



Activity Descriptions and Web Resources

Post-Georges Disaster Mitigation Project in Antigua & Barbuda and St. Kitts & Nevis

September 2001

Post-Georges Disaster Mitigation in Antigua & Barbuda and St. Kitts & Nevis is implemented by the Organization of American States, Unit for Sustainable Development and Environment for USAID-Jamaica/Caribbean Regional Program

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Post-Georges Disaster Mitigation in Antigua/Barbuda and St. Kitts/Nevis

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Post-Georges Disaster Mitigation in Antigua/Barbuda and St. Kitts/Nevis

Hurricane Georges, a category 3 storm, struck the Eastern Caribbean islands of Antigua and Barbuda and St. Kitts and Nevis, 20-22 September 1998. The hurricane caused severe damage to economic and social infrastructure and dealt a serious blow to both islands' economies.

In response to the damages from Hurricane Georges, the US Agency for International Development-Jamaica/Caribbean Regional Program (USAID-J/CAR), established a program entitled *Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean*, targeting Antigua and Barbuda and St. Kitts and Nevis. The Organization of American States' Unit for Sustainable Development and Environment (OAS/USDE) implemented the disaster mitigation capacity building component for USAID-J/CAR, under the project *Post-Georges Disaster Mitigation (PGDM)*. [See PGDM background information for further details.] The PGDM included four primary objectives: 1. develop national hazard mitigation policies and plans, 2. strengthen building practices, 3. strengthen national emergency shelter policies and programs, 4. support public information programs on hazard mitigation.

All documents produced under the PGDM are available on this web site and are accessible through the thematic descriptions of project activities, below. A chronological description of project events is also available for Antigua/Barbuda and St. Kitts/Nevis.

Hazard Mitigation Planning

- Overview
- Hazard Mitigation Planning
- Hazard and Vulnerability Assessment and Mapping
- Pre-disaster Planning for Post-disaster Recovery

Strengthening Building Practices

- Overview
- Building Inspector Training Course
- Multi-hazard Building Design Course
- Building Code Sensitization Meetings
- Hazard Mitigation in the Insurance and Banking Sectors
- Hazard Resistant Housing Review
- Status of Building Codes in the Caribbean

Emergency Shelter Strengthening

- Overview
- Emergency Shelter Policy/Handbook Development
- Structural Vulnerability Assessment

Post-Georges Disaster Mitigation Overview

Background

Hurricanes and tropical storms periodically wreak havoc in the Caribbean, creating conditions of disaster among the general population and destroying infrastructure. The capacity of small island states to stabilize and resume normal economic activity following hurricane-induced setbacks depends upon several factors, including the initial level of hazard vulnerability, the size of the country's international reserves, the country's capacity to organize external financial aid flows and the speed with which normal trade patterns can be reestablished.

Hurricane Georges, a category 3 storm, struck the Eastern Caribbean islands of Antigua and Barbuda and St. Kitts and Nevis, 20-22 September 1998. The hurricane caused severe damage to economic and social infrastructure and dealt a serious blow to both islands' economies. In St. Kitts and Nevis, the hurricane affected 85 percent of the housing stock, the majority of schools (including half of the schools that had been designated as shelters) and the general hospital. Electrical, telephone, water and transportation infrastructure were also damaged. One-third of the country's hotel rooms were damaged and up to half of the sugar cane crop was lost. In Antigua, the south coast of the island suffered most of the damage, with 400 homes destroyed, disrupted electrical supply and damage to a number of health facilities. The tourism sector, livestock and fisheries also suffered significant losses.

In response to the damages from Hurricane Georges, the US Agency for International Development-Jamaica/Caribbean Regional Program (USAID-J/CAR), established a program entitled *Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean*, targeting Antigua and Barbuda and St. Kitts and Nevis. This program included three components: restoring hospital services (St. Kitts only), enhancing local capacity for disaster mitigation and reactivating economic activities. The Organization of American States' Unit for Sustainable Development and Environment (OAS/USDE) implemented the disaster mitigation capacity building component for USAID-J/CAR, under the project *Post-Georges Disaster Mitigation (PGDM)*.

Post-Georges Disaster Mitigation Program

The goal of the PGDM program was to reduce the vulnerability of population and economic activities in St. Kitts and Nevis and Antigua and Barbuda to natural hazards, including tropical storms and related flooding and seismic and volcanic hazards, through enhanced capacity for hazard mitigation. Under this broad goal, four specific objectives were pursued in each country:

1. Develop, adopt and begin implementation of effective national hazard mitigation policies and operational plans.
2. Adopt national building codes and improve building practices.
3. Establish comprehensive national emergency shelter policies and programs, with appropriate training for emergency and shelter managers.
4. Increase public understanding of the need and options for hazard mitigation, through public information and education programs.

Further information about these activities and the overall project is available in the full project proposal.

As natural hazards affect all economic and social sectors in these countries, development of an appropriate response must also be multi-sectoral. To ensure an integrated approach to hazard risk reduction under this project, disaster mitigation councils were established to guide project planning and execution. These councils are composed of public- and private-sector representatives of the national disaster office, physical planning, economic planning, the insurance sector, the tourism sector and NGOs, such as the national development foundations. Activities under the PGDM built on the experiences and lessons of the USAID/OAS Caribbean Disaster Mitigation Project.

Program Details

Period of Activity January 2000 - July 2001
Funding Agency USAID/J-CAR in Kingston Jamaica
Implementing Agency OAS Unit for Sustainable Development and
 Environment

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

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Post-Georges Disaster Mitigation

Objective 1 | Objective 2 | Objective 3 | Objective 4

Objective 1: An effective hazard mitigation policy and operational plan is adopted and implementation has started in each country

National Natural Hazard Mitigation Policy and Plan Development

The Post-Georges Disaster Mitigation project supported the drafting of comprehensive national hazard mitigation policies and plans in both Antigua/Barbuda and St. Kitts/Nevis. This activity served as a framework for many of the other project activities. In both countries, multi-sectoral working groups were convened to guide the development of the mitigation policy/plan. The project engaged an individual in each country to serve as the focal point for development and writing of the plan, specialists to carry out specific hazard assessments, and a geographic information system specialist to integrate these assessments into a vulnerability assessment. The PGDM also provided the assistance of two regional mitigation planning experts to help structure the planning process and to provide guidance to the local individuals and agencies developing the policies and plans. Under this arrangement, the PGDM undertook the following activities:

- Provided training in disaster mitigation concepts, planning and process for participating agencies, organizations, institutions and hazard mitigation committee members.
- Reviewed current policy, institutional capacity, and coordination mechanisms for disaster mitigation. In particular, obstacles to integrating mitigation into development policy and practice were identified. Recommendations and follow-up actions to overcome the obstacles and strengthen these institutional arrangements and systems were included in the final draft policies/plans.
- Produced multi-hazard maps as a basis for identifying vulnerability. The specific hazard assessments undertaken under the project were identified in hazard mapping/vulnerability assessment prioritization workshops held in both countries. Hazard assessments undertaken included beach erosion, drought, inland erosion, inland flooding, tropical storm winds and surge and volcanic hazards. The existing tide gauges in both countries were strengthened to better withstand the effects of severe storms.
- Assessed the vulnerability of population, infrastructure and economic activities, for use in prioritization of mitigation activities and, over the longer term, in improved land use planning, economic development and evacuation planning. The specific categories of facilities included in the vulnerability assessment were identified by the local stakeholder groups during the hazard mapping/vulnerability assessment prioritization workshops.
- Developed mitigation priorities, goals and objectives and formulated mitigation strategy and measures, with the goal of reduced long-term vulnerability to the effects of natural hazards across all sectors of the government and society.

Further details on the hazard mitigation policy and plan development process and products are available on the PGDM Hazard Mitigation Planning Page.

National Mitigation Planning Councils

All sectors and segments of society are affected by natural hazards in Antigua/Barbuda and St. Kitts/Nevis. Any effective program to reduce the overall vulnerability to natural hazards must be similarly all-inclusive. Multi-sectoral bodies with high political support are critical to the coordination and long-term success of the hazard mitigation initiatives. In both countries, the national hazard mitigation policies/plans were developed under the mandate of national mitigation councils.

In Antigua/Barbuda, the National Office of Disaster Services (NODS) and the Government of Antigua/Barbuda had proposed, prior to the inception of the PGDM, the establishment of a National Mitigation Council. With the assistance of the PGDM, an organizational meeting of the Council was held in August 2000 and the first official meeting was held in March 2001. The National Mitigation Council is chaired by the Minister of Planning and comprises senior public servants and representatives of the private and non-governmental sectors, across a wide variety of sectors. NODS serves

as secretariat to this council. A technical guidance committee was also established to guide the development of the mitigation policy/plan.

In St. Kitts/Nevis, a National Mitigation Council existed prior to the inception of the PGDM. This Council met on a regular basis throughout the project and is chaired by the Deputy Prime Minister. Its membership includes the heads of each Government Ministry and Department and representatives of the National Emergency Management Agency (NEMA), the Chamber of Commerce, the Hotel and Tourism Association, protective services, church and women's organizations. A technical guidance committee was established to provide day-to-day guidance to the mitigation plan development process.

Pre-disaster Planning for Post-Disaster Recovery

In the aftermath of a disaster, there is great pressure to repair damages and return society and the economy to "normal." The post-disaster period, however, also provides an opportunity not just to return damaged structures to a functioning state, but to make them less vulnerable than before to future such events. The time pressures and difficulties in communication and transport in the post-disaster environment make it difficult to undertake the planning necessary to increase the resilience during reconstruction. Advance planning for appropriate reconstruction can assist in meeting this goal by ensuring access to appropriate building materials and by identifying key strengthening measures to be incorporated in any reconstruction activities.

Under the PGDM, plans were developed for post-disaster reconstruction of the housing sector. Included in these plans were training and public information materials on safe building techniques. These plans can be used by other sectors as models for development of their own reconstruction and recovery plans. Further information is available on the PGDM Pre-disaster Planning for Post-disaster Recovery page.

Pre-project Baseline (December 1999)

Antigua and Barbuda: The national disaster office recently formed a Disaster Mitigation Strategy Committee. Composition of the committee is not yet final, and representation seems to be below the desired level. The private sector is under-represented. The committee does not yet have a coordinator and no workplan has yet been developed.

St. Kitts and Nevis: In 1998, Parliament passed a disaster mitigation act and an accompanying National Disaster Plan, which was revised in September 1999. Both the Plan and the Act were widely distributed for review before the bills were presented for debate and passage by Parliament. Although the Disaster Plan exists, there is no clear-cut mitigation plan or policy. A review will determine the extent to which the plan is consistent with government policy, and will identify steps to be taken to operationalize the plan.

Neither country has a plan that would enable the appropriate agencies to learn from failures in housing and infrastructure, and to carry out reconstruction in such a way that impact of future hazards would be minimized.

Expected outcomes (December 1999)

1. Each country has adopted an effective disaster mitigation policy and plan that makes full use of the hazard and vulnerability information.
 2. Each country has agreed on a mechanism to integrate the plan into the ongoing physical and economic development planning process.
 3. Each country has a plan to ensure that mitigation is built in future post-disaster reconstruction projects.
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Pre-PGDM Documents and Reference Information

Antigua/Barbuda

- Draft National Physical Development Plan for Antigua/Barbuda and St. John's.

- GTZ/Government of Antigua and Barbuda. *Early Warning Systems Workshop Report, May 1999.*
- *Planning for Coastline Change: Coastal Development Setback Guidelines in Antigua and Barbuda.* Dr. Gillian Cambers, University of Puerto Rico Sea Grant [<http://gmv.ifas.ufl.edu/~seaweb/homepage/upr.htm>] June 1998.
- CDMP Storm Surge Atlas: Introduction (650k) and individual atlases for Antigua (375k) and Barbuda (360k)

St. Kitts/Nevis

- *A Probable Maximum Loss Study of Critical Infrastructure in Three Caribbean Island States* (HTML 660k) and Appendices (HTML and PDF)
- CDMP Storm Surge Atlas: Introduction (650k) and atlas for St. Kitts/Nevis (375k)

OAS/Other

- *OAS Primer on Natural Hazards and Integrated Development Planning*
- *Planning to Mitigate the Impacts of Natural Hazards in the Caribbean* — a mitigation planning manual produced by CDMP, October 1997. [Acrobat 353k.]
- Caribbean Disaster Mitigation Project's resources pages on a) *Mitigation Planning*, b) *Storm Hazard Modeling* and c) *Hazard Mapping*.
- *CHA/CTO Hurricane Procedures Manual: June 1998.* [HTML, 3 section 745k total.]
- *Multi-Hazard Identification and Risk Assessment.* US Federal Emergency Management Agency.

PGDM Hazard Mitigation Planning Page

The Post-Georges Disaster Mitigation (PGDM) is supporting the countries of Antigua/Barbuda and St. Kitts/Nevis in the development of comprehensive hazard mitigation policies and plans. This activity will serve as a framework for many of the other project objectives and activities.

To be effective, hazard vulnerability reduction activities must be designed and implemented in an integrated development framework. Hazard mitigation planning can provide this necessary framework for hazard risk reduction. It is a comprehensive approach to understanding both the character and effects of hazards on a region and the context for responding to those hazards. Hazard mitigation planning can encompass a wide range of hazards and involve representatives of a broad spectrum of disciplines and interests. To support the practice of mitigation planning in the Caribbean region, a hazard mitigation planning methodology was developed under the USAID/OAS Caribbean Disaster Mitigation Project (CDMP). This approach is described in the document *Planning to Mitigate the Impacts of Natural Hazards in the Caribbean*. Steps in this approach include (see diagram for another perspective):

- hazard assessment and mapping
- vulnerability assessment
- institutional capability assessment
- hazard mitigation policy development and
- implementation of a mitigation response

Under the PGDM, the Governments of both Antigua/Barbuda and St. Kitts/Nevis undertook a comprehensive hazard mitigation planning process, based on this approach. The project supported the work of both governments through the provision of expert assistance in the fields of hazard mapping and assessment, mitigation planning, geographic information systems and policy/plan development.

To begin this activity, PGDM sponsored national-level hazard mitigation introductory workshops in Antigua/Barbuda and St. Kitts/Nevis. The goals of this workshop were to:

- introduce mitigation planning concepts and approaches;
- establish a common vocabulary and approach to mitigation planning among the agencies, organizations and institutions contributing to natural hazard risk reduction; and
- establish a baseline of available hazard information.

The following reports and documents describe the results of these introductory workshops:

- *Antigua/Barbuda workshop, May 2000*: Mitigation Planning Workshop Report | Workplan Development Workshop Report | Initial Plan Development Timeline/Tasks | Participant Photo
- *St. Kitts/Nevis workshop, June 2000*: Mitigation Planning Workshop Report | Workplan Development Workshop Report | Initial Plan Development Timeline/Tasks

Natural Hazard Assessment and Mapping

Studies that assess natural hazards provide information on the probable location and severity of dangerous natural phenomena and the likelihood of their occurrence within a specific time period in a given area. These studies rely heavily on available scientific information, including geologic, geomorphic, and soil maps; climate and hydrological data; and topographic maps, aerial photographs, and satellite imagery. Historical information, both written reports and oral accounts from long-term residents, also helps characterize potential hazardous events. Ideally, a natural hazard assessment promotes an awareness of the issue in a developing region, evaluates the threat of natural hazards, identifies the additional information needed for a definitive evaluation, and recommends appropriate means of obtaining it.

During the third quarter of 2000, PGDM conducted Hazard Mapping/Vulnerability Assessment Prioritization workshops in both Antigua/Barbuda and St. Kitts/Nevis. The goal of these workshops was to identify gaps in existing hazard mapping information and specific needs for hazard mitigation activities to be undertaken under the PGDM. A

formal prioritization exercise was conducted during these workshops to identify the most appropriate uses of PGDM hazard mapping funds for filling identified gaps and needs. As part of this activity, terms of reference were developed for the hazard mapping/vulnerability assessment activities selected to be funded by the project. Further information on these workshops is available through the workshop reports: Antigua/Barbuda Workshop Final Report | St. Kitts/Nevis Workshop Final Report.

Based on the results of the prioritization workshops, the PGDM undertook hazard assessments of beach erosion; drought; inland flooding; inland erosion; tropical storm-related surge, wind and waves; and volcanic hazards. The reports, data and maps resulting from these assessments are available on the PGDM Hazard Mapping page and the PGDM GIS data page.

Vulnerability Assessment

Vulnerability assessments estimate the degree of loss or damage that would result from the occurrence of a natural phenomenon of given severity. Vulnerability can be estimated for selected geographic areas, e.g., areas with the greatest development potential or already developed areas in hazardous zones. The techniques employed include lifeline (or critical facilities) mapping and sectoral vulnerability analyses for sectors such as energy, transport, agriculture, tourism, and housing. The vulnerability assessments undertaken under the PGDM focused on critical governmental facilities and infrastructure.

In Antigua/Barbuda, maps describing the hazards from each of the PGDM hazard assessments were incorporated into the national geographic information system (GIS) database, housed at the Development Control Authority, with the assistance of a PGDM consultant. A team, led by the National Office of Disaster Services, inventoried and mapped over 250 facilities for use in the PGDM vulnerability assessment. Using the hazard GIS layers, an assessment of the mapped facilities was undertaken to identify those that are at the highest risk to the mapped natural hazards. [Antigua/Barbuda Hazard Vulnerability Assessment results.]

In St. Kitts/Nevis, the geographic information system (GIS) capacity of both the Government of St. Kitts/Nevis and the Nevis Island Administration was expanded under the project, through the digitization of basemap information, inventory and mapping of critical facilities and the incorporation of summary hazard layers from each of the PGDM hazard assessments into the national GIS databases in St. Kitts and Nevis.

To assess the vulnerability of critical facilities to natural hazards, the priority categories of facilities were identified and mapped. These categories included any facilities that functioned as a shelter, hospitals and clinics; government administrative buildings; airports and sea ports; power, water and telecommunication installations; oil and gas companies; protective services and the road network. Using the hazard GIS layers, those facilities that are at the highest risk to each of the mapped natural hazards were identified. The results of this vulnerability assessment were presented to the national mitigation committee at public meetings in July 2001. [St. Kitts/Nevis Hazard Vulnerability Assessment results.]

