World Bank/ OECS Emergency Recovery and Disaster Management Project
And
Caribbean Disaster Emergency Response Agency/Caribbean Development Bank

Government of Saint Lucia

Natural Hazard Mitigation Plan

Document of the Saint Lucia National Emergency Management Plan

Model based on
Hazard Mitigation Plan of the Office of Disaster Preparedness - 1995
British Virgin Islands

Rev: August 1996 | January 2001 |December 2002 | January 2006 | May 2006 | July 8, 2006

Approved by *[NEMAC]*	*Approved by* *[Cabinet of Ministers]*
October 27, 2006 *[Date of Approval]*	*[Date of Approval]*


Cap Pt.
Pigeon I.
Rodney Bay
Gros Islet
CASTRIES
Grande Cul de Sac Bay
Babonneau
Roseau
La Caye
Dennery
Mt. Gimie
Praslin
Micoud
Canelles
Choiseul
Laborie
Vieux Fort
Maria Is.
St. Lucia I.

ACKNOWLEDGEMENT

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CONTENTS **PAGE**

Part I General Information

Part II Assessment of Hazards, Vulnerability And Mitigation Capacity.

Part III Mitigation

Part I General Information.

1.0 INTRODUCTION

Country Background

Saint Lucia is situated within a string of islands located east of Central America, known as the West Indies (also called the Caribbean).

It has an area of 610 km2 (238 square miles) and a coastline of 158 km. The island has a continuous maritime zone of 24 nautical miles (nm) with an exclusive economic zone of 200 nm, the territorial sea is 12 nm. The climate is tropical, moderated by northeast trade winds. The dry season is from January to May and the wet season is from June to December.

Saint Lucia is vulnerable to a number of natural hazards: The annual hurricanes and coastal storms, which can and do cause flooding. The island also experiences earthquakes, and is not exempt from the potential and increasing disastrous effects of the global climate change. All this, together with high population densities and the resource-intensive life style and development of Saint Lucia, create relatively high incidence and risk of technological hazards.

While the island has taken action over the years to reduce and mitigate such hazards, much remains to be done. With this plan, the National Emergency Management Office is attempting to create a hazard mitigation strategy to reflect changes in the State.

This Hazard Mitigation Plan is built on five foundation stones:

- An understanding of the economic, physical, social and cultural development of Saint Lucia;
- Objective analysis of resources, hazard experience, and risk;
- Review of previous mitigation efforts and capabilities;
- An analysis of hazard exposure revealed by the most recent disasters;
- Financial resources needed to effect the plan

It is the intention of this document to serve as a framework for systematic, strategic coordination and prioritization of mitigation proposals. This plan represents a commitment to long-term mitigation of the effects of natural and technological hazards.

It is the intention of this document to eventually be able to use a Hazard Mitigation Plan as a tool for actively learning the lessons being taught by the costly disasters which

have occurred in the past few years. Despite the lack of the long-debated call for a building code for Saint Lucia, this plan will seek to explore as many areas as possible that need mitigation attention.

Hazard Mitigation Planning should be viewed as a tool for teaching the lessons of disasters better, quicker and cheaper than in the past. This Hazard Mitigation Plan proposes to promote better incentives for private actions to promote mitigation, and to shift the burden of hazard mitigation from command and control-based systems to information, incentives and empowerment.

The plan incorporates analyses of past storms and of the hazards that may occur; a capability survey of the Saint Lucian Government and associated agencies potentially involved in disaster mitigation.

This mitigation plan is composed of several components. Following this introduction and other sections, an overview of the natural hazards in Saint Lucia is presented (Sections 6.0, 7.0), including a discussion of the current and future vulnerability of people and property. Section 9.0 discusses the island's capability to address hazard mitigation. Section 10.0 sets forth a set of public mitigation goals that will serve to guide subsequent policies, programs and specific decisions made with respect to mitigation. The bulk of the plan is contained in Section 12.0 which sets forth a list of recommended mitigation actions for reducing vulnerability based on better knowledge of both our exposure to risk, and our demonstrated institutional capacity to respond. Finally, 14.0 provides some conclusions and states responsibilities for periodic revision of the plan

National Emergency Management Organisation (NEMO)

MISSION STATEMENT

The role of the National Emergency Management Organisation [NEMO] is to develop, test and implement adequate measures to protect the population of Saint Lucia from the physical, social, environmental and economic effects of both natural and man-made disasters. Its responsibility is to ensure the efficient functioning of preparedness, prevention, mitigation and response actions.

The National Emergency Management Office exists to coordinate disaster responses. The National Emergency Management Office is the Secretariat of NEMO.

The National Emergency Management Organisation’s (NEMO) duty is to ensure the efficient functioning of preparedness, prevention, mitigation and response actions. The main responsibility of NEMO is to ensure that Saint Lucia is in a state of readiness at all times to meet the threat or impact of any hazard.

GOAL

A Nation highly resilient to disasters and proactive in effectively managing its natural and technological hazard risks.

2.0 AUTHORITY

The HAZARD MITIGATION PLAN as part of the National Emergency Management Plan documents Government's commitment to disaster preparedness, prevention, mitigation and effective response. It defines the organisational and functional, mechanisms and procedures for carrying out a mitigation program.

This plan was initially designed under the guidance of the Saint Lucia National Disaster Coordinator as a responsibility conferred by the Cabinet of Ministers on August 1, 1996 by decision 1149 of 1996.

It was revised and updated by the National Hazard Mitigation Council and NEMO in December 2002 (3rd version) and this fifth version was revised and updated by Planning and Development Limited within the World Bank /OECS project by Arturo López-Portillo, emergency planning and mitigation advisor to the NEMO in June 2003 and was submitted to the sectors described in Appendix C for their comments and input.

This version is the result of the revision and comments of all the sectors consulted mentioned in Appendix C.

The plan and its yearly updating and evaluation is the responsibility of the National Hazard Mitigation Council, chaired by the Minister of Works. (See section 11.1.2 National Hazard Mitigation Council).

2.0 THE WAVE OF OCTOBER 26, 1996

The initial version of the Hazard Mitigation Plan was drafted in the immediate aftermath of the Wave of October 26, 1996 that caused serious damage in the village of Anse la Raye and the town of Soufriére. The plan therefore reflects most immediately the hard lessons of the Wave, which together with Tropical Storm Debby (September 9, 1994) has proven to be a stern teacher. Especially significant for this Plan is a new focus on marine and coastal effects of hurricanes (and other extreme storms).

In previous plans, and in the implementation activities supported by previous post-disaster mitigation programs, the marine environment has been largely ignored. There are simple reasons to place a high priority on marine and coastal hazards of hurricanes and storms. This issue will be more fully developed as one of the priority mitigation activities, but the elements of such an argument include:

- Damages were incurred by boats (yachts and fishing boats) washed ashore during the storm;
- Great shoreline and coastal damages the subsequent crushing of areas under the boats and occasional leakage of fuel for the weeks that boats remain stationery;
- Extremely expensive and extensive dock repairs, which can affect insurance rates;

Hurricane damage to the marine and coastal community is not a phenomenon which only affects a few rich boaters who are covered by private insurance; the fishing community of Saint Lucia have their livelihood affected and as such may suffer even more. It is a general pattern of hazards with significant impacts on all aspects of the marine community. As such it requires and receives attention in this National Hazard Mitigation Plan.

Part II Assessment of Hazards, Vulnerability and Mitigation Capacity.

