaster recovery.

1.5 Risk Analysis⁸

Risk analysis has been transformed from a simple function to an essential area of risk management. The systematic use of available information allows risk management organizations to determine the probability of certain adverse events and the magnitude of their consequences.

Risk analysis includes:

- Identifying the nature, extent, intensity and magnitude of the hazard
- Determining the existence and degree of vulnerability
- Identifying the measures and resources available
- Constructing probable risk scenarios
- Determining acceptable risk levels as well as cost-benefit considerations
- Establishing priorities regarding time and movement of resources
- Designing effective and appropriate management systems for implementation and control of these processes.

The inputs generated from risk analysis are fundamental to all other components of risk management.

⁶ Cardona, O. D., 2002.

⁷ Cardona, O. D., 2002.

⁸ "De donde venimos y hacia donde vamos, una perspectiva de 30 años sobre el tema de desastres en las Américas", Bell, Paul C.; Sarmiento P. Juan Pablo; Olson, Richard Stuart. Draft, August, 2002.

1.6 Risk Reduction

Risk reduction is the newest, and still evolving, area of risk management aimed at risk elimination or reduction. Significant progress has been made in the area of risk reduction, though it has been subject to limitations. One of its greatest problems is the sector (compartmentalized) approach assumed by most risk management organizations. Approaches towards risk management have been fragmented, rather than comprehensive, and overly dependent on the view of the specific discipline involved in the assessment. This situation has resulted in numerous epistemological and methodological variations. These scattered efforts have not facilitated the work of decision makers, who require a comprehensive, inter-sectoral and multidisciplinary approach.⁹

Most organizations working in the field are education or research institutions such as universities, geology and hydro-meteorology institutes, and non-governmental organizations and foundations, supported by economic development or financing funds, fellow governments and multi- and bilateral organizations. Multilateral banks have recently begun to participate in this area, as they recognize the economic, political, environmental and social impact of disasters on development.

Disaster management and risk reduction are now being recognized as broad and complex issues that can no longer be left in the hands of a few specialists. Therefore, the trend is toward a proactive and comprehensive treatment. The old myth of response as the solution has been replaced by the focus on reducing risk, which involves multiple actors and institutions.

Two components of risk reduction can be clearly distinguished:

Prevention: Actions aimed at eliminating risk, by preventing the event from occurring or preventing damage by avoiding or limiting the subject's exposure to the hazard. It is difficult to implement measures to totally neutralize risk, particularly if it originates from natural hazards such as hurricanes, earthquakes, volcanic eruptions and tsunamis. In general, preventive measures are highly costly and nonviable when analyzed within the context of the existing reality. An example of a preventive measure is the permanent relocation of houses, production centers and infrastructure located in hazardous areas (landslides, floods, volcanic eruptions, etc.). Undoubtedly, prevention is of the utmost importance and can most benefit future development processes, such as expansion of a city or a change in land use. In these circumstances, the concept of prevention may be included as another variable in the decision-making criteria.

Mitigation: A set of actions aimed at reducing the magnitude and effects of an event. Mitigation measures include instrumentation and research of potentially

⁹ Segura, N., 1995.

dangerous phenomena, identification of high risk areas, and preparation of natural resource management standards and building codes.

1.7 Disaster management

Disaster management is the area of risk management that forecasts the best way to handle the impact and effects of a disaster. It also encompasses the execution of actions necessary for a timely response, such as evacuation procedures, victim care, and reduction of property loss.

A decade ago, disaster-related activities focused predominantly in this area. Disaster management has enjoyed political support at the national level as well as from international organizations, and has attained an acceptable level of professionalism among first responder organizations. Impressive technological advances in recent years have no doubt benefited this component. Progress has been made in planning, project development, and implementation. There have been important achievements in the definition of guidelines, protocol and procedures, as well as in the design of simulation exercises. However, while some disciplines and organizations have made significant progress, others still lag behind.

Despite the progress made in disaster management, vulnerability levels in many areas have increased. This situation is complicated by the great losses resulting from disasters that create the need for new soft loans to cover reconstruction costs, which aggravates the already fragile financial situation of many affected countries.

Disaster management works hand-in-hand with risk reduction so that response capabilities are adequate to deal with disasters and reduce the level of damage. If this is done successfully, disasters are simple emergencies, rather than catastrophes; fewer lives, goods and services are lost; less resources are spent on recovery; and the affected population can quickly return to traditional living conditions.

Disaster management includes three components:

Preparedness: A set of measures and actions aimed at reducing the loss of human life and other damages. Examples include the preparation of search and rescue and response plans as well as the definition of procedures or contingency plans. Tools used for disaster preparedness include: inventory of physical, human and financial resources, monitoring and surveillance of dangerous phenomena, personnel training for emergency work, and definition of evacuation routes and shelters.

Alert: A state of formal declaration of the near or imminent occurrence of a disaster. Not only is a disaster warning issued, but guidelines for institutions and the

population are also announced. Timely alerts depend on the changing speed of the event, as some are slow-onset (tropical storms, droughts, etc.), and others appear suddenly (earthquakes, landslides, etc.); therefore it is not always possible to issue an alert. Remote sensors, precipitation register networks, satellite systems, etc. are examples of instruments utilized in this component.

Response: Actions undertaken when facing an adverse event to save lives, reduce human suffering, and diminish property losses. It is the immediate reaction to provide timely assistance to a population undergoing a severe change to its life patterns resulting from the emergency. Examples include search and rescue, medical assistance, damage assessment, temporary shelter, and clothing and food supply.

1.9 Recovery

Finally, recovery includes all measures that initiate the reestablishment of normal living conditions of the community affected by a disaster. It involves two broad aspects: temporary measures to restore basic, short-term critical services, and long-term, permanent solutions to reinstate the normal living conditions of the affected population.

Much of the criticism of recovery management deals with certain practices to rebuild affected infrastructure and processes without consideration of the risk variables. Overlooking these considerations leads to “rebuilding the vulnerability” by creating a new risk scenario. Other criticisms include the lack of citizen participation in reconstruction processes, and the difficulty regarding the entities responsible for managing the recovery. Another issue has to do with the entities responsible for managing the recovery. There is an ample range of experiences and the options for dealing with recovery, and these differ noticeably from country to country. Entities range from ad-hoc commissions in charge of coordinating efforts with the ministries in charge of the different sectors (public works, agriculture, livestock, treasury, energy, telecommunications, etc.) to autonomous organizations formed because of a disaster to independently manage rehabilitation and reconstruction work.¹⁰

Despite these differences, there is a clear need for future design of comprehensive reconstruction and transformation plans that incorporate civil society, NGOs and the private sector, both in the planning as well as the implementation phases.

Based on recent experiences, some guiding principles for reconstruction efforts have been established and adopted, which recognize that each situation deserves specific analysis of existing conditions, idiosyncrasies, and capabilities of the affected population.

¹⁰ Segura, N., 1995.

Two components can be clearly identified in this area:

Rehabilitation: The transition period that begins during response to reestablish critical basic services in the short term. Gradual recovery of the affected services begins here as well as rehabilitation of the stricken area. Reestablishment of services is achieved through provisional or temporary measures that do not necessarily constitute the definitive repair of the affected system, as they only strive to restore short-term service.

Reconstruction: The process of infrastructure repair, restoration of the production system, and resumption of the population's normal life pattern. This process generates the most opportunities to improve the development level that existed prior to the disaster. Medium- and long-term measures aim to create new employment sources, repair material damages, and incorporate and adopt prevention and mitigation measures.

Recovery offers the window of opportunity in which to surpass the pre-disaster level of development and include the incorporation and adoption of prevention and mitigation measures.

As discussed, there is a close link between the four areas – risk analysis, risk reduction, disaster management and recovery – and therefore, the implementation of one affects the others and the general development process of the population. Socioeconomic development is intimately related to all areas and components. Development can therefore positively influence risk management by creating appropriate conditions for risk reduction intervention, or it can generate harmful situations leading to greater vulnerability and increased risk. However, the development process itself may be compromised when existing risk conditions evolve into disaster situations.

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Ref: The World Bank, 2002, Natural Hazard Risk Management in the Caribbean – Revisiting the Challenge, Caribbean Group for Cooperation in Economic Development

1. Natural Disasters - A Development Challenge

The consequence of natural disasters for economic activities, property, human welfare and natural resources can be devastating. In the Caribbean, these events have greatly affected the productive sectors of the economy such as agriculture and tourism, not to mention the impact on communities, in particular the poor. On average, at least one major hurricane and numerous tropical storms cross the Caribbean each year. Within the Caribbean region, individual countries have incurred losses from a single hurricane event exceeding annual GDP. Climate change is likely to make matters worse. Extreme weather events may occur more frequently, sea-level rise would magnify the impact of storm surge and waves on coastal areas, while protective eco-systems like coral reefs and mangroves would be weakened by increased sea-surface temperatures and changes in salinity.

With increasing frequency, countries in the region are facing situations in which scarce resources that were earmarked for development projects have to be diverted to relief and reconstruction following disasters, thus setting back economic growth. Recent experience in countries such as Jamaica, Dominican Republic and

Box .1: Main Natural Disasters in the Caribbean (1979-2001)

Year	Country (Hazard Type)	Persons Affected	US\$ (000'S)*
1979	Dominica (David & Frederick)	72,100	44,650
1980	St Lucia (Allen)	80,000	87,990
1988	Dominican Republic (Flood)	1,191,150	91,286
1988	Haiti (Gilbert)	870,000	
1988	Jamaica (Gilbert)	810,000	1,000,000
1989	Montserrat (Hugo)	12,040	240,000
1989	Antigua, St Kitts/Nevis, Tortolla, Montserrat (Hugo)	33,790	3,579,000
1991	Jamaica (Flood)	551,340	30,000
1992	Bahamas (Andrew)	1,700	250,000
1993	Cuba (Storm)	149,775	1,000,000
1993	Cuba (Flood)	532,000	140,000
1994	Haiti (Storm)	1,587,000	
1995	St Kitts & Nevis (Luis)	0	197,000
1995	US Virgin Islands (Marilyn)	1,800	1,500,000
1998	Dominican Republic (Georges)	10,000	2,193,000
2000	Antigua/ Barbuda, Dominica, Grenada, St Lucia (Lenny)	975,595	
2001	Cuba (Michelle)	5,900,012	87,000

* valued at the year of the event.