Concurrent with the PGDM, the Unit for Sustainable Development and Environment of the Organization of American States (OAS/USDE) and the US National Oceanographic and Atmospheric Administration's Coastal Services Center (NOAA/CSC) have been collecting and disseminating information on vulnerability assessment tools and techniques currently in use throughout the hemisphere. As part of this work, two workshops on Vulnerability Assessment Techniques and Applications have been held at the NOAA/CSC. PGDM sponsored the participation of representatives from both project countries at the first workshop, held in March 2000. The PGDM vulnerability assessment work in Antigua/Barbuda and St. Kitts/Nevis was presented at the second workshop in August 2001.

A review of the PGDM hazard and vulnerability assessment activities is contained in the *Training in Hazard and Vulnerability Assessment Final Report*.

Capability Assessment

A *capability assessment* reviews the ability of a government, individual or company to address hazards. Such an assessment should review technical ability, financial resources, legal and institutional frameworks and political will. A capability assessment can reveal gaps in existing capability for hazard response and development control, as well as take

credit for currently functioning mitigation activities. This assessment can help identify policy and structural changes that must be made to institutionalize mitigation. Some mitigation options may be eliminated from consideration due to barriers to implementation identified during the capability assessment. Results of the Antigua/Barbuda and St. Kitts/Nevis capability assessments are included in the final draft hazard mitigation policies and plans. [Capability Assessment Form (Word 42k)]

Plan Development

Draft Natural Hazard Mitigation Policies and Plans were completed in both Antigua/Barbuda and St. Kitts and Nevis during the summer 2001. As the culmination of the mitigation planning process, these documents include information collected in all steps in this process, including a disaster history, the legal framework for disaster mitigation, the capability assessment, mitigation opportunity analysis and the hazard and vulnerability assessments. The centerpieces of these documents, however, are the goals, objectives and proposed actions and programs to reduce the existing and future vulnerability to natural hazards.

These documents were officially handed over to the Governments at the final project closing ceremonies, held on 26 July in Antigua and on 14 August in St. Kitts.

- [Antigua/Barbuda Draft Natural Hazard Mitigation Policy and Plan page](#)
 - [St. Kitts/Nevis Draft Natural Hazard Mitigation Policy and Plan page](#)
 - [PGDM National Mitigation Policy/Plan Development Final Report \(HTML 33k\)](#)
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Other Resources

- [Caribbean Disaster Mitigation Project mitigation planning resources page](#)
 - [North Carolina Division of Emergency Management mitigation planning resources page](#)
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USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

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PGDM Hazard Assessments

Overview

- Beach Erosion
- Inland Erosion
- Inland Flooding
- Drought
- Tropical Storms
- Storm Surge
- High Winds
- Tide Gauges
- Volcanic

Vulnerability Assessments

Antigua/Barbuda
 St. Kitts/Nevis

PGDM Hazard Mapping Page

To build the information base necessary for development of appropriate national hazard mitigation policies and plans, PGDM is supporting hazard assessments in Antigua/Barbuda and St. Kitts/Nevis. The specific hazard assessments to be undertaken in each country were identified in two national Hazard Mapping Prioritization workshops (for more information, see the PGDM Hazard Mitigation Planning page.) The priority hazards selected in these workshops were:

- Beach Erosion (Antigua, Barbuda, St. Kitts, Nevis)
- Inland Erosion (Antigua, Barbuda, St. Kitts)
- Inland Flooding (Antigua, Barbuda, St. Kitts, Nevis)
- Drought (Antigua, Barbuda, Nevis)
- Tropical Storm-related hazards
 - Storm Surge (Antigua, Barbuda, St. Kitts, Nevis)
 - High Winds (Antigua, Barbuda, St. Kitts, Nevis)
 - Tide Gauge Strengthening (Antigua, St. Kitts)
- Volcanic Hazards (St. Kitts, Nevis)

The results of the individual hazard assessments will be integrated into national GIS databases in both countries. To assist these hazard assessment and mapping activities, PGDM supported the development of digital elevation models and ancillary data (e.g. roads, coastlines, contours) for Antigua, Barbuda, St. Kitts and Nevis. All digital data produced under this project will be made available through the PGDM GIS data page. A set of PGDM hazard map guidelines was developed to promote consistency of the maps produced under the project.

Hazard Assessment Background Information

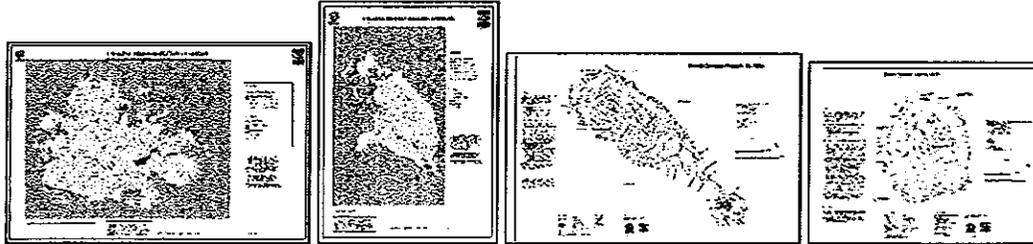
Hazard/Data	Products
Digital Elevation Model, Base GIS Data development (Antigua/Barbuda, St. Kitts/Nevis) [Terms of Reference]	DEM Data Development Final Report Metadata Collection Form (MS Word)
Ground Shaking (Antigua/Barbuda, St. Kitts)	Links: UWI Seismic Research Unit home page USGS Earthquakes Hazard Page

Other Resources

- Caribbean Disaster Mitigation Project Hazard Mapping Resources Page
- OAS Primer on Natural Hazard Management in Integrated Regional Development Planning ["Primer"]

PGDM Hazard Mapping: Beach Erosion

Beach Erosion Hazard Assessments have been completed under PGDM for Antigua, Barbuda, St. Kitts and Nevis. Both Technical and Summary reports on these hazard assessment are available by country and maps are available for each island. Individual beach erosion hazard maps were produced for each island. The scope of work for this activity is available in the Beach Erosion Hazard Assessment Terms of Reference



	Antigua and Barbuda	St. Kitts and Nevis
<i>Summary Report</i>	Antigua/Barbuda Summary (HTML 95k)	St. Kitts/Nevis Summary (HTML 350k)
<i>Technical Report</i>	Antigua/Barbuda Report (HTML 180k)	St. Kitts/Nevis Report (HTML 750k)
<i>Beach Erosion Hazard Maps</i>	Antigua Map (JPG 1,030k) Barbuda Map (JPG 590k)	St. Kitts Map Nevis Map
<i>Beach Erosion Hazard Shapefiles</i>	Antigua Shapefiles (still to be posted) Barbuda Shapefiles (still to be posted)	St. Kitts Shapefiles (zip archive 13k) Nevis Shapefiles (zip archive 14k) St. Kitts/Nevis hazard zones: description (HTML page) shapefiles (zip archive 42k)

Related Links: Coastal erosion hazard assessment for the US (April 2000)

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

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Inland Erosion Hazard

Inland Erosion Hazard Assessments are complete under PGDM for Antigua, Barbuda and St. Kitts. A combined technical report (encompassing all three islands) was produced for the overall assessment. Summary reports on these hazard assessment were produced by country and maps are available for each island. [Inland Erosion Hazard Assessment Terms of Reference]



Combined report (Antigua, Barbuda and St. Kitts): Erosion Hazard Assessment Report (MSWord 175k) | Appendices (MSWord 305k)

Antigua and Barbuda

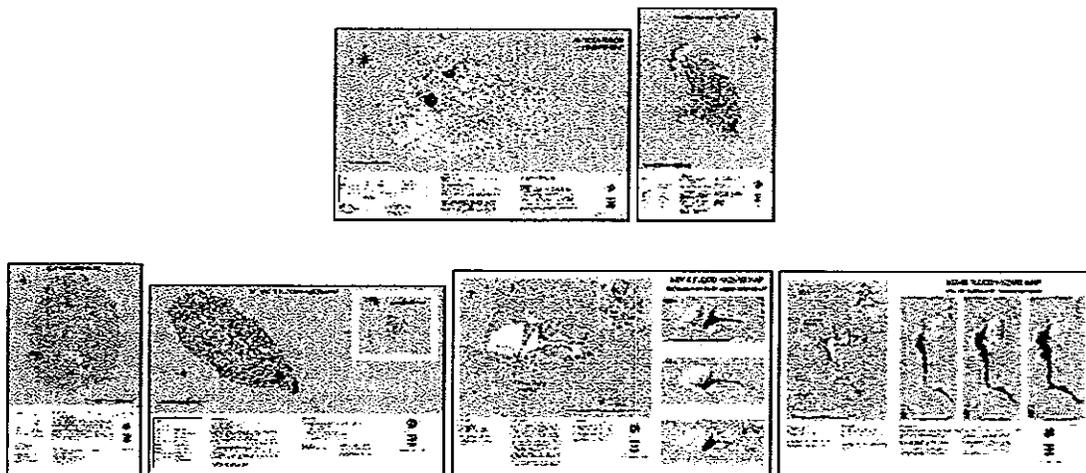
- Antigua and Barbuda Summary Report (HTML 32k)
- Antigua Erosion Hazard Assessment map (HTML 275k)
- Barbuda Erosion Hazard Assessment map (HTML 115k)

St. Kitts

- St. Kitts Summary Report (HTML 32k)
- St. Kitts Erosion Hazard Assessment map (HTML 150k)

PGDM Inland Flooding Hazard Mapping Page

Inland Flood Hazard Assessments have been completed under PGDM for Antigua, Barbuda, St. Kitts and Nevis. Both Technical and Summary reports on these hazard assessment are available by country and maps will be available for each island. Individual inland flood hazard maps have been produced for each island. [Inland Flood Hazard Assessment Terms of Reference]



Antigua and Barbuda

- Antigua/Barbuda Technical report (MSWord 915k) | compressed version (zip archive 580k)
- Antigua/Barbuda Summary report (HTML 30k)
- Antigua Inland Flood Hazard Map
- Barbuda Inland Flood Hazard Map
- Antigua Inland Flood Hazard Shapefiles (zip archive 33k)
- Barbuda Inland Flood Hazard Shapefiles (zip archive 40k)
- Antigua Rainfall (MS Excel format): 1995 (160k) | 1995-2000 (40k)

St. Kitts and Nevis

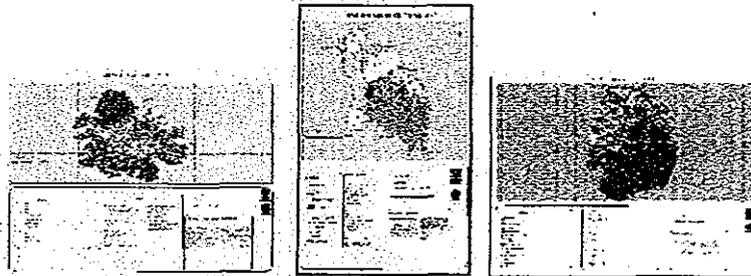
- St. Kitts/Nevis Technical report (MSWord 200k) | Figures (HTML 810k)
- St. Kitts/Nevis Summary report (HTML 30k)
- St. Kitts Inland Flood Hazard Map
- Nevis Inland Flood Hazard Map
- Lower Bath Ghaut (Nevis) Flood Hazard Map
- Camps River (Nevis) Flood Hazard Map
- St. Kitts Inland Flood Hazard Shapefiles (zip archive 15k)
- Nevis Inland Flood Hazard Shapefiles (zip archive 9k)
- St. Kitts Rainfall data 1977-1999 (MS Excel format): uncompressed (1,310k) | compressed (345k)

Background information

- Antigua/Barbuda Mission (November 2000): Mission Report (Word 33k) | Daily Log (Word 22k) | TOR for surveyor (RTF 16k) | Status of data acquisition (Word 27k)
- St. Kitts/Nevis Mission (November 2000): Mission Report (Word 32k) | Daily Log (Word 35k) | TORs for local surveyor (Word 13k) and foreign surveyor (RTF 18k) | Status of data acquisition (Word 24k)

PGDM Hazard Mapping: Drought

Drought hazard assessments have been completed for Antigua, Barbuda and Nevis. Both Technical and Summary reports on these hazard assessment are available by country and maps are available for each island. Individual drought hazard maps will be produced for each island. The scope of work for this activity is described in the drought hazard assessment terms of reference.



	Antigua and Barbuda	Nevis
<i>Summary Report</i>	Antigua/Barbuda Summary (HTML 30k)	Nevis Summary (HTML 32k)
<i>Technical Report</i>	Antigua/Barbuda Report: Acrobat format (955k) MSWord format (325k)	Nevis Report: Acrobat format (935k) MSWord format (305k)
<i>Drought Risk Map</i>	Antigua Map: Medium detail (HTML 70k) Higher detail (Acrobat 280k) Barbuda Map: Medium detail (HTML 100k) Higher detail (Acrobat 225k)	Nevis Map: Medium detail (HTML 75k) Higher detail (Acrobat 740k)
<i>Drought Risk Data</i>	Antigua shapefile (zip archive 15k) Barbuda shapefile (zip archive 55k)	Nevis shapefile (zip archive 7k)
<i>Other GIS Data</i>	Antigua landuse shapefile (zip archive 250k) Barbuda landuse shapefile (zip archive 101k) Antigua shapefiles: watersheds, roads and contours (zip archive 340k) Barbuda shapefiles: watersheds and wells (zip archive 9k)	Nevis landuse shapefile (zip archive 60k) Nevis shapefiles: water resources features (zip archive 6k)

Related Links: US National Drought Mitigation Center (University of Nebraska, Lincoln) | Drought Hazard Mapping Chapter of *OAS Primer* | United Nations Secretariat of the Convention to Combat Desertification

PGDM Tropical Storm Wind and Storm Surge Hazard Mapping Page

Storm Surge/Wind Hazard Assessments have been completed under PGDM for Antigua, Barbuda, St. Kitts and Nevis. Maps of storm surge, wind and wave hazards for 10-, 25-, 50- and 100-year return periods are available for each island. [Storm Surge/Wind Hazard Assessment Terms of Reference] To assist with the development of a long-term database of storm hazard information, the PGDM assisted with the strengthening of existing tide gauges in Antigua and St. Kitts to increase the probability that the equipment can withstand (and record information during) a severe storm.

The *introductory section* for all atlases will be identical. Section A of the atlas is available in MS PowerPoint in both uncompressed (1,600k) or compressed (zip archive 1,285k) formats. A sub-regional version atlas, covering all four islands, is also available in uncompressed (MS PowerPoint 1,715k) and compressed (zip archive 1,455k) formats.

Map Types

Two types of hazard maps are available: *numeric* maps, which show the actual expected wind, surge and wave values, and *category* maps, which recast these value maps into high/medium/low hazard categories. All maps are in MS PowerPoint format. The numeric maps are the most appropriate maps for use in land use planning and site selection. The category maps were used in the vulnerability assessment undertaken as part of the PGDM.

Numeric Maps



Antigua and Barbuda

- Antigua atlases: numeric (1,210k)
- Barbuda atlases: numeric (715k)
- Antigua and Barbuda numeric atlases compressed (zip archive 1,090k)

St. Kitts and Nevis

- St. Kitts atlases: numeric (820k)
- Nevis atlases: numeric (550k)
- St. Kitts and Nevis numeric atlases compressed (zip archive 770k)

Category Maps

Antigua and Barbuda

- Antigua atlases: category (860k)
- Barbuda atlases: category (540k)
- Antigua shapefiles: category (Zip format, 240k)
- Barbuda shapefiles: category (Zip format, 165k)

St. Kitts and Nevis

- St. Kitts atlases: category (460k)
- Nevis atlases: category (415k)
- St. Kitts shapefiles: category (Zip format, 135k)
- Nevis shapefiles: category (Zip format, 65k)

Tide Gauge Strengthening

During 1998 the Caribbean: Planning for Adaptation to Global Climate Change (CPACC) installed eighteen (18) sea-

level and climate monitoring stations in twelve Caribbean (CARICOM) countries. Two of the countries, Antigua and Barbuda and St. Kitts and Nevis, had sites installed at their Defense Force facilities. These installations proved to be particularly sensitive to damage from intense storms and both monitoring sites were damaged by hurricanes repeatedly after the 1998 installation. Because of the importance of these monitoring sites to the region and to the local meteorological offices, it was determined that the best course of action was to "harden" the installations to better withstand the rigors of storms.

St. Kitts and Nevis: In March 2001, the monitoring equipment was relocated from its original location on the concrete pier to the top of a steel gantry structure on the same pier. The tide gage was relocated to a more protected place with additional bracing. The additional elevation and additional bracing should increase the probability that the equipment can withstand a severe storm. The sea-level sensor was re-surveyed and the meteorological sensors were replaced with new ones.

Antigua and Barbuda: In July 2001, the monitoring equipment was relocated from its original location on the concrete pier to a site that would accommodate installing additional system height (3m) and placing guy wires on the tower. Additional brackets were added to the sea-level system. The additional height and increased bracing should increase the probability that the equipment can withstand a severe storm.

Background information

- Trip reports: December 2000 (MS Word 325k) | March 2001 (MS Word 150k)
- *Links:* NOAA Tropical Prediction Center

Volcanic Hazards

The Seismic Research Unit of the University of the West Indies is undertaking a volcanic hazard assessment in the Eastern Caribbean. Under a memorandum of understanding, the PGDM is covering the field and laboratory costs for the field work for this assessment in St. Kitts and Nevis. The following interim volcanic assessment for St. Kitts/Nevis was produced in June 2001. A final updated assessment will be produced by the SRU by early 2002. [SRU MOU activities.]



Interim volcanic hazard assessment for St. Kitts/Nevis (HTML 380k)

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

Page last updated on 08 Aug 2001

Pre-disaster Planning for Post-disaster Recovery

In the aftermath of a disaster, there is great pressure to quickly repair damages. However, the quality of the reconstruction and rehabilitation work that takes place during this period often determines how well the same location weathers future hazard events. Time pressures and the difficulties in communication and transport in the post-disaster environment make it difficult to increase the resilience of reconstruction. Pre-disaster planning is necessary to ensure adequate materials are available following a disaster and to ensure that builders, homeowners and government agencies are aware of damage reduction measures and construction techniques that can reduce vulnerability to future hazard events.

Under this activity, plans and training materials were developed to assist in post-disaster reconstruction efforts to ensure that the reconstruction efforts result in a more hazard-resistant housing sector. The Housing Sector Recovery Plans for Antigua and Barbuda and St. Kitts and Nevis provide guidance and recommended action items for the respective governments, construction sectors, finance and insurance sectors, and homeowners in each nation. The Reference Guides are intended for use by the general population during disaster preparation and disaster reconstruction. The Training Outlines can be used for short courses offered on a continuous basis or immediately after a hazard event. In addition, links to hazard reconstruction manuals are provided for in-depth information on construction techniques, standards and materials.