3.0 HAZARDS IN SAINT LUCIA

3.1 Hurricanes

Historically, hurricanes have been the most likely hazard to impact Saint Lucia. Like most islands, Saint Lucia has had a dramatic history of severe weather systems hitting in: 1780, 1818, 1819, 1831, 1837, 1841, 1894, 1898, 1923, 1951, 1955, 1960, 1963, 1967, 1978, 1980, 1990, 1994, 1995, 1996, 1999, 2002. (See Appendix A)

The occurrence of three severe weather systems hitting within three consecutive years may represent an early foretaste of a greater frequency of storms predicted in some forecasting models used by the International Panel on Climate Change.

Saint Lucia faces a constant threat from hurricanes and other coastal storms, and the resulting shoreline flooding and water surges. Hurricanes and coastal storms also bring extremely high winds that place unusual stresses on buildings, facilities and the population.

Tropical Storm Debby in 1994, produced losses of more than EC$230 million. The Tropical Wave of October 1996, a significantly less energetic storm caused EC$12 million damage (preliminary estimate).

3.2 Floods

Another significant natural hazard is the inland flooding which results from large amounts of rainfall, occurring over short periods, within the interior of the island. Runoff from rainfall is collected in the narrow, steep drainage ditches called "guts". The island's steep topography, non-porous rock base, thin claylike soils and ever-increasing development of roads, and other impermeable surfaces exacerbate the runoff. As a result, percolation of rainwater is limited, especially during storms which generate 8-12 inches in a twenty-four hour period (considered heavy rains).

There are two types of inland flooding problems which occur: One is the flooding which occurs in the islands' urban areas, (e.g. Castries basin) and which often results from relatively small rains. This is largely the result of an increase in impermeable surfaces, the lack of an adequate storm water drainage system and inappropriate garbage disposal that block drains. While an adequate drainage system at one time existed, the urban development that has occurred in the last twenty years has eliminated or altered many of the older drainage ditches that have been filled and/or built upon.

On the other hand, these smaller rains have less impact outside of the heavily urbanized areas. Flooding problems occur in these non-urbanized areas during heavier rains largely as a result of a failure to recognize the importance of maintaining and respecting the natural guts and flood plains. These guts have been built upon, channelised and traversed by roads. Loss of natural vegetation may also contribute to increased runoff and flooding. The Wave of 1996 revealed

that undersized culverts reduce natural flow and cause overtopping of roads and gut banks causing flooding of adjacent properties (as the flood waters do not return to the natural gut). While larger culverts may be more costly in the short-run, in the long run they may save money since they will reduce flood damages and prevent the need to later replace undersized culverts. The use of guardrails instead of solid walls on top of road culverts may be a low cost mitigation measure for consideration.

Flooding in Saint Lucia causes tens of thousands of dollars in damage. Recent storms include:

- Floods during Tropical Storm Debbie.
- The floods of October 26, 1996 which resulted in severe flooding and damage in Soufrière, Anse la Raye, Castries and Vieux Fort;
- The Castries floods of October 31, 1996 which cut off south Castries from north Castries;

3.3 Seismic Events

Earthquakes are the hidden hazards of the West Indies, and they affect Saint Lucia as much as any other island. Many of the tremors pass unnoticed. The strongest felt by the island was 7.5 on the Richter Scale on March 19, 1953.

Saint Lucia is located near the eastern side of the Caribbean Plate and as such is susceptible to earthquakes and seismic hazards as her sister islands. Strong shocks have been recorded in 1909 (7.0), 1953 (7.5) and in 1996 the island experienced a tremor of 4.8.

Site-specific vulnerability to earthquake damages will depend upon localized soil and geologic conditions. For example, recently filled areas will tend to be more subject to earthquake effects, as these are areas where liquefaction and ground settling are likely to be greatest. Much of the waterfront areas of Castries for example, pose potential liquefaction hazards, as they are located on reclaimed land.

High-slope areas subject to rock or landslides may pose special hazards further. The land sliding potential is particularly great in Saint Lucia; it is likely that substantial road damage will occur as a result of earthquake-induced landslides.

The island is subject to seismic hazard-tsunamis or seismic-induced sea waves. Saint Lucia's tsunami threat is posed by volcanoes like Mt. Pelée in Martinique to the North, Soufriere in St Vincent and the Submarine volcano Kick ’em Jenny in Grenada to the South.

It is important to mention that the Seismic Research Unit of the University of the West Indies has determined that the fifty-year return period for a > 7 Magnitude earthquake is almost due. This means that, according to probability, there is likely to be a > 7 Magnitude earthquake in Saint Lucia or its surroundings in the next few years. Therefore, mitigation activities tending to reduce vulnerability against earthquakes and to be prepared and respond to an earthquake impact will be a disaster management priority in the years to come.

4.4 Volcanic Activity

The most active volcanic centre on the island is the Qualibou Caldera that is located in the Southwest. The youngest volcanic centre is the Soufriere Volcano. The Caldera was formed over 35,000 years ago. There are several volcanic domes within the Caldera region. The Soufriere volcano has in the past demonstrated its ability to produce violent and destructive eruptions causing serious damage to life and property. One incidence of great violence was observed in 1770. It seemed to have been a pyretic eruption.

Because the last evidence of an explosive magmatic eruption of the volcano dates back some 20,000 years ago, it is considered less likely to erupt with an eruption of that magnitude in the near future. However, pyretic explosions and small and moderate eruptions are more likely to occur.

4.5. Oil Spills.

Marine traffic, especially Oil Tankers and cruise vessels which are in transit through coastal waters in the Atlantic Ocean and Caribbean Sea present the risk of Marine Oil Pollution from collisions, groundings, sinkings, oil cargo and bunker transfer and other marine incidents. Such pollution can threaten recreational areas, sea birds, marine life, coastal installations and fisheries. Similarly, cruise ships and pleasure yachts using Ports in the Caribbean Sea coupled with Oil Tankers en route to Oil Terminals pose serious threat to the entire Saint Lucian coast.

In addition the environment is at risk from terrestrial activities, which would include the transportation, storage and use of hydrocarbons and other hazardous materials. Potential pollution sources would include garages' workshops and service stations and industrial installations. Many of these lack suitable protocols or facilities, which result in the uncontrolled discharge into the environment.

The Caribbean is one of two regions in the world which face the greatest risk to its marine environment from major oil spills. Approximately 6 million barrels a day of crude oil (23% of the world's sea-borne oil) is transported in the Wider Caribbean Region (ITOPF, October 1996).

In Saint Lucia, Hess Oil Co. has a storage facility (capacity 9.2 million barrels) located on a 677-acre facility to the south of Castries. The Saint Lucia facility has a full deep water access for the largest oil tankers.

The NEMO and the Oil Spill Action Committee chaired by the Director of Maritime Affairs conducted in 2002 the revision of the Oil Spill Contingency Plan. A new version was written including emergency procedures for several response activities such as notification, oil spill assessment, etc.

4.6 Fire

The history of Saint Lucia is doted with fires. In the first quarter of 1996 the island had experienced over 100 fires.

Fires in the bush or grasslands that cover extensive areas can usually do damage. These may be started by natural causes such as lightening, arsonists, careless smokers and by those burning woods for clearing a forest area.

4.7 Dam Collapse

In July 1996 the John Compton Water Dam was officially opened.

The uncontrolled or untimely Dam water releases due to weather conditions, natural forces and other causes may lead to flash flooding in downstream areas and eventually destruction of properties and loss of lives. It is essential that flood control plans and appropriate warning systems in connection with dam water release be in place. Although not all Dam failure can be averted, coordination and proper monitoring can help reduce the uncertainties.