Source: OFDA/CRED International Disaster Database (EM-DAT) 2002.

#USAID/Jamaica 2000. Hurricane Lenny Recovery in the Eastern Caribbean.

the OECS countries confirms that economic growth only recovers slowly from a major natural disaster. Disasters directly impact on the foreign exchange earnings capacity of a country, at a time when extra resources are needed to finance imports of food, energy, and inputs for the agricultural and manufacturing sectors. If sustainable development is to be achieved in the Caribbean region, countries will have to take effective measures to manage these natural hazard risks.

Box E.2: Hurricane Georges, September 1998: Social and Economic Impact

In late September 1998, Hurricane Georges traveled through the region, causing significant damage in the north and southern Caribbean.

In *St Kitts and Nevis*, physical infrastructure was severely damaged, including 85 per cent of the housing on St Kitts. The majority of the country's schools and the primary hospital, and almost half of the sugar crop was lost. Most tourist facilities were closed for two months or more after the storm. Total losses were estimated at almost US\$484 million. Damage in *Antigua and Barbuda* was concentrated on the southern coast of Antigua, with 400 houses destroyed. Tourism facilities on both islands sustained significant losses and damage to schools was over US 1.5 million.¹¹

In the *Dominican Republic*, over 200 people were killed by the storm and the health of hundreds of thousands of others was threatened by damages to potable water systems and health centers. The majority of crops, in particular on small farms, were damaged, leaving many in need of food assistance. Overall almost one million people were directly affected by the storm. A quarter of the roads, more than half of the country's bridges and 1 of every 7 hotel rooms was destroyed or damaged. Over half of the forests in the eastern half of the country were damaged. Considerable losses of soil through flooding and erosion will have significant, long-term effects.¹²

The monetary loss from direct and indirect damage in *Haiti*, valued at \$180 million, was lower than in surrounding countries, yet an estimated 300,000 people lost everything they owned. Crops, livestock and agricultural infrastructure sustained significant damage, leading to food security concerns in the rural areas. Erosion and soil loss from deforested hillsides were substantial.¹³

Disasters associated with natural hazards are fundamentally an issue of development. Each natural disaster leaves in its wake an overwhelming volume of evidence of how planning and investment decisions contribute to vulnerability – and the consequent risk of further disasters. The location of a housing development, how it is considered, and how land use affects the natural environment are all factors that contribute significantly to the damage inflicted during a hazard event. For the most part, this damage is avoidable by first investing in hazard assessments and then incorporating the findings of these assessments into decisions affecting future development. In this regard, Puerto Rico, also in the Hurricane George's path, escaped serious economic disruption and loss of life, primarily because it was better prepared. The experience of the British Virgin Islands also demonstrates the benefits of preventive steps to lessen the damage from recurring hurricanes. Since the management of natural hazards has a close link to a country's

¹¹ USAID 1999. *Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean, Special Objective Document.*

¹² USAID/Dominican Republic, 1999. *Hurricane Georges Recovery and Reconstruction, Special Objective Document.*

¹³ USAID/Haiti 1999. *USAID/Haiti Operation Bounce Back Post-Hurricane Georges Recovery Program.*

development prospects, it is essential that hazard considerations are incorporated more systematically into development planning and resource allocation processes, something that is currently not taking place.

There is also a close link between environmental degradation and poverty, with low-income populations and communities being disproportionately affected by natural hazards. Limited resources, skewed land ownership and tenure patterns can drive the poor to settle on vulnerable land. Easy access to production resources can also prompt settlement of otherwise hazardous locations. Unsustainable natural resource use associated with poverty can exacerbate these existing vulnerabilities. Sectoral planning, resource allocation and land use decisions must give special attention to their repercussions on the vulnerability of low-income communities.

2. Hazard Risk Management: A New Approach to Recurring Natural Disasters

Traditionally, disaster management has focused nearly exclusively on actions that can be taken immediately prior to, during, or shortly after a disaster event to reduce economic damage and loss of life. It has also often been seen as the sole responsibility of governments. In recent years, this traditional disaster management approach has been evolving slowly to include natural hazard risk management, in addition to preparedness, response, and recovery planning and management.

Natural hazard risk management is significantly different from traditionally preparedness and response activities. A traditional approach attempts to address existing problems, while hazard risk management focuses more on anticipating problems by ensuring that growth and development address the likelihood of hazards; and their inaction with environmental systems. Whereas traditional preparedness and response mechanisms often focus on individual hazard events, risk management views hazard exposure as an ongoing process and aims at reducing vulnerability to these hazards across all sectors of society and the economy. Such an approach needs to become an integral part of economic planning and policy making.

Outside of the traditional disaster management system, no comprehensive framework for coordinating multi-sectoral risk management activities has existed until recently. Two new regional initiatives, the development of a proposed *Strategy and Results Framework for Comprehensive Disaster Management in the Caribbean (CDM)* and the establishment of the *Disaster Mitigation Facility for the Caribbean (DMFC)* within the Caribbean Development Bank, significantly enhance the potential for integration of risk management into the region's development agenda.

Disaster are typically seen as discrete events, such as a rainstorm, hurricane or earthquake. Damage from a disaster event, however, is the result of vulnerability that existed prior to the event. Little can be done to reduce the occurrence and intensity of

Box E.3: Developing a Regional Risk Management Strategy

Comprehensive Disaster Management Strategy (CDM). In 2001, a working group, representing regional and national disaster management organizations, the private sector, regional technical institutions and multi- and bi-lateral donors and lending institutions developed a proposed *Strategy and Results Framework for Comprehensive Disaster Management in the Caribbean*. Funding for the development of this strategy was provided by USAID and UNDP. This strategy was undertaken with the objective of integrating comprehensive disaster management into the development process within the region, providing an important framework for strengthening and coordinating risk management efforts. This proposed CDM strategy emphasizes hazard risk reduction. Within this framework, the institutional capacity and role of the Caribbean Disaster Emergency Response Agency (CDERA) to promote CDM at the regional level will be strengthened. At the national level, consultations are being held to encourage governments to develop national strategies within the CDM framework and to identify champions for hazard risk management at the ministerial level and within the private sector.

Disaster Mitigation Facility for the Caribbean (DMFC). Also in 2001, with support from the USAID Office of Foreign Disaster Assistance, the Caribbean Development Bank (CDB) established the Disaster Mitigation Facility for the Caribbean, marking an important step towards the promotion and coordination of risk management within the region. The CDB assists borrowing member states, across the broad range of activities and sectors, including poverty reduction, infrastructure development and environmental management, placing it in a strong position to promote and coordinate activities in sectors that have not traditionally addressed directly hazard risk management. The DMFC will focus on the incorporation of hazard risk management into development decision making within the internal operations of the CDB, its borrowing member countries and regional institutions. Activities of the DMFC include support for strengthened building standards and enforcement mechanisms and assistance to member countries with the development of national-level risk management policies and plans.

most natural hazards, but their effects can be minimized through disaster preparedness and response activities, to safeguard lives, and hazard risk management activities and programs, to reduce existing and future vulnerability to damage and loss. Reducing vulnerability to near-term climate hazards is also an effective strategy for reducing long-term risks to the effects of climate change. There are three main, interrelated categories of risk management actions – **risk identification, risk reduction and risk transfer.**

Risk Identification. A thorough understanding of existing vulnerabilities, including their location and severity, is critical for the development and prioritization of investment programs and activities for hazard risk management. As the level of vulnerability can increase, or decline, with the aging of existing facilities and with new growth, determining underlying causes makes it possible to eliminate or reduce new vulnerabilities as communities, countries and the region as a whole develop. A broad range of activities contributes to the identification and understanding of natural hazard risk: hazard data collection and mapping, vulnerability assessment, risk assessment and post-disaster assessment.

Risk E.4: Dominican Republic: Community involvement in reducing risks

In the Dominican Republic, the Asociación Dominicana de Mitigación de Desastres (ADMD) and a coalition of NGOs have championed disaster preparedness and prevention among the most vulnerable communities, conducting workshops in over 700 communities since 1995. In these workshops, local participants prepare a community emergency plan, which is built on an assessment of local hazard vulnerabilities and of locally available resources to address these vulnerabilities. During hurricane Georges (1998), communities that had established emergency committees through this program successfully evacuated people from flood-prone areas, established shelters, organized clean-up brigades, and requested and distributed assistance without incident. In addition, these communities have identified and implemented small risk reduction projects and actions. Projects, such as the construction of containment walls and drainage ditch embankments, are designed to address local health and environmental contamination problems as well as reduce and mitigate the constant floods and landslides, which are a daily concern for these communities. The positive effect of these initiatives was demonstrated by the reduced impact of hurricane Georges on the participating communities.

Risk Reduction. Risk reduction activities are designed to mitigate damage from hazard events. These activities address existing vulnerability through such measures as retrofit, strengthening and relocation. Actions taken to reduce future vulnerability, such as the implementation and enforcement of building standards, environmental protection measures, land use planning that recognizes hazard zones and resource management practices, will provide significant benefits over the long term. Risk reduction measures should lead to “safer” growth, rather than a further accumulation of vulnerability. However, they should always complement activities to safeguard individuals and resources exposed to existing vulnerabilities. Risk reduction measures can be directed towards physical, social and environmental vulnerability.

Risk Transfer. It is often not possible to eliminate completely the vulnerability of key assets. In small island states, there may be critical components of the nation’s infrastructure for which no replacement is readily available. In such cases, it is important to strengthen fiscal resilience and to reduce financial risk through mechanisms that ensure funds are readily available to rectify the damage or replace the facility should a loss occur. Utilizing the insurance mechanisms is appropriate for risks that cannot be mitigated through structural or ex-ante damage reduction measures, and against events that have the potential to cause large economic losses. Limiting public- and private-sector debt and creating contingency funds also build up economic resilience to the effects of natural hazards.