Out of this exercise, a set of short- and medium-term recommended actions for pre-disaster planning has been developed. Implementation of these actions could reduce the disaster recovery period and could significantly increase the resilience of buildings reconstructed in the post-disaster period.

Housing Sector Recovery Plans

- Housing Sector Recovery Plan, Antigua and Barbuda: MS Word (720k) | PDF (850k)
- Housing Sector Recovery Plan, St. Kitts and Nevis: MS Word (750k) | PDF (840k)

Reference Guides

- Flyer: *Hurricane Coming and you don't have much time?* HTML (32k) | MS Word (101k)
- Homeowner's Guide to a Safer House: MS Word (393k) | PDF (176k)
- Checklist for Monitoring Builders and Tradesmen: MS Word (89k) | PDF (64k)
- Guide to Safe Building Practices for Tradesmen, Builders and Contractors: MS Word (275k) | PDF (208k)

Training Outlines

Training in hazard-resistant construction techniques is especially important in the post-disaster period, as the demand for construction assistance typically far outstrips the available supply of skilled labor. Outlines for a series of training course were developed. These courses can be offered in the immediate post-disaster period, as well as on an on-going basis to strengthen hazard-resistant building practices.

- Training Outline for Builders and Upgrading training: MS Word (31k) | PDF (16k)
- Training Outline for Part-time Builders: MS Word (32k) | PDF (17k)
- Training Outline for Part-time Building Supervisors: MS Word (32k) | PDF (17k)

Hazard-resistant Construction Resources

Overview: www.oas.org/en/cdmp/safebldg.htm

- *Basic Minimum Standards for Retrofitting* (www.oas.org/en/cdmp/document/minstds/minstds.htm)
- *Make the Right Connections: A manual on safe construction techniques* (www.oas.org/en/cdmp/document/connect/index.htm)

- *Diagrams to accompany the Organisation of Eastern Caribbean States Building Guidelines*
(www.oas.org/en/cdmp/document/codedraw/intro.htm)
- *Toolkit: A manual for implementation of the hurricane-resistant home improvement program in the Caribbean*
(www.oas.org/en/cdmp/document/toolkit/toolkit.htm)

Other Resources

- *Rebuilding for a More Sustainable Future: An Operational Framework*. US Federal Emergency Management Agency.

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

Page last updated on 17 Sep 2001

Pre-disaster Planning for Post-disaster Recovery: Recommended Activities

The following action lists are drawn from the Antigua and Barbuda and St. Kitts and Nevis Post-Georges Disaster Mitigation Housing Sector Reconstruction Plans.

Action list A: Consensus on construction material standards

1. Clarify the role of the Bureau of Standards.
2. Conduct an analysis of materials demand and timing over previous hurricane events. Assemble data on problem areas and materials.
3. Set up committee with public- and private-sector professionals, hardware suppliers, contractors, and Bureau of Standards and Customs personnel to agree on materials standards.
4. Train Customs officials in identification of building materials and their specifications.
5. Promulgate a materials list with minimum specifications.
6. Identify sources of supply and contingency supply plans. Communicate minimum specification and likely quantities to traditional donors and suppliers. Seek agreements for private-sector storage and supply of emergency materials. Investigate regional supply agreements.
7. Prepare material and labour cost information flyer in lay terms for general distribution.

These actions will require local organisation work to ensure the development of consensus and the drafting of standards.

Action list B: Household preparation

1. Run workshops for householders on disaster resistant design, siting and safe building practices.
2. Run workshops on essential details for householders.
3. Create good practice training videos for householders and builders.

These actions would require various workshops, preferably with a local training institution so that they are run as pilots of an institutionalized set that can be repeated at regular intervals. Training materials would be required, and the videos would be part of these tools. Private-sector buy-in would be desirable, particularly as there are already firms contributing in this area (e.g. Antigua Masonry Products). The national disaster organisations might be able to take on the running of these workshops if they assisted in the development of them with others to train where necessary.

Action list C: Construction sector preparation

1. Make available and promote the adopted national building codes.
2. Promote good design through hardware stores and contractors.
3. Promulgate a list of trained contractors, builders and supervisors for use after a storm.
4. Set up training courses for Part-time Builders, Part-time Building Supervisors, and refresher courses for Builders using technical vocational training system.
5. Formalize and standardize national vocational standards.

For the building codes, public- and private-sector engineers must be involved. The training action items will require teaching materials and curriculum development and could entail cooperation with others to upgrade existing vocational training.

Action list D: Policy development

1. Formulate policy or regulations on lease land to enable proper attachment of small houses to foundations.
2. Make clear decisions on vulnerable sites and communicate the information widely.
3. Maintain enforcement of siting and zoning laws.

4. Ensure all ministries and government organisations use the existing building standards.

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

Page last updated on 15 Feb 2001

Post-Georges Disaster Mitigation

Objective 1 | Objective 2 | Objective 3 | Objective 4

Objective 2: National Building Codes Adopted, and Building Practices Improved

Building Code Strengthening

At the beginning of the Post-Georges Disaster Mitigation project, recently adopted building codes were in place in both Antigua/Barbuda and St. Kitts/Nevis. Enactment of a national building code, however, does not guarantee that buildings will be constructed to the specified standards. To strengthen the compliance with and enforcement of building codes in both countries, PGDM reviewed existing administrative mechanisms for code enforcement, provided training to architects and engineers on multi-hazard building design and to building inspectors on permit review and inspection, and met with building and home owners to discuss the benefits and requirements of building to the standards required by the building code.

Documents: Status of Building Codes in the Caribbean

Administrative Mechanisms for Building Code Implementation

In Antigua/Barbuda, the PGDM reviewed existing building inspection and control procedures and commented on draft procedure manuals compiled by the Development Control Authority (DCA). The project assisted the DCA with an internal staff training program, held in October 2000, by providing facilitators and instructors. The purpose of the training program was to strengthen the capacity of the staff to undertake development review and inspection activities. Topics covered included the legal context for land use planning and development control in Antigua/Barbuda, a discussion of the mission and vision of the agency, administrative procedures for application review and a review of the Antigua/Barbuda building code and guidelines. The final report from this workshop is available on the Building Inspector Training Course Materials page.

In St. Kitts/Nevis, PGDM reviewed the status of the existing mechanisms for code administration. The findings of this review included the fact that the government has an insufficient number of building inspectors for its needs and that a new building board needs to be established (as specified in the Development Control and Planning Act of 2000). Also, although the St. Kitts/Nevis building code had been gazetted by the beginning of the project, the document had not been made available for public use. The document was printed and made available in January 2001. PGDM worked with the Government to complete the printing of this document in time for use with PGDM building code strengthening activities.

Multi-hazard Building Design

The PGDM sponsored a five-day course on Multi-hazard Building Design at the Ocean Terrace Inn in St. Kitts during the week of 13 November 2000. This course was developed and conducted for the PGDM by the Council of Caribbean Engineering Organizations (CCEO). The objectives of the course were twofold:

- To provide structural engineers with a deeper understanding of the fundamentals of wind and earthquake hazards and of the design process for resisting these hazards
- To introduce the course participants to the standards and building codes relevant to the Caribbean region for wind-resistant and earthquake-resistant design.

Sixteen public- and private-sector engineers participated in the full week-long course. PGDM sponsored the participation in this course of Public Works Directors and Engineers from Antigua/Barbuda and St. Kitts/Nevis, as well as two participants from the Engineering Faculty of the University of the West Indies, St. Augustine. Private sector engineers from the project countries participated in the course free of charge.

Documents: Multi-hazard Building Design Course page

Building Inspection Training

Proper enforcement of a building code not only strengthens compliance with the code, but also can provide opportunities for educating owners, developers and builders about safe and hazard-resistant construction techniques. To support enforcement of the existing building codes, PGDM conducted a two-week training course for building inspectors from Antigua/Barbuda and St. Kitts/Nevis. The objective of the building inspector training course was to provide public- and private-sector building inspectors with the expertise necessary to review buildings under construction for compliance with adopted codes.

The course began with a 4-day introductory session for inspectors from local banks, insurance companies and interested agencies, in addition to the building inspectors from the Development Control Authorities. The remainder of the course was primarily for government building inspectors and incorporated significant fieldwork. Over 25 individuals participated in this training course. The training course was quite well received. A series of recommendations for further strengthening the building inspectorate are included in the final report for this workshop. Highlights of these recommendations include:

- Annual training courses for building inspectors are essential to ensure that all inspectors are familiar with the building codes and standards, as well as proper construction and engineering techniques.
- Post-secondary institutions in Antigua and St. Kitts that teach building-related subjects should use the locally adopted building code and guidelines, or in conjunction with the texts currently in use.
- The development control authorities in both countries are encouraged to update their inspection procedures to ensure that reviews are conducted according to the standards set in the building codes.

Further details on the training course, resulting recommendations and training materials used during the course are included in the final report on this activity.

Documents: Building Inspector Training Course Overview

Building Code Sensitization

During March 2001, the PGDM organized discussion meetings with home owners and home builders in St. John's and Liberta (Antigua); Basseterre, Cayon and Sandy Point (St. Kitts) and Charlestown and Gingerland (Nevis). The purpose of the meetings was to discuss with participants the problems of building a small house to be resistant to the natural hazards of hurricanes and moderate earthquakes which affect the islands, and to develop simple and effective ways of engaging persons to design the house and then to engage builders to construct the house. The intention was to provide the potential home owner with the information which would lead to appropriate decisions with respect to the resistance of the building to the natural hazards and importantly on the proposed cost of the building before signing a contract with the builders. The meetings were designed to provide this information in an interactive manner with the participants being involved in the decisions for building their house. The workshop presentations focused on the Buildings Guidelines, the use of which is mandatory. The processes for seeking building approval from the relevant Ministry and Development Control Authority were also discussed.

Meetings were also held with members of the building fraternities in Antigua/Barbuda and St. Kitts/Nevis to discuss strengthening of the use and enforcement of the building code in both countries. A report of these meetings was produced.

Documents: Building Code Sensitization Meetings page

Roundtables on Hazard Mitigation in the Insurance and Banking Sectors

As both the insurance and banking sectors play significant roles in building and development, the PGDM organized a series of roundtables with representatives of the banking and insurance industries in Antigua/Barbuda and St. Kitts/Nevis regarding private-sector approaches to supporting more resilient building practices. This roundtable series

builds off hazard mitigation initiatives in the insurance sector that were begun under the Caribbean Disaster Mitigation Project.

The first of the two roundtables was held in Antigua on 18 January 2001; the second meeting was held in St. Kitts on 4 April 2001. All insurance companies and retail banking establishments currently active in Antigua/Barbuda and St. Kitts/Nevis were invited to participate and both meetings included participants from both countries. There were 31 representatives from the banking and insurance sectors at the first roundtable and 22 at the second.

Four primary approaches and mechanisms for more fully integrating hazard mitigation into the operations of these sectors were identified and discussed in detail:

1. Establish effective cooperation between bankers/insurers/construction professionals and trades people.
2. Achieve effective dissemination, application, and enforcement of building codes
3. Upgrade public awareness on vulnerability reduction cost/benefits, methods and procedures.
4. [From the banking sector] Reduce reliance on the existing insurance mechanism (due to high and inflexible costs). Focus on better building standards and new group insurance mechanisms.

The results of these discussions are available in the final report for the roundtable series. One additional outcome of this roundtable series was that the professional organizations for both the banking and insurance sectors in Antigua/Barbuda and the banking sector in St. Kitts/Nevis have reactivated their organizations.

Documents: Hazard Mitigation in the Insurance and Banking Sectors

Safer Housing

A substantial portion of the housing stock in the Eastern Caribbean is built through the "informal sector" and does not meet official standards. Much of this housing is vulnerable to the impacts of natural hazards. Under the Caribbean Disaster Mitigation Project, selected non-governmental National Development Foundations were assisted in establishing Hurricane Resistant Home Improvement Programs. These programs include outreach to homeowners, training of construction artisans, minimum standards for retrofitting, and a revolving loan fund to finance small construction/improvements. In Antigua and Barbuda, the National Development Foundation has been operating the program since early 1999.

Under the Post-Georges Disaster Mitigation Project, safer housing activities were reviewed in Antigua/Barbuda, St. Kitts/Nevis and, for comparison, St. Lucia. Under this assessment, the status of the following activities were reviewed in these three countries:

- the Hurricane Resistant Home Improvement (both training and lending) that began under the CDMP in Antigua and Barbuda and the status of similar non-governmental programmes in St Kitts/Nevis.
- government-sponsored housing programmes in both countries
- options for low interest lending programmes or other mechanisms for supporting safer housing activities.

The full findings and recommendations are available in the final report, *A Review of the Safer Housing Activities in Antigua/Barbuda, St. Kitts/Nevis and St. Lucia*.

Documents: Hazard-resistant Housing Page

Pre-project Baseline (December 1999)

A national code based on the OECS model code was introduced in Antigua/Barbuda in 1996, following an extensive national consultation. The code is now a legal document and is available for purchase from the office of the Town Planner. Awareness of the code among builders and those who finance construction is still considered insufficient. In St. Kitts/Nevis a code was presented to Parliament in the fall of 1999, without any national consultation. The Act making the building code officially operable is pending parliamentary approval.

Building inspection is ineffective in both countries. CDMP organized in Barbados a three-week training workshop (Sept. 27- Oct. 15, 1999) with participation of 2 inspectors from Antigua. It is generally recognized that building inspection alone cannot ensure compliance with building codes. Effective compliance systems need to include economic incentives and need to involve stakeholders who benefit from safe construction such as insurance companies and mortgage finance companies.

A large portion of the housing stock (around 50%) in both countries is what can be called "informal sector", traditionally built without regard to official standards. Much of this is vulnerable to the impacts of natural hazards. One of the CDMP programs has helped national Development Foundations (NGOs) in establishing Hurricane Resistant Home Improvement Programs. These programs include outreach to homeowners, training of construction artisans, minimum standards for retrofitting, and a revolving loan fund to finance small construction/improvements. In Antigua and Barbuda, the National Development Foundation has been operating the program since early 1999. In St. Kitts and Nevis, CDMP is assisting the Foundation for National Development of St. Kitts and Nevis in starting a similar program, with access to low interest funds from CDB to feed the revolving loan fund.

The existing housing policy in each country does not explicitly address the need to avoid hazard prone areas, nor to set minimum standards that would greatly reduce the impact of disasters. Direct involvement of key stakeholders such as the insurance industry, and the mortgage finance industry is seen as necessary for the adoption by the governments of forward looking housing policies and for effective compliance with building and development regulations.

Expected outcomes (December 1999)

1. A national building code is adopted and effectively implemented.
2. A public awareness and training program has been completed.
3. Mechanisms are in place to ensure private sector commitment to building code compliance and safe construction.
4. Sustainable Hurricane Resistant Home Improvement programs are operating in each country.

Pre-PGDM Documents and Reference Information

- *Building Code and Building Guidelines for Antigua and Barbuda*. Available for purchase from the Government Printery in St. John's.
- *Best Practices for Construction of Wood-frame Homes*. National Office of Disaster Services of Antigua and Barbuda.
- *A Manual for Construction of Hurricane-resistant Homes in Antigua and Barbuda*. Funded by USAID/OAS Caribbean Disaster Mitigation Project, produced by National Development Foundation of Antigua and Barbuda.
- *Hurricane Resistant Home Improvement Program: Toolkit*. Revised December 1999. (HTML 75k)
- *Diagrams for the OECS Building Guidelines*. 1999. Document is in 8 sections [HTML, 2,875k total]. AutoCAD drawing files are also available for download through this document [.ZIP files containing DWG format AutoCAD files, 2,235k total].
- *Building Codes: The Failure of Public Policy to Institutionalize Good Practice*. (HTML 9k).
- *Cost-Benefits of Disaster Mitigation in the Construction Industry: A Case Study*. January 1995. (HTML 42k).
- *Vulnerability Audit. St. Lucia Electricity Services Ltd. Inception Report* [HTML 560k] and *Final Report* [HTML 750k]
- *Basic Minimum Standards for Retrofitting*. May 1997. (HTML 700k)
- *Safer Building Toolkit for Credit Unions*. December 1998. (HTML 160k).
- *Make the Right Connections. A Manual on Safe Construction Techniques*. November 1995. Available in HTML (30 individual pages, each approx 35k)
- *Architectural Practice and Earthquake Hazards: The Architect's Role in Earthquake Hazard Mitigation*. 1991. From the California Seismic Safety Commission and the American Institute of Architects (AIA) California Council. (PDF)

Status of Building Codes in the Caribbean (as of August 2001)

Prepared in March 1999 and updated in August 2001 by Alwyn Wason

The building regulatory system plays an important role in ensuring the quality of the built environment. Common components of the regulatory system are building codes, land use zoning and development plans, and an inspection mechanism to enforce adherence to the code and plans. Enforcement is generally the weakest part of the system, often due to lack of human and financial resources allocated to this function and political interference with the regulatory system.

Building Codes are standards and guidelines for construction of buildings to ensure a minimum level of safety for the occupants. An appropriate building code incorporates a thorough understanding of the forces that natural hazards impose on the area governed by the code. The Caribbean Uniform Building Code (CUBiC) was developed to provide appropriate building standards for the Caribbean region. In the Eastern Caribbean, a model building code, based on CUBiC, has been developed by the Organization of Eastern Caribbean States to facilitate the introduction of national codes.

The status and legality of building codes in the Caribbean has caused some confusion, mainly because the existing building and planning regulations never mentioned the use of building codes as such. The emphasis on the legislation has generally been to safeguard health and property by proper planning and spatial requirements. In some States, notably Antigua and Barbuda, Dominica and Anguilla, there is an attempt to incorporate Building Codes into existing planning or building legislation.

In the legal system used in most of the OECS States, the Building Code has been introduced into existing national legislation as a schedule of the Building or Planning Regulations. This allows the Code to be amended easily and approved by the Minister without the requirement of parliamentary approval. There should be no constitutional problem with mandating the use of Codes. The constitutions of all of the States are similar and give parliament the authority to pass laws controlling development in the State. But to change the building culture of any country takes a long time. The problems with residential buildings erected near the cliffs or on hill tops or in flood plains can only be solved if the people wish to accept the solutions offered. It does take a long time to change the pattern of building, but experience in Anguilla and in the TCI shows that it is sometimes easier to change cultures in small places than in big places. Jamaica for instance has had a building code - the Jamaica National Building Code - drafted and distributed for comment in 1984. Nothing has come of this as the use of the Code was not legislated, and another effort has been made since to develop a new Code.