4.8 Effects of Global Climate Change.

Saint Lucia's open, fragile and dependent economy combined with its: (a) geographic location within the hurricane belt; (b) small size and limited land space; (c) location of major settlements and infrastructure in low-lying coastal areas prone to flooding and storm damage; (d) its location within a tectonically-active area, allowing for the possibility of significant earthquakes and; (e) limited human and financial resources; make it highly vulnerable to the impacts of Climate Change and other natural hazards.

Climate Change is a major environmental phenomenon with serious ramifications for the country and all nations of the world. Scientific evidence that the global climate is changing is now unchallengeable. The projections of the Intergovernmental Panel on Climate Change (IPCC) are that by the year 2100, global average temperatures will rise by between 1.4 and 5.8 degrees centigrade. Changes of this magnitude are expected to produce dramatic impacts on various parts of the global climate system, with substantial regional variations. Under IPCC scenarios, global seal level is expected to increase by between 0.09 and 0.88 metres by the year 2100. It is anticipated that warmer seas will provide additional energy for storm formation resulting in extreme weather events. Within the Caribbean, there is widespread concern that such extreme events have already begun, with an unprecedented number of hurricanes of Category-5 strength having been experienced between 1995 and 2004.

While Saint Lucia and other Small Island Developing States contribute only a minute amount of total global greenhouse gas emissions, they bear an overwhelmingly disproportionate level of risk to the impacts of Climate Change due to their inherent vulnerability. Scientific research has indicated that climate change-related impacts are likely to include:

- Changes in the frequency, intensity and duration of extreme events including hotter days, heat waves and heavy precipitation events;

- Sea level rise (SLR) leading to land and infrastructure losses, beach erosion, storm surge, floods and inundation of low-lying areas; ;
- Loss of marine and terrestrial biodiversity as a result of changes of temperature and rainfall;
- The depletion of water supplies;
- Reduced agricultural productivity;
- An increase in the occurrence of pests and vectors, contagious diseases and stress-related diseases;
- increased coastal erosion and infrastructure damage as a result of the increased intensity of cyclonic events and storm surges.

There is general consensus that the world is entering a period of significant global climate change as the result of global warming. Among the issues which need to be closely monitored for their significance will be:

- Sea level rise;
- Increased frequency of large storms and hurricanes; and
- New climate change models that suggest diminished rainfall in the tropics.

Sea level rise has dramatic implications for natural hazard management. The first and most obvious impact is the shoreline erosion and flooding which will occur as the normal level of the sea rises. This is a serious problem as the towns, villages and City are located on the coastal areas. There are substantial amounts of property and development in low harbour and shorefront locations. A second more indirect outcome of global and ocean warming is the likely increase in the frequency and severity of hurricane events which are fuelled by latent ocean heat.

5.0 VULNERABILITY ASSESSMENT

Hazard mapping and vulnerability assessment

5.1 Recommendations for Map Improvement arising out of consultants reports

The following recommendations were made:

(a) a landslide inventory map should be included, showing landslide distribution by landslide type;

(b) key place names to be included on the maps;

(c) map use and limitations to be clearly stated on the map; map should be able to stand on its own;

5.2 Other Recommendations

There is a need for:

(a) a landslide register, to enable landslide incidence to be routinely documented, including reporting by the public;

(b) landslide map which includes effect of land use patterns; and

(c) education regarding affordable cost-effective management practices in high risk zones e.g. drainage, retrofitting affordable to communities.

5.3 FLOOD HAZARD MAPS (St. Lucia and Castries)

General recommendations

There is a need for:

(a) a pubic education campaign regarding the reporting of flood incidence;

(b) need for detailed monitoring during flooding to enhance database of flood events and incorporate in map thus increasing accuracy;

(c) future maps should incorporate the temporal distribution of rainfall on flooding, rainfall regime and changes in land use patterns; and

(d) national agencies should lobby for data enhancement as a priority, if maps are to be more accurate and if detailed mapping is to be conducted.

5.4 WIND/WAVE/STORM SURGE HAZARD MAPS (St. Lucia and Castries)

Recommendations for Map Improvement

Colour coding of hazard categories in the map legend should be more distinct; note two “reds” make it difficult to distinguish hazard degrees.

The map legend should contain only those categories that are relevant to the particular map.

Descriptors of the hazard zones should be included. e.g. state what “100 year MLE” means in terms of hazard degree, in simple terms.

5.5 GENERAL RECOMMENDATIONS (ALL MAPS)

a) The maps produced are likely to contain deficiencies related primarily to a lack of data or data quality. In this context the maps may be used as an effective tool to justify the need for additional resources to be allocated for the generation of high quality databases, and for the preparation of accurate and more detailed maps in vulnerable areas (areas where communities and other development are located in high hazard zones).

b) Individual atlases of natural hazards in the Caribbean should be prepared, similar to the volcanic hazard atlas of the Lesser Antilles prepared by the Seismic Research Unit, UWI with support from the Caribbean Development Bank's Disaster Mitigation Facility for the Caribbean.

c) The suite of hazard maps for St. Lucia should be accompanied by a booklet containing background information, a non-technical summary of the mapping methodology and map results, map use and limitations and metadata descriptions.

5.6 Population Exposed to Hazards

Saint Lucia is vulnerable to a number of major natural hazards with the potential for substantial loss of life and property damage. Indeed, the history of the Island is filled with accounts of major natural disasters, including the Hurricane of 1780 that wrecked havoc from Tobago to Hispaniola. In this section of the plan a brief overview of these hazards is provided as well as a qualitative assessment of the extent of people and property currently at risk.

Current development trends suggest that the island's population is increasingly vulnerable to the impacts of Hurricanes. There has been a tremendous increase in the building of homes and other structures on hillsides and high slopes, much of it on stilts, and involving the removal of stabilizing vegetation.

Table 5.7 Population Exposed to Hazards.

AREA	Population 2000*
All Castries	**62,967**
Castries City	**2,362**
Castries Sub-Urban	**15,441**
Castries Rural	**45,164**
Anse-La-Raye	**6,356**
Canaries	**1,935**
Soufriere	**9,075**
Choiseul	**7,323**
Laborie	**8,861**
Vieux-Fort	**14,833**
Micoud	**17,708**
Dennery	**12,966**
Gros-Islet	**13,972**
TOTAL	**155,996**
***SOURCE: GOVERNMENT STATISTICS DEPT. (SAINT LUCIA). Nov. 2001.**	

It is known that higher densities incur greater vulnerability in natural hazards. The special populations of the elderly, hospitalized and handicapped tend to be over looked and must be considered by management plans.

5.8 Assessment of Property Value Exposed to Hazards

There has been no comprehensive assessment of property values exposed to hazards in Saint Lucia, but the experience of the past two major storms/wave is instructive. The value of damages from Tropical Storm Debby (1994), concentrated on Vieux Fort, Dennery and Anse la Raye was EC$230 million; preliminary estimates of the value of damages from the Wave of 1996 is EC$12 million.

A preliminary estimate, issued by the Ministry of Works early in the aftermath of The Wave of 1996 included:

NO.	ITEM	IMMEDIATE ($M)	MEDIUM ($M)
1.	Clearing of slides	1.0	
2.	Clearing of drains, culverts, and crossings	1.4	
3.	Construction of retaining structures and drains, and culvert/crossing	1.5	
4.	Reinstatement of roads	0.6	
5.	Bridge replacement/Reinstatement	1.8	1.9
6.	River protection	2.8	
7.	Strengthening of bridge abutments	0.5	
	TOTAL	9.6	1.9

This estimate indicates that much of the rehabilitation work done by the Government had to be done on the infrastructure of the State. This supports the call for the introduction of a building code in mitigating the total costs of hazards. Other high costs for lost employment and lost tourist revenues indicate the importance of rapid recovery, in order for economic activities to resume rapidly.