3. Review of risk management practices in the Caribbean

As a foundation for this report, a comprehensive review of hazard risk management practices in a number of Caribbean countries has been undertaken. As part of this review, the report identified certain activities as ‘good’ practices, which are intended to provide practical guidance to governments and other organizations. Using these ‘good’ practices as a yardstick, assessments of actual management practices in several regional countries were carried out. The status of practices and gaps in Jamaica, Dominican Republic, and individual OECS countries is summarized in the matrix tables, which are presented in a separate technical annex to this report.

This paper focuses exclusively on policies and practices for long-term hazard risk management, through risk identification, risk reduction and risk transfer approaches to the community, national, and sub-regional and regional levels. Preparedness, response and recovery activities are not included in the analysis framework adopted in this paper. This is not to imply that these activities are not important; effective risk management is not possible without them. Despite existing discussions and successful pilot initiatives, natural risk management initiatives do not have the same constituency and political support as do the traditional disaster management activities. Accordingly, the work outlined in this paper addresses that gap by focusing exclusively on hazard risk management.

This review established that there is already considerable experience with risk management in the region. However, the existing knowledge is not well developed, has not been widely shared and has not been incorporated into mainstream development decision in either the public or private sector. The main reasons for this are:

- a) A continued perception that risk management is the sole province of government agencies responsible for disaster management rather than a shared responsibility involving sector ministries, trade associations, and the private sector.
- b) Low public demand for risk management measure due to complacency, a lack of understanding of the risks involved, and the perceived cost of these measures;
- c) A lack of dissemination and public education with respect to the potential benefits and successful experiences with hazard risk management.

Box E.5: Hazard Risk Management in the British Virgin Islands

Background. Hurricane Hugo had a traumatic impact on the physical and socio-economic fabric of the BVI in September 1989. Losses amounted to US\$40 million and 30 per cent of the country's housing stock was destroyed. This event was a catalyst for introduction of an administrative, operational and policy framework to reduce the impacts of future hazard events. In response, the Government recruited regional disaster management professionals for advice on how best to strengthen the country's technical capacity for disaster management.

A new approach to disasters. The post-Hurricane Hugo assessment study undertaken in 1993 represented an important departure from the traditional approaches to disaster management that focused on response and recovery and shifted the emphasis to mitigation. This study influenced all subsequent work on hazard assessment and disaster mitigation in the BVI, including the 1997 Hazard Risk Assessment, the 1999

Building Regulations, revised development standards, environmental protection measures and the current Mitigation Strategy, which was recently submitted to Executive Council.

Lessons.

1. Disaster and hazard management in the BVI has benefited tremendously from strong political support of the territory's Governor and Deputy Governor. Successive Chief Ministers have also provided financial and political support.
2. Much emphasis has been placed on public awareness and education for disaster and hazard risk management. The aggressive approach of the national disaster agencies is reflected in the high level of consciousness among residents of the need to adopt appropriate hazard resistant construction techniques. Almost all new buildings are equipped with hurricane shutters, which are manufactured locally and exempted from government taxes – a practical example of government's commitment to disaster mitigation.

- d) A lack of effective coordination between governments, regional, and international financing agencies in developing a framework for hazard risk management.
- e) Collective absence of political will across governments, private sector institutions, and international financing agencies in enforcing existing standards; and
- f) a lack of widespread technical know-how on the use of insurance risk modeling techniques by public sector planners and private sector local insurance industries to project potential loss exposures on both specific sites and for wider geographical areas.

Box E.6: Disaster Preparedness and the Private Sector: The Grace Kennedy Group in Jamaica

In Jamaica, the Grace Kennedy Group actively pursues hazard risk management throughout its operations. With the assistance of the Jamaica Office of Disaster Preparedness and Emergency Management, the company has developed and tested a disaster manual and a business continuity plan. Safety and vulnerability audits are conducted regularly on its buildings and facilities. A Group Disaster Preparedness Committee oversees disaster and safety-related activities. Safety reports are included on the primary agenda of the Grace Kennedy board meetings.

Notwithstanding these shortcomings, the recent development of a comprehensive disaster management strategy for the region and the establishment of a disaster management facility at the CDB are important steps in the right direction. They reflect a growing consensus as to which and where the main interventions are needed for hazard risk management.

4. Institutional and Coordination Implications

Effective hazard risk management requires close coordination of all activities and the participation of all sectors of the economy; national disaster agencies, sector ministries, business and private sector organizations, as well as community level organizations. At the national level, it is the individual sector ministries rather than the national disaster offices that are best placed to implement hazard risk management measures, since they are directly responsible for investments that affect actual levels of vulnerability to natural hazards. Investments in key sectors such as agriculture, forestry, fisheries, housing and public works can degrade natural protective systems and end up increasing disaster impacts if proper consideration is not given to vulnerability issues. Since low-income communities are often more vulnerable to natural hazards than the population at large, sectoral investment planning and resource allocation processes need to give particular attention to the vulnerability of these communities.

The involvement of business, industry and civil society organizations is critical to strengthening public sector risk management activities. Businesses rely on government to set proper building standards, but incentives such as insurance premium reductions or 'seals of approval' for good practice are also needed. While private sector interests are normally represented on national disaster bodies, private and public sector hazard risk management efforts in most countries of the Caribbean are not well coordinated.

Regional level involvement is also needed. The small size and limited internal capacity of a number of countries in the region limit what can be undertaken at the national level and strongly argue for a greater emphasis on collaboration and decision making at the sub-regional and regional level. Specifically, regional centers of expertise need to be established, within existing regional institutions, with the mandate and funding to provide hazard risk management assistance in areas such as hazard mapping, vulnerability assessment and building code implementation and enforcement. Financial management of natural hazard risks via the use of insurance should also exploit the economies of scale and pricing achievable through the establishment of sub-regional funding mechanisms for this purpose, while differentiating among the different risk profiles of each country.

Coordination amongst multilateral and bilateral financing agencies must also be improved. To date, little coordination amongst the financing agencies has taken place, in part due to a traditional focus on, and response to, specific hazard events. At the same time, there has been no consistency in applying common standards when financing new infrastructure and local development programs. For progress on hazard risk management within countries and the region, donors will need to coordinate actions in a common framework and use consistent standards.

5. The Way Forward – A Program for Action

If the economic and social impact of future disaster is to be reduced, current practices and policies cannot continue. A new approach to disaster management in the Caribbean is called for, one that incorporates the experience and good practices from hazard risk management and becomes integral to economic planning, investment decision and donor assistance. This approach also needs to build on initiatives already underway, with sustained donor support, in both CDERA and the CDB to improve coordination and integration of risk management activities in the region. Possible priority actions and proposed institutional responsibilities to initiate the implementation of this approach are indicated in the table below.

Better understanding of the nature, magnitude and potential impact of natural hazard risks is a prerequisite to policy making, as is a clear understanding of the level of risk that various actors should and can assume. To this end, technical capacity in the region needs first to be strengthened by identifying and supporting regional centers of expertise and establishing common methodologies for risk mapping and vulnerability assessments within the region.

Hazard mapping information and vulnerability assessment tools ought to be further exploited to project contingent liabilities of both the public and the private sectors with regard to potential natural hazard events. This should be coupled with judicious consideration of cost effective risk reduction options and transfer mechanisms which maximize protection while minimizing cost.

Cooperation between governments, the business community and industry towards hazard risk management needs to be strengthened at both national and regional levels. This should be supported by easily available quality information, coupled with implementation of awareness campaigns and training programs. Also, government programs must be complemented by incentives to the private sector to adopt appropriate risk management practices.

At the national level, economic resilience must be strengthened through limiting debt, creation of disaster contingency funds and transferring of risks. Political will, particularly in the area of enforcement of land use planning and building codes, is a prerequisite for any progress.

The particular vulnerability of low-income communities needs to be recognized, their potential role in identifying and addressing local hazard risks need to be developed and specific micro-credit, cooperative and self-insurance schemes should be implemented.

PRIORITY AREAS FOR ACTION

I. Identify and Provide Financial Support for Regional Centers of Expertise

<i>Action</i>	<i>First Step</i>	<i>Possible Lead Agency(ies) for initial Step</i>	<i>Link to CDM strategy</i>
<p>Regional Center(s) of Expertise for Hazard Identification and Vulnerability Assessment. Identify and support regional centers of expertise for hazard mapping, vulnerability assessment and natural hazard impact assessment.</p> <ul style="list-style-type: none"> • Common Methodologies. Develop common regional methodologies for hazard mapping, vulnerability assessment and natural hazard impact assessment. 	<p>Conduct baseline institutional assessment and review of existing materials. Organize regional consultation to identify and designate appropriate center(s).</p>	CDB DMFC, CDERA, UWI	IR 1.3
	<p>Identify and review existing methodologies, draft model approach for testing</p>	CDB DMFC, CDERA, UWI, OAS	IR 1.3
<p>Regional Center(s) of Expertise for Risk Reduction Measures Identify regional center to strengthen building practices, to harmonize existing legislation (including building codes, physical planning and disaster management) and to develop appropriate enforcement mechanisms.</p> <ul style="list-style-type: none"> • Enhanced Implementation of Risk Relation Measures. Strengthen implementation and enforcement capacity for building codes and physical development standards within the region. 	<p>Organize baseline review and regional consultation to identify and designate appropriate center(s).</p>	CARICOM Secretariat, UWI Engineering	IR 1.3 IR 2.2
<ul style="list-style-type: none"> • Current Building Standards. Update the Caribbean Uniform Building Code and include provisions to address adaptation to climate change.. 	<p>Conduct assessment of the weaknesses of the present system and the potential links to private sector interests</p>	CDB DMFC, OECS/NRMU, IAC	IR 4.1 #3 IR 5.1 #3
<ul style="list-style-type: none"> • Coordinated Initiatives. Develop a mechanism for integrating public and private sector risk management information and experiences. 	<p>Review and support existing proposal to update CUBC</p>	CDB DMFC, CARICOM Secretariat	
	<p>Identify measures to stimulate business and industry to undertake risk management measures in coordination with Governments. Identify government incentives that could motivate business and industry to minimize risks.</p>	CTO, CHA/CAST, IAC, CLAA, PADF	