Antigua/Barbuda. Antigua has passed legislation mandating the use of the Antigua Building Code for all building in Antigua and Barbuda as regulations to the Development Control Ordinance. Current problems with use of the Code in Antigua and Barbuda have to do primarily with the apparent non-availability of documents and the lack of trained building inspectors and not with the legislation itself. [Note: *The Antigua/Barbuda Building Code and Guidelines are available at the Government Printery, but this does not appear to be widely known.*] As in many jurisdictions, the legislation has caught the regulating body (the Development Control Authority) unprepared. This is a "hiccup", but the law is firmly on the books and gazetted. The documents are available for purchase at the Government Printery at a cost of EC\$ 348.00. The OAS/PGDM project has recently (2001) supplied twenty five copies of the Code and Guidelines for use by the regulatory bodies.

Anguilla. In Anguilla, the existing Building Ordinance was amended in September of 1997 to mandate the use of the Anguilla Building Code and approved by the Executive Council. The present position (August 2001) is that the Government has decided that the building regulations mandating the use of the Building Code should be included in the new physical planning act now under discussion by the Attorney General and the Ministries responsible.

Barbados. The Code has been drafted (1992) and accepted by the Government. The administrative requirements for the establishment of a Building Authority have been developed with the assistance of the USAID/OAS Caribbean Disaster Mitigation Project. The current position is that the passing of the necessary enabling legislation to mandate the use of

the Code and to set up a properly staffed regulatory body is under discussion.

Dominica. Dominica is drafting legislation to include the Code in the Development Control Regulations. The legislation will be based on the model Physical Planning legislation prepared for the OECS with the assistance of the UNDP/UNCHS.

Turks and Caicos Islands. In the Turks and Caicos Islands (TCI) the TCI Building Code was included in the building regulations of 1990 and has been in use for the last 11 years. The building fraternity has found no major problems with the use of the Code. Copies of the Code and Guidelines are printed by the Department of Planning and sold to developers and the building fraternity.

It is important to know that the Codes that have been drafted for the various States are (with the exception of the St Kitts and Nevis Code) based on the technical requirements of CUBiC. In fact, certain parts of the OECS Codes such as wind and earthquake loads simply refer to CUBiC as the principal reference. The Codes however contain administrative requirements that are specific to particular States.

Table: Summary of Building Code Status

Country	Code Status	Code Availability	Building Inspection Capacity
Anguilla	<p>Anguilla Building Code completed. Anguilla Building Ordinance mandates the use of the Anguilla Building Code. Building Code being used administratively.</p> <p>Building regulations mandating the use of the Code will be incorporated into the new Physical Planning Ordinance (administered by the Department of Physical Planning). The Attorney General's office is now discussing the draft legislation with the Public Works and the Physical Planning Departments.</p>	<p>Hardcopy can be purchased from the Government of Anguilla.</p> <p>About 50 copies of the Code have been sold to the building fraternity and to developers.</p> <p>Electronic version available.</p>	<p>Being developed. Building inspectors being trained</p> <p>At present the Public Works Department employs a Building Inspector</p>
Antigua and Barbuda	<p>Completed, based on OECS model building code. Legislated in 1996 as regulations under the Development Control Ordinance.</p>	<p>Hardcopy can be purchased from the Government Printery</p>	<p>5 Building inspectors on staff.</p> <p>Training program to be developed.</p>
Bahamas	<p>Code was in operation from the mid 1970's. The Code was based generally on the South Florida Building Code</p>	<p>Copies available from the Ministry of Works, Nassau, Bahamas</p>	<p>Building inspectors in place in adequate numbers and training.</p>
Barbados	<p>Draft Building Code developed in 1993. The Government proceeding with the establishment of a Building Authority and the appointment of Building Inspectors. Technical provisions of the Code based on the standards contained in CUBiC</p>	<p>Copies of the Code available for the Barbados National Standards Institute</p>	<p>Recommendations made for the engagement of an adequate number of building inspectors for monitoring residential construction. Other buildings will be monitored by professional</p>

	<p>Detailed recommendations for establishing the Building Authority and other mechanisms required for legislative review completed in 1999 with the assistance of the OAS/CDMP.</p> <p>The working papers for the enabling legislation and for the establishment of the Building Authority now being discussed with the Minister responsible prior to submission to Cabinet.</p>		<p>engineers and architects engaged on a case by case basis.</p>
Belize	<p>Belize City Building Code in place from 1963. Belmopan has building and planning regulations. There is no national building code.</p> <p>Draft of technical standards for Belize building construction and a residential construction guide have been completed by the Belize Chamber of Commerce and Industry with the assistance of OAS/CDMP.</p> <p>Documents completed in December 1999 and being reviewed for legislative approval by the Attorney General's office.</p>	<p>Copies of the National Building Code when completed will be available from the Government of Belize.</p> <p>Electronic versions will be available.</p>	<p>The Ministry of Housing and the Reconstruction and Development Corp. in Belmopan have building inspectors.</p> <p>Consideration has been given to the nature of inspection desired and to the number of building inspectors required and training requirements.</p>
Dominica	<p>Code drafted, based on OECS model building code. Submitted for legislative review. OECS Model Planning Act being used as the basis of a new Dominica Physical Planning Act which will mandate the use of the Building Code.</p>	<p>Copies will be available from the Government of the Commonwealth of Dominica.</p>	<p>The Development Control Authority has 5 building inspectors of staff.</p>
Grenada	<p>Currently drafting code, based on OECS model building code.</p>	<p>Completed. Hard and electronic copies will be available from the Government of Grenada.</p>	<p><i>No information available</i></p>
Jamaica	<p>Jamaica National Building code drafted and distributed for comment in 1984 -- not adopted. A revised Code has been drafted and is being discussed.</p> <p>There are building by-laws in each of the Parishes and in Kingston-St. Andrew.</p>	<p>Code being reviewed. The Government has appointed a facilitator to move the project along to the legislative stages</p>	<p>There are building inspectors in each Parish with training in building and in construction. The staffing in some Parishes will have to be augmented to ensure that building plans can be properly reviewed in accordance with the requirements of the new Code.</p>

<p>St. Kitts and Nevis</p>	<p>Building code approved by Parliament and mandated for use by the Development Control and Planning Bill which was gazetted in 2000.</p> <p>The building regulations include the Building Code and Building Guidelines as the second and third schedules.</p>	<p>The Code and Guidelines have been compiled in one book. This is available at the Government printery for EC.\$ 300.00.</p>	<p>Four building inspectors are in place in St. Kitts and one in Nevis.</p>
<p>St. Lucia</p>	<p>Code drafted and accepted by the Development Control Authority. Code is based on OECS model building code.</p> <p>Physical Planning Bill drafted and forwarded for legislative approval. This Bill will mandate the use of the Code and Guidelines.</p>	<p>Copies of the Code and Building Guidelines have been made available to the Government by the OAS/CDMP project.</p> <p>Electronic versions will also be available.</p>	<p>There are twelve building inspectors in the employ of the Development Control Authority. The inspectors are engaged mainly in monitoring residential construction.</p>
<p>Trinidad and Tobago</p>	<p>The Trinidad and Tobago Building Code has been drafted and is submitted for comments by the building fraternity. The enabling legislation has been submitted for legislative approval.</p> <p>Small building code being drafted based on Chapter V of CUBiC.</p> <p>For engineered buildings British, American and Canadian codes are used as standards.</p>	<p>Hardcopies and electronic versions will be available from the Government of Trinidad and Tobago upon completion.</p>	<p>Special committee mandated to prepare building regulations for legislative review.</p>
<p>Turks and Caicos Islands</p>	<p>TCI Building Code included in the building regulations of 1990. Code in regular use in the islands since 1991.</p> <p>The technical requirements of the Code are based generally on CUBiC.</p> <p>Revisions to the administrative sections of the Code are carried out by the Department of Planning and members of the building fraternity of TCI.</p>	<p>Hard copies are available from the Department of Planning</p> <p>Electronic versions will also be available.</p>	<p>There are three building inspectors and one building control engineer on the staff of the Department of Planning. Monitoring of construction of large buildings such as hotels and condominiums is generally carried out by engineers and architects engaged as Special Inspectors.</p>

Multi-hazard Building Design: Course Overview

Most of the decisions that determine a building's ability to withstand the effects of natural hazards are determined during the original siting and design of the structure. To assist with compiling and disseminating information on building design appropriate to the hazards prevalent in the Caribbean, the PGDM supported the Council of Caribbean Engineering Organizations in the development and implementation of a multi-hazard building design course. The objectives of the course are twofold:

- To provide structural engineers with a deeper understanding of the fundamentals of wind and earthquake hazards and of the design process for resisting these hazards
- To introduce the course participants to the standards and building codes relevant to the Caribbean region for wind-resistant and earthquake-resistant design.

The 5-day course is structured in two modules. A first module of 2 days introduced the conceptual and construction administration elements. The second module covered the more technical material geared at practicing design engineers. The course also introduced participants to the standards proposed for CUBIC 2000 for wind- and earthquake-resistant design. The specific topics covered in the course include:

- i. Hurricane and earthquake hazards in the Caribbean;
- ii. Multi-hazard design—synergies and contradictions;
- iii. Conceptual designs to resist hurricanes and earthquakes;
- iv. Determination of forces for use in analysis;
- v. Outline of analytical procedures;
- vi. Detailing

Course overview: St. Kitts, Fall 2000

The PGDM sponsored the first offering of the Multi-hazard Building Design course at the Ocean Terrace Inn in St. Kitts during the week of 13 November 2000. Sixteen public- and private-sector engineers participated in the full week-long course. PGDM sponsored the participation in this course of Public Works Directors and Engineers from Antigua/Barbuda and St. Kitts/Nevis, as well as two participants from the Engineering Faculty of the University of the West Indies, St. Augustine. Private sector engineers from the project countries participated in the course free of charge. Private-sector engineers from other countries could participate upon paying a course fee. A final report on this course was produced by the CCEO.

The University of the West Indies is undertaking a critical review of the course, to determine which components could be incorporated into both final year undergraduate and postgraduate studies in the Department of Civil Engineering. The Engineering Faculty also intends on incorporating this course into its continuing education course series.

Course Materials

- Course Outline (HTML)
- Cover, Table of Contents and Introduction (MS Word 75k)
- A1 Hurricane and Earthquake Hazards in the Caribbean (MS Word 65k)
 - A1.1 Hurricane Hazards: Figures and Tables (zip archive 1,235k)
 - A1.2 Earthquake Hazards: Figures and Tables (zip archive 335k)
- A2 Multi-hazard Design (MS Word 100k)
 - A2.1 Synergies and Contradictions: Figures and Tables (zip archive 900k)
 - A2.2 The Process of Structural Design: Figures and Tables (zip archive 330k)
- A3 Conceptual Design (MS Word 150k)

- A3.1 Conceptual Designs to Resist Hurricanes: Figures and Tables (zip archive 960k)
- A3.2 Conceptual Designs to Resist Earthquakes: Figures and Tables (zip archive 1,015k)
- A3.3 Problems Associated with Detailing and Construction: Figures and Tables (zip archive 380k)
- B1 Determination of Forces (MS Word 115k)
 - B1.1 Determination of Wind Forces for Use in Analysis: Figures and Tables (zip archive 1,450k)
- B2 Analysis (MS Word 150k)
 - B2.1 Outline of Analytical Procedures- I: Figures and Tables (zip archive 50k)
 - B2.2 Outline of Analytical Procedures- II: Figures and Tables (zip archive 475k)
 - B2.3 Introduction to Dynamic Analysis: Figures and Tables (MS PowerPoint 385k)
 - B2.4 NEHRP Analysis: Figures and Tables (zip archive 490k)
- B3 Detailing (MS Word 135k)
 - B3.1 Detailing for Hurricanes: Figures and Tables (zip archive 2,070k)
 - B3.2 Detailing for Earthquakes: Figures and Tables (zip archive 115k)

Other Materials

- *Architectural Practice and Earthquake Hazards*. California State Seismic Safety Commission.
- *Wind Engineering in the Caribbean Disaster Mitigation Project*. Tony Gibbs 2001.

USAID/OAS Post-Georges Disaster Mitigation Project

Building Inspectors Training Workshop Antigua, 15-26 January 2001

Workshop Final Report (MSWord 150k) | Workshop Recommendations | Workshop Materials

See also: Building Code Sensitization Meeting Overview

The USAID/OAS Post-Georges Disaster Mitigation (PGDM) project hosted a two-week workshop for over 25 Building Inspectors from Antigua and Barbuda and St. Kitts and Nevis. The workshop was held in Antigua, 15-26 January 2001. The purpose of the workshop was to review with the participants the problems of inspection of developments for adherence to acceptable building practices as provided in existing building codes in Antigua and Barbuda and St. Kitts and Nevis and to impress on participants the need for safe construction to mitigate the actions of extreme natural events of hurricanes, heavy rainfall and earthquakes. The first 4 days of the course focused on issues appropriate to individuals who provide building inspection services to banks, insurance companies and other private sector organizations.

The workshop was designed to be as practical as possible, with participants being asked to examine and to critique building plans and buildings in construction. The focus of the examinations was to determine whether the plans meet with the requirements of the Building Code and whether the construction meets the terms of the building permits issued for construction of the buildings being examined. There were a minimum of lectures. Selected resource persons guided the participants in their examination of the building plans and field construction. Existing buildings and building sites were examined, ranging from small houses to major office and public buildings, exposing the participants with the range of problems to be solved in the inspection of building plans and construction.

Participants spent about 40 percent of their time discussing the details of inspection of facilities with resource personnel and 60 percent of the time in actual examination of building plans and field construction.

Participants in the full two-week course were drawn from the Development Control Authorities or Ministries responsible for planning and with the responsibility for approving building plans and for inspection of construction. All participants were to have technical training at a technical institute and normally engaged in field inspection of construction after examination of plans submitted for approval. The initial 4 days of the course were also open to individuals who provide building inspection services in other contexts.

The resource persons involved in the organization and presentation of the workshop were all practicing architects and engineers who have had extensive experience in the design of buildings and in the inspection of construction in the Caribbean and were able to relate to the problems faced by the building inspectors. The coordinator of the program was Mr. Alwyn Wason, who has coordinated similar programs in Antigua, Anguilla, Barbados, British Virgin Islands, Dominica, St. Vincent and the Turks and Caicos Islands. Mr. Wason was involved in the development of the Caribbean Uniform Building Code (CUBiC) and the OECS Building Codes and Building Guidelines, which have become the base for the building regulations in Antigua and Barbuda and in St. Kitts and Nevis.

In response to requests made at the building inspector training workshops, PGDM prepared and delivered, with the approval of both governments, 25 copies each of small-format versions of the building codes and building guidelines for Antigua/Barbuda and St. Kitts/Nevis. These documents were specially formatted and prepared for ease of use by government building inspectors while they are at inspection sites.

Course Materials

- Training Course Agenda (HTML)
- Building Guidelines Workbook (MSWord 70k) | Building Guidelines Workbook Answers (MSWord 80k)
- Discussion Notes on How to Build a Small House (MSWord 90k)
- Notes to Guide the Review of the Design of Small Buildings (HTML 25k)
- Lecture Notes: *Design, Construction and Maintenance of Access Roads and Drainage for Developments* (HTML)

2k)

Background Documents

- *The Importance of Development Plans/Land Use Policy for Development Control* (HTML)
- *Natural Hazards in the Caribbean* (HTML 15k) | *Figures* (HTML 1,650k)
- *Hurricanes and Their Effects on Buildings and Structures in the Caribbean* (HTML 35k) | *Figures and Photos* (HTML 3,000k)
- Antigua:
 - *Antigua and Barbuda Land Development and Control Act CAP 235* (HTML)
 - *Construction Principles in Antigua & Barbuda* (HTML 34k)
 - *Antigua/Barbuda Procedures for the Examination of Plans and the Inspection of Buildings* (MSWord 115k)
- *Belize: Building Procedures in Belize: Design and Construction of Small Buildings* (MSWord 420k)
- *St. Kitts/Nevis: Construction Principles and Practice as related to Small Buildings in St. Kitts and Nevis* (HTML 35k) | *Appendices* (HTML): *Figures 1-3* (200k) | *Pictures 1-9* (950k) | *Pictures 10-20* (425k) | *Pictures 21-29* (720k) | *Pictures 30-39* (375k)

Other

- *Building Inspector Training Course Opening Remarks: Minister Bernard Walker and Cecily Norris, Director OAS Antigua/Barbuda*
- *Remarks by Don Hill, Secretary of the Antigua/Barbuda Plumbers' Association*
- *Antigua/Barbuda Development Control Authority (DCA) Staff Training Program (Fall 2000)*
 - *Final training program report by DCA*
 - *Wason Recommendations to the Development Control Authority* (Word 27k)

USAID/OAS Post-Georges Disaster Mitigation Project

Building Inspectors Training Workshop Antigua, 15-26 January 2001

Workshop Materials

Workshop Information

- Final report (MSWord 150k) | Recommendations
- Announcement

Course Materials

- Training Course Agenda (HTML)
- Building Guidelines Workbook (MSWord 70k) | Building Guidelines Workbook Answers (MSWord 80k)
- Discussion Notes on How to Build a Small House (MSWord 90k)
- Notes to Guide the Review of the Design of Small Buildings (HTML 25k)

Background Documents

- *The Importance of Development Plans/Land Use Policy for Development Control* (HTML)
- *Natural Hazards in the Caribbean* (HTML 15k) | *Figures* (HTML 1,650k)
- *Hurricanes and Their Effects on Buildings and Structures in the Caribbean* (HTML 35k) | *Figures and Photos* (HTML 3,000k)
- Antigua:
 - *Antigua and Barbuda Land Development and Control Act CAP 235* (HTML)
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- Belize: *Building Procedures in Belize: Design and Construction of Small Buildings* (MSWord 420k)
- St. Kitts/Nevis: *Construction Principles and Practice as related to Small Buildings in St. Kitts and Nevis* (HTML 35k) *Appendices* (HTML): *Figures 1-3* (200k) | *Pictures 1-9* (950k) | *Pictures 10-20* (425k) | *Pictures 21-29* (720k) | *Pictures 30-39* (375k)
- Remarks by Don Hill, Secretary of the Antigua/Barbuda Plumbers' Association

Wason Mission to Antigua, Barbados (October 2000)

- Mission Report (Word 51k)
- Antigua/Barbuda Development Control Authority (DCA) Staff Training Program:
 - Final training program report by DCA
 - *Introductory Remarks The Use of the Building Code and the Building Guidelines* (WordPerfect 9k)
 - Information to be Examined by Building Inspectors (Word 67k)
 - Participant List (Word 21k)
- Recommendations to the Development Control Authority (Word 27k)
- Signing Ceremony for Establishment of CDB Disaster Mitigation Facility: CDB Remarks (Word 33k) | USAID Remarks (WordPerfect 11k)

Wason Mission to St. Kitts, Antigua (November 2000)

- Mission Report (Word 59k)
- St. Kitts and Nevis Development Control and Planning Bill 2000, Part VII: Building Regulations (Word 29k)

Terms of Reference

- Alwyn Wason

Meetings with Home Builders and Home Owners

Antigua and Barbuda and St. Kitts and Nevis 5-14 March 2001

Handouts: *Discussion Notes on How to Build a Small House* (MS Word 90k)
Draft Contract between a Builder and an Owner for Construction of a House (MS Word 50k)

See also: Building Inspector Training Course Overview

To further support and encourage use and application of existing building codes, the USAID/OAS Post Georges Disaster Mitigation Project (PGDM) hosted a series of discussion meetings with home owners and home builders in Antigua and Barbuda and in St. Kitts and Nevis during March 2001. The purpose of the meetings was to discuss with participants the problems of building a small house to be resistant to the natural hazards of hurricanes and moderate earthquakes which affect the islands, and to develop simple and effective ways of engaging persons to design the house and then to engage builders to construct the house. The intention was to provide the potential home owner with the information that would lead to appropriate decisions with respect to the resistance of the building to the natural hazards and its impact on the proposed cost of the building before signing a contract with the builders. The meetings were designed to provide this information in an interactive manner with the participants being involved in the decisions for building their house. The workshop presentations focused on the Buildings Guidelines, the use of which is mandatory. The processes for seeking building approval from the relevant Ministry and Development Control Authority were also discussed.

