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Organization of
American States

STATUS OF HAZARD MAPS VULNERABILITY ASSESSMENTS AND DIGITAL MAPS

SAINT LUCIA COUNTRY REPORT

THE CARIBBEAN DISASTER EMERGENCY
RESPONSE AGENCY (CDERA)

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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.

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Status of Hazard Map, Vulnerability Assessments and Digital Maps in the Caribbean: Saint Lucia

1.0 Introduction

1.1 Physical and socio-economic background

Saint Lucia, a small island developing state in the Eastern Caribbean chain of islands, is situated at approximately between 13° 43' and 14° 07'N, and 60° 05'W. With a total area of 238 square miles (616 km²), this volcanic island is mountainous and rugged, with numerous rivers flowing in deep, narrow valleys over short distances to the sea. The highest peak, Mount Gimie (3117ft or 950m), is in the southwestern part of the main north-south trending axial ridge.

The island has a tropical marine type of climate, being affected by the prevailing Northeast Trade winds throughout the year. The dry season is from January to May and the wet season from June to December. Saint Lucia is affected by tropical storms and hurricanes, mainly from June to November, during the wet season.

Roughly 20% of the island is covered by tropical rainforest vegetation that provides habitats for a wide range of flora and fauna.

The population of Saint Lucia is about 162,000 (2003), with 31% of its people under 15 years old and 64% being the economically active population. The country is actively diversifying its economy from bananas to tourism and offshore banking. Its per capita GDP is an estimated US \$5,400, with the sectors of agriculture, industry and services contributing 7%, 20% and 73% respectively to the GDP (2002) (CIA Fact Book 2003).

1.2 Major disaster issues confronting the country

Saint Lucia is part of a volcanically active ridge formed along the subduction zone in the Eastern Caribbean. As a result, the island is affected by volcanic and seismic activity. The landscape carries evidence of volcanic activity, namely lava domes, volcanic necks/plugs or 'pitons', explosion craters, pyroclastic flows and surges, and lahars. The potentially active centre is the Soufrière Volcanic Centre, found in the southwest of the island. The Sulphur Springs geothermal field form part of the Soufrière Volcanic Centre.

The island experienced at least five swarms of shallow earthquakes over the last hundred years, occurring in 1906, 1986, 1990, 1999, and 2000 (Seismic Research Unit, 2002).

Saint Lucia has been affected several times by tropical storms and hurricanes within recent times. Storm surges, floods and landslides often accompany these

events. Coastal erosion is a continuous threat to property and communication networks, along with anticipated sea level rise that make the coastal zone particularly vulnerable to beach erosion, loss of habitat for marine life, loss of fresh water aquifers, and damage to coastal infrastructure.

Volcanoes, earthquakes, hurricanes, storm surges, floods, landslides and coastal erosion are potential disaster issues facing the country.

2.0 Hazard Mapping Initiatives

Table 1 provides the particulars of hazard maps that have been produced for Saint Lucia.

Table 1 – Hazard Maps for Saint Lucia

<i>Type</i>	<i>Purpose</i>	<i>Coverage</i>	<i>Scale</i>	<i>Date produced</i>	<i>Primary sources</i>	<i>Author</i>
Landslide risk	Mapping landslide	Entire country	1:50 000	Nov. 1985	Physical Planning Section, Min. of Phys. Planning, Environment & Housing	Jerome V. deGraff
Landslide risk	Updating of 1985 landslide hazard map	Entire country	1:75 000	1992	Physical Planning Section, Min. of Phys. Planning, Environment & Housing	Cassandra Rogers
Debris risk severity	Mapping debris flows and slides	Entire country	1:75 000	1992	Physical Planning Section, Min. of Phys. Planning, Environment & Housing	Cassandra Rogers
Volcanic	Mapping of areas to be affected by volcanic hazards	Entire country	1:25 000	June 2002	Physical Planning Section, Min. of Phys. Planning, Environment & Housing	Seismic Research Unit

2.1 Methods of preparation and distribution

2.1.1 Landslide Risk Map 1985

The landslide risk map for Saint Lucia produced by deGraff in 1985 used landslide susceptibility to arrive at landslide hazard. It tries to show where landslides will occur in the future and their probability of occurrence, rather than their actual occurrence. Relative landslide hazards are given in four zones of probable occurrence, namely, "Low", "Moderate", "High", and "Extreme". The map is meant to be used as a guide for identifying possible landslides that would affect development projects, a means for comparing the degree of possible landslide occurrence for alternatives considered and for identifying sites requiring remedial measures. The map is to be used for regional planning purposes and not for specific site use. Mr. deGraff, of the Forest Service, Department of Agriculture, was the technical specialist for the OAS, who worked on the "Natural Hazards Risk Assessment and Disaster Mitigation Pilot Project in Latin America and the Caribbean Basin", carried out by the Department of Regional Development, OAS.