II. Mainstream Hazard Risk Management

<i>Action</i>	<i>First Step</i>	<i>Possible Lead Agency(ies) For initial Step</i>	<i>Link to CDM strategy</i>
Information Clearinghouses. Identify national and regional clearinghouses for hazard information; develop open sharing and distribution mechanisms for hazard information, for governments, the private sector and the public in general.	Organize baseline review of potential institutions. Develop model data sharing and distribution guidelines.	CDERA, UWI, CDB DMFC	IR. 2.3
Development and Economic Growth. Integrate hazard risk management into development decision-making through planning and budgeting, with emphasis on the impacts of decisions and resource allocations on critical facilities and in low-income communities.	Review good practices and develop methods for integrating risk appraisal into the public-sector budget process. Develop risk management training components for government and private sector development planning courses.	CDB DMFC, ECLAC	IR 4.5#3
Legal Framework. Adopt national building codes, physical planning acts and corresponding administrative and enforcement mechanisms.	Finalize adoption of building codes, where pending. Develop model for code administration. Develop, adopt and implement updated physical planning legislation and frameworks.	National Cabinets	IR 3.2 IR 4.1
Incentives for Risk Management. Establish public and private sector incentives for proper risk management, such as insurance premium reductions and tax incentives.	Identify and publicize successful public and private sector incentives for appropriate risk management practices. Define training needs.	ECCB, Ministries of Finance, Chambers of Commerce, IAC, Banking Sector	
III. Expand Use of Risk Transfer Measures			
<i>Action</i>	<i>First Step</i>	<i>Possible Lead Agency(ies) For initial Step</i>	<i>Link to CDM strategy</i>
Public Sector Exposure. Understand and define limits of public sector responsibility for hazard risks.	Review levels of existing risk, including key infrastructure, and determine the level of risk that can be assured.	Ministries of Finance, ECCB	
<ul style="list-style-type: none"> • Vulnerable Communities. Address the special vulnerabilities of low-income communities. 	Develop micro-credit, cooperative and self-insurance schemes.	ECCB, Ministries of Finance, Community NGOs, National Development Foundations	
Sharing Risk. Develop risk pooling mechanisms at the sub-regional and regional levels.	Implement the Eastern Caribbean Risk Pooling proposal.	ECCB, CDB	
Insurance Industry. Strengthen oversight of the insurance industry and rationalize market	Improve insurance supervision at the national and regional levels and ensure adequate reserves for retained risk.	ECCB, IAC	[IR 3.3]

2

DISASTER RISK IDENTIFICATION: CHARACTERISTICS OF NATURAL HAZARDS

Intensity

Intensity refers to the damage-generating attributes of a hazard.

Probability

The likelihood or probability of a hazard occurring usually is calculated on an annual basis, for example, a 10% chance of a particular area being struck by a Category 1 hurricane. For many hazards, likelihood is expressed as a recurrence interval such as a 100- year storm (a storm with a 1% annual probability).

Floods

For example, water depth and velocity are commonly used measures of the intensity of a flood.

Duration: Number of days flooding

Severity: Severity classes are based on the recurrence interval: (class 1) Large flood events: recurrence < 20 year; (class 2) Very large events: 20 year < recurrence < 100 year; (class 3) Extreme events: recurrence > 100 years.

Recurrence interval

The statistical return period of an event of the same intensity (e.g. a 100 year recurrence interval flood has 1% chance to occur each year, which does not mean that it will occur every 100 years).

Hurricanes

Tropical cyclones are characterized by their destructive winds, storm surges and exceptional level of rainfall which may cause flooding. For hurricanes, intensity typically is characterized with the Saffir/Simpson scale, which is based on wind velocity and storm surge depths.

Destructive winds – The strong winds generated by a tropical cyclone circulate clockwise in the Southern Hemisphere and counter-clockwise in the Northern Hemisphere, while spiraling inwards and increasing toward the cyclone center. Wind speeds progressively increase toward the core.

150 to 300 km from the center of a typical mature cyclone, winds of 63-88 kph;

100-150 km from the center, storm force winds of 89-117 kph;

50 to 100 km from the center; winds in excess of hurricane force, 117 kph or greater ;

20 to 50 km from the center, on the edge of the inner core contains winds 250 kph or higher.

A scale classifying the intensity of the storms, the Beaufort scale, estimates the wind velocity by observations of the effects of winds on the ocean surface and familiar objects. Both the United States (Saffir-Simpson Potential Hurricane Damage Scale) and Australia (Cyclone Severity Categories) use country-specific scales which estimate potential property damage in five categories.

The Saffir-Simpson Hurricane Scale is a 1-5 rating based on the hurricane's present intensity. This is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. Wind speed is the determining factor in the scale, as storm surge values are highly dependent on the slope of the continental shelf and the shape of the coastline, in the landfall region. Note that all winds are using the U.S. 1-minute average.

Category One Hurricane

Winds 74-95 mph (64-82 kt or 119-153 km/hr). Storm surge generally 4-5 ft above normal. No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some damage to poorly constructed signs. Also, some coastal road flooding and minor pier damage.

Category Two Hurricane

Winds 96-110 mph (83-95 kt or 154-177 km/hr). Storm surge generally 6-8 feet above normal. Some roofing material, door, and window damage of buildings. Considerable damage to shrubbery and trees with some trees blown down. Considerable damage to mobile homes, poorly constructed signs, and piers. Coastal and low-lying escape routes flood 2-4 hours before arrival of the hurricane center. Small craft in unprotected anchorages break moorings.

Category Three Hurricane

Winds 111-130 mph (96-113 kt or 178-209 km/hr). Storm surge generally 9-12 ft above normal. Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures. Damage to shrubbery and trees with foliage blown off trees and large trees blown down. Mobile homes and poorly constructed signs are destroyed. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Flooding near the coast destroys smaller structures with larger structures damaged by battering from floating debris. Terrain continuously lower than 5 ft above mean sea level may be flooded inland 8 miles (13 km) or more. Evacuation of low-lying residences with several blocks of the shoreline may be required

Category Four Hurricane

Winds 131-155 mph (114-135 kt or 210-249 km/hr). Storm surge generally 13-18 ft above normal. More extensive curtainwall failures with some complete roof structure failures on small residences. Shrubs, trees, and all signs are blown down. Complete destruction of mobile homes. Extensive damage to doors and windows. Low-lying escape routes may be cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of structures near the shore. Terrain lower than 10 ft above sea level may be flooded requiring massive evacuation of residential areas as far inland as 6 miles (10 km). [Hurricane Dennis](#) of 2005 struck the island of Cuba as a Category Four hurricane.

Category Five Hurricane

Winds greater than 155 mph (135 kt or 249 km/hr). Storm surge generally greater than 18 ft above normal. Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. All shrubs, trees, and signs blown down. Complete destruction of mobile homes. Severe and extensive window and door damage. Low-lying escape routes are cut by rising water 3-5 hours before arrival of the center of the hurricane. Major damage to lower floors of all structures located less than 15 ft above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5-10 miles (8-16 km) of the shoreline may be required.

DISASTER RISK IDENTIFICATION & REDUCTION

BASIC CONCEPTS:

MAJOR AREAS: Scope, components, key players, and stakeholders: roles and responsibilities

MAIN REFERENCE: *"Natural Hazard Risk Management In The Caribbean: Revisiting The Challenge"*, Caribbean Group for Cooperation in Economic Development, Private Sector & Infrastructure Department – Latin America and the Caribbean Region, The World Bank, Discussion Draft, 2002.

3.1 Introduction

Disasters are typically seen as discrete events, occurring at a specific point in time and associated with a specific trigger, such as a rainstorm, hurricane or earthquake. Damage from a disaster event, however, is the result of vulnerability that existed prior to the event, vulnerability that has often accumulated over an extended period of time. Since little can be done to reduce the occurrence and intensity of most natural hazards, hazard risk management activities and programs necessarily focus on reducing existing and future vulnerability to damage and loss. There are three primary, interrelated categories of risk management actions—**risk identification**, **risk reduction** and **risk transfer**.

3.2 Risk Identification

A thorough understanding of existing vulnerabilities, including their location and severity, is critical for the development and prioritization of investment programs and activities for hazard risk management. As the level of vulnerability can increase, or decline, with the aging of existing facilities and with new growth, determining underlying causes makes it possible to eliminate or reduce new vulnerabilities as communities, countries and the region as a whole develop. A wide range of activities contribute to the identification and understanding of natural hazard risk:

- ❑ **Hazard data collection and mapping.** Identification and proper communication of locations subject to hazards and the expected severity of hazard effects inform many other components of hazard risk management, such as development siting, environmental protection and insurance coverage. Formal hazard mapping projects and geographic information system (GIS) database development are typical examples of hazard identification and documentation activities. When properly coordinated, ongoing activities across a broad range of sectors, both private and public, can also contribute to a better understanding of prevalent natural hazards. Environmental impact assessments and insurance claims databases, for instance, contain information that can be used to validate or update local and national hazard knowledge. At the regional level, universities and specialized institutions house critical expertise and information for hazard mapping and analysis. Mechanisms for sharing hazard maps and communicating available hazard information are necessary to ensure that available hazard information is accurate and to make optimal use of the resources expended on hazard mapping and assessment.
- ❑ **Vulnerability assessment.** Vulnerability assessments are systematic examinations of building elements, facilities, population groups or components of the economy to identify features that are susceptible to damage from the effects of natural hazards. Vulnerability is a function of the prevalent hazards and the characteristics and quantity of resources or populations exposed to their effects; it can have social, economic, physical and environmental components. Vulnerability can be estimated for individual structures, for specific sectors or for selected geographic areas (e.g., areas with the greatest development potential or already developed areas in hazardous zones.) Information from vulnerability assessments is critical to determine appropriate and safe uses of facilities, to identify weak links in infrastructure systems and to prioritize limited retrofit and use of rehabilitation funds.
- ❑ **Risk assessment.** Risk assessment is performed by applying the probability of a specific hazardous event to the vulnerability of resources, facilities and populations affected by such an event, to determine the expected loss from its impact. Risk assessments provide critical information on the potential economic impact and costs associated with hazard-related risks. Such information is key for developing budget estimates for and prioritizing hazard risk management interventions.