Participants in the meetings included those who are proposing to build small homes, designers and builders of small homes, representatives of the State and Technical Colleges, and representatives of the contractors associations and the plumbers associations. The meetings were held in the evenings so as to allow persons who have to spend a full day at work to attend the meetings. Meetings were held in St. John's and Liberta (Antigua); Basseterre, Cayon and Sandy Point (St. Kitts) and Charlestown and Gingerland (Nevis). The Barbuda meeting was cancelled due to the elections there.

Mr. Addison Workman, a Consulting Engineer of Antigua and Barbuda, and Mr. Lawrie Elmes, a Consulting Engineer of St. Kitts and Nevis, were the principal resource persons for these meetings. Mr. Alwyn Wason coordinated the sessions. Mr. Wason has coordinated similar programs in Antigua, Anguilla, Barbados, British Virgin Islands, Dominica, St. Vincent and the Turks and Caicos Islands and was involved in the development of the Caribbean Uniform Building Code (CUBiC) and the OECS Building Codes and Building Guidelines, which have become the base for the building regulations in Antigua and Barbuda and in St. Kitts and Nevis.

Meetings were also held with members of the building fraternities in Antigua/Barbuda and St. Kitts/Nevis to discuss strengthening of the use and enforcement of the building code in both countries. A report of these meetings was produced, which contains the following recommendations:

Antigua/Barbuda

- The Government should relax its financial rules to allow the Development Control Authority (DCA) to seal the regulatory documents under the similar controls in place for the payment for development application fees. This will make it easier for the DCA to encourage the applicants for development permission to purchase copies of the Code or Guidelines as applicable, and hence ensure to some extent that the buildings are being designed in accordance with accepted standards.
- The DCA should be strengthened on a temporary basis (at least six months) by the addition of an experienced development control engineer who will work with the Building Inspectors and show them how to deal with the examination of plans and inspection of construction of all types of development.

St. Kitts/Nevis

- The Building Boards of St. Kitts and that of Nevis should be strengthened on a temporary basis (at least six months) by the addition of an experienced development control engineer who will work with the Building

Inspectors and show them how to deal with the examination of plans and inspection of construction of all types of development.

Other Resources

- *Make the Right Connections. A Manual on Safe Construction Techniques.* November 1995. Available in HTML (30 individual pages, each approx 35k) and Microsoft PowerPoint97 format (large: 2.6mb).
- *Diagrams for the OECS Building Guidelines.* 1999. Document is in 8 sections [HTML, 2,875k total]. AutoCAD drawing files are also available for download through this document [.ZIP files containing DWG format AutoCAD files, 2,235k total].
- *Hurricane Resistant Home Improvement Program: Toolkit.* Revised December 1999. [HTML 75k].
- *Basic Minimum Standards for Retrofitting.* May 1997. (HTML 700k)

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

Page last updated on 17 Sep 2001

Hazard Mitigation in the Insurance and Banking Sectors: Roundtable Discussions in Antigua/Barbuda and St. Kitts/Nevis

Natural hazards in the Caribbean, such as hurricanes, earthquakes and landslides, regularly cause damage across all sectors of society and the economy. While there is little that can be done to stop or alter the progress of hazardous events, much can be done to minimize their effects on homes, communities and economies in the region. As holders of mortgages and insurance portfolios in this hazard-prone region, national and regional banks and insurance companies have a vested interest in promoting vulnerability reduction. While the success of vulnerability reduction measures such as building codes depends, to a large degree, on proper implementation and enforcement by government, financial and insurance companies can play a significant role in promoting hazard-resistant building practices through financial incentives, educational information and promotion of minimum building standards.

Catastrophe insurance focuses foremost on spreading or distributing losses, rather than on reducing losses. It is in the industry's interest, however, to promote vulnerability reduction in its market, and consequently the potential loss, as this would lead to lower premium rates (because the risk is lower) and a larger overall market. The insurance industry can promote loss reduction through incentives to policyholders for taking loss reduction measures, and by providing support for public sector and community-based disaster prevention. In the retail lending sector, it is in a bank's best interest to ensure that the buildings built or purchased with their funds will survive through the life of the mortgage.

As both the insurance and banking sectors play significant roles in building and development, the PGDM organized a series of roundtables with representatives of the banking and insurance industries in Antigua/Barbuda and St. Kitts/Nevis regarding private-sector approaches to supporting more resilient building practices. This roundtable series builds off hazard mitigation initiatives in the insurance sector that were begun under the Caribbean Disaster Mitigation Project.

The first of the two roundtables was held in Antigua on 18 January 2001; the second meeting was held in St. Kitts on 4 April 2001. All insurance companies and retail banking establishments currently active in Antigua/Barbuda and St. Kitts/Nevis were invited to participate and both meetings included participants from both countries. There were 31 representatives from the banking and insurance sectors at the first roundtable and 22 at the second.

Four primary approaches and mechanisms for more fully integrating hazard mitigation into the operations of these sectors were identified and discussed in detail:

1. Establish effective cooperation between bankers/insurers/construction professionals and trades people.
2. Achieve effective dissemination, application, and enforcement of building codes
3. Upgrade public awareness on vulnerability reduction cost/benefits, methods and procedures.
4. [From the banking sector] Reduce reliance on the existing insurance mechanism (due to high and inflexible costs). Focus on better building standards and new group insurance mechanisms.

The results of these discussions are available in the final report for the roundtable series. On additional outcome of this roundtable series was that the professional organizations for both the banking and insurance sectors in Antigua/Barbuda and the banking sector in St. Kitts/Nevis had reorganized themselves.

Roundtable Documents

- First Roundtable [Antigua, 18 January 2001]: Agenda | Discussion Materials | Roundtable 1 report | Roundtable 1 Transcript: Part 1 | Part 2 | Part 3
- Second Roundtable [St. Kitts, 4 April 2001]: Agenda | Roundtable 2 report

Other Resources

- *Insurance, Reinsurance and Catastrophe Protection in the Caribbean:*
<http://www.oas.org/en/cdmp/document/insuranc.htm>
- *Risk Transfer and Finance Experience in the Caribbean, by Jan Vermeiren:*
<http://www.oas.org/en/cdmp/document/papers/riskxfer.htm>
- *Caribbean Disaster Mitigation Project's Insurance, Reinsurance and Natural Hazard Vulnerability Reduction*
page: <http://www.oas.org/en/cdmp/insuranc.htm>
- *Post-Georges Disaster Mitigation project page:* <http://www.oas.org/pgdm>

USAID/OAS Post-Georges Disaster Mitigation: <http://www.oas.org/pgdm>

Page last updated on 17 Sep 2001

Hazard-resistant Housing

A substantial portion of the housing stock in the Eastern Caribbean is built through the "informal sector" and does not meet official standards. Much of this housing is vulnerable to the impacts of natural hazards. Under the Caribbean Disaster Mitigation Project, selected non-governmental National Development Foundations were assisted in establishing Hurricane Resistant Home Improvement Programs. These programs include outreach to homeowners, training of construction artisans, minimum standards for retrofitting, and a revolving loan fund to finance small construction/improvements. In Antigua and Barbuda, the National Development Foundation has been operating the program since early 1999.

Under the Post-Georges Disaster Mitigation Project, safer housing activities were reviewed in Antigua/Barbuda, St. Kitts/Nevis and, for comparison, St. Lucia. Under this assessment, the status of the following activities were reviewed in these three countries:

- the Hurricane Resistant Home Improvement (both training and lending) that began under the CDMP in Antigua and Barbuda and the status of similar non-governmental programmes in St Kitts/Nevis.
- government-sponsored housing programmes in both countries
- options for low interest lending programmes or other mechanisms for supporting safer housing activities.

A summary of the findings of this assessment is included below. The full findings and recommendations are available in the final report, *A Review of the Safer Housing Activities in Antigua/Barbuda, St. Kitts/Nevis and St. Lucia*. This report was produced by Bryan Walcott, Executive Director of the National Development Foundation of St. Lucia.

St. Kitts/Nevis

The housing situation in St. Kitts and Nevis is primarily affected by availability and accessibility to land. Most of the available land in St. Kitts in particular was, and is, owned by large estates. The Government has acquired most of those estates. In Nevis, the situation is different as most of the land is owned by private individuals.

The ownership of land in St. Kitts by the Government makes private sector housing developments almost impossible and the sale of land to potential homeowners can be heavily influenced by political considerations. With a current population of approximately 46,000, there does not appear to be an urgent need for land, and unplanned developments are not readily apparent. However, developments in the La Guerite area, near the reservoir, suggests the nature of things to come.

Another factor that affects low-income housing development in St. Kitts is the aversion for wooden houses. The construction material of choice is concrete, notwithstanding the fact that for low-income homeowners concrete structures may not be affordable. This aversion for wooden structures particularly the T111 plywood, may be the cause of the third factor to be considered, the lack of community or family coming together to erect a house for a friend or family member. This type of activity still occurs in Nevis but is practically non-existent in St. Kitts.

There are no formal training programmes for the construction of hazard resistant houses. The lessons taught by the experience of hurricanes in recent years have created the awareness of the need for such housing. These lessons, however, may soon be forgotten.

Finally, the accessibility to financing as an impediment to the low-income homeowner. Where funds are available the criteria for eligibility for access to those funds often present an insurmountable hurdle for most low-income earners.

Antigua/Barbuda

The housing situation in Antigua is affected not so much by the availability but by access to land. Most of the available land is owned by the Government. Though the low-income earner is unable to purchase land, there are possibilities of renting "house spots." The Government also makes land available for sale. There is the perception, however, that without political connections, as in the "Land for Youth Project," the effort to acquire such land is an exercise in futility,

resulting in a lack of aggression in the effort to own land, especially among low-income earners. This predicament will, and is, leading to the increase in squatting. There is a great demand for safe and affordable shelter as evidenced by the new building systems being introduced. Wooden houses, though, remain popular.

The experiences of Hurricanes Marilyn, Georges, Luis, Hugo, José, Debbie and Lenny are still fresh in the minds of many resulting in a heightened awareness of the need for disaster resistant construction techniques, adherence to an appropriate Building Code and Standard and a recognition of the need for proper training.

The only recognisable form of training is that provided by Antigua Masonry Products Ltd, which focuses on the methods of mixing concrete to achieve the required PSI. There are suggestions of on-the-job training but this cannot be relied upon. Two training manuals have been produced in Antigua/Barbuda:

- *A Manual for the Construction of Hurricane Resistant Homes in Antigua and Barbuda* by the National Development Foundation of Antigua and Barbuda; and
- *Build It Strong – Training Manual* by the Government of Antigua and Barbuda.

There are a number of financial institutions which finance the acquisition of houses for the middle and upper income earners. The traditional financial institutions find it difficult to cater to the needs of the low-income earners and to those persons whose incomes are not regular or easily verifiable.

Even the National Development Foundation, whose mandate is to provide such services, finds it difficult to do so. Though the funds are available, it is the access to those funds that creates the difficulty.

St. Lucia

In July 1994, the Directors of the National Research and Development Foundation approved the establishment of a revolving loan facility for financing of Retrofitting and Safer Housing Projects for St Lucian homeowners in the low-income sector.

The primary goal of this facility was to better enable homeowners, small entrepreneurs, contractors, artisans and non-professional builders to adopt appropriate and cost effective disaster vulnerability reduction measures in the informal housing sector.

The funds were intended to be used for: retrofitting/safeguarding existing structures against storms and hurricanes; renovating existing structures; extending existing structures to better accommodate basic family needs; purchasing existing small structures; and building new small structures. In each approved case, the building would be retrofitted. Loans would be granted to a maximum of EC\$15,000.00 per project for not more than four years.

The following minimum eligibility criteria applied:

- real need of the family
- credit rating of the applicant
- ownership of the structure
- ownership of other tangible assets to be encumbered
- family capability to repay within 48 months
- employment status and real asset worth of the applicant
- family debt ratio under 40%
- availability of funds at NRDF

The Directors agreed to enter into collaborative arrangements with local, regional and international institutions and agencies to mobilise technical, financial and other resources for the support of the Programme. The Foundation accepted the invitation from the Organisation of American States to participate in the Retrofitting and Safer Housing Programme in conjunction and collaboration with the Co-operative Housing Foundation (CHF) and Caritas Antilles Ltd.

After much discussion and debate, the Foundation, in April 1995, decided to withdraw from the CHF funded component of the project since it did not consider the CHF terms and conditions amenable to the interests of its clientele or in

keeping with its credibility and, in particular, the self-sustaining priorities of the Foundation. The Foundation continued its own Programme which included a retrofitting component, in keeping with the specific vulnerability reduction standards of the CDMP, and close collaboration in information sharing, marketing, staff training with Caritas and the OAS.

Marketing. The marketing of the Programme commenced with a household survey of the two pilot communities of Gros Islet and Dennery. This was followed up with an extensive market study which illustrated the extent and nature of demand and finance required for both hurricane retrofit and household safety and improvement purposes.

Community meetings, radio and television talk programmes, press releases, church notices as well as contact with Community Leaders assisted this process. The Foundation actively marketed the programme to other financial institutions and insurance companies.

Training. The other major preparatory activity was the training of a pool of tradesmen and artisans to support the project. The Foundation obtained the assistance of the Sir Arthur Lewis Community College in providing two tutors to carry out practical training in retrofitting techniques. Specific topics covered were: installation of roof ties, hurricane clamps and framing anchors; construction techniques for floors, walls and roofs; and safety procedures. The Foundation's Project Officers, as well as the Caritas Project Officer, were trained in the process.

The workshop methodology included:

- discussion on the Safer Housing Programme
- lectures and discussions on the content of the Retrofitting Handbook
- Review and discussion of retrofitting techniques as shown on a video
- The practical application of the retrofitting techniques to one or two structures

Insurance. The Foundation was able, through a local insurance broker, to obtain Group Insurance at very reasonable rates for those persons benefiting from the Housing Programme of the Foundation, on condition that all properties be retrofitted. The Project Officers of the Foundation were trained by the insurer in property evaluations. These evaluations, upon which the premium is based, are accepted by the insurer.

In cases where the insured is unable to meet the first year's insurance premium, this is paid for by the Foundation and added to the amount borrowed. The insurance company informs the Foundation when the renewal premium becomes due and the Foundation then advises the client to pay and where this is not possible pays the premium and charges the client's loan account.

CDMP Safe Construction Techniques, Guidelines and Minimum Standards

1. *Basic Minimum Standards for Retrofitting.* May 1997. (HTML 700k)
2. *Make the Right Connections. A Manual on Safe Construction Techniques.* November 1995. Available in HTML (30 individual pages, each approx 35k) and Microsoft PowerPoint97 format (large: 2.6mb).
3. *Hurricane Resistant Home Improvement Program: Toolkit.* Revised December 1999. (HTML 75k)
4. *Safer Building Toolkit for Credit Unions.* December 1998. (HTML 160k).
5. *Proceedings of the 1999 Workshop on the CDMP Hurricane-resistant Home Improvement Program.* December 1999. (HTML 115k)
6. *Cost Benefits of Disaster Mitigation in the Construction Industry. A Case Study.* January 1995. (HTML 42k).

Post-Georges Disaster Mitigation

Objective 1 | Objective 2 | **Objective 3** | Objective 4

Objective 3: Comprehensive national emergency shelter policies and programs established, with appropriate training for emergency and shelter managers in both countries

Emergency Shelter System Strengthening

National Emergency Shelter Management Policy/Handbook Development

Under a memorandum of understanding with the OAS and with funding from the PGDM, the Caribbean Disaster Emergency Response Agency (CDERA) assisted both Antigua/Barbuda and St. Kitts/Nevis with the development of national shelter management policies and guidebooks for the implementation of those policies. As part of this assistance, CDERA undertook the following activities; all work was undertaken in collaboration with the national emergency management offices:

- Reviewed the current shelter management policy, activities and programmes in Antigua/Barbuda and St. Kitts/Nevis.
- Updated the CDERA Model Shelter Management Policy and programme guide.
- Organized workshops in both countries to discuss and share experiences in the adoption and implementation of national shelter management policies. The updated model shelter management policy was presented, as were examples from the British Virgin Islands, Montserrat and St. Lucia.
- Prepared draft national shelter management policies for Antigua/Barbuda and St. Kitts/Nevis, based on the CDERA model and incorporating comments and suggestions from the national workshops.
- Organized one-day work sessions to present and discuss the full drafts of the national Shelter Management Policies and handbooks.

