



# **STATUS OF HAZARD MAPS VULNERABILITY ASSESSMENTS AND DIGITAL MAPS**

## **ANGUILLA REPORT**

**THE CARIBBEAN DISASTER EMERGENCY  
RESPONSE AGENCY (CDERA)**

October 2003

## Table of Contents

	Page
Preface	1
1.0 Introduction	2
1.1 Physical and socio-economic background	2
1.2 Major disaster issues confronting the country	2
2.0 Hazard mapping initiatives	3
2.1 Methods of preparation and distribution	3
2.2 Users and uses	3
2.3 Current condition and limitations	4
2.4 Critical success factors	4
2.4 Respondents	4
3.0 Vulnerability Assessment Studies	4
3.1 Methods of preparation and distribution	5
3.2 Users and uses	5
3.3 Current condition and limitations	5
3.4 Critical success factors	5
4.0 Digital Maps	6
5.0 Conclusion and Remarks	6

## Preface

From 2002 – 2005, the Caribbean Disaster Emergency Response Agency (CDERA) is implementing two major regional initiatives which are designed to reduce vulnerability to natural and technological hazards. These are the Japanese International Cooperation Agency (JICA) supported Caribbean Disaster Management (CADM) Project and the Canadian International Development Agency (CIDA) supported and Organization of American States executed Caribbean Hazard Mitigation Capacity Building Programme (CHAMP). The hazard mitigation planning component of the latter is being implemented in close collaboration with the Caribbean Development Bank's Disaster Mitigation Facility for the Caribbean. Hazard maps, vulnerability assessment studies, and digital maps are critical inputs to both initiatives.

This survey reviewed the status of these thematic activities in sixteen (16) CDERA Participating States, Haiti, Martinique, Suriname and Puerto Rico over the period August – October 2003. The objectives of the Survey were as follows:

1. To determine the status of hazard maps and vulnerability assessment studies and their use in the socio-economic planning and management of the Caribbean.
2. To determine critical success factors, gaps and best practices in the preparation and use of hazard maps and vulnerability assessment studies in the Caribbean.
3. To compile a database of hazard maps, vulnerability assessment reports, and digital maps available in the Caribbean.

Hazards considered under the survey included natural hazards such as floods, hurricanes, landslides, coastal disasters (surge, wave, and erosion), earthquakes, and volcanic eruptions as well as technological hazards. The types of vulnerability assessment considered were structural, economic, and human assessments.

This report was prepared by Jacob Opadeyi, Shahiba Ali, and Eva Chin of the Centre for Geospatial Studies, Faculty of Engineering, The University of the West Indies, St. Augustine, Trinidad and Tobago.

## **Status of Hazard Map, Vulnerability Assessments and Digital Maps in the Caribbean: Anguilla**

### **1.0 Introduction**

#### **1.1 Physical and socio-economic background**

Anguilla is the most northerly of the Leeward Islands. It is located to the east of Puerto Rico and immediately north of St. Maarten. The island is 102 km<sup>2</sup> and is composed of coral and limestone. Anguilla is extremely low-lying and rises only to 65m at Crocus Hill.

The topography is characterized by a number of “bottoms” or limestone sinkholes located throughout the island, which create a centrifugal drainage pattern. Some of the sinkholes are ponds. However, development has occurred in a few of the larger sinkholes. One example of this is the capital of The Valley, where built development has expanded into one of the largest sinkholes.

The population of Anguilla was estimated to be 12,738 in July 2003. The population has experienced a moderate growth rate of 2.21% per annum. The average age of the population is 30 years and 68% of the population is within the working age group. It is therefore fortunate for the population that unemployment is relatively low at 6.7% (2001).

The country has few natural resources other than its natural beauty. It has a large salt pond, which in the past supported a thriving salt industry but is now abandoned. The economy depends heavily on luxury tourism, offshore banking and lobster fishing. Growth in the tourism sector has spawned growth in the construction sector and supported economic development. The economy is therefore very dependent on the tertiary sector. In 1997, 78% of the GDP was based on services in contrast to 18% on Industry and 4% on agriculture.