The map is distributed by published copies and digital files (.shp), the latter created by the GIS Unit of the Physical Planning Section from the hard copy map.

The 1985 landslide risk map was updated in 1992 by Dr. Cassandra Rogers in collaboration with the Government of Saint Lucia. Categories of information shown on the map are "Debris flow", "Debris slide", "Landslide", "Rock fall", "Rockslide/Earthflow".

No information was available on its method of preparation and distribution.

2.1.2. Debris Risk Severity Map 1992

The debris risk severity map, showing debris flows and slides, was done by Dr. C. Rogers in an attempt to map the actual occurrences of debris slides and flows after the passage of tropical storm, Debbie in 1995. Categories of information shown on the map are "Extreme severity", "High severity", "Moderate severity", "Low severity", and "Unclassed".

No information was available on its method of preparation and distribution.

2.1.3 Volcanic Hazard Assessment 2002

The Volcanic Hazard Assessment, done by the Seismic Research Unit in collaboration with the Government of Saint Lucia, in 2002, proposed four scenarios of volcanic eruption. Volcanic hazard maps were produced for only two

scenarios, namely, a dome-forming eruption scenario and an explosive magmatic eruption scenario. Using an empirical approach, the volcanic hazards mapped were ash fall, ballistic projectiles, lahars and pyroclastic flows or surges. The categories for pyroclastic flows are “High”, “Moderate” and “Low”.

Each of these layers was overlaid using GIS to produce an integrated volcanic hazard map for St. Lucia based on the scenarios. Categories of hazards for the integrated volcanic hazard map were placed in four zones, namely, “Very high”, “High”, “Moderate” and “Low”.

The report, containing the maps, is distributed by photocopies or printouts from a .pdf document. No cost is attached to the distribution.

2.2 Users and uses

The users of the landslide risk maps and the debris risk severity map are the Physical Planning Section, consultants, and other government agencies, such as National Emergency Management Organisation (NEMO), Ministry of Agriculture and Water Resources Department. So far, one consultant has used the Volcanic Hazard report. The maps and report are used:

- a. to undertake application assessments for physical planning
- b. for forward planning exercises
- c. for flood studies
- d. for soil studies
- e. for Environmental Impact Assessments (EIAs) and
- f. to inform the location rain gauges.

2.3 Current condition and limitations

The limitations noted with the Landslide Risk maps, the Updated Landslide Risk maps and the Debris Risk Severity map were that their small scale (1:50,000 - 1:75,000) allowed only planning at the regional level.

The legend of the Debris Risk Severity map needed an accompanying explanation on the map itself of the purpose of the map, a better interpretation of the areas at risk and the parameters used in their derivation, as the map is being used without its accompanying report.

With respect to the Volcanic Hazard maps, no limitations were noted.

2.4 Respondents

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Please see Appendix 1 for a list of persons interviewed.

3.0 Vulnerability Assessment Studies

The Saint Lucia Country Paper on National Climate Change Issues entitled *Toward the Implementation of CPACC Component 4: Formulation of a Policy Framework for Integrated (Adaptation) Planning Framework* was submitted January 2001. The report identifies some major climate change issues, and does not claim to be an exhaustive Vulnerability and Adaptation study. The coastal resources likely to be impacted upon by sea level rise are coral reefs, sea grass beds, mangroves and beaches. Table 2 shows details of vulnerability assessment study undertaken in the country.

Table 2 – Vulnerability Assessment

Type	Purpose	Coverage	Date produced	Primary source	Author
Sea level rise	To identify coastal resources most likely to be affected by sea level rise	Island wide	2001	CPACC	Brain Challenger, Joanna Raynold, Lyndon John, Marie-Louise Felix
Storm	To understand the distribution, magnitude, and frequency of storm hazard	Island wide	Yet to be determined	http://www.oas.org/en/cdmp/document/reglstrm/st.lucia.pdf	OFDA/ USAID and OAS

Seismic	Seismic Hazard Maps: Windward Islands	Island wide	Yet to be determined	http://www.oas.org/en/cdmp/document/seismap/index.htm	OFDA/ USAID and OAS
Wind	To estimate probable maximum loss of critical infrastructure	Island wide	Yet to be determined	http://www.oas.org/en/cdmp/document/pml/	
Multiple hazards (torrential rains, hurricanes, floods, tsunamis, earthquakes)	To audit the vulnerability of Saint Lucia Electricity Services Ltd (LUCELEC)	Island wide	1996	http://www.oas.org/en/cdmp/document/lucilec/lucilec2.htm	OFDA/ USAID and OAS
Structural	To develop national building codes	Island wide	1996	http://www.oas.org/en/cdmp/bulletin/codes.htm	
Human and structural	To assist homeowners in making their homes Hurricane-resistant	Island wide	Yet to be determined	http://www.oas.org/en/cdmp/bulletin/house.htm	
Human and structural	To assist the hotel industry with structural mitigation	Island wide	1998	http://www.oas.org/en/cdmp/safebl dg.htm	