5.9 Assessment of Critical Facilities Exposed to Hazards

- Critical facilities in Saint Lucia include:
- Hospitals;
- Electrical power (LUCELEC);
- Sewerage systems maintained by the Water and Sewerage Company (WASCO);
- Fire houses and police stations and their associated communications systems island wide;
- Designated emergency shelters
- Air and sea ports maintained by the Saint Lucia Air and Sea Ports Authority;
- Communications systems for both intra-island and critical long-distance systems;
- The various cruise ships which dock;

In the extreme conditions of the last two recent severe weather systems, various combinations of these critical facilities have suffered severe damages, which require outside support and reconstruction before they have been able to resume "normal" service to their respective communities.

5.10 Assessment of Danger from Secondary Hazards

The following table illustrates the secondary effects anticipated from major triggering disasters:

SECONDARY > / PRIMARY \/	land slip	blast	flash flood	fire	storm surge	dam fail	ship sink	power fails	fuel cut off	h2o fails	sea level rise	hazard material	phone fails	road fail
NATURAL HAZARDS														
HURRICANE	*		*	*	*	*	*	*		*	*		*	*
INLAND FLOODING	*		*			*				*			*	*
EARTH QUAKE	*			*		*		*	*	*	*	*	*	*
LANDSLIDE						*							*	*
TSUNAMI			*		*	*	*	*		*	*	*		*
MARINE STORMS														
COASTAL FLOODING					*									
CLIMATE CHANGE					*	*					*			
OTHER HAZARDS														
MAJOR FIRE		*						*	*	*			*	
SHIP SINKING				*								*		
CARGO SHIP ACCIDENT		*		*				*	*			*		
AIRCRAFT ACCIDENT				*								*		*
CIVIL DISTURBANCE		*			*			*						
PETROL SPILL		*			*							*		*

5.11 Assessment of Facilities Managing Hazardous Materials.

Major hazardous facilities in Saint Lucia include the Hess Oil storage facility, on the West Coast of the island. This plant has many large tanks for storing crude oil and petroleum products, and is near to a bay that docks tankers.

The major plants of the Water and Sewerage Company are also hazardous facilities. They are located near catchment areas that are subject to flooding and landslides.

Secondary hazardous facilities include the public sewerage plants. Associated with the sewage treatment plants is the sewerage distribution system, which relies on a number of electrically powered lift stations of sometimes indifferent reliability to move the sewage through the system.

Equally distressing in a major coastal storm are the dozens of package sewage treatment plants maintained by private operators such as condominiums, and resort hotels. These facilities are subject to erratic operation in the best of times and in a major storm they may be abandoned for long periods of time after the disaster.

Contamination of coastal waters after a disaster as a result of failure of the sewage treatment plants is a major concern, especially since people may use the bays for bathing with no power or other means to readily get water from their cisterns.

Other than petroleum spills, there are few other instances of danger from exposure to hazardous materials after a natural disaster. Increasingly, the Government and people of Saint Lucia must become aware of the attempts to use the region as a route for the movement of radioactive material.

5.12 Assessment of Shelter Need, Existing Capacity and Evacuation Planning

Lack of shelters has not been a major problem in disaster conditions in Saint Lucia in part because of support from extended family groups and informal assistance networks. The tendency after the destruction caused by an event is that most residents either move in with neighbours/relatives, or put together housing from the shards of their prior home. This is possible because many houses have their own system for water storage which provides a source of potable water, even after destruction of the rest of the building, and the mild climate of the region in general makes camping out possible.

Evacuation from the island after a disaster would be an enormous logistical challenge. Evacuation experience to date has been limited to tourists, severely injured patients, and hospital residents when the facilities suffer major damage as occurred with the fire at Victoria Hospital on February 1, 1996. The logistics complexities and costs of evacuation over sea are enormous, but could be accomplished given sufficient barge capacity and the ability to lodge the refugees on open accessible land.

5.13 Assessment of Environmental Impacts of a Disaster

Depending on the nature of the disaster and the secondary elements associated with it, environmental consequences of a disaster can be extreme. Surviving natural ecosystems tend to be relatively resilient, but sometimes the time scales of man can create problems when the time scale of the ecosystems are not in sync. This creates problems, when, for example, pressure mounts to "reclaim" apparently dead mangrove forests which may take six months or longer to begin to recover from severe salt blast damage from a hurricane.

The recovery process is also dangerous to natural features because of the tendency to relax standards for the disposal of trash and more noxious solid waste in the immediate aftermath of cleanup activities. Recovery operations should try to harness local private voluntary organizations to monitor this process.

Hurricanes and their impact are most critical to Saint Lucia in terms of broad scale environmental impacts because of the continuous flooding impacts on low, coastal and marine areas with severe habitat destruction of coral reefs, forested upland areas, including the destruction of food sources for many animals.

6.0 RISK ASSESSMENT

Saint Lucia is vulnerable to a number of major natural hazards, with the potential for substantial loss of life and property damage. Indeed, like the rest of the region, the history of the island is replete with accounts of major natural disasters. In this section of the plan a brief overview of these hazards is provided as well as qualitative assessment of the extent of people and property currently at risk.

6.1 Systematic Risk Assessment

There is a need to incorporate comprehensive hazard or natural hazard risk in the planning and development permitting systems. Further development of systematic risk assessment studies for the island, especially in the wake of the severe disasters of the past few years, may provide understanding of insurance costs and active mitigation efforts for future planning. Installation of a systematic risk assessment process should be a long-term goal of the Government. Because there is such a small insurance market, insurance rates do not provide a useful surrogate for risk assessment as they may in other jurisdictions. Risk in Saint Lucia is tightly linked to geography. It is important to any systematic assessment of risk that the Government implements its geographic information systems capability.

6.2 Assessment of Data Quality

Data resources, especially mapped resources and hazards (i.e., GIS) offer the potential for substantially increased data quality for mitigation planning, as well as disaster preparedness and recovery operations. Efforts are currently being made to provide accurate data and information on hazard mapping so that areas of vulnerability can be clearly identified.

7.0 ANALYSIS OF SAINT LUCIA'S ORGANISATIONS, LEGISLATION AND MITIGATION PROJECTS

7.1 Disaster Legislation in Saint Lucia

Disaster Preparedness and Response Act.

At the CDERA 5th Board Meeting held in Antigua in May 1996, member States were presented with a Draft Disaster Preparedness Model Legislation as prepared by the Caribbean Law Institute.

On June 26, 1996 the National Emergency Management Office hosted a one-day consultation to discuss the Draft Disaster Preparedness Model Legislation.

The Disaster Preparedness and Response Act # 13 of 2000 was approved in August 2000 and gives responsibilities to the NEMO, its members and the Director of NEMO. It is based on the CDERA Model.

Emergency Powers Act

If damage and circumstances warrant such action, the Governor General will, on the advise of the Cabinet, issue a Proclamation declaring a State of Emergency under the Emergency Powers and Declaration of Emergency, sections 14 and 17 of the Saint Lucia Constitution, Order 1978. Under such a Proclamation the Emergency Powers (Disasters) Act No. 5 of 1995 can be invoked providing the National Disaster Coordinator and/or his/her Agents with specific powers of the requisition of resources.

Specific Issues addressed in Legislation.