#### **1.2 Major disaster issues confronting the country**

The major disaster issues facing Anguilla are hurricanes, tropical storms and flooding. The low-lying topography and centrifugal drainage pattern of the numerous sinkholes increases the risk of Anguilla to high wind and flooding damage. Several areas of the coast are also prone to coastal erosion and landslides.

During the last decade Anguilla has suffered infrastructure and economic losses as a result of hurricanes. Most of the damage was as a result of storm surge and flooding. Hurricanes Luis (1995) and Lenny (1999) resulted in extensive flooding in areas such as The Valley and The Bottom. Some areas of The Valley had more than 10 feet of water that took days to recede. Structural damage to homes was minimal, since the majority of Anguillian houses are concrete houses with flat roofs and narrow eaves.

## 2.0 Hazard Mapping Initiatives

Two hazard maps have been produced for the island of Anguilla. There is a general disaster preparedness map for the entire island and a detailed hazard vulnerability map of Sandy Ground. The general map identifies areas prone to flooding. The detailed map identifies areas prone to flooding, coastal erosion and landslides. The maps were produced from a 1:2500 base map dated 1992. The base map datum is WGS84 Clarke 1880 modified and the projection is Transverse Mercator. Table 1 summarises the hazard maps that exist for the island of Anguilla.

**Table 1 – Hazard Mapping of Anguilla**

Type	Purpose	Coverage	Date Produced	Primary Sources	Author
Flood	Disaster preparedness	Entire Island	2000	ODP	ODP / DPP
Flood	Disaster preparedness	Sandy Ground	2003	ODP	ODP / DPP
Coastal Erosion	Disaster preparedness	Sandy Ground	2003	ODP	ODP / DPP
Landslides	Disaster preparedness	Sandy Ground	2003	ODP	ODP / DPP

ODP - Office of Disaster Preparedness

### 2.1 Methods of preparation and distribution

The maps were prepared in-house as a result of collaboration between the Office of Disaster Preparedness (ODP) and the Department of Physical Planning (DPP). Costs incurred were minimal as they consisted only of the technician's time to prepare the map. The delineation of hazard zones was based on historical data. The maps are distributed in digital and published format.

### 2.2 Users and uses

The ODP, the Department of Physical Planning and the Christian Council actively use the maps. The ODP uses the maps for disaster planning. The Department of Physical Planning uses the maps as an input to development planning policy and development control. The Christian Council is using the maps to develop a mitigation plan for the Sandy Ground area.

### 2.3 Current condition and limitations

The maps are both relatively current and there are plans to update them. Although the interviews did not identify any limitations, the methodology used to identify the hazard zones is limited. A more rigorous scientific approach based on a wider range of data inputs would help to identify all areas at risk. The current methodology only identifies areas that have experienced the effects of hazards.

### 2.4 Critical Success factors

The major success factor in the preparation of the maps is the collaboration that occurred between the ODP and the Department of Physical Planning. This collaboration allowed for the documentation and mapping of areas prone to the hazards. The mapping of this information allows for easy and effective data dissemination.

### 2.5 Respondents

← Formatted: Bullets and Numbering

Two interviews were conducted in Anguilla on August 12<sup>th</sup> 2003. The interviews were with representatives of the Physical Planning Unit and the Office of Disaster Preparedness. Personal and contact information is listed below:

- a. Vincent Proctor, Principal Planning Officer, Department of Physical Planning, Anguilla. Telephone: 1-264-497-5392; email: [vinceproctor@hotmail.com](mailto:vinceproctor@hotmail.com) or [vincent.proctor@gov.ai](mailto:vincent.proctor@gov.ai)
- b. Wycliffe Richardson, Disaster Coordinator, Office of Disaster Preparedness, Anguilla. Telephone: 1-264-235-7269; email: [axaeoc@anguillanet.com](mailto:axaeoc@anguillanet.com)

In addition, information was sourced from the Ministry of Infrastructure to complete the data required on the Halcrow Drainage Study<sup>1</sup> executed in Anguilla.