- ❑ **Post-disaster assessment.** Even the most robust program of hazard mapping and vulnerability assessment will fail to identify some existing vulnerabilities, due to concealed hazards and weaknesses or an incomplete understanding of hazard impacts and interactions. Assessments of damage incurred in a hazard event can provide important new insights into hazard-related forces and into deficiencies in current development management systems, such as specific building practices, environmental management programs and development policies.

- ❑ How to characterize a hazard (intensity, magnitude, duration, periodicity, return periods)

3.2 Risk Reduction

Risk reduction, scope

Risk reduction activities are designed to minimize or eliminate damage from hazard events. Risk reduction measures can address existing vulnerability through such measures as retrofit, strengthening and relocation. Actions taken to reduce future vulnerability, such as the implementation and enforcement of building standards, environmental protection measures and resource management practices, can have a more profound effect over the long term, but must always be paired with activities to safeguard individuals and resources exposed to existing vulnerabilities. Risk reduction measures can be directed towards physical, social and environmental vulnerability. The post-disaster period provides an important window of opportunity for implementing risk management measures.

Physical measures

Physical risk reduction measures are divided into structural and non-structural actions. Structural risk reduction measures include any actions that require the construction or strengthening of facilities or altering of the environment to reduce the effects of a hazard event, such as flood- and wind proofing, elevation, seismic retrofitting and burial of utilities; in this context, the term 'structural' applies to a broader range of actions than implied by its definition within the engineering community. Non-structural measures are policies and programs that guide future development and investment towards reduced hazard vulnerability. Examples of non-structural measures include physical development plans, development regulations, acquisition of hazardous properties, tax and fiscal incentives and public education.

Socio-economic measures

Social risk reduction measures are designed to address gaps and weaknesses in the systems whereby communities and society as a whole prepare for and respond to disaster events, with the ultimate goal of increasing the resilience of individuals and communities to hazard effects. Many agencies and groups play a role in building such resilience. National Disaster Offices, through their district- or community-level organizations, build awareness of hazards and vulnerabilities and help construct community and mutual assistance networks and programs. Public -and private-sector employment protection programs help ensure the availability of jobs and income after hazard events. Effective community- and national-level social networks and health systems also contribute to assuring continuity and recovery after a disaster event. Weaknesses in these systems are often concentrated in disadvantaged areas and groups. High land prices often push poorer communities onto marginal, hazard-prone sites, such as steep slopes or low-lying coastal areas. Lack of access to alternatives often leads to unsustainable uses of natural resources in such communities, such as deforestation and poor agricultural practices, which lead to higher vulnerability to natural hazards. Addressing these underlying social and economic problems can effect a significant decrease in current and future hazard vulnerability. Activities that help build individual and community hazard resilience require a parallel strengthening of the capacity of the State to anticipate and respond to future extreme events, since failures at the national level can render many community initiatives ineffective.

Environmental measures

Environmental risk reduction measures are designed to protect existing, or rehabilitate degraded, environmental systems that have the capacity to reduce the impacts of natural hazards. These can take the form of policies and programs, such as development control or environmental impact assessments, that reduce or eliminate the effect of human activities on the environment. They can also include physical measures that restore or fortify damaged environmental systems, such as coral reef protection, reforestation of critical watersheds or restoration of degraded river courses. Man-made hazards often occur as secondary effects of hazard events, e.g. oil spills caused by flooding. The potential for such secondary hazards should be accounted for in natural hazard risk management activities, as they often cause more significant environmental damage than do

the primary hazard effects. Incorporating natural hazard impact assessments, which identify potential hazard impacts on a proposed project, into project development and permit approval process can potentially significantly reduce hazard risk in new developments. The CDB DMFC is developing a standard approach to natural hazard impact assessment for use in the region.

Post-disaster measures

In the aftermath of a disaster, there is great pressure to repair damage quickly. However, the quality of the reconstruction and rehabilitation work that takes place during this period often determines how well the same system weathers future hazard events. Time and budget pressures and the difficulties in communication and transport in the post-disaster environment make it difficult to increase resilience during reconstruction. Putting in place pre-approved and tested reconstruction plans and procedures, with identified financing, can significantly reduce vulnerability to future hazard events, while overcoming the traditional time and budget constraints. Although reconstruction measures are a component of long-term response and recovery, they form a critical component of a comprehensive risk reduction program, as the recovery period provides an important window of opportunity for implementing necessary risk reduction measures.

3.3 Risk Transfer and Financing

It is often not possible to eliminate completely the vulnerability of key assets either because some assets, due to their function or to prior location decisions, are located in hazardous areas or because retrofitting is too expensive or may take an extended period of time. In small island states, there are often critical components of the nation's infrastructure for which no replacement is readily available. In such cases it is important to reduce financial risk through risk transfer mechanisms, which ensure that funds are readily available to rectify the damage or replace the facility, should a loss occur.

Risk transfer mechanisms do not reduce actual vulnerability and are often inefficient from a cost perspective. Consequently, all efforts to reduce the vulnerability of the assets to be covered should be taken before transferring the risk. To be sustainable, insurance mechanisms should qualify risks and strive to bring in good risks, not serve as a dumping ground for bad or unwise risks. Great reliance on reinsurance in the Caribbean makes insurance prices in the region vulnerable to shocks unrelated to immediate disaster experiences in the region.

Budget self-insurance.

The owner of a property—the government, a private company or an individual—allocates a modest yearly budget to spend on improved maintenance and on selected retrofit investments, which have the effect of reducing future expected losses in the event of a disaster. This enables the owner either to forego the purchase of regular insurance or to accept a higher deductible, thus reducing the cost of insurance.

Market Insurance and Reinsurance.

Insurance provides coverage for damage and expenses that are beyond the potential for budget self-insurance. Market insurance stabilizes loss payments through pre-payment in the form of regular premium payments. Once the extent of coverage has been agreed and premiums are paid under an insurance contract, the insurer assumes the risk. Insurance makes available funds necessary to repair damage or rebuild shortly after a disaster event. Business interruption insurance can help companies and their employees survive the recovery and rehabilitation period. Insurance costs for certain categories of buildings or uses, however, may be unaffordable, and coverage for some categories of natural hazards may be unavailable.

Public asset coverage.

Most public assets are not covered by insurance. Funds for rebuilding damaged assets, therefore, must come from annual budgets or external sources. This puts great pressure on public budgets in the post-disaster period when economies are often particularly weak, as typically little has been set aside for budget self-insurance purposes. Insurance coverage for critical public assets will ensure that key infrastructure can be rebuilt or rehabilitated quickly if damaged in a hazard event. Selection of assets that merit insurance coverage should be based on careful prioritization of public facilities and on comprehensive facility vulnerability assessments.

Risk pooling and diversification.

Insurance costs for geographically concentrated or relatively homogeneous groups or facilities are often high, due to the potential for simultaneous damage to all members of the group or category. Diversification of the risk pool, through banding with others from separate areas or industries can result in reduced insurance premiums for all participants.

Risk financing

Risk financing mechanisms allow losses to be paid off in the medium- to long-term via some form of a credit facility. Alternative risk financing mechanisms provide cost-effective, multi-year coverage that assists with the stabilization of premiums and increases the availability of funds for insurance purposes. Examples of such mechanisms include risk capitalization, credit backstop facilities and finite insurance mechanisms.

3.4 Natural Hazard Risk Reduction Actors

Natural hazard risk management actions must be taken at many different levels simultaneously to achieve maximum effectiveness. Currently, most existing risk management activities and programs in the Caribbean are undertaken at the national level, coordinated by the designated national disaster office. As governments, private-sector enterprises, communities and individuals repeatedly suffer losses and attempt to recover from the effects of natural hazards, a broader range of groups and organizations have become actively involved in hazard risk management in the region. For particularly vulnerable communities, decisions that can be made and actions taken close to the individual- and community-level have more immediate and significant effects than do more distant ones. Often, however, appropriate expertise, decision-making power, organizational mechanisms and economies of scale require actions and decisions to be taken at the sub-regional and regional levels in areas such as hazard mapping, vulnerability assessment and building code implementation and enforcement. This section describes the range of individuals, agencies and organizations that are, or should be, active in the management of hazard risks in the region¹⁴.

¹⁴ A detailed review of the existing risk management activities in the region, organized by agency, can be found in the *Caribbean Disaster Management in the Caribbean: Baseline Study*.

3.4.1 Local level

At the local level, civil society (individuals, the private sector, the labor sector, political parties, academics and other non-governmental actors and organizations), local disaster committees and, where existing, local governments can play important roles in hazard risk management. Many local organizations and groups serve communities, often focusing on specific geographic areas. Churches, service organizations, school-related groups and sports clubs can serve as information conduits, provide mutual support for members and neighbors and identify practices and developments that increase or decrease hazard vulnerability. Local businesses serve the needs of the community and provide critical employment. Where they exist, local media outlets, such as newspapers and radio stations, can provide appropriate information, tailored to the community, and serve as an important voice of the community. All parts of civil society also play a strong role in risk management at the national and regional levels. Most national disaster and emergency management organizations in the region support a network of local disaster committees. These committees implement, in coordination with other local groups, the activities of the national disaster organization, such as local shelter management, and inform national disaster policies and actions through local disaster management planning. Local governments, where they exist and function, must be given the ability to guide local hazard risk management efforts through policies which encourage local participation and through the provision of technical assistance to local groups.

3.4.2 National level

Nationally, central governments, including their disaster offices, are in a strong position to guide and coordinate hazard risk management. National-level planning and sectoral agencies develop and implement national government policies and programs. Both long-term planning activities and the day-to-day workings of the national government can significantly increase or decrease the current and long-term vulnerability of a country to natural hazards. National disaster offices (NDOs) are responsible for developing and implementing disaster preparedness, response and recovery efforts at the national and local levels. NDOs must also serve as the major champion of hazard risk management initiatives.

However, most hazard risk management actions and programs, by their nature, must be implemented by the sectoral agencies and organizations responsible for the infrastructure, assets, programs and individuals involved.