Specially Vulnerable Areas. In the DPRA, Part VI, 15 (1) we read: "The Prime Minister may on the recommendation of the Director designate specially vulnerable areas for the purpose of mitigation of, preparedness for, response to and recovery from emergencies and disasters by delimiting such areas under this section" The NEMO, the NHMC and particularly the Ministry of Physical Development must work together to establish these areas in Saint Lucia and delimit them considering different hazards. Knowing these areas will allow a better planning of development that considers risk and vulnerability in order to implement adequate mitigation measures.

Environmental Impact Assessments (EIAs). All EIAs as part of the report submission should have a Hazard Impact Assessment (HIA). Wherein potential hazard and damage shall be considered and mitigation steps outlined.

Trees. One area of heated debate was that of trees as a hazard. There was particular interest in the rights of agencies and individuals when it came to the trimming of neighbouring of trees that constituted a hazard. The powers of the Hazard Officer as defined by the Model Bill were of concern. Careful consideration must be given to the level of creditability given to these officers particularly in light of the fact that the reports produced by them would carry weight in a Court of Law.

In the mean time the Public Health (Nuisances) Regulations No. 10 of 1978 states as follows:

Nuisances. For the purpose of these Regulations, the following shall be nuisances:
(viii) any tree or other erection which interferes with the entrance of sunlight into or with free ventilation of any neighbouring premises or building which is dangerous to public health and safety;

Abatement. (1) The Medical Officer (Health) or Public Health Inspector on becoming aware of a nuisance shall serve on the person committing or permitting same, or upon the owner or occupier of the premises or in respect of which the nuisance exists or is liable to occur, a notice to abate or prevent the same within a specified time and, in addition, to do such things as may be necessary for that purpose.

Roofs. Unless such permission to the contrary is given, it is recommended that all roofs should be pitched between the recommended pitch of 26 to 40 degrees. It is also recommended that all balcony roofs be constructed separate form the main roofing systems. Overhangs should be at maximum 1'-6". (GOSL - Hurricane Resistant Construction Manual pp. 25)

Other Legislation.

Education Act. It is recommended that Principals be informed in writing that they are expected to be the Shelter Manager for their structure.

Tax Laws. The possibility of financial incentives must be given consideration for individuals, families and institutions that make a concerted effort to mitigate against disasters.

7.2 National Emergency Management Organisation (NEMO)

The role of the National Emergency Management Organisation [NEMO] is to develop, test and implement adequate measures to protect the population of Saint Lucia from the physical, social, environmental and economic effects of both natural and man-made disasters.

Its responsibility is to ensure the efficient functioning of preparedness, prevention, mitigation and response actions. The main responsibility of the National Emergency Management

Organisation is to ensure that the island is in a state of readiness at all times to respond to the threats and impacts of hazards.

7.3 National Hazard Mitigation Council:

The National Hazard has the following composition:

Chairman: Minister of Works
Deputy Chair: Permanent Secretary, Ministry of Physical Development.
Permanent Secretary Ministry of Education
Permanent Secretary Ministry of Health.
Permanent Secretary Ministry of Agriculture.
Representative of NEMO
Chairperson of the Emergency Works Committee (Chief Engineer).
Representative of the Chamber of Commerce and Industry.
Co-ordinator Crisis Management Unit (Permanent Secretary, Ministry of Tourism).

The objectives of the NHMC are:

1. To co-ordinate government programmes for vulnerability reduction.
2. To foster scientific and engineering endeavours aimed at closing gaps in knowledge in order to reduce loss of life and property.
3. To develop measures for the assessment, prediction, prevention and mitigation of natural disasters through programmes of technical assistance and technology transfer, demonstration projects and education and training, tailored to specific hazards and locations and to evaluate the effectiveness of those programmes.
4. To prepare a National Mitigation Plan for Saint Lucia.

Additionally, at a meeting of governmental agencies held in November 19th,1999, the following additional objectives were recommended:

1. That the disaster legislation be reviewed to include mitigation.
2. That the existing initiatives for the preparation of mitigation plans formulated by the FAO/CDERA and the CHA should be reviewed with a view to informing the requirements for carrying forward and co-ordinating work in hazard mapping and vulnerability assessments.
3. That a harmonized template be developed for data collection for mitigation.
4. That the technical requirements for the production of hazard maps need to be comprehensively developed.

Technical Working Group.

The NHMC set up a Technical Working Group (TWG), which comprises representatives from the following:

Chair: NEMO
Deputy Chair: Ministry of Physical Development/Physical Planning Section.

Ministry of Agriculture
Fisheries Department
Forestry Department
Ministry of Works

In the period of 24 months the TWG has to liaise with the staff of the NEMO to:

1. Review the draft disaster legislation to include mitigation.
2. Review the existing initiatives for the preparation of mitigation plans formulated by the FAO/CDERA and the CHA with a view to informing the requirements for carrying forward and co-ordinating work in hazard mapping and vulnerability assessments.
3. Develop a harmonised template for data collection for mitigation
4. Develop the technical requirements for the production of hazard maps
5. Provide regular maintenance of the equipment on a quarterly basis
6. Provide a review of the Hazard Mitigation Plan as developed by the NHMC in the month of May, on an annual basis
7. Collaborate with the relevant agencies such as the Ministry of Public Utilities, Telecommunication Companies, OECS Telecom Unit, etc. and other departments in order to identify, formulate and institute appropriate systems for defining, reviewing, and revising medium and training institution for staff development.
8. Identify additional training requirements and recommend appropriate training programmes and training institution for staff development.
9. For a five period to be reviewed at the end design appropriate systems for the continuous monitoring of the system.

All activities related to the conduct of the work of the TWG shall be completed within twenty four (24) calendar months.

The TWG shall report to the NHMC on a quarterly basis. The NHMC in turn shall forward all reports with comments to the Chairperson of the NEMAC or his designated agent. The following reports are required:

1. An initial report within four weeks of commencement of work by the TWG setting out the preliminary findings with a revised work programme.
2. Quarterly reports on the progress of the work programme
3. A training programme to enhance the capacity of personnel in Geographic Information Systems.

7.4 National Emergency Management Plan.

The National Emergency Management Plan is designed as the Official Guideline for National Coordination of all resources involved in emergency management and is to be referred to in any emergency situation.

The purpose of this Plan is to outline preparedness, prevention mitigation and response activities to an emergency situation associated with natural/man-made disaster or technological incidents on the island. It provides operational concepts relating to the various emergency situations,

describes the overall responsibilities of the National Emergency Management Organisation [NEMO] and the role of all concerned sectors in assisting in minimizing loss of life and suffering.