### 3.0 Vulnerability Assessment Studies

Two studies were conducted for Anguilla that had vulnerability assessment components, the Anguilla Drainage Study and the Anguilla Slope Study. Halcrow, in collaboration with the Ministry of Infrastructure executed both of these studies over the period 1999 to 2000. The Ministry of Infrastructure owns these studies.

The Anguilla Drainage Study was a six-month study that examined flood risk and drainage. The results of the Drainage Study are being used to develop a flood mitigation plan. The vulnerability assessment component was a structural, economic and human assessment of the communities, agriculture and infrastructure at risk from flooding. Technical guidelines on drainage matters

---

<sup>1</sup> Halcrow, 2000. Anguilla Drainage Study. Contact Ken Banks, Ministry of Infrastructure. Telephone: 1-264-497-2651

were prepared for use by the planning authorities in assessing drainage at coastal hotel developments.

In November 1999, the Caribbean Island of Anguilla was badly affected by Hurricane Lenny, causing extensive landslide activity affecting coastal slopes. As a result of widespread coastal slope instability, Halcrow was commissioned to provide geo-technical advice to the Government of Anguilla. The study extended for a period of one month and examined the hazards posed by slope instability, identified appropriate remedial works and provided guidelines for development planning. Recommendations were made for the cataloguing of areas at risk to slope instability.

### **3.1 Methods of preparation and distribution**

The drainage vulnerability analysis integrated historical data, an analysis of topography and flood modeling. The study is distributed in report format.

The slope stability vulnerability analysis was based on historical data and visual site inspections of the geology. This study is also distributed in report format.

### **3.2 Users and Uses**

The Department of Physical Planning and the Ministry of Infrastructure use both of the studies. The Department of Physical Planning uses the results as an input to development planning and development control. The information is also being used to develop a building policy. The Ministry of Infrastructure uses the study to inform infrastructure works.

### **3.3 Current Conditions and Limitations**

The results of the studies are still very current and there are therefore, no plans to update them. There are no plans at present to prepare any other vulnerability studies for Anguilla.

### **3.4 Critical Success Factors in its Preparation, Maintenance and Use**

The expertise that Halcrow brought to the project contributed to its successful preparation. The collaboration between the Ministry of Infrastructure and Halcrow also contributed to the successful completion of the project.

#### 4.0 Digital Maps

Digital Mapping and the GIS function are located in the Department of Physical Planning. It is the primary source of all digital mapping in the country with the exception of the hazard maps. The Department of Physical Planning uses ArcInfo and all maps are in ArcINFO coverages. The digital layers were produced from 1:2500 scale base. The parameters of the maps are as follows: Datum: WGS 84; Projection: Transverse Mercator; Grid: British West Indies

**Table 3 – Digital Mapping in Anguilla**

<i>Data Theme</i>	<i>Scale of input map</i>	<i>Year input map was produced</i>	<i>Area covered</i>	<i>Primary Source</i>	<i>Digital File format</i>
Flood	1:2500	1992	Entire island	ODP	ArcINFO coverage
Flood			Sandy Ground		
Storm surge					
Coastal Erosion					
Landslide					
Contours	1995		Entire Island	Department of Physical Planning	
Soils					
Roads					
Buildings	2001				
Population					
Social facilities					
Economic facilities	2002				

#### 5.0 Conclusions and Remarks

Anguilla is located in an area of the Caribbean that is at risk to hurricanes. Its low-lying topology combined with the existence of large sinkholes increases its susceptibility to damage from high winds and flooding. Several areas of the coast are also prone to slope instability, which is worsened with the occurrence of high rainfall.

The initiative to prepare hazard maps has been taken by the ODP. It collaborated with the DPP to prepare a general hazard map of flood zones and a local area hazard map of Sandy Ground for flood, coastal erosion and landslides. The ODP and DPP are using the maps as inputs to disaster and development planning and the development of a mitigation plan.

Halcrow has undertaken two studies in Anguilla with vulnerability assessment components, the Anguilla Drainage Study and the Anguilla Slope Stability Study. These studies examined the hazards and identified remedial works required. The results of the studies inform development planning, development control and infrastructure works.