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**Planning to Mitigate the Impacts
of Natural Hazards
in the Caribbean**

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Section I. **Hazard Mitigation Planning—An Introduction**

Natural Hazards and Disasters

Natural hazards are part of the world around us, and their occurrence is inevitable. Floods, hurricanes, volcanoes, earthquakes, wildfires and other hazardous events are natural phenomena that we cannot control. These events can result in great changes to the natural environment: fire can destroy forests, coastal storms can create and fill inlets and move barrier islands, high winds and wave surge can wreak havoc in wetlands, tornadoes can uproot trees, earthquakes can alter the landscape. However, despite their power these occurrences are part of the natural system. The natural environment is amazingly recuperative from the forces of wind, rain, fire and earth and can regenerate with remarkable resiliency, even restoring habitat and ecosystems in time for the next generation of plant and animal life to begin anew.

It is when the man-made environment intersects with these natural phenomena that “disasters” result. Disasters occur when human activity, such as buildings, infrastructure (roads, pipelines), crops, livestock and other land uses take place in the path of the forces of nature. The human environment, particularly the built environment, is not nearly as indestructible nor as resilient as the natural one, and the occurrence of a natural hazard can result in the debilitation of an entire community for many years following the event.

Unfortunately, the frequency of disasters is rising at an alarming rate, not necessarily because natural hazards have become more frequent (although such phenomena do occur in cycles of more and less frequency), but because more and more people have chosen to live and work in locations that put them at risk. Often human development has taken place in areas of risk from coastal storms, repeated flooding and seismic activity, often with little or no attention to the need for sound building practices or land use policy. As a result, risk of disasters occurring in the wake of natural hazards has grown exponentially.

While we cannot prevent natural hazards, we do have some means at hand to reduce some of their adverse consequences. We have tools and techniques which, when put into effect in a timely fashion, allow us to avoid the worst-case scenario when a hazard does occur. By managing the characteristics of the existing and future human environment in a community before a hazardous event occurs, we can mitigate many of its negative impacts so that a *disaster* is less likely to result or will at least be of diminished magnitude.

This manual is intended to serve as a guide to policy makers, business leaders, planners, disaster managers, builders and developers, environmental and conservation groups, private citizens and others who wish to make use of available mitigation tools and techniques to decrease the vulnerability of their community to future hazards. By following the steps outlined in the manual, a government can create an effective plan for mitigating the impacts of the natural hazards that occur in the jurisdiction.

The Four Elements of Comprehensive Emergency Management

Comprehensive emergency management is a widely used approach at all levels of government to deal with the inevitability of natural hazards and their potential to cause disasters in a given community. The components of a comprehensive emergency management system include:

- *Preparedness* activities involve at least two types of activities. Structural activities include actions to prepare for the imminent arrival of a hazard event, such as putting up storm shutters and sandbagging. Non-structural activities involve taking steps to minimize damage to personal property and to minimize harm to individuals. For instance, anchoring boats and storing outdoor furniture in sheds prior to the arrival of a hurricane will lessen the chance of damage to personal property. Following recommendations to evacuate an area will lessen the chance of harm to individuals. Preparedness activities include development of response procedures, design and installation of warning systems, exercises to test emergency operational procedures and training of emergency personnel.
- *Response* activities occur during or immediately following the disaster and include time-sensitive activities such as search and rescue operations, evacuation, emergency medical care, food and shelter programs. Response activities are designed to meet the urgent needs of disaster victims.
- *Recovery* activities are emergency management actions that begin after the disaster, as urgent needs are met. These actions are designed to put the community back together and include repairs to roads, bridges and other public facilities, restoration of power, water and other municipal services and other activities that help restore normal operations to a community.
- *Mitigation* activities reduce or eliminate the damages from hazardous events. These activities can occur before, during and after a disaster and overlap all phases of emergency management. Structural mitigation pertains to actions such as dam and levee projects to protect against flooding, constructing disaster-resistant structures, and retrofitting existing structures to withstand events. Non-structural mitigation activities include development of land use plans, zoning ordinances, subdivision regulations and tax incentives and disincentives to discourage development in certain high-hazard areas. Mitigation also includes education programs for members of the public about the hazards to which their community is vulnerable, as well as the importance of mitigation and how to prepare their property to withstand a disaster.