It also provides for a rapid response to such disasters through maximum use of Local, National, Regional and International resources. Among the plans incorporated in this document are:

Table 7.5 The Saint Lucia National Emergency Management Plan SLU/NEMP

Name of section	Name of Sub-section
The Saint Lucia National Emergency Management Plan	
Policies & Guidelines	
	Donations and Importation of Relief Supplies Policy
	Emergency Shelter Management Policy
	Emergency Housing Policy
	Mitigation Policy
	Travel Policy
	Adequate Management and Disposal of Dead Bodies Policy
National Plans	
	The Saint Lucia National Hurricane Plan
	The Saint Lucia National Earthquake Plan
	The Saint Lucia National Volcanic Eruption Plan
	The Saint Lucia Oil Spill Contingency Plan
	The Saint Lucia Hazard Mitigation Plan
	The Saint Lucia Stress Response Team Plan
Sectoral Plans	
	The Ministry of Communications, Works, Transport and Public Utilities Plan
	The Saint Lucia National Emergency Health Sector Plan
	The Hospitality Industry Crisis Management Plan
	The Saint Lucia Private Sector Response Plan
Specific Plans	
	Mass Crowd Events Plan
	Plan for Evacuation of Anse La Raye
	Mode Plan for the District Disaster Committees in Saint Lucia
	The Saint Lucia Prison Emergency Plan
	The Port Authority Cruise Line Ships Plan
	The Saint Lucia Seaports Contingency Plan

The plan is available on the Internet at:
http://geocities.com/slunemo/response_plans/memo.html

7.6 Mitigation Policy.

Promoted by CDERA and CDB during in the month of May, 2003, started a process to adapt the CDERA Model Mitigation Policy to Saint Lucia's conditions and to develop a National Hazard Mitigation Policy for Saint Lucia. Since then a number of initiatives have been undertaken towards providing a plan that is relevant to the existing conditions in St. Lucia. To that extent, an exercise to show greater harmonisation between the policy and the plan is currently being undertaken and is reflected in this current version (version 5, April 2006)

7.7 Hazard Mitigation Projects.

In post Tropical Storm Debby mitigation planning, the Government undertook a series of special initiatives. The table below is a short assessment of the recommendations post TS Debby:

SECTOR	MANAGING AGENCY
AGRICULTURAL/CROP DIVERSIFICATION	MINISTRY OF AGRICULTURE
REPAIRS TO FEEDER ROADS, SLOPE STABILISATION OF THE BARRE DE L'ISLE AND WEST COAST ROADS, DESILTING AND RETRAINING OF MAJOR RIVERS, RECONSTRUCTION OF DAMAGED BRIDGES AND CULVERTS	MINISTRY OF WORKS
REPAIRS TO EDUCATIONAL FACILITIES	MINISTRY OF EDUCATION
REPAIRS TO HEALTH FACILITIES	MINISTRY OF HEALTH

With the advent of the Wave of 1996 these Ministries were again called upon to repeat the actions of two years before.

***CDB Funding*.** Recently and with funds from the CDB, the following projects have been conducted:

Improvement of the Drainage Systems in Castries and Anse La Raye.

This project includes:

- Preparation of detailed designs and tender documents for the execution of the works
- Assisting the Programme Co-ordinator in the pre-qualification of contractors and the evaluation of tenders, including preparation of tender reports, and
- Assisting the Programme-Co-ordinator in negotiation of the contracts for the construction works and preparation of contract documents.

The works will start January-February 2004.

Castries River Wall

This project considers extensions to the river wall to fill gaps. Particularly in the areas of Marchand and La Cou Dou.

World Bank Funding. Within the World Bank/OECS Emergency Recovery and Disaster Management Project, the following projects have been/are being conducted:

Hewanorra Airport Flood Protection Works.

Flood protection works carried out, consisting of the embankment of the Vieux Fort river to prevent the river from going through the old bed. The Engineering Study includes hydrological assessment of river, and detailed engineering to prepare a sea defences project to protect both the airport landing strip and the ring road.

Bridges and Rivers Training.

Bridges and River Training works carried out at: (i) Marc Floissac, and (ii) Caico including the launching of a Bailey-type bridge, a new abutment and wingwalls, and river training. Additional studies carried out to assess the frequency of floods and complete the design for the bridges. The project is aimed also to strengthen the capacity of the Ministry of Works to carry out bridge works through the procurement of about 60 meters of Bailey-type components and the replenishment of the gabions stock which will enable the Ministry to respond quickly to emergency flood situations.

Cul de Sac Prevention Works.

The project would finance bridge construction, drainage and embankment for Cul de Sac Valley and raise the West Coast Road.

Supplementary Reservoir for Victoria Hospital.

A supplementary water reservoir at La Toc will be constructed to ensure water supply to Victoria Hospital.

Disaster Management Programme for Schools and libraries.

This project will include retrofitting of schools used as shelters and the installation of sanitary facilities.

Study and Design of Coastal Protection for Dennery Village.

This project will assess protection options and develop appropriate recommendations and designs for coastal protection to Dennery Village.

The Ministry of Works, besides co-ordination most of previous projects mentioned, conduct permanent activities such as desilting, construction of culverts, roads repair, clearing of drainage, etc.

Part III Mitigation.

8.0 MITIGATION GOALS

8.1 Protection of the general public

The National Emergency Management Organisation's fundamental objective is to eliminate or reduce the human loss and suffering resulting from natural disasters. This protection extends to both residents and visitors. Other disaster planning functions, not strictly considering mitigation, have a substantial role to play in protecting health and safety, including warning, evacuation and other response functions. From a mitigation viewpoint, citizens have the right to live and work in structures that will be structurally sound in the event of hurricanes, earthquakes or other natural events. Moreover, they have the right to be out of harms way, to the extent possible, during disaster events. This implies the need for public warning, shelter, and evacuation programs, and the regulation of construction of buildings. In addition, NEMO needs to encourage safe developmental practices and to advise on developments in high-hazard areas. Of great importance are the policies on emergency housing, emergency shelter management, the national emergency management plan and the building code soon to be adopted.

The local community is one of the more critical players in the process of hazard mitigation planning and implementation. In this regard it is imperative that all necessary measures be adopted to ensure full participation of the community by engaging the following groups:

- professional organisations such as the Chamber of Commerce, Small Business Association, Agriculturist Association, as well as non-governmental organisation;

- Co-operative Societies to include Credit Unions, Fishermen’s Co-operatives, Farmers’ Co-operatives, Farmers’ Unions, Friendly Societies.

- Voluntary organisations to include mothers’ and fathers’ groups, development committees, community councils.

It is to be noted that the integration of the contributions of community groups into the plan as far as is practicable, must be pursued to assist in the development of a more enhanced plan of action.

Tropical Storm Debby demonstrated that mariners assume special vital risks in hurricanes, which need to be addressed in future mitigation activities and in the Hospitality Industry Crisis Management Plan.

Transportation is perhaps one of the more problematic logistical problems in a disaster situation. The situation becomes even more challenging when there is need for mass transportation of people. Three scenarios could be pursued.

- External Transportation: On the assumption that both airports may be closed, the other option is sea transportation. There is need to enter into dialogue with the owners and agents of ferries servicing Saint Lucia, as well as those of large barges and pleasure boats.

- Internal Transportation: Assuming that roads are accessible, owners of coaches and other large carriers have to be engaged. Additionally, all appropriate government vehicles are to be commissioned.

- Assuming most major roads become impassable, sea transport is the other option for internal transportation. In this regard schooners, fibreglass boats, fishing boats and pleasure boats are to be engaged. Also, non-fixed-winged aircrafts could be called into use if available.

8.2 Reduction of damage to existing development

As is evident from the costs of the last four severe weather systems (Allen, Debbie, Lenny and Lili), much development is already at substantial risk to natural disasters. Settlements are located in hazardous shoreline zones, structures have been constructed on top of natural drainage gutters, and many buildings have been constructed in hillside areas subject to landslides. An increasing practice is construction too near riverbanks, thus, at the slightest swelling of a river, many persons become severely affected. It is the goal of NEMO, to make the public aware of the threats to existing settlements. Such a goal suggests the possibility of a range of public actions, including, in extreme cases, the recommendation of relocation of structures out of high hazard zones and into less hazardous areas. The retrofitting of structures to better withstand hurricanes and other hazards, and undertaking certain structural improvements such as additional drainage channels to help alleviate existing flooding problems, among others.

Many actions have been undertaken or proposed in the post- Tropical Storm Debby mitigation activities to support this objective.