Private companies and their organizations—chambers of commerce, business and trade associations and standards organizations—control the majority of the businesses and assets that make up a country's economy. Their decisions on how to invest, build, maintain and insure these assets have a significant effect on how well a country's economy can weather and recover from a natural hazard event. Indigenous financial institutions provide the funding for most local construction and development activities and, therefore, have the potential to contribute significantly to risk management through their lending standards and policies. Business and industry actors play a central role in risk management at all levels— local, national and regional. Links to other businesses, both nationally and internationally, through trade associations and business transactions, provide businesses with access to tested and appropriate risk management practices.

3.4.3 Sub-regional and regional levels

The small size and similarity of legal and political frameworks of many of the countries of the region provide arguments and opportunities for collaboration at the supra-national level. Many of the institutions and structures necessary for such coordination already exist. The secretariat and specialized agencies of the Organization of Eastern Caribbean States (OECS) provide assistance to member countries, which can contribute to hazard risk management within the sub-region. Development of appropriate model legislation, harmonization of existing legislation, collaboration on financial issues, such as risk pooling, are examples of appropriate actions that can be taken at the sub-regional level to advance hazard risk management.

Similarly, regional institutions can play an important role in facilitating adoption of appropriate risk management practices by member countries and organizations. CDERA is the CARICOM agency with the mandate for emergency response and hazard risk management in the region. Many other organizations, both private sector and inter-governmental, must contribute to regional hazard resilience, by furthering hazard risk management measures within their own sectors. For instance, CARILEC has participated in the development of a manual for hazard mitigation in the electrical utility sector and could serve as a powerful conduit for guidance and advocacy for risk management in this sector. The CDB has become an important component of a regional hazard risk management strategy, through the development of its natural disaster management strategy and the recent establishment of the DMFC.

3.4.4 *Multilateral and Bilateral Lending Institutions and Development Partners*

Multi- and bi-lateral lending institutions and donors can affect the vulnerability of the region to natural hazards through their lending and grant programs. Although funds from donor agencies for post-disaster reconstruction and response are diminishing, international donors continue to be seen by many countries as the prime insurer of natural catastrophe risk. In an effort to change this perspective and to promote better hazard risk management in the region, a number of donors have supported broad hazard mitigation projects and initiatives in the region over the past decade. These focused risk management interventions must be reinforced by the incorporation of risk management measures into all funded activities. Appraisal of hazard risk, through mechanisms such as natural hazard impact assessments, and identification and implementation of appropriate risk management interventions must be incorporated into standard project development and approval processes. By coordinating efforts and taking explicit steps to ensure that funded projects are appropriately located and constructed and by supporting related institutional capacity building, financial and donor institutions at all levels can contribute significantly to overall hazard risk management in the region.

3

DISASTER RISK REDUCTION

BASIC CONCEPTS: Disaster and Development

MAJOR AREAS: Disaster Management, Development Planning

MAIN REFERENCE: **Disasters and Development. Frederick C. Cuny**
Sponsored by Oxfam America. Edited by Susan Abrams
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Mitigation and Preparedness – Introduction

Planning may be defined as the process of preparing a set of decisions for action in the future directed at achieving goals by optimal means. The stated goals of disaster relief are the reduction of human suffering, the improvement of material well-being, and the increase of personal security. It goes without saying that these goals are best served if disaster, in the first place, can be avoided or reduced. Thus, the primary goal of pre-disaster planning may be seen as the prevention or mitigation of disaster. If we refer to the definition of disaster in terms of the need for "outside" help, we may describe the goal of pre-disaster planning as the creation of self-sufficiency in dealing with natural phenomena. In those cases where prevention is not possible, the goal must be to plan the effective application of aid.

Pre-disaster planning is the term used to describe the comprehensive range of efforts made to reduce the destruction and disruption of a disaster before it occurs. The term is intended to denote action and accurately describes the most important part of the *activity-planning*.

Pre-disaster planning consists of three types of activities: disaster prevention, disaster mitigation, and disaster preparedness. *Disaster prevention* focuses on the hazard that causes the disaster and tries to eliminate or drastically reduce its direct effects. The best example of disaster prevention is the construction of dams or levies to prevent flooding. As a general rule, prevention is expensive and the results are often far less than hoped.

Disaster mitigation focuses on measures that can be taken to minimize the destruction and disruptive effects of a hazard and thus lessen the magnitude of a disaster. Mitigation efforts offer by far the best and most cost-effective method for dealing with disasters. With good planning, most mitigation measures can be integrated with normal development activities at very little, sometimes no, additional cost. Some examples are: strengthening buildings so that they are hurricane- or earthquake-resistant; the planting of crops that are less affected by disasters; changing crop cycles so that crops mature and are harvested before the peak of a hurricane or rainstorm season; adoption of land-use controls to restrict development in high-risk areas; and development of diversified economies so that losses in one sector can be absorbed by others.

The underlying assumption of *disaster preparedness* is that disasters are no time to be trying to decide what to do. Preparedness focuses on developing plans to respond to a disaster once it threatens or has occurred. At its simplest, preparedness is an estimation of emergency needs and the identification of resources to meet those needs. A more sophisticated definition is that preparedness is the development of plans to structure the entire post-disaster response, to ensure that emergency aid is managed so that each activity lays the foundation for the next, and to plan the response in that each sector contributes in some way to the others. The first objective of preparedness is to get the absolute maximum benefit out of relief and to swiftly complete the transition from emergency assistance to rehabilitation and reconstruction. The second is to insure that disaster assistance makes the greatest possible contribution to ongoing development. Finally, preparedness should guide reconstruction so that it reduces vulnerability and mitigates a recurrence of the disaster.

People have much more experience in preparedness than in other pre-disaster planning activities. The best known are the development of warning and evacuation plans; stockpiling of supplies; developing emergency plans for hospitals; improving infrastructure to support or facilitate emergency services; establishing emergency command, control, and communications systems; training in search and rescue and first aid. Other measures less known but equally important include developing disaster assessment plans; establishing relief and reconstruction standards and policies; developing stand-by plans for economic assistance to victims; developing crop salvage and marketing plans for economic assistance to victims; developing crop salvage and marketing plans for small farmers; adopting legislation defining emergency powers; and establishing prior inter-governmental and/or multilateral agreements for disaster assistance to support the planned response.

In recent years there has been some debate among the experts about which activity to emphasize. In the 1950s, most of the emphasis was on preparedness, much of which was an unsophisticated spin-off from Cold War civil defense activities. In the 1960s, there was intense interest in prevention, fueled by the public's enchantment with the space age and everything technological. In the 1970s, there was a shift toward mitigation, sparked by Krimgold's writings. The pendulum seems to be moving back toward preparedness, though on a much more sophisticated level.

The reasons for this swing are not difficult to understand. Prevention, once seen as the ultimate answer to disasters, has come under growing criticism. While such actions as weather modification and earthquake control were formerly thought desirable, the more we learn about the purpose of these events in nature, the more likely we are to challenge the wisdom of preventing their occurrence on environmental and ecological grounds. Even such long-touted measures as flood control are now seen to have adverse effects, and while research continues, the emphasis has shifted more to mitigation and to finding ecologically suitable alternatives.

Mitigation itself is proving to be more difficult to accomplish in the Third World than was originally foreseen. Mitigation is a complex process, and many of its parts cannot be dealt with in terms of a disaster only, for they are also related to development.

As we have seen, disasters can be a primary cause of underdevelopment, as well as intertwined with a country's progress toward development. Similarly, many mitigation activities either require a certain level of development or are themselves development activities. Third World countries are so affected by disaster in part because of their inability or failure to address the root causes of poverty and underdevelopment. Thus it is difficult to carry out mitigation activities successfully. For example, many of the most vulnerable areas are urban squatter settlements that have sprung up due to lack of opportunity in rural areas. They are often situated on hazardous sites because governments have failed to provide suitable alternatives due to incapacity, neglect, or failure to seek land reform. For people living there, two of the traditional tools of mitigation, zoning and building regulations, simply will not work. Thus prevention and mitigation can work only in situations where all these problems are addressed. In summary, progress toward development is required in order to mitigate, and mitigation is required in order to develop.

Preparedness, on the other hand, offers something that governments and agencies can do now, at low cost, and that can have positive results in any situation.

Disaster preparedness measures can be undertaken with the skills that are available within the country, with the technological resources that are available, and usually with little outside assistance. The most vulnerable areas can be identified; contingency plans can be developed; where necessary, supplies or materials can be stockpiled; and plans can be drawn, outlining the actions to be taken by all concerned.

Preparedness is at best an interim measure. Monies spent on preparedness are considered nonrecoverable and they will not contribute to development. But while the benefits of preparedness are short-term, this investment can save lives, and money spent on preparedness will help to reduce the incidence of suffering following the disaster and can shorten recovery time.

1.1 Mitigation

The objective of disaster mitigation is, obviously, to lessen the impact of a disaster. Traditionally, mitigation has concentrated on human settlements and man-made buildings and structures, with the focus on development of land use regulations, settlement planning, the development of techniques for strengthening buildings and structures, and the development of building codes to encourage or enforce use of these building techniques.

A broader and more progressive view of mitigation has evolved in the last decade. For example, efforts can be taken to diversify economies and to balance and place job- and income-producing

resources strategically so as to reduce the likelihood that all would be affected in a disaster. Economic buffers such as insurance have received new emphasis. In the agricultural sector, there have been conscious moves to reduce the vulnerability of one-crop societies by diversifying the staples and introducing new cropping methods.

Concepts in Mitigation

Mitigation activities can be classified as passive or active. Passive mitigation is the development or application of measures such as building codes, land use, zoning, and urban or regional planning techniques to reduce vulnerability. Active mitigation encompasses those activities that require direct contact with the people. When using active approaches, the implementing body assumes the role of an activist in helping to guide balanced growth and reduce vulnerability. Activities include public education, the introduction of modifications techniques, the initiation of housing improvement programs, the promotion of land swaps or re-location of people from vulnerable to suitable and safe sites, and economic diversification of those sectors most vulnerable to disasters. Passive mitigation measures cannot work without active measures to follow them up. But active mitigation can be independent of passive activities.