The Concept of Mitigation and Its Importance

The tension between natural hazards and the decisions people make regarding land use and the built environment is mounting every day. We must take steps to significantly reduce the vulnerability of people and their communities to natural hazards; this can only be done through mitigation. Mitigating the impact of natural hazards involves recognizing and adapting to natural forces and is defined as *any sustained action taken to reduce long-term vulnerability of human life and property to natural hazards*. This definition highlights the long-term impact that effective

mitigation can produce. While the actions involved in the preparatory, response and recovery phases of emergency management are related to specific events, mitigation activities have the potential to produce repetitive benefits over time and should concern events that may occur in the future.

Hazard mitigation can be viewed as the foundation of emergency management and should be interwoven with all the other phases of comprehensive emergency management program. The aftermath of a disaster provides a unique window of opportunity to assess the damage that has befallen a community and to elucidate its causes. This allows members of the community to take action during re-building to prevent or diminish the same disaster when the next natural phenomenon occurs. Whether applied in post-disaster reconstruction or during pre-disaster planning efforts, hazard mitigation provides planners with guidelines for reducing vulnerability to future disaster-related damages. By developing mitigation programs that affect the impact of future disasters, planners can break the cycle of damage, reconstruction and repeated damage.

A fundamental premise of mitigation strategy is that current dollars invested in mitigation will significantly reduce the demand for future dollars by reducing the amount needed for emergency recovery, repair and reconstruction following a disaster. Mitigation can also provide a degree of socioeconomic continuity in the community by reducing the social and economic disruption that often accompanies a hazardous event through damage to transportation and communication systems, dislocation of people, loss or interruption of jobs and closing or disabling of businesses, schools and social outlets. Mitigation also calls for conservation of natural and ecologically sensitive areas (such as wetlands, floodplains and dunes) which enables the environment to absorb some of the impact of hazard events. In this manner, mitigation programs can help communities attain a level of *sustainability*, ensuring long-term economic vitality, social and environmental health for the community as a whole.

Section II.

Rationale for Mitigation Planning: To Influence Decision-Makers

Mitigation is the only component of comprehensive emergency management that has the potential to break the cycle of damage and reconstruction that can occur when a community is subjected to repeated natural hazards. To be effective, a mitigation strategy must be in place and ready for immediate implementation when the appropriate window of opportunity opens. This can only be done through advance preparation; i.e., planning.

First and foremost, a hazard mitigation plan can be an effective vehicle for establishing commitment to mitigation goals, objectives, policies and programs. By articulating what the government hopes to achieve, the plan can serve to establish an important connection between the public interest and mitigation measures to be employed. While the plan is useful for articulating the vision and developing the programs and initiatives that encourage and support community-based implementation, the real success or failure of the hazard mitigation plan depends on decisions made by individuals—in both private and public sectors. To this end, the hazard mitigation plan provides a medium to inform the community about natural hazards and about mitigation, increasing public awareness of the risks present in the community, as well as the resources available to reduce those risks. Achieving widespread public awareness of natural hazards in a community will enable citizens to make informed decisions on where to live, purchase property or locate a business and how to protect themselves and their property from the impact of natural hazards. In the public sector, decision-makers who are well-informed and well-guided by a mitigation plan can carry out their daily operational activities in a manner that will include mitigation concepts. The plan, then, guides the implementation of goals, objectives, policies and programs for both public and private sectors as it educates the community.

A meaningful mitigation plan also provides the impetus for the government to become a “good leader” in the forefront of mitigation strategy. Governments at all levels, must, through their own activities in the built environment, set a good example in terms of mitigation. All new public facilities should be sited away from hazardous areas and should be built to meet or exceed model building codes and standards or their substantial equivalent. Existing public structures should be retrofitted to withstand the impact of natural hazards, protecting public investment. By demonstrating first-hand the efficacy of mitigation, as well as the level of commitment the government is willing to put forth, governments will provide incentive to private owners and builders to carry out the goals and policies of the hazard mitigation plan as well.