8.3 To reduce disaster damages to future development.

Future growth and development in the island is to be encouraged in ways that do not place people and property at risk. It is the objective that developers and planners of all new developments be provided with greatly improved information on the risks and opportunities in new development areas, in order to fully evaluate and manage natural hazards-or where development in high hazard areas cannot be avoided that its impacts are minimized. This can be achieved through the design of hazard and vulnerability maps. While it is typically quite difficult to correct past mistakes with respect to development in hazardous locations, opportunities do exist to direct new developments in ways which make it cost-effectively less vulnerable to natural disasters. In this regard, the building code, soon to be adopted, and its enforcement by the authorities, will play a very important role in ensuring that every structure will be hazard resistant.

8.4 To reduce the extent of damage.

Just as private development is subject to damage and destruction from natural hazards, so also are public investments. Many public investments are vulnerable to natural hazards, including schools, government buildings, roads and streets, airports, among many others. These investments can be located and designed in ways that minimize their vulnerability. Public roads, for instance, can be located outside of flood plains, or can be elevated above predicted flood levels. Efforts can also be made to correct past mistakes, for instance by retrofitting critical public buildings so that they will better withstand earthquakes or other hazards.

9.0 GUIDING PRINCIPLES

9.1 To reduce public expense for emergency and recovery services required by natural disasters

There is a direct correlation between hazardous development patterns and the post-disaster emergency and recovery expense that must be assumed by the public. If buildings and infrastructure had not been permitted to locate in a flood hazard area, for instance there would be little or no need to expend public monies to rebuild and restore them.

Costs are also incurred by the inability to access critical information in a timely fashion. This goal includes a commitment to preserve, protect and promote the use of cost-effective information resources for hazard mitigation.

9.2 To protect and advance the long term economic prosperity of the Country

A critical goal, upon which most agree, is the need to protect and enhance the conditions under which the island will grow and prosper economically. Tourism is a key element of the local economy and hazard mitigation figures into this in several important ways. Firstly, because a healthy tourist economy cannot thrive and grow unless prospective tourists perceive the island as a safe place to visit and vacation. A hurricane, a flood, a fire or an earthquake with tremendous damage, destruction or loss of life may create a long lasting image that the island is a dangerous and risky vacation setting.

Secondly, the continued viability of the tourist economy depends on the ability to preserve the beauty and natural features that attract people in the first place. Obvious elements of this attraction include clean beaches, green vegetated hills, and clear blue waters, among many others. Many of the hazard mitigation policies have the additional result of protecting these aesthetic and natural features and consequently, these other non-hazard goals should be considered along with mitigation. For example, an increased shoreline setback, in addition to reducing the risks of hurricane and shoreline flooding damage will protect the incredible beauty of the island's beaches and shoreline upon which much of the tourism industry is founded. Mitigating natural hazards will also reduce or eliminate the loss of business activity and income that necessarily results while the commercial sector rebuilds following a disaster. Even a short period of recovery can translate into a substantial loss of commercial revenue.

9.3 To ensure an equitable distribution of the risks and the associated costs

An important mitigation goal is to ensure that there is basic equity in the distribution of natural risks and the costs and benefits associated with mitigation programs. It is the case, for instance, that low-income residents, by virtue of their economic status are at greater risk to flooding, earthquakes and other natural hazards.

Once mitigation is contemplated, the issue of who should pay for it emerges. Does the goal of equity suggest, for instance, that any costs generated from hazard mitigation requirements imposed on new development be assumed by this new development (i.e., by the developers, new residents, etc.). To many, this seems equitable because these mitigation costs are in fact created by the new development.

Insurance is a major tool for redistributing risk. A goal of this plan is to work proactively with the insurance industry to ensure that insurance contribute positively to equitable and effective responses to hazard mitigation. Among the tools that need to be considered, are programs that provide incentive fees for incorporating mitigation activities in existing and future developments. The sharing of the risk is another area in which insurance companies can come together to provide coverage in areas too risky to be handled by one company.

9.4 To reduce the liability for loss of life and property from natural hazards

An important goal behind much hazard mitigation is the need to reduce or eliminate the country's liability for private and public damages and loss of life.

This line of reasoning suggests the need for the State to assume a very conservative and cautious posture with respect to natural hazards preventing where possible any unnecessary exposure.

Again, this can be achieved through detailed hazard and vulnerability maps.

9.5 To protect the natural environment

An important goal, consistent with and complementary to natural hazard mitigation is the protection of the natural environment. Development pressures and neglect have substantially damaged many important elements of the natural environment, and threaten continued destruction in the future. Many of these features, such as wetlands and mangroves, serve to naturally mitigate or minimize hazards. Development impacts on the environment in several ways, including:

- Direct alteration of critical habitat by destroying reefs, filling in on top of mangrove swamps, and making marinas out of salt ponds;

- Injection of pollutants into the environment such as fertilizers, pesticides and herbicides commonly used for lawns and agriculture;

- Over-exploiting natural resources such as using sand for construction, or over fishing the reef fisheries.

On the other hand, some efforts to mitigate natural hazards can have negative impacts on the natural environment. Construction of major flood control projects, for instance, intended to correct perennial flooding problems in specific areas, may have negative water quality and flooding impacts on mangroves and other resources which ultimately receive these redirected flood waters. Thus, there is a direct and close relationship between hazard mitigation and natural resource protection. The island's natural resource base is crucial to the future of the area's economy and should be carefully considered in any mitigation program or policy.

Environmental Impact Assessments and the implementation of mitigation measures are of extreme importance in the protection of the environment.

10.0 PLAN OBJECTIVES AND STRATEGIC MITIGATION ACTIONS

Priority attention will be given to seven plan objectives. These objectives provide the platform for the development of strategic interventions necessary to implement the Policy. They are as follows:

Objective 1: Incorporation of the hazard mitigation measures in all public and private development planning initiatives and programme budgets

- Review and enhance hazard maps and vulnerability assessments and prioritize areas for future studies
- Locate high density development in areas of relatively low hazard vulnerability.
- Restrict development in high risk areas
- Seek innovative solutions to address illegal squatter settlements located in highly vulnerable locations
- Incorporate hazard risk reduction as a component of an Integrated Development Planning (IDP) initiative
- Promote the conduct and use of hazard impact assessments in the Physical Planning Section review of development proposals
- Improved design and maintenance standards for : port facilities; airports; public buildings; drainage systems; and other infrastructure
- Integration of hazard mitigation objectives in the EIA process

Objective 2: Development, implementation and enforcement of an effective and comprehensive legislative and regulatory framework that supports hazard mitigation

- Enforce regulations regarding land development that would have hazard mitigation benefits
- Enact and enforce the building code
- Amendments to Disaster Preparedness and Response Act to more strongly support hazard risk reduction
- Establish an effective monitoring system to ensure that all development initiatives are consistent with the relevant regulatory framework
- Periodically review and update relevant legislation and regulations that have implications for hazard risk management

Objective 3: Increased public awareness and outreach at every level of society to encourage continuous involvement in hazard risk management

- Involve community groups in decision-making
- Maintain and enhance links to communities, NGOs and CBOs on hazard mitigation topics
- Develop a Social Studies curriculum unit on comprehensive disaster management for primary and secondary level students
- Arrange for regular meetings with key stakeholders in communities
- Recognise the participation as well as contribution of individuals, community groups and organisations in implementing hazard mitigation measures

Objective 4: Establish mechanisms for enhancing collaboration on hazard risk reduction among all stakeholders and civil society

- Prepare a brochure to demonstrate the benefits to be derived in reducing risks when things are handled collaboratively.
- Design an integrated approach to hazard mitigation involving all stakeholder groups
- Identify key stakeholder groups and their roles in hazard mitigation