In practice, passive activities have had little impact on reducing vulnerability in the Third World. For the most part, zoning and building codes are unenforceable. This is in part due to the fact that the codes adopted are often based on those developed in the industrialized countries for engineered structures. In the few countries where people have attempted to develop applicable codes for non engineered structures, the types that most Third World people live in, the methods chosen to reinforce the buildings have proved too costly or too complicated for local craftsmen to understand and implement. Several innovations, however, have been introduced, including the use of building guidelines that describe the options for increasing the resistance of a building through simple and low-cost methods, and the use of performance standards in lieu of the more restrictive zoning and land use regulations.¹⁵ Zoning and building regulations are usually considered restrictive. Active mitigation is considered more "permissive" and usually allows for more variations based on local needs.

Steps in Mitigation

Reducing the harmful effects of natural disasters requires actions on three fronts: reducing vulnerability of the physical settlements and houses; reducing vulnerability of the economy; and the strengthening of the social structure of a community, so that coping mechanisms can help absorb the shock of a disaster and promote rapid recovery.

¹⁵ For further information on the use of building guidelines, see the Save the Children Fund "Report on the Joyabaj Reconstruction Program," Report #2, August 1976.

1.2 Reducing Physical Vulnerability

Vulnerability reduction for communities and human settlements has been emphasized more than any other activity to date, and the methodology employed has been thoroughly tested. The first step is to identify the high-risk areas. This is done by relating a hazard, such as an earthquake, to the terrain and to the probability that such an event will occur. This activity is known as risk mapping and the results of the analyses are usually presented in the form of "risk maps," which show the type and degree of hazard represented by a particular natural phenomenon on a given geographic location. Earthquake risk mapping, for example, identifies faults and the underlying geological conditions of the locality. Flood plain mapping indicates the areas likely to be covered by water during floods of given magnitudes (Krimgold 1974).

A further refinement of risk mapping is known as microzonation, which is simply risk mapping at a very small scale. For example, within any particular area there are numerous geological variations



that can dampen or reduce the forces of earthquakes. Thus, even within a high risk zone, some areas will be safer than others. Microzonation delineates each of these areas so that communities can select the safest possible sites for development, or the location of critical facilities.

Risk mapping requires technical skills and the application of various scientific disciplines; thus it is said to be a function of the technical services. Risk mapping is usually assigned to organizations at the government level and can be a joint effort of such groups as geological departments, meteorological services, and water resource management departments. The disciplines involved could include geology, meteorology, hydrology, engineering, geophysics, geography, agriculture, forestry, physics, cartography, and remote sensing.

This is not to say that high-risk areas cannot be identified by non-technical means. Certainly, historic patterns of disaster and the recurrence of disaster hazards can provide a practical guide in determining whether or not a community is at risk from certain phenomena. (People have explored many resources in an attempt to gather historical information about disasters. In Latin America, it is not uncommon to review old church records for information about earthquakes. In Jamaica, researchers trying to determine the occurrence of storm surges turned to accounts of shipwrecked Spanish gold fleets and pirates' log books for information on the date and location of the events. And the attempt to recover stolen Maya artifacts known as stelae from Central American archeological sites received new impetus when it was learned that many of the stelae recorded significant events such as severe storms and earthquakes.)

The second step in vulnerability reduction is to identify those communities that are particularly susceptible to damage or destruction. This is done by relating risk to human settlements and their structures. One determines whether a community is situated on a site within a high-risk area, and if this is the case, the specific areas that are the most vulnerable, based on the microzonation data. At the same time, the buildings and structures (such as dams and hydroelectric facilities) are evaluated to determine if they can withstand the forces in nature to which they may be subjected.

Vulnerability analysis is said to be both a technical and planning function. Many of the disciplines involved in risk mapping are also involved here, but emphasis clearly shifts to engineering, architecture, and planning.

The third step is the selection of the vulnerability reduction strategy. This requires two sets of actions. First is the determination of the site strategy. Options may include construction of protective works, such as embankments, to protect from flooding; zoning to control development of the site; restricted development (to ensure that any development meets certain standards that take into consideration the threat to the site), and land swaps, which would provide alternatives to development of the site.



The second set of actions determines the *structural strategies* for reducing vulnerability. These include the imposition of design criteria or building standards to govern construction; the modification of existing structures; and the replacement of existing structures with newer buildings more resistant to disasters.

The selection of vulnerability reduction strategies is again considered both an engineering and a planning function, but a new dimension—the political one—is added at this point, for in the end, the strategies selected will be the result of political decisions, based as much on a government's capabilities as on its perception of the possibilities, potential, and value of mitigation.

Peru provides a good example for examining the physical vulnerability reduction process. It is one of the most seismically active countries in the world; between 1970 and 1980, several minor and two major earthquakes struck the country.

Peru is situated on the South American Plate, close to a major fault, where the South American Plate abuts the Nazca Plate. At this juncture, there is a subduction zone, which means, in effect, that the faster-moving South American Plate is attempting to pass over the slower-moving Nazca Plate. It is this relative movement that causes the earthquakes that periodically affect the country.



While earthquakes can occur anywhere along this subduction zone, as a general rule the earthquakes will be stronger the closer they occur to the earth's surface. This means that the coastal region and western-most portions of the mountains will experience more ground motion than the eastern portions of the country.

Major fault systems exist throughout the mountains, however, and any earthquake that occurs in the western-most regions can trigger movement along a parallel fault farther inland. One example is the earthquake that occurred near Chimbote in 1970. The epicenter was located in the ocean west of Chimbote, but its effect was felt in the mountain regions near the city of Huaraz, which is located on one of the major parallel fault systems in the mountains.

By locating the major fault systems and recording the movement of the faults, as well as examining the history of earthquakes throughout the country, it is possible to assemble maps showing where the greatest seismic activity occurs and to identify the relative potential for recurrence of seismic activity in each of the zones.

The casualties and widespread damage in each earthquake have under-scored the vulnerability of the population and shown that the housing stock of the vast majority of the people cannot withstand the forces of the earthquakes. Making the houses safe requires one of two approaches: either provision of stronger building systems, or re-engineering the building materials now used. Both approaches are possible, but they require resources not widely available to the majority of the population, namely, money, materials, and technical skills. Almost 80 percent of the people in Peru live in non engineered structures. Even within the larger cities (for example, Lima, Arequipa, Ica, Trujillo), engineering and architectural input into housing construction is minimal. In Lima alone, over three million people live in non engineered buildings that do not meet basic criteria for earthquake-resistant construction.

The map below shows the predominant housing type for different areas of Peru. To the side of each type is a number representing its potential for collapse in an earthquake. This map shows that the most vulnerable structures are located along the coast and in the mountainous regions.



1.4 Reducing Economic Vulnerability

Reducing economic vulnerability follows much the same pattern as does reducing physical vulnerability. Step one, for example, is virtually the same, namely, identifying those areas where there is a high probability that a disaster event could occur. The second step is to identify the sectors of the economy that are vulnerable in disasters. This is done by relating risk to economic activities or means of production. First, the



key elements of the economy and those that are particularly vulnerable to a disaster are identified. Often this is not difficult, especially for countries that have one-crop economies, or only a few industries, or are earners of foreign currency. Every economic activity should be examined, however, to determine whether each type of threatening event could affect a significant portion of that activity. This type of analysis should be conducted both at the macro and micro levels. While a flood may not have a significant economic impact on a country as a whole, it may have a major impact on a community or region.

In determining economic vulnerability, there are other critical activities and installations that should be considered. Energy facilities and systems are of prime concern, as are transportation networks and road systems, in addition to financial institutions. Vulnerability studies in Jamaica revealed that the main power generating station, the fuel-oil storage depot, the principal wharves, the largest airport, the central bank, and the government's central data processing center, as well as the major financial institutions, were all located in areas subject to damage from earthquakes, hurricanes, flash floods, and land subsidence in earthquakes, not to mention fire or explosion from a nearby refinery.

The third step is the selection of a vulnerability reduction strategy. Economic protection can be provided in three ways: diversification, insurance, and the establishment of reserves. Diversification spreads the risk, so that if a disaster occurs, the total losses in any one area or sector are acceptable. For many countries, diversification can be a difficult choice. Small nations

that are dependent upon one or two crops for their livelihood may find it politically difficult to justify diversification simply on grounds of disaster mitigation. Once again, long-term development choices come into play, and ultimately the decision may rest more on political or economic factors than on disaster-mitigation strategies.

The role of insurance in disaster mitigation will be discussed later, but suffice it to say now that insurance is another method for spreading the risk and providing adequate capital and resources for reconstruction.

Reserves can be established at all levels. Governments can establish cash and food reserves that can be released following a disaster. Families can also be encouraged to establish savings upon which they can rely in lieu of insurance. Many innovative methods have been tried. Recent efforts to protect against famine include development of food banks and an international food reserve system. In Peru, where wood is in short supply, the government has established forest preserves with fast-growing eucalyptus trees, which can be used by communities in times of disaster for rebuilding houses.

Other simple measures can also be effective. In hurricane areas where crops are harvested just before the hurricane season, small farmers can be encouraged to build ferro cement or other strong grain silos to help protect harvests until they are sold. Agencies should help communities to identify small-scale community-based measures to reduce vulnerability.

1.5 Reducing Vulnerability to the Social Structure of a Community

Reducing the vulnerability of a community social structure is the most difficult of the mitigation measures. For the most part, this can best be accomplished through extending normal development work in one of three ways. The first is institution building. Local organizations that serve as coping mechanisms can be identified and strengthened. A conscious effort can be made to increase their capacities and skills, thus enhancing their ability to deal with a crisis.

The second activity is to increase the number of coping mechanisms within a community. By developing formal institutions and linking these groups to outside resources, one establishes a vehicle for intervention and the provision of assistance.

The third activity is to broaden the contacts of local groups and to encourage whatever promotes cooperation among different elements or groups within the society. Such cooperation can reduce the social impact of a disaster.

In their development activities, agencies should be careful to avoid those that will further increase or institutionalize a society's vulnerability. It is especially important to identify dependency relationships, particularly those that are threatened in disaster, and work to eliminate them.