Documents: Emergency Shelter Strengthening page

Shelter Management Training

Both the National Office of Disaster Services (Antigua/Barbuda) and the National Emergency Management Agency (St. Kitts/Nevis) have the necessary internal training and experience to conduct shelter management training courses for the local shelter managers. To support local training efforts, PGDM provided both national disaster offices with 80 copies of the Emergency Shelter Management training materials, developed by USAID's Office of Foreign Disaster Assistance. With support from the PGDM, NODS organized and conducted a shelter management training course in September 2000 to address existing gaps in its roster of trained managers for designated shelters. Further shelter management training is planned once the shelter management policies and handbooks prepared under the PGDM are finalized.

Shelter Retrofit

In Antigua/Barbuda, the PGDM supported retrofit work on John Hughes School, a designated emergency shelter. Under this activity, the PGDM engaged a local engineer to review the structure, recommend retrofit works and supervise the implementation of the recommendations. The project covered the cost of the building supplies and materials required for the retrofit. The Antigua/Barbuda Public Works Department provided the labor for this activity.

In St. Kitts and Nevis, the scope of the structural vulnerability assessment was expanded in lieu of undertaking any direct retrofit activities under the PGDM.

Structural Vulnerability Audits

Appropriate building practices (design, construction and maintenance) are a critical determinant of the resilience of the built environment when faced with the stresses imposed by natural hazards. A thorough audit of existing buildings can identify significant vulnerabilities prior to the advent of a hazardous event. To identify retrofit needs and suitability for insurance, structural vulnerability assessments of selected government buildings and buildings used as emergency shelters were carried out in Antigua/Barbuda and St. Kitts/Nevis, with the support of the PGDM.

In these audits, the design, construction, maintenance status, locational characteristics and damage history of the selected facilities were reviewed. For buildings that have been designated as shelters, additional information was collected, including the building's capacity and availability of required shelter amenities. Based on these audits, the shelters were categorized for use (during a storm or only after a storm) or recommended to be discontinued as designated shelters.

Documents: Structural Vulnerability Assessment page

Pre-project Baseline (December 1999)

Both Antigua and Barbuda and St. Kitts and Nevis have existing disaster management offices, with functioning shelter management programs. Experiences with Georges and other recent hurricanes have identified weaknesses in the shelter management plans. Problems included poorly designed and located shelters, shelter staffing problems and inadequate understanding by residents of shelter use.

Currently, both Antigua and Barbuda and St. Kitts and Nevis rely heavily on schools to serve as shelters. Since they were designed for a different purpose, these schools often do not have the appropriate facilities for shelter use. Additionally, many of the identified shelters would be inadequate for any extended use in this capacity. OFDA's shelter management training course was conducted in St. Kitts and Nevis during 1999.

Widespread adoption of hurricane-resistant construction and retrofit practices will reduce the need for shelters during hazard events, but a functioning shelter system will always be a critical part of any emergency management plan.

Expected outcomes (December 1999)

1. Each country has developed and adopted national emergency shelter policies and programs.
 2. Each country has conducted shelter management course conducted for managers and local trainers.
 3. Each country has completed vulnerability audits for all schools currently identified as shelters and developed plans for undertaking necessary repairs.
-

Activities

Note: specific activities to be undertaken in each country in support of this objective will be defined through the local disaster mitigation planning process.

- Develop a national emergency shelter policy and program that is coordinated with both the national emergency and the national hazard mitigation plans. Existing shelter management programs will be reviewed in the development of the new policies and programs.
 - Conduct shelter management training for shelter managers and selected local trainers, using OFDA's shelter management training course.
 - Conduct structural vulnerability audits for schools that serve as shelters in St. Kitts and Nevis. The CDMP methodology will be followed, and only facilities that were not previously audited under the CDMP will be included in this survey.
 - Develop a plan for funding and undertaking necessary repairs to currently identified emergency shelters.
-

Pre-PGDM Documents and Reference Information

- CDMP School/shelter vulnerability reduction resources page
- *Vulnerability Assessment of Shelters in the Eastern Caribbean* — a manual containing Consultant Terms of Reference, Retrofit Standards and Global Estimates for Retrofit of Schools and Shelters. (HTML 100k)
- CDMP School/shelter vulnerability assessments reports for schools in Antigua (HTML 175k) and St. Kitts (HTML 175k)
- National plans to reduce the vulnerability of school buildings to natural hazards in Antigua and Barbuda (HTML 120k) and St. Kitts and Nevis (HTML 75k)

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Emergency Shelter Strengthening

National Emergency Shelter Management Policy/Handbook Development

Under a memorandum of understanding with the OAS and with funding from the PGDM, the Caribbean Disaster Emergency Response Agency (CDERA) assisted both Antigua/Barbuda and St. Kitts/Nevis with the development of national shelter management policies and guidebooks for the implementation of those policies. As part of this assistance, CDERA undertook the following activities; all work was undertaken in collaboration with the national emergency management offices:

- Reviewed the current shelter management policy, activities and programmes in Antigua/Barbuda and St. Kitts/Nevis.
- Updated the CDERA Model Shelter Management Policy and programme guide.
- Organized workshops in both countries to discuss and share experiences in the adoption and implementation of national shelter management policies. The updated model shelter management policy was presented, as were examples from the British Virgin Islands, Montserrat and St. Lucia.
- Prepared draft national shelter management policies for Antigua/Barbuda and St. Kitts/Nevis, based on the CDERA model and incorporating comments and suggestions from the national workshops.
- Organized one-day work sessions to present and discuss the full drafts of the national Shelter Management Policies and handbooks.

The final drafts of these policies and handbooks are being circulated to the national disaster offices in other CDERA member states for review and potential adaptation/adoption.

Both countries have agreed that the draft manuals should be further reviewed by stakeholders and personnel involved in disaster management. To finalize these draft documents and begin implementation of the suggested program, CDERA will support the following steps over the coming year:

Activity	Suggested Deadlines
1. National circulation and review	1. July - August 2001
2. Constitution of Emergency Shelter Management Committee	2. August - September 2001
3. Policy and manual adoption by relevant authorities	3. August - December 2001
4. Development of Shelter Management Program	4. September - December 2001
5. Shelter Management Training Program	5. January - March 2001
6. Establish budget to support program	6. September - December 2001
7. Identification, selection, categorization and preparation of shelters	7. January - June 2002
8. Organization of shelters for hurricane season	8. March - June 2002

Shelter Management Training

Both the National Office of Disaster Services (Antigua/Barbuda) and the National Emergency Management Agency (St. Kitts/Nevis) have internal training and experience to conduct shelter management training courses for the local shelter managers. With support from the PGDM, NODS organized and conducted a shelter management training course in September 2000 to address existing gaps in its roster of trained managers for designated shelters.

Shelter Retrofit

In Antigua/Barbuda, the PGDM supported retrofit work on John Hughes School, a designated emergency shelter. Under this activity, the PGDM engaged a local engineer to review the structure, recommend retrofit works and supervise the implementation of the recommendations. The project also covered the cost of the building supplies and materials required for the retrofit. The Antigua/Barbuda Public Works Department provided the labor for this activity.

In St. Kitts and Nevis, the scope of the structural vulnerability assessment was expanded in lieu of undertaking any direct retrofit activities under the PGDM.

Project Documents

- *[Draft] Antigua/Barbuda Emergency Shelter Management Policy and Handbook, July 2001 (MS Word 450k)*
- *[Draft] St. Kitts/Nevis Emergency Shelter Management Policy and Handbook, July 2001 (MS Word 450k)*

Preparatory Materials

- National Consultations (Spring 2001)
 - Antigua/Barbuda: Report (MSWord 95k) | CDERA Antigua/Barbuda Presentation (PowerPoint 160k) | Regional Shelter Program (PowerPoint 85k) | BVI Shelter Program (PowerPoint 100k)
 - St. Kitts/Nevis: Report (MSWord 150k) | CDERA St. Kitts/Nevis Presentation (PowerPoint 160k) | Regional Shelter Program (PowerPoint 85k) | BVI Shelter Program (PowerPoint 100k)
 - Updated CDERA Model Shelter Policy, January 2001 (MS Word 61k)
 - Activity update, Dec 2000-Feb 2001 (HTML 7k)
-

Pre-PGDM Documents and Reference Information

- CDMP School/shelter vulnerability reduction resources page
 - School/shelter vulnerability assessments reports for schools in Antigua (HTML 175k) and St. Kitts (HTML 175k)
 - National plans to reduce the vulnerability of school buildings to natural hazards in Antigua and Barbuda (HTML 120k) and St. Kitts and Nevis (HTML 75k)
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PGDM Structural Vulnerability Assessment

Appropriate building practices (design, construction and maintenance) are a critical determinant of the resilience of the built environment when faced with the stresses imposed by natural hazards. A thorough audit of existing buildings can identify significant vulnerabilities prior to the advent of a hazardous event. To identify retrofit needs and suitability for insurance, structural vulnerability assessments of selected government buildings and buildings used as emergency shelters were carried out in Antigua/Barbuda and St. Kitts/Nevis, with the support of the PGDM.

In these audits, the design, construction, maintenance status, locational characteristics and damage history of the selected facilities were reviewed. For buildings that have been designated as shelters, additional information was collected, including the building's capacity and availability of required shelter amenities. Based on these audits, the shelters were categorized for use (during a storm or only after a storm) or recommended to be discontinued as designated shelters. Specifically, the following information was collected or assessed:

For all buildings

- Copies of building plans, where available.
- A photograph of the building.
- Vulnerability of the building site to natural hazards, including flooding, landslides, storm surge, wind and wind-blown hazards.
- General building design and construction information, including age, geometry, materials, roof design, foundation type, window type, detailing and damage history.
- Status of the building connections, maintenance and other characteristics that increase or decrease structural vulnerability.
- Ability of the structure to withstand wind hazards and earthquake hazards.
- Alternative methods for retrofitting against both wind and earthquake hazards and describe the most appropriate course of action, with an estimate of retrofit needs and costs.

For facilities identified as emergency shelters:

- Occupancy capacity and availability of facilities required for proper shelter operation, including the number/location of bathrooms, kitchen, water storage capacity and electrical generation capacity.
- Recommendations for use in future selection of facilities and for design of new facilities for use as emergency shelters.

Antigua/Barbuda

In Antigua/Barbuda, 37 facilities were audited. The buildings assessed included twenty school facilities, eight medical facilities and nine governmental offices, varying in age from seven to seventy-two years. The buildings were generally in good shape, however, there is a clear need for general, ongoing maintenance to these facilities. The school buildings are fitted with a combination of window-types to include vent blocks, wooden shutters, awning windows and Miami shutters. The awning windows and vent blocks are generally unprotected. Designated sections of the schools' facilities are used as transitory hurricane shelters. These facilities for most part are not equipped with the necessary amenities and in many cases the sanitary facilities are not accessible during a hurricane. Detailed information on each of these facilities was added to the critical facilities database, which was developed as part of the PGDM hazard mapping and vulnerability assessment activity.

The final report of the *Structural Vulnerability Assessment for Selected Government Facilities in Antigua and Barbuda* is available in three parts:

- Full Report (MS Word 375k)
- Floor plans (MS Word 400k) and
- Photos (HTML): School Facilities (1,360k) and Other Facilities (1,275k)

St. Kitts/Nevis

In St. Kitts/Nevis, 94 facilities were audited. The study clearly identified the need for a structured and well-funded approach to regular maintenance of public buildings. The state of disrepair of steel-framed buildings was most noticeable. The most frequently observed vulnerability of the buildings was related to the absence of storm windows to protect the windows. The four buildings surveyed that were designated as emergency shelters were generally found to be either not sufficiently strong or lacking in the necessary facilities to support use as an emergency shelter.

The final report of the *Structural Vulnerability Assessment for Selected Government Facilities in St. Kitts and Nevis* is available in two parts:

- Full report [MS Word format (600k) or PDF format (405k)] and
 - Appendices (PDF 760k)
-

Pre-PGDM Documents and Reference Information

- CDMP School/shelter vulnerability reduction resources page
 - *Vulnerability Assessment of Shelters in the Eastern Caribbean* — a manual containing Consultant Terms of Reference, Retrofit Standards and Global Estimates for Retrofit of Schools and Shelters. (HTML 100k)
 - School/shelter vulnerability assessments reports for schools in Antigua (HTML 175k) and St. Kitts (HTML 175k)
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Post-Georges Disaster Mitigation

Objective 1 | Objective 2 | Objective 3 | **Objective 4**

Objective 4: Increased public understanding of the need and options for hazard mitigation, through public information and education programs

The impacts of natural hazards are experienced by all sectors and segments of society, particularly in the hazard-prone small island states of the Caribbean. Any effective response to these hazards must also be broad-based and multi-sectoral. To meet this goal, all activities of the Post-Georges Disaster Mitigation Project included representatives of a wide range of agencies, organizations and individuals. Through participation in training courses, working sessions and field work, many individuals and groups who are not typically involved in disaster-related activities gained an understanding of, and experience with, hazard vulnerability reduction tools and techniques. In addition, each component of the project included significant public information activities.

Mitigation Planning. During the preparation of the national hazard mitigation policies and plans, over 60 individuals from a variety of backgrounds were trained in hazard mitigation planning. With the completion of each of the individual hazard assessments, public presentations were made on the methodology, findings, maps and recommendations of each assessment. In both St. Kitts/Nevis and Antigua/Barbuda, open public presentations were held at the conclusion of the hazard vulnerability assessments. In Antigua/Barbuda, the final presentation of the final assessment was well-covered by the local media and a news bulletin on this meeting was distributed by the Caribbean News Agency (CANA). In St. Kitts/Nevis, the vulnerability assessment presentation was coordinated by the Physical Planning Unit; this presentation also provided an opportunity to display and highlight publicly the capabilities of the geographic information system housed at the PPU. Throughout the development of the national hazard mitigation policies and plans, a local advisory group, led by the local disaster offices and assisted by a local consultant, actively participated in the preparation of the plan. The work of this group was presented and vetted by the national mitigation councils in both countries. This hands-on experience with plan development and review by individuals across all sectors of government and the private sector reportedly built a strong understanding of the options and opportunities for hazard mitigation. Final public presentations of the plans were organized in St. Kitts and in Nevis and Antigua/Barbuda.

Strengthened Building Practices. Under this activity, a number of workshops and training courses were organized to build the skills and knowledge of vulnerability reduction techniques and activities. For public and private sector architects and engineers, a five-day course on Multi-hazard Building Design was conducted in the fall of 2000. Building inspectors, associated both with the government building inspectorate and with local banks and insurance agencies, received training on the recently adopted building codes and code review in a two-week training course. During the spring of 2001, public meetings were held to sensitize home owners and home builders on the contents and importance of national building codes and safer building. Finally, a series of roundtables were held with representatives of the local financial industries to develop approaches for promoting hazard mitigation in the insurance and banking sectors. As a result of these meetings, the local professional organizations in both countries have become reactivated.

Emergency Shelter Management. During the development of the national emergency shelter management policies and handbooks, broad public consultations were held at the beginning of the process to identify issues to be addressed. Similar meetings were held at the completion of the draft documents, to provide review and feedback. In organizing these consultations, special emphasis was placed on engaging the coordinators of the district disaster committees, to ensure that the concerns of all parts of the islands were addressed.

The public information activities within the individual project components were supplemented by the development of more general public information materials. In St. Kitts and Nevis, the PGDM supported the National Emergency Management Agency in the development and publication of a series of hazard brochures, in the construction and installation of a billboard and banner campaign, and in funding of radio and TV public service announcements, production of a safer construction video and with the incremental costs for a hazards-related community survey. In Antigua/Barbuda, a series of public information brochures was drafted and a mitigation calypso by Calypso Joe were produced.

Pre-project Baseline (December 1999)

Active hurricane seasons during the past decade-and numerous damaging strikes in both Antigua and Barbuda and St. Kitts and Nevis-have reinforced to residents of both countries the destructive power of hurricanes and related hazards. Despite this, mitigation remains a difficult sell.

As part of annual pre-hurricane season preparedness activities, both countries mount public awareness campaigns to reinforce proper preparedness and response activities. To promote hazard mitigation activities, these campaigns must be expanded throughout the year and integrated into a broader range of activities and sectors.

To facilitate a shift in attention towards mitigation activities, a targeted public awareness campaign will be undertaken. This campaign will focus on low- and middle-income homeowners and school preparedness programs, to strengthen preparedness and mitigation within these vulnerable sectors.

No comprehensive program exists to ensure that rebuilding after damaging hazard events will be carried out so that overall vulnerability is reduced by the rebuilding activities.