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The relevant documents can be found at <http://www.oas.org/en/cdmp/publist.htm>

3.1 Methods of preparation and distribution

The Vulnerability and Adaptation study looked at the impact of climate change on key environmental aspects and economic sectors, such as coastal ecosystems, agriculture, tourism, settlements and infrastructure, human health, forestry and the financial sector. The study attempted to rank the areas of concern by magnitude and significance. A matrix was prepared where the areas of concerns were ranked from 1 (Lowest significance) to 5 (Highest significance) as shown in Table 3:

Table 3: Ranking of Areas of Concerns

Area of concern	Ranking
Water/Hydrology	5
Biodiversity	5
Coastal zone	5
Fisheries	4.5
Agriculture	4.5
Human settlements	4
Human health	3.5
Financial sector	3.5

The Vulnerability Assessment report currently exists in unpublished version and there are future plans, to publish it. It is however available in electronic form to researchers and other interested persons and hard copies may also be accessed.

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3.2 Users and uses

Government ministries, Regional Corporations and consultants use the report for preparation of national communication planning, policy development, and background information to other reports.

3.3 Current condition and limitations

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Limitations noted were:

- a. Nature and complexity of the interactions and processes involved
- b. Uncertainty surrounding the level of climate change parameters
- c. Data gaps
- d. GIS was not used in its preparation
- e. A time constraint for preparation of the document for national communication.

3.4 Critical success factors in its preparation, maintenance, and use

No information was provided on the success factors involved in the preparation and distribution of the study.

3.5 Respondent

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4.0 Digital Maps

Theme	Input scale	Year produced	Coverage	Format	Primary source
Landslide risk	1:75 000	1985, 1995	Entire country	.shp .dxf	OAS, CDB?, Physical Planning Section Min. of Phys. Planning, Environment & Housing
Landslide risk	1:50 000				
Debris risk	1:75 000				
Contours	1:2500	1980	Entire country	shp .dxf	D.O.S., U.K.; Lands & Surveys Division, Saint Lucia
Land use	1:20 000 1:10 000 1:5 000 1:2500	1980-1983	Specific project sites: names not provided	shp .dxf	Lands & Surveys Division, Min. of Phys. Planning, Environment & Housing, Saint Lucia
Soils	1:50 000	1966	Entire country	.shp	Physical Planning Section
Vegetation and Forest management	1:25 000	1992	Entire country	.dxf	Physical Planning Section, Min. of Phys. Planning, Environment & Housing; Forestry Dept, Ministry of Agriculture
Geology	1:50 000	1966	Entire country	.shp	Physical Planning Section, Min. of Phys. Planning, Environment & Housing
Roads	1:2500	1980-83	Entire country	.shp	Physical Planning Section; Min Comm. & Works
Rivers	1:2500	1980-83	Entire country	.shp	Physical Planning Section, Min. of Phys. Planning, Environment & Housing; Min Comm. & Works
Rainfall	1:75 000	1984	Entire country	.shp	OAS; Water Res. Mgt Unit.
Buildings	1:2500	1982-83; & 1992	Entire country	.shp	Lands & Surveys Division, Min. of Phys. Planning, Environment & Housing

Bridges/Culverts	1:2500	1980-83	Entire country	.dxf	Lands & Surveys Division, Min Comm. & Works
Settlement	1:50 000	1984	Entire country	.shp	Physical Planning Section, Min. of Phys. Planning, Environment & Housing
Social facilities	1:2500	1980-83	Entire country	.shp	
Economic facilities	1:2500	1980-83	Entire country	.shp	
Population	1:75 000	1980-83	Entire country	.shp	

5.0 Conclusions and Remarks

Overall, it appears that the hazard maps available in the country are not as widely circulated as they should be. There is also need for more updated maps at a larger scale and the inclusion of other hazards such as flooding. Hazard maps may be more useful if the scale of preparation is at the local or community level, rather than the national level.

Vulnerability assessments are being done by the Ministry of Communications and Works on roads, bridges and culverts. Under the OECS Emergency Recovery and Disaster Management Project, a vulnerability assessment of public buildings is on-going.

Appendix 1: Persons interviewed on 11-12 August 2003, Saint Lucia

Contact	Position	Agency	Tel. No./Fax. No	Email
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