By increasing self-sufficiency and reliance on internal resources, agencies improve the ability of local people to cope with disaster. This can be a mitigating factor and can help to speed recovery.

1.6 Participation in Mitigation

Disaster mitigation is the responsibility of all organizations working in a threatened area. There has often been a tendency to leave mitigation measures to governments or to intergovernmental organizations. Voluntary agencies, however, have an important role to play, especially in reducing economic and social structure vulnerability. By recognizing the threat of disaster, organizations can include remedial measures in many of their normal development activities. It has been said that almost any good development program can have a positive effect on mitigating disasters. In fact, many of the activities carried out under the normal development programs have done so. The introduction of wheat, for example, to India in the 1960s and 1970s, not only improved the nutritional balance, but also helped diversify the agriculture and reduce the possibility of widespread famine due to rice crop failure or insect infestation. In Guatemala, the establishment of savings and loan programs by the cooperative movement mitigated the economic impact of disasters and gave those suffering losses in the earthquake a reserve of money that could be committed for reconstruction. Without this cash reserve and its instant availability after the disaster, recovery time would have been prolonged.

Thus hazard reduction measures should be taken into account in the administration of general development aid (Krimgold 1974). One can take leadership in mitigation in housing, agriculture, economic development, urban and regional development, village planning, and community organization. It should be remembered, however, that mitigation activities included in normal programs cost relatively little, but retroactive mitigation, especially in settlements and buildings, is very costly.

1.7 Common Mistakes in Mitigation

The following are some of the more common mistakes agencies make when dealing with mitigation.

1. *Placing responsibility for certain mitigation activities in the wrong type of organization.* For example, some countries have assigned physical mitigation responsibilities to social service agencies. It is important to determine the particular function- of the mitigation activity and to assign it to an agency with appropriate responsibilities, interests, and capabilities.
2. *Overreliance on passive rather than active mitigation.* Many countries have attempted to follow the model of the industrial societies and pass strict legislation in the hope that these measures would encourage mitigation. For developing countries, active measures should be emphasized.
3. *Failure to determine the complete range of options.* Mitigation is a complex undertaking, and many options exist. Agencies should be careful to examine the complete range and select a mix of strategies for dealing with vulnerability reduction, not being content with the selection of only one approach.
4. *Failure to identify all the disaster threats.* Most communities are threatened by more than just one type of disaster. In areas such as the Caribbean, where hurricanes are considered an annual threat, it is easy to forget that earthquakes, volcanoes, and regionalized flooding also pose hazards. Countries must be sure to determine all the potential threats and design their mitigation programs accordingly.
5. *Failure to relate vulnerability reduction to normal development plans and activities.* As stressed earlier, vulnerability reduction will have little impact unless it is conducted in concert with normal development activities. Only if one stresses the development aspects will mitigation be feasible in many developing countries.

BASIC CONCEPTS:

MAJOR AREAS: Plan of action – who / what / when / where / resource / etc.

MAIN REFERENCE: "Facilitation Skills Course" – USAID/OFDA-LAC, Jan 2003.

4.1 Introduction

In order to develop action plans individuals or groups can use the Responsibility-Charting Technique. There are several other techniques that can be used.

Responsibility Charting is determining what actions need to be taken, who will do them, when they will do them and what resources are needed to carry them out. They can be very detailed.

Responsibility Charting can be a time-consuming process. It may be something that is undertaken by the individual or the group or something that is delegated. The individuals or group members should have the necessary planning skills, particularly if they will not have the support of the Facilitator.

There are many options for action planning. It can be delegated to an individual or a smaller group that can then report back to the larger group. Other options might include using an outside consultant, forming a committee or an ad hoc group, going forward without outside advice or help.

If planning is delegated, it is important that the individual or the group has a good understanding of the problem, has the necessary resources (time, support) and relevant decision makers are informed and engaged.

On the assumption that there will be a Facilitator that works with the individual or the group in the action-planning process, follow the following steps:

- Write the problem statement and the solution/decision at the top of the FC. Have these statements in view at all times.
- Below that, make a grid of four columns labelled: *What*, *Who*, *When*, *Resources* and explain them.
- Start with the first column: ***What***.
 - Identify the steps that will need to occur to implement the solution.
 - Give participants time and encourage them to be specific.
 - Put the steps in sequence.
 - Ensure that the steps include reporting and evaluation (How will we monitor progress and mistakes? What will success look like? How will we know if it worked? How will we collect the information?)
 - Write these in the ***What*** column of the grid.
- Move to the next column: ***Who***.
 - Determine the decision makers whose approval/ cooperation will be sought.
 - Determine how and who will seek this approval/ cooperation.
 - Determine who will have responsibility for each step. Only persons present at the meeting can be listed here. If someone not present should carry out the task, list an action step for someone present to contact that person.
 - Spend time discussing who will be involved in actual implementation – the group, only a few individuals, an individual. Will outside assistance be needed, i.e. an outside expert.
 - Write these in the ***Who*** column of the grid.'
- Move to the next column: ***By When***
 - Identify the time each step will take (start/finish).
 - Encourage group members to be realistic. Can that timeline be met with the resources available?
 - Is the action step dependent on another step being completed first?
 - Create a schedule/timeline.
 - Establish deadlines.
 - Write these in the ***By When*** column of the grid.
- Move to the next column: ***Resources***
 - Resources – these can be money, human, equipment or materials.
 - Identify the human, material and financial resources needed for each step.
 - Use the column to help those responsible for the task to think ahead and strategically.

- Resource setting should also include preparation of the budget, or at least provision for it.
- ☐ Review the chart and summarize the steps and who will do what. Point out those items that have the most immediate target date. Summarize the resources needed and discuss how those resources will be distributed. You may need to involve the group’s convenor in this process.
- ☐ Tell group members that the plan will be written and copied for each person. Determine how this will be distributed and who will do it, if not the Facilitator.
- ☐ Options for Responsibility Charting:
 - Include a column **Report to** to identify who will monitor each particular step. This may be useful when plans involve persons from several different groups.
 - Develop a **Troubleshooting Plan** to minimize potential problems to implementation. This involves identifying all the constraints or things that could get in the way of successfully implementing the plan and creating strategies to deal with each of the blockages.

Once this planning step is satisfactorily accomplished, implementation can commence.

What	Who	By When	Resources	Report to

4.1.1 Advantages and Disadvantages of Responsibility Charting

Advantages:

- Encourages individuals or group members to take responsibility for solving the problem.
- Provides transparency and accountability for each person’s responsibilities.
- It is a systematic process.
- Ensures that other key “stakeholders” are included or provided for.
- Provides action plan details for those persons who lack vision.
- Starts to disengage Facilitator from the individual or the group.
- Can be delegated to an individual or a smaller group.

Disadvantages:

- Group members may be reluctant to take responsibility.
- Group members may lack sufficient design and planning skills.

- Individuals who are decision makers or who can best carry out actions may not be present.
- The planning process can be complex and time consuming. It may not be feasible to do Responsibility Charting in one session if the problem and solution are complex.
- Success depends on the convenor/person initiating the problem solving and the group to follow through. The Facilitator can assist the group with action planning, but has little control over the outcome.

4.2 Key Points of Action Planning

- Group members will not take responsibility for action if they have not been involved in earlier steps of identifying the problem and selecting a solution.
- Facilitators can use this step to disengage from the group and continue to encourage group ownership of the problem.
- The Facilitator will want to work with the convenor to determine the focus and feasibility of this step. It may need to be carried out at a later time with additional persons.
- There may be other follow-up tasks for which the Facilitator is responsible that do not include the leading group through the five steps to problem solving.
- The group or convenor may not want, or need, the Facilitator to be involved in this step. If so, the Facilitator may want to recommend how this step is carried out.

4.2.1 Implementation and Evaluation

Implementation is putting plans into action.

Evaluation is measuring if the action plan worked and was effective. Has the problem been solved? How well did the plan contribute to solving the problem?

Purpose of **Implementation** is to carry out and monitor the action plan.

Key points:

- Implementation is the step where the leading/directing/COORDINATING occurs.
- If the previous four steps in the problem-solving process have been carried out correctly, the group has made a good start. If the group has poorly completed the previous steps, implementation is also more likely to fail.
- Groups will sometimes lose interest in the implementation, especially if someone else is responsible.
- Tracking progress, identifying mistakes are an important part of implementation. Sometimes the implementation process itself can be flawed, which will affect the solution.
- Troubleshooting – helps to anticipate barriers that will get in the way of success and to correct mistakes as they occur in the implementation process.

Purpose of **Evaluation** is to monitor, evaluate and update the plan. Document results.

Key points:

- Evaluation is developed as part of action planning though it should be discussed prior to or at the start of the process.
- Evaluation provides closure on the process.
- If the intended results are not obtained or achieved, then use the evaluation to start the problem-solving process again, returning to Part I of the follow-up process or, if needed, back to Step 1 in the problem-solving process.
- Put recommendations and key findings in writing to the group and key decision makers.
- Evaluation can be on several levels – the action plan and implementation process, short- or long-term results or how well the solution addressed the problem.

4.2.2 What is the Role of the Facilitator in Implementation and Evaluation?

The Facilitator may or may not have a role in either of these two activities. If the Facilitator does not have an active role, prior to finishing his/her work with the individual or the group, he/she can help the group/convenor/decision maker understand what is needed in order to be successful in implementing action plans.

4.3 Troubleshooting Worksheet

Use this worksheet to identify all of the things that could get in the way of success in implementing the solution to a problem. (Use it with a Responsibility Chart.) Create anticipatory strategies to deal with each of the serious blockages.

Use these questions to help identify trouble spots:

- What are the most difficult, complex or sensitive aspects of our plan?
- What sudden shifts could take place to change priorities or otherwise change the environment?
- What organizational blocks and barriers could we run into?
- What technical or materials-related problems could stop or delay us?
- Should we be aware of any human resources issues? Which ones?
- In which ways might members of this group not fulfil their commitments?

Activity Planned: _____

What could go wrong, block us or change suddenly?	What actions do we need to take to overcome each block? (what, how, by whom, when)