- Assess the capacity of each stakeholder group to undertake hazard mitigation measures
- Mobilize all stakeholder groups to undertake hazard mitigation measures
- Regular monitoring and evaluation of the collaborative approach of all stakeholder groups

Objective 5: Empowerment of local community groups and institutions to undertake hazard mitigation measures

- Assign various task and responsibilities to community organisations for vulnerability reduction
- Encourage involvement of influential persons in community organisations.
- Following a rapid needs assessment, provide appropriate training to community leaders
- Include a line item in Government programme budget for annual hazard mitigation projects to be implemented under the direct management of community groups
- Conduct periodic briefings on risk reduction initiatives to community leaders
- Develop criteria to prioritise vulnerable communities for a local risk reduction planning initiative
- Undertake community-level Comprehensive Disaster Management (CDM) planning for highly vulnerable communities in collaboration with NGOs

Objective 6: Development of an effective information sharing system to support multi-sectoral decision-making in the implementation of hazard mitigation measures

- Prepare a comprehensive inventory of information on existing hazards
- Explore opportunities to optimise the use of hazard maps and vulnerability assessments by public, private and non-profit sectors
- Identify baseline data for hazard risk assessment and hazard mitigation measures
- Develop and maintain information and data on the human resource capacities of various stakeholders including community groups and individuals
- Develop an effective system to disseminate information and data to all stakeholders to facilitate the identification, prioritization and implementation of hazard mitigation measures

- Do regular monitoring and evaluation of the information system

Objective 7: Building national institutional and technical capacity for risk reduction

- Request of government to make a financial provision in the annual budget for hazard mitigation.

- Conduct a needs assessment to determine the human, technical and financial resources required to effectively implement hazard mitigation

- Provide on-going training for builders and contractors on safer building practices

- All government agencies should be required to prepare institutional continuity plans and review them annually

- Conduct a structural engineering study and benefit/cost analysis of the most vulnerable critical facilities

- Provide a more extensive range of fiscal incentives in post-disaster recovery in a timely fashion; however, subject to fiscal prudence

- Develop a strategy and mechanisms for mainstreaming disaster risk reduction in post-disaster recovery and reconstruction

- Collaborative effort with insurance industry and brokers to provide incentives for employing disaster resistant construction or retrofitting

- Encourage or promote low-income housing insurance schemes in dialogue with insurance and banking sectors

- Incorporate hazard risk reduction into relevant national policies and sectoral plans

11.0 DATABASE MANAGEMENT AND MAINTENANCE

NEMO is responsible for maintaining the database of hazards and the NHMC is responsible for hazard mitigation information. As mentioned previously, there is a special need for archiving and library functions, in part because of the many unique institutional and natural environmental conditions of the island.

Geographic Information Systems (GIS) resources will be maintained by the Ministry of Planning.

12.0 DEVELOPMENT OF STANDARDS

The Development of Standards has to be vigorously pursued. Operational benchmarks must be established emphasising the following:

- A minimum acceptable living standard for evacuees;
- adequacy and quality of food and water
- a minimum acceptable level of security to be provided.
- upholding ethical considerations – honesty, fairness, distributive justice, impartiality.
- a clearly defined methodology and approach on the treatment of the physically challenged, the very poor, the elderly and the institutionalised must be developed

13.0 TERRITORIAL PLANNING FOR EMERGING EVENTS.

- the northern corridor of Castries that is, Castries to Gros Islet, has to be examined with a view to making appropriate mitigation plans in light of the movement and congregation of masses of people at the Beausejour Cricket facility.
- the designing and operationalising of new routes to reduce traffic accidents, while protecting natural habitats and wetlands.
- provisions for adequate entrances and exits to be given high priority in the mitigation proposals.

14.0 CONCLUSIONS

Saint Lucia and her sister states are confronted with a variety of serious natural hazards. The island is also confronted with growth and development pressures which, if not carefully managed could result in even greater numbers of people and properties being vulnerable to natural hazards. In addition, in order to further promote and develop its tourism-based economy, Saint Lucia needs to maintain an attractive and safe environment for visitors.

This Mitigation Plan is a first and an important step in addressing a comprehensive and sustainable manner the natural hazard problem. It is important to view hazard mitigation planning as a continuous and ongoing process. Consequently, this Plan will be reviewed annually and updated accordingly. New programs and policies may need to be added, and mitigation priorities may change. As a result of such changes, long-term mitigation measures may rise in importance and may be reclassified as short-term priority actions. The reverse may also occur. At each annual review a status or progress assessment will be prepared for each identified policy or program. Where a short-term priority measure has not been achieved the reasons for such will be identified and proposals formulated to overcome these difficulties.

The National Hazard Mitigation Council will have the primary responsibility for the co-ordination and evaluation of mitigation activities. It is important that agencies become acquainted with this Mitigation Plan and work to incorporate its elements into day-to-day decision making. These agencies should also be intimately involved in the annual update and progress report.

APPENDIX A

DISASTERS EXPERIENCED BY SAINT LUCIA

October 11, 1780 - Hurricane strikes - 2,000 dead, every bridge on island collapsed
August 11, 1831 - Hurricane strikes - 1 dead
October 14, 1844 - Riots in Castries
July - Oct., 1854 - Cholera outbreak (est.) 1,500 dead
October 3, 1894 - Gales and floods
September 10/11, 1898 - Cyclone strikes
February 16, 1909 - Earthquake measuring 7.0
October 26, 1923 - Storm strikes
May 14/15 1927 - Castries Fire - 17 blocks burnt
February 24, 1935 - MV George overturned - 41 persons drown
February 13, 1937 - Sinking of the May Rose - 12 persons drown
November 21/22, 1938 - Ravine Poisson Landslide - 100 dead
June 19/20, 1948 - Castries Town Fire - 2,300 homeless
March 19, 1953 - Earthquake measuring 7.5
June 9, 1955 - Soufriére Town Fire - 2,000 homeless
March 25, 1957 - Labour unrest at Cul de Sac, Dennery and Roseau
July 10, 1960 - Hurricane Abby causes landslides at Fond St Jacques - 6 dead
September 20, 1972 - Earthquake measuring 3.7
October 29, 1973 - Plane Crash at 2,000 ft on Mt Gimie - 3 dead
June 24, 1979 - Riots in Castries, majority of shop windows smashed
August 4, 1980 - Hurricane Allen - EC$250 million in damage/9 dead
November 30, 1981 - Guyana DC6B crashes at Vigie Airport
September 1989 - Swarm of Locusts arrive in Saint Lucia
May 19, 1990 - Earthquake measuring 4.5
October 7, 1993 - Civil unrest by banana farmers at Dennery 2 shot dead
September 9/10, 1994 - Tropical Storm Debby - EC$230 million in damage/4 dead
October 8, 1995 - Earthquake measuring 4.3
October 19 - 30, 1995 - Oil Spill in Cul de Sac Bay
February 1, 1996 - Fire at Victoria Hospital
February 11, 1996 - Fire at Patterson's Gap 10 families displaced
October 26, 1996 - Tropical Wave EC$12 million in damage
October 21, 1998 - Tropical Wave - 1 dead
November, 1999. Hurricane Lenny.
September 22, 2002.- Tropical Storm. Lili.

APPENDIX B

ABBREVIATIONS USED

CDERA	-	Caribbean Disaster Emergency Response Agency
EOC	-	Emergency Operations Center
ESM	-	Emergency Site Manager
GIS	-	Geographical Information Systems
HAZMAT	-	Hazardous Material
LUCELEC	-	Saint Lucia Electric Company