Expected outcomes

1. Each country has conducted a targeted public information campaign to promote hazard-resistant building practices.
 2. Each country has implemented a school disaster preparedness program and prepared disaster plans for all schools.
 3. Each country has organized and trained a disaster auxiliary corps and has developed an action plan for the corps for post-disaster activities.
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Pre-PGDM Documents and Reference Information

- CDMP School/shelter vulnerability reduction resources page
 - *Building for Safety in Hazardous Areas*. (HTML 25k)
 - *Public Education for Earthquake Hazards*. This publication was produced by the Natural Hazards Center at the University of Colorado, Boulder. Although it focuses on earthquake hazards, it is an excellent resource for any public information campaign focused on reducing natural hazard vulnerability.
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PGDM Documents

Objective 1: Mitigation Planning

Hazard Mapping

- *Beach Erosion*: Beach Erosion Hazard Assessment Page
 - Antigua/Barbuda Summary Report (HTML 95k) | Antigua/Barbuda Technical Report (HTML 180k)
 - St. Kitts/Nevis Summary Report (HTML 350k) | St. Kitts/Nevis Technical Report (HTML 750k)
- *Drought*: Drought Hazard Assessment Page
 - Antigua/Barbuda Summary Report (HTML 30k) | Antigua/Barbuda Technical Report [Acrobat format (955k), MSWord format (325k)]
 - Nevis Summary Report (HTML 32k) | Nevis Report [Acrobat format (935k), MSWord format (305k)]
- *Inland Erosion*: Inland Erosion Hazard Assessment Page | Erosion Hazard Assessment Technical Report (MSWord 175k)
 - Antigua and Barbuda Summary Report (HTML 32k)
 - St. Kitts Summary Report (HTML 32k)
- *Flooding*: Flood Hazard Assessment Page
 - Antigua/Barbuda Technical report (MSWord 915k) [compressed version (zip archive 580k)] | Antigua/Barbuda Summary report (HTML 30k)
 - St. Kitts/Nevis Technical report (MSWord 200k) and Figures (HTML 810k) | St. Kitts/Nevis Summary report (HTML 30k)
- *Storm Surge and Wind*: Storm Surge and Wind Hazard Assessment Page
 - Antigua Atlas (1,210k) | Barbuda Atlas (715k)
 - St. Kitts Atlas (820k) | Nevis Atlas (550k)
- *Volcanic Hazard Assessment*: Volcanic Hazard Assessment Page
 - Volcanic hazard assessment for St. Kitts/Nevis (HTML 380k)

Vulnerability Assessment

- Antigua/Barbuda
 - *Hazard Vulnerability Assessment for Antigua and Barbuda* (MS Word 2,040k) | Supplemental information
 - *Developing a GIS Database In MS Access 2000 and ArcView 3.2 For Antigua/Barbuda Hazard Vulnerability Assessment*. April 2001. (MS Word 800k)
- St. Kitts/Nevis
 - *Hazard Vulnerability Assessment for St. Kitts and Nevis Final Report: Main document* (MS Word format, compressed 1,875k | uncompressed 4,180k) and appendices (PDF format 515k) | Maps Page
 - *Procedure Documentation: GIS Database Integration, MS Access 2000 and ArcView 3.2 For St. Kitts/Nevis Hazard Vulnerability Assessment*. July 2001. (MS Word format 520k)

Mitigation Policies and Plans

- *[Draft] Antigua/Barbuda Natural Hazard Mitigation Policy and Plan*: Full document (MS Word 2,460k) | Full document without maps (MS Word 610k | PDF 380k)
- *[Draft] St. Kitts/Nevis Natural Hazard Mitigation Policy and Plan*

Pre-disaster Planning for Post-disaster Recovery

- Housing Sector Recovery Plan, Antigua and Barbuda: MS Word (720k) | PDF (850k)
- Housing Sector Recovery Plan, St. Kitts and Nevis: MS Word (750k) | PDF (840k)
- Training Outline for Builders and Upgrading training: MS Word (31k) | PDF (16k)
- Training Outline for Part-time Builders: MS Word (32k) | PDF (17k)
- Training Outline for Part-time Building Supervisors: MS Word (32k) | PDF (17k)

- Flyer: *Hurricane Coming and you don't have much time?* HTML (32k) | MS Word (101k)
- Homeowner's Guide to a Safer House: MS Word (393k) | PDF (176k)
- Checklist for Monitoring Builders and Tradesmen: MS Word (89k) | PDF (64k)
- Guide to Safe Building Practices for Tradesmen, Builders and Contractors: MS Word (275k) | PDF (208k)

Objective 2: Strengthened Building Practices

- Multi-hazard Building Design Course: Course Materials
- Building Inspector Training Course: Course Materials and Reports
 - Training Course Agenda (HTML)
 - Building Guidelines Workbook (MSWord 70k) | Building Guidelines Workbook Answers (MSWord 80k)
 - Discussion Notes on How to Build a Small House (MSWord 90k)
 - Notes to Guide the Review of the Design of Small Buildings (HTML 25k)
 - *The Importance of Development Plans/Land Use Policy for Development Control* (HTML)
 - *Natural Hazards in the Caribbean* (HTML 15k) | Figures (HTML 1,650k)
 - *Hurricanes and Their Effects on Buildings and Structures in the Caribbean* (HTML 35k) | Figures and Photos (HTML 3,000k)
 - Antigua:
 - *Antigua and Barbuda Land Development and Control Act CAP 235* (HTML)
 - *Construction Principles in Antigua & Barbuda* (HTML 34k)
 - *Antigua/Barbuda Procedures for the Examination of Plans and the Inspection of Buildings* (MSWord 115k)
 - Belize: *Building Procedures in Belize: Design and Construction of Small Buildings* (MSWord 420k)
 - St. Kitts/Nevis: *Construction Principles and Practice as related to Small Buildings in St. Kitts and Nevis* (HTML 35k) Appendices (HTML): Figures 1-3 (200k) | Pictures 1-9 (950k) | Pictures 10-20 (425k) | Pictures 21-29 (720k) | Pictures 30-39 (375k)
- Building Code Sensitization Meetings: Materials and Reports
 - *Discussion Notes on How to Build a Small House* (MS Word 90k)
 - *Draft Contract between a Builder and an Owner for Construction of a House* (MS Word 50k)
- Hazard Mitigation in the Insurance and Banking Sectors: Materials and Reports

Objective 3: Emergency Shelter Strengthening

Emergency Shelter Policy/Handbook

- [Draft] *Antigua/Barbuda Emergency Shelter Management Policy and Handbook*, July 2001 (MS Word 450k)
- [Draft] *St. Kitts/Nevis Emergency Shelter Management Policy and Handbook*, July 2001 (MS Word 450k)

Structural Vulnerability Assessments

- *Structural Vulnerability Assessment for Selected Government Facilities in St. Kitts and Nevis: Main document* [MS Word format (600k) or PDF format (405k)] | Appendices (PDF 760k)
- *Structural Vulnerability Assessment for Selected Government Facilities in Antigua and Barbuda: Report* (MS Word 375k) | Floor plans (MS Word 400k) | Photos (HTML): School Facilities (1,360k) and Other Facilities (1,275k)

Reference and Project Documents

- *Hurricane Georges Reconstruction and Recovery in the Eastern Caribbean*. USAID, 1999.
- Post-Georges Disaster Mitigation Project: project proposal (MS Word format). OAS, 1999.
- Reference Information for Hurricanes Georges and Lenny

Post-Georges Disaster Mitigation Project Chronicle of Events: Antigua & Barbuda

February 16, 2000, Antigua, Initial Project Roundtable in Antigua/Barbuda.

A one-half day roundtable was held at the National Office of Disaster Services (NODS) to introduce the PGDM and discuss the project's objectives and coordination. Representatives of 10 government agencies, the Barbuda Council, the insurance industry, the banking sector, professional associations, civil society and the media participated in this meeting. Key outcomes of the meeting include:

- A recommendation that additional participants be recruited, including representatives of the Ministry of Tourism and Environment, the Central Planning and Housing Authority, the Ministry of Finance, Builders and Building Supply Stores, the Tourism Association and the Chamber of Commerce
- Agreement that the PGDM should not be a traditional disaster project, one that is focused on preparedness and response and executed solely by the national disaster office. Rather, it should focus on mitigation/vulnerability reduction of everyday planning and investments, requiring the participation of all government agencies and private sector interests.
- A National Mitigation Committee (NMC) should be constituted, representing all stakeholders. The NMC would serve as a mechanism to facilitate inter-agency coordination and to give project implementation guidance. NODS should serve as the secretariat to the NMC and would be the host institution for project coordination. The NMC would appoint a smaller Executive Committee to oversee local project coordination.
- Once the initial membership of the NMC has been identified, a national consultation will be organized to formally launch the PGDM.

Documents: PGDM Introductory Slideshow (Antigua/Barbuda) (MS Powerpoint, 430k)

May 16-18, 2000, Antigua, Hazard Mitigation Planning Workshop. May 19, Mitigation Planning Workplan Development

Twenty-three individuals participated in the workshop, representing 12 government ministries/agencies, the Barbuda Council and the Antigua Public Utilities Authority. The goals of this workshop were:

- to introduce mitigation planning concepts and approaches;
- to establish a common vocabulary and approach to mitigation planning among the agencies, organizations and institutions contributing to natural hazard risk reduction; and
- to establish a baseline of available hazard information.

The first 1½ days of the workshop included presentations on the hazards prevalent in Antigua/Barbuda (origin, history and scientific basis) and an approach to hazard mitigation and mitigation planning. During the rest of the workshop, participants worked in small groups to develop and present draft mitigation plans—at the national level and for selected sectors. Information gathered and goals developed by the small groups will be useful in the initial development of the national hazard mitigation policy/plan under the PGDM.

On 19 May, a half-day meeting was held to finalize the workplan for development of a natural hazards mitigation policy/plan for Antigua/Barbuda between June 2000 and June 2001. Eleven government representatives (all of whom had participated in the 3-day hazard mitigation planning workshop) and the executive director of the Antigua/Barbuda Chamber of Commerce participated in this meeting. The resulting project timeline is available through the links below.

Documents: Mitigation Planning Workshop Report | Workplan Development Workshop Report | Initial

Plan Development Timeline/Tasks | Participant Photo

August 1, 2000, Antigua, National Hazard Mitigation Council Meeting

On 1 August 2000, the Antigua/Barbuda National Mitigation Council (NMC) held its first meeting. The role of this meeting was to develop policies for strategic planning and management of natural disaster mitigation interventions in the development of Antigua and Barbuda. The objectives of this meeting were to identify lists of Council and Committee members for approval by Cabinet, to develop strategies and incentives to support disaster mitigation-friendly policies and legislation and to develop a plan to achieve a nation-wide consensus on the importance of mitigation. Presentations were made on the definition of hazard mitigation and examples of vulnerability reduction approaches. Smaller group discussions were held to identify the membership in the National Mitigation Council and Committee and to generate ideas for promoting and enforcing disaster mitigation. Over 25 public and private-sector representatives participated in this meeting.

Documents: Minutes

August 16-17, 2000, Antigua, Hazard Mapping Prioritization Workshop

The objectives of the workshop were:

- To identify the priority natural hazards for which hazard assessments will be performed under the project;
- To conduct a data needs assessment for the hazard mapping exercise, including the identification of hazard information gaps and recommendations to fill these gaps;
- To identify the critical facilities for which vulnerability assessments will be performed under the project;
- To conduct a data needs assessment for vulnerability analysis of critical facilities, including the identification of information gaps and recommendations to fill these gaps;
- To develop guidelines for the terms of reference for identified hazard assessments;
- To develop a workplan to complete the tasks identified in ii to vi above.

The first day of the workshop was devoted to a review of hazard assessment methodologies, the identification and prioritisation of natural hazards and a data needs assessment for prioritised hazards. On Day 2, the methodologies for conducting simple and detailed vulnerability assessments were reviewed. This was followed by a data needs assessment for identified critical facilities at risk, and an exercise on vulnerability assessment. The latter part of the day was devoted to the development of guidelines for the terms of reference for the hazard assessment studies and a workplan for hazard and vulnerability assessments. Twelve participants attended the first day of the workshop while 20 attended on the second day.

Participants conducted a formal prioritisation exercise to identify the natural hazards of critical importance to Antigua and Barbuda. The prioritisation exercise employed a methodology which ranked the hazards on a relative ranking scale according to their probability, frequency, area of impact and magnitude. Using this methodology, six priority hazards were identified: wind, storm surge, drought, ground shaking, flood and coastal and river erosion. Similarly, the workshop participants identified the priority critical facilities for the PGDM: medical, schools, shelters, government buildings, infrastructure, utilities, tourism and agriculture.

Documents: Workshop Final Report

September 13-14, 2000, Antigua, Emergency Shelter Management Training Course

The National Office of Disaster Services had identified a number of disaster districts with an inadequate number of trained shelter managers to staff existing shelters. To fill this gap, NODS staff conducted, with PGDM support, a shelter manager training course September 14–15, 2000. The USAID/Office of US

Foreign Disaster Assistance Shelter Manager Training Course materials were used for this course. PGDM covered the workshop costs and provided 80 copies of OFDA shelter management course manual for use at this and future shelter manager training courses. 41 persons attended the first day of this course and 30 on the second.

October 9-13, Antigua, Development Control Authority Staff Training Program

The PGDM assisted the Antigua/Barbuda Development Control Authority with an internal staff training program by providing facilitators and instructors. The purpose of the training program was to strengthen the capacity of the staff to undertake development review and inspection activities. Topics covered included the legal context for land use planning and development control in Antigua/Barbuda, a discussion of the mission and vision of the agency, administrative procedures for application review and a review of the Antigua/Barbuda building code and guidelines. The final report from this workshop is available on the Building Inspector Training Course Materials page.

November 2000. Workshop on pre-disaster planning for post-disaster recovery

In the aftermath of a disaster, there is great pressure to repair damages and return society and the economy to "normal." The post-disaster period, however, also provides an opportunity not to just return damaged structures to their pre-disaster state, but to make them less vulnerable to future such events. The time pressures and difficulties in communication and transport in the post-disaster environment make it difficult to undertake the planning necessary to increase the resilience during reconstruction. Advance planning for appropriate reconstruction can assist in meeting this goal by ensuring access to appropriate building materials and by identifying key strengthening measures to be incorporated in any reconstruction activities. In this workshop, guidelines for pre-disaster planning for post-disaster reconstruction will be presented, as well as a sample plan for the housing sector. Other sectors will be guided through the process of preparing sector-specific plans.

Documents: Pre-disaster planning for Post-disaster recovery: national plans and reference materials.

November 13-17, 2000, St. Kitts, Multi-hazard Building Design Course

The PGDM sponsored a five-day course on Multi-hazard Building Design for engineers and architects of both countries at the Ocean Terrace Inn in St. Kitts during the week of 13 November 2000. This course was developed and conducted for the PGDM by the Council of Caribbean Engineering Organizations (CCEO). The objectives of the course were twofold:

- To provide structural engineers with a deeper understanding of the fundamentals of wind and earthquake hazards and of the design process for resisting these hazards
- To introduce the course participants to the standards and building codes relevant to the Caribbean region for wind-resistant and earthquake-resistant design.

Sixteen public- and private-sector engineers participated in the full week-long course. PGDM sponsored the participation in this course of Public Works Directors and Engineers from Antigua/Barbuda and St. Kitts/Nevis, as well as two participants from the Engineering Faculty of the University of the West Indies, St. Augustine. Private sector engineers from the project countries participated in the course free of charge.

Documents: Multi-hazard Building Design Course page

December 6, 2000, Antigua, Mitigation Plan Development Work Session

PGDM supported working sessions on development of mitigation planning goals and objectives. In this session, the PGDM hazard mitigation planning consultant met with the plan writer and individuals assisting with the development of the hazard mitigation policy/plan. The purpose of this work session

was to detail the process for developing goals and objectives and to review draft materials that have been completed, including capability assessment forms and historical hazard information. PGDM consultant also accompanied NODS representatives in meetings with high-level government officials to discuss hazard mitigation.

Documents: PGDM Mitigation Planning Page

January 15-26, 2001, Antigua, Building Inspector Training Course

PGDM conducted a two-week training course for building inspectors from Antigua/Barbuda and St. Kitts/Nevis. The objective of the building inspector training course was to provide public- and private-sector building inspectors with the expertise necessary to review buildings under construction for compliance with adopted codes. The course began with a 4-day introductory session for inspectors from banks, insurance companies and interested agencies, in addition to the building inspectors from the Development Control Authorities. The remainder of the course was primarily for government building inspectors and incorporated significant fieldwork. Over 25 individuals participated in this training course. The training course was quite well received. A series of recommendations for further strengthening the building inspectorate are included in the final report for this workshop. Highlights of these recommendations include:

- Annual training courses for building inspectors are essential to ensure that all inspectors are familiar with the building codes and standards, as well as proper construction and engineering techniques.
- Post-secondary institutions in Antigua and St. Kitts that teach building-related subjects should use the locally adopted building code and guidelines, in place of or in conjunction with the UK texts currently in use.
- The development control authorities in both countries are encouraged to update their inspection procedures to ensure that reviews are conducted according to the standards set in the building codes.

Further details on the training course, resulting recommendations and training materials used during the course are included in the final report on this activity.

Documents: Building Inspector Training Course Overview

January 18, 2001, Antigua, First Roundtable on Hazard Mitigation in the Insurance and Banking Sectors

This meeting was held at the Cortsland hotel, Antigua, on 18 January 2001. All insurance companies and retail banking establishments currently active in Antigua/Barbuda and St. Kitts/Nevis were invited to participate. 31 representatives from the banking and insurance sectors participated from the two project countries (19 from the banking sector and 12 from the insurance sector). During the workshop, a three-year vision for hazard mitigation was developed and the following three short-term actions were proposed:

1. Upgrading Public Awareness on vulnerability reduction cost/benefits, methods and procedures.
2. Effective Dissemination, Application, and Enforcement of Building Codes
3. Establish Effective Cooperation between Bankers/Insurers/Construction Professionals and trades people.

Documents: Hazard Mitigation in the Insurance and Banking Sectors

March 2001, Antigua, Building Code Sensitization Meetings

During March 2001, the PGDM organized discussion meetings with home owners and home builders in

St. John's and Liberta. The purpose of the meetings was to discuss with participants the problems of building a small house to be resistant to the natural hazards of hurricanes and moderate earthquakes which affect the islands, and to develop simple and effective ways of engaging persons to design the house and then to engage builders to construct the house. The intention was to provide the potential home owner with the information which would lead to appropriate decisions with respect to the resistance of the building to the natural hazards and importantly on the proposed cost of the building before signing a contract with the builders. The meetings were designed to provide this information in an interactive manner with the participants being involved in the decisions for building their house. The workshop presentations focused on the Buildings Guidelines, the use of which is mandatory. The processes for seeking building approval from the relevant Ministry and Development Control Authority were also discussed.

Meetings were also held with members of the building fraternities in Antigua/Barbuda and St. Kitts/Nevis to discuss strengthening of the use and enforcement of the building code in both countries. A report of these meetings was produced, which contains the following recommendations:

- The Government should relax its financial rules to allow the Development Control Authority (DCA) to seal the regulatory documents under the similar controls in place for the payment for development application fees. This will make it easier for the DCA to encourage the applicants for development permission to purchase copies of the Code or Guidelines as applicable, and hence ensure to some extent that the buildings are being designed in accordance with accepted standards.
- The DCA should be strengthened on a temporary basis (at least six months) by the addition of an experienced development control engineer who will work with the Building Inspectors and show them how to deal with the examination of plans and inspection of construction of all types of development.

Documents: Building Code Sensitization Meetings page

April 4, 2001, St. Kitts, Second Roundtable on Hazard Mitigation in the Insurance and Banking Sectors

22 representatives from these sectors in both countries participated in the second roundtable. The discussions focused on the approaches and mechanisms originally identified in the first roundtable, held in the previous quarter:

1. Establish effective cooperation between bankers/insurers/construction professionals and trades people.
2. Achieve effective dissemination, application, and enforcement of building codes
3. Upgrade public awareness on vulnerability reduction cost/benefits, methods and procedures.
4. Reduce reliance on the existing insurance mechanism

Each of these points were discussed and elaborated upon in smaller group discussions at the roundtable. The results of these discussions are available in the final report for the roundtable series.

During this roundtable, participants reported that, in response to the first roundtable, the professional organizations for both the banking and insurance sectors in Antigua/Barbuda and the banking sector in St. Kitts/Nevis had reorganized themselves.

Documents: Hazard Mitigation in the Insurance and Banking Sectors

May 16, 2001, Antigua, Presentation of Hazard Vulnerability Assessment Results

With the assistance of a PGDM consultant, summary hazard layers from each of the PGDM hazard

assessments were incorporated into the national geographic information system (GIS) database, housed at the Development Control Authority. A team, led by the National Office of Disaster Services, inventoried and mapped over 250 facilities for use in the PGDM vulnerability assessment. Using the hazard GIS layers, an assessment of the mapped facilities was undertaken to identify those that are at the highest risk to the mapped natural hazards. The results of this vulnerability assessment were presented to a multi-sectoral group at the Multi-Purpose Cultural Center.

Documents: Antigua/Barbuda Hazard Vulnerability Assessment page

July 2001, Antigua, Tide Gauge Strengthening

Under the project Caribbean Planning for Adaptation to Global Climate Change (CPACC), a tide gauge was installed in St. Kitts in 1998. This gauge proved to be particularly sensitive to the effects of severe storms. Under the PGDM, this gauge was hardened to increase the probability that the equipment can withstand the effects (and record information during) of tropical storms. The monitoring equipment was relocated from its original location on the concrete pier to a site that would accommodate installing additional system height (3m) and placing guy wires on the tower. Additional brackets were added to the sea-level system.

Documents: Tropical Storm Hazard Assessment page

July 26, 2001, Antigua, Final Project Handover Ceremony

The final event for the project was held at the Cortland Hotel in the evening of 26 July 2001. At this event, Cecily Norris, OAS Director in Antigua/Barbuda, delivered the final draft of the Antigua/Barbuda National Hazard Mitigation Policy and Plan to the Government of Antigua and Barbuda. Hon. Gaston Browne, Minister of Planning, Implementation and Public Service Affairs, accepted the document, which represented all activities and products of the PGDM. Remarks were made by the Minister Browne, Patricia Julian (Director of the National Office of Disaster Services), Philmore Mullin (NODS Deputy Director) and Steven Stichter (PGDM Project Manager). The ceremony was followed by cocktails and refreshments. Approximately 50 people attended this event.

Documents: Photos

Pre-PGDM Documents and Reference Information

- Draft National Physical Development Plan for Antigua/Barbuda and St. John's (Produced by the Antigua/Barbuda Development Control Authority)
- GTZ/Government of Antigua and Barbuda. *Early Warning Systems Workshop Report, May 1999.*
- *Planning for Coastline Change: Coastal Development Setback Guidelines in Antigua and Barbuda.* Dr. Gillian Cambers, University of Puerto Rico Sea Grant [<http://gnv.ifas.ufl.edu/~seaweb/homepage/upr.htm>] June 1998.
- CDMP Storm Surge Atlas: Introduction (650k) and individual atlases for Antigua (375k) and Barbuda (360k)
- School/shelter vulnerability reduction resources page | *Vulnerability Assessment of Shelters in the Eastern Caribbean* — a manual containing Consultant Terms of Reference, Retrofit Standards and Global Estimates for Retrofit of Schools and Shelters. (HTML 100k) | School/shelter vulnerability assessments reports for schools in Antigua (HTML 175k) | National plans to reduce the vulnerability of school buildings to natural hazards in Antigua and Barbuda (HTML 120k)

Post-Georges Disaster Mitigation Project Chronicle of Events: St. Kitts & Nevis

April 10-12, 2000, St. Kitts and Nevis, Initial Project Mission to St. Kitts and Nevis.

During the week of 10 April, the OAS conducted its first mission to St. Kitts and Nevis for the PGDM. During this mission, meetings were held with stakeholders groups in both St. Kitts and Nevis, with the subcommittee of the National Mitigation Guidance Committee (which will serve as a guidance committee for the project), with the Deputy Prime Minister, with individual technical agencies and with the insurance industry.

Key outcomes of these meetings include:

- The OAS and the Ministry of Finance, Development and Planning will co-sign the project agreement, and NEMA will serve as the executing agency for the PGDM.
- Establishment and institutionalization of a national building code was seen by all as a high priority. A draft building code has been submitted to Parliament. The PGDM will support a national consultation to review and/or train individuals and organizations on the contents/application of the building code.
- Training on building inspection would be useful to a number of different groups: government building inspectors (for enforcement of the building codes and standards), in-house inspectors for banks and insurance companies and NEMA staff (for reviewing the safety of emergency shelters).
- There was broad support for the multi-hazard approach proposed by the PGDM. Hurricanes garner the most attention, but damaging flood are regular occurrences and landslips, earthquakes and volcanic hazards are of concern.
- Close collaboration with the activities funded by the World Bank loan is critical to the success of this project.

Documents: PGDM Introductory Slideshow (St. Kitts/Nevis) (MS Powerpoint, 625k)

June 13-15, 2000, St. Kitts, Hazard Mitigation Planning Workshop. June 16, Mitigation Planning Workplan Development

Over forty individuals participated in this three-day workshop, including ten participants from Nevis. The goals of this workshop were:

- to introduce mitigation planning concepts and approaches;
- to establish a common vocabulary and approach to mitigation planning among the agencies, organizations and institutions contributing to natural hazard risk reduction; and
- to establish a baseline of available hazard information.

The first 1½ days of the workshop included presentations on the hazards prevalent in St. Kitts/Nevis (origin, history and scientific basis) and an approach to hazard mitigation and mitigation planning. During the rest of the workshop, participants worked in small groups to develop and present draft mitigation plans-at the national level and for selected sectors. Information gathered and goals developed by the small groups will be useful in the initial development of the national hazard mitigation policy/plan under the PGDM.

On 16 June, a half-day meeting was held to finalize a workplan for development of a natural hazards mitigation policy/plan for St. Kitts/Nevis between June 2000 and June 2001. More than twenty individuals participated in this workshop, the majority of whom had participated in the hazard mitigation workshop. Deadlines were set and responsibilities assigned for each step in the development of the national hazard mitigation policy/plan.

Documents: Mitigation Planning Workshop Report | Workplan Development Workshop Report | Initial Plan Development Timeline/Tasks

September 13-14, 2000, St. Kitts, Hazard Mapping Prioritization Workshop

The objectives of the workshop were:

- To identify the priority natural hazards for which hazard assessments will be performed under the project;
- To conduct a data needs assessment for the hazard mapping exercise, including the identification of hazard information gaps and recommendations to fill these gaps;
- To identify the critical facilities for which vulnerability assessments will be performed under the project;
- To conduct a data needs assessment for vulnerability analysis of critical facilities, including the identification of information gaps and recommendations to fill these gaps;
- To develop guidelines for the terms of reference for identified hazard assessments;
- To develop a workplan to complete the tasks identified in ii to vi above.

The first day of the workshop was devoted to a review of hazard assessment methodologies, the identification and prioritisation of natural hazards and a data needs assessment for prioritised hazards. On Day 2, the methodologies for conducting simple and detailed vulnerability assessments were reviewed. This was followed by a data needs assessment for identified critical facilities at risk, and an exercise on vulnerability assessment. The latter part of the day was devoted to the development of guidelines for the terms of reference for the hazard assessment studies and a workplan for hazard and vulnerability assessments. Forty participants from both St. Kitts and Nevis attended the workshop.

Participants conducted a formal prioritisation exercise to identify the natural hazards of critical importance to St. Kitts and Nevis. The prioritisation exercise employed a methodology which ranked the hazards on a relative ranking scale according to their probability, frequency, area of impact and magnitude. Using this methodology, eight priority hazards were identified: wind (tropical storms), coastal erosion, flooding, volcanic hazards, storm surge, ground shaking, inland erosion (St. Kitts only) and drought (Nevis only). Similarly, the workshop participants identified the priority critical facilities for the PGDM: health, education/schools, utilities, transportation, tourism, agriculture, protective services, shelters, government administrative buildings, environment.

Documents: Natural Hazard and Vulnerability Assessment Prioritization Workshop Report

November 2000. Workshop on pre-disaster planning for post-disaster recovery

In the aftermath of a disaster, there is great pressure to repair damages and return society and the economy to "normal." The post-disaster period, however, also provides an opportunity not to just return damaged structures to their pre-disaster state, but to make them less vulnerable to future such events. The time pressures and difficulties in communication and transport in the post-disaster environment make it difficult to undertake the planning necessary to increase the resilience during reconstruction. Advance planning for appropriate reconstruction can assist in meeting this goal by ensuring access to appropriate building materials and by identifying key strengthening measures to be incorporated in any reconstruction activities. In this workshop, guidelines for pre-disaster planning for post-disaster reconstruction will be presented, as well as a sample plan for the housing sector. Other sectors will be guided through the process of preparing sector-specific plans.

Documents: Pre-disaster planning for Post-disaster recovery, national plans and reference materials.

November 13-17, 2000, St. Kitts, Multi-hazard Building Design Course

The PGDM sponsored a five-day course on Multi-hazard Building Design for engineers and architects from both countries at the Ocean Terrace Inn in St. Kitts during the week of 13 November 2000. This course was developed and conducted for the PGDM by the Council of Caribbean Engineering Organizations (CCEO). The objectives of the course were twofold:

- To provide structural engineers with a deeper understanding of the fundamentals of wind and earthquake hazards and of the design process for resisting these hazards
- To introduce the course participants to the standards and building codes relevant to the Caribbean region for wind-resistant and earthquake-resistant design.

Sixteen public- and private-sector engineers participated in the full week-long course. PGDM sponsored the participation in this course of Public Works Directors and Engineers from Antigua/Barbuda and St. Kitts/Nevis, as well as two participants from the Engineering Faculty of the University of the West Indies, St. Augustine. Private sector engineers from the project countries participated in the course free of charge.

Documents: Multi-hazard Building Design Course Overview

December 5, 2000, Nevis, Mitigation Plan Development Work Session

PGDM supported working sessions on development of mitigation planning goals and objectives. In this session, the PGDM hazard mitigation planning consultant met with the plan writer and individuals assisting with the development of the hazard mitigation policy/plan. The purpose of this work session was to detail the process for developing goals and objectives and to review draft materials that have been completed, including capability assessment forms and historical hazard information.

Documents: PGDM Mitigation Planning Page

January 15-26, 2001, Antigua, Building Inspector Training Course

PGDM conducted a two-week training course for building inspectors from Antigua/Barbuda and St. Kitts/Nevis. The objective of the building inspector training course was to provide public- and private-sector building inspectors with the expertise necessary to review buildings under construction for compliance with adopted codes. The course began with a 4-day introductory session for inspectors from banks, insurance companies and interested agencies, in addition to the building inspectors from the Development Control Authorities. The remainder of the course was primarily for government building inspectors and incorporated significant fieldwork. Over 25 individuals participated in this training course. The training course was quite well received. A series of recommendations for further strengthening the building inspectorate are included in the final report for this workshop. Highlights of these recommendations include:

- Annual training courses for building inspectors are essential to ensure that all inspectors are familiar with the building codes and standards, as well as proper construction and engineering techniques.
- Post-secondary institutions in Antigua and St. Kitts that teach building-related subjects should use the locally adopted building code and guidelines, in place of or in conjunction with the UK texts currently in use.
- The development control authorities in both countries are encouraged to update their inspection procedures to ensure that reviews are conducted according to the standards set in the building codes.

Further details on the training course, resulting recommendations and training materials used during the course are included in the final report on this activity.

Documents: Building Inspector Training Course Overview

January 18, 2001, Antigua, First Roundtable on Hazard Mitigation in the Insurance and Banking Sectors

This meeting was held at the Cortsland hotel, Antigua, on 18 January 2001. All insurance companies and retail banking establishments currently active in Antigua/Barbuda and St. Kitts/Nevis were invited to participate. 31 representatives from the banking and insurance sectors participated from the two project countries (19 from the banking sector and 12 from the insurance sector). During the workshop, a three-year vision for hazard mitigation was developed and the following three short-term actions were proposed:

1. Upgrading Public Awareness on vulnerability reduction cost/benefits, methods and procedures.
2. Effective Dissemination, Application, and Enforcement of Building Codes
3. Establish Effective Cooperation between Bankers/Insurers/Construction Professionals and trades people.

Documents: Hazard Mitigation in the Insurance and Banking Sectors

March 2001, St. Kitts and Nevis, Building Code Sensitization Meetings

During March 2001, the PGDM organized discussion meetings with home owners and home builders in Basseterre, Cayon and Sandy Point (St. Kitts) and Charlestown and Gingerland (Nevis). The purpose of the meetings was to discuss with participants the problems of building a small house to be resistant to the natural hazards of hurricanes and moderate earthquakes which affect the islands, and to develop simple and effective ways of engaging persons to design the house and then to engage builders to construct the house. The intention was to provide the potential home owner with the information which would lead to appropriate decisions with respect to the resistance of the building to the natural hazards and importantly on the proposed cost of the building before signing a contract with the builders. The meetings were designed to provide this information in an interactive manner with the participants being involved in the decisions for building their house. The workshop presentations focused on the Buildings Guidelines, the use of which is mandatory. The processes for seeking building approval from the relevant Ministry and Development Control Authority were also discussed.

Meetings were also held with members of the building fraternities in Antigua/Barbuda and St. Kitts/Nevis to discuss strengthening of the use and enforcement of the building code in both countries. A report of these meetings was produced, which contains the following recommendation:

The Building Boards of St. Kitts and that of Nevis should be strengthened on a temporary basis (at least six months) by the addition of an experienced development control engineer who will work with the Building Inspectors and show them how to deal with the examination of plans and inspection of construction of all types of development.

Documents: Building Code Sensitization Meetings page

March 2001, St. Kitts, Tide Gauge Strengthening

Under the project Caribbean Planning for Adaptation to Global Climate Change (CPACC), a tide gauge was installed in St. Kitts in 1998. This gauge proved to be particularly sensitive to the effects of severe storms. Under the PGDM, this gauge was hardened to increase the probability that the equipment can withstand the effects (and record information during) of tropical storms. The monitoring equipment was relocated from its original location on the concrete pier to the top of a steel gantry structure on the same pier. The tide gage was relocated to a more protected place with additional bracing. The additional elevation and additional bracing should increase the probability that the equipment can withstand a severe storm. The sea-level sensor was re-surveyed and the meteorological sensors were replaced with new ones.

Documents: Tropical Storm Hazard Assessment page

April 4, 2001, St. Kitts, Second Roundtable on Hazard Mitigation in the Insurance and Banking Sectors

22 representatives from these sectors in both countries participated in the second roundtable. The discussions focused on the approaches and mechanisms originally identified in the first roundtable, held in the previous quarter:

1. Establish effective cooperation between bankers/insurers/construction professionals and trades people.
2. Achieve effective dissemination, application, and enforcement of building codes
3. Upgrade public awareness on vulnerability reduction cost/benefits, methods and procedures.
4. Reduce reliance on the existing insurance mechanism

Each of these points were discussed and elaborated upon in smaller group discussions at the roundtable. The results of these discussions are available in the final report for the roundtable series.

During this roundtable, participants reported that, in response to the first roundtable, the professional organizations for both the banking and insurance sectors in Antigua/Barbuda and the banking sector in St. Kitts/Nevis had reorganized themselves.

Documents: Hazard Mitigation in the Insurance and Banking Sectors

July 2001, St. Kitts, Presentation of Hazard Vulnerability Assessment Results

With the assistance of a PGDM consultant, the geographic information system (GIS) capacity of the Government of St. Kitts/Nevis and the Nevis Island Administration was expanded under the project, through the digitization of basemap information, inventory and mapping of critical facilities and the incorporation of summary hazard layers from each of the PGDM hazard assessments into the national GIS databases in St. Kitts and Nevis.

To assess the vulnerability of critical facilities to natural hazards, the priority categories of facilities were identified and mapped. These categories included any facilities that functioned as a shelter, hospitals and clinics; government administrative buildings; airports and sea ports; power, water and telecommunication installations; oil and gas companies; protective services and the road network. Using the hazard GIS layers, those facilities that are at the highest risk to each of the mapped natural hazards were identified. The results of this vulnerability assessment were presented to the national mitigation committee in early July and at public meetings later in the month.

Documents: St. Kitts/Nevis Hazard Vulnerability Assessment page

July 18-19, 2001, St. Kitts and Nevis, Public Consultations on Hazard Mitigation Policy/Plan

Public consultations were held on the draft National Hazard Mitigation Policy/Plan in Nevis and St. Kitts on July 18 and 19, respectively. In both meetings, the overall PGDM project and the mitigation plan development process were described and detailed presentations were made on the goals, objectives and activities proposed in the plan. The hazard and facility vulnerability maps produced under the project were also displayed.

Documents: St. Kitts/Nevis Draft National Mitigation Policy and Plan page

August 14, 2001, St. Kitts, Final Project Handover Event

The final event for the project was held at the Ocean Terrace Inn in the evening of 14 August 2001. At this event, Kenneth Parker, OAS Director in St. Kitts/Nevis, delivered the final draft of the St. Kitts/Nevis National Hazard Mitigation Policy and Plan to the Government of St. Kitts and Nevis. Dr. Denzel Douglas, Prime Minister, accepted the document, which represented all activities and products of the PGDM. Remarks were made by the Prime Minister, Sam Condor (chair of the National Mitigation Council), Joseph Edmeade (Chief Secretary), Sheila Lutjens (Acting Director of the USAID Caribbean Regional Programme) and Steven Stichter (PGDM Project Manager). Sir Cuthbert M. Sebastian, Governor General of St. Kitts and Nevis, and Vance Armory, Nevis Island Premier, were also present at the ceremony. In remarks in acceptance of this document, the Government of St. Kitts and Nevis made a strong commitment to hazard mitigation and vulnerability reduction.

The 45 minute ceremony was followed by cocktails and refreshments. Approximately 60 people attended this event.

Pre-PGDM Documents and Reference Information

- *A Probable Maximum Loss Study of Critical Infrastructure in Three Caribbean Island States* (HTML 660k) and Appendices (HTML and PDF)
- CDMP Storm Surge Atlas: Introduction (650k) and atlas for St. Kitts/Nevis (375k)
- School/shelter vulnerability reduction resources page | *Vulnerability Assessment of Shelters in the Eastern Caribbean* — a manual containing Consultant Terms of Reference, Retrofit Standards and Global Estimates for Retrofit of Schools and Shelters. (HTML 100k) | School/shelter vulnerability assessments reports for schools in St. Kitts (HTML 175k) | National plans to reduce the vulnerability of school buildings to natural hazards in St. Kitts and Nevis (HTML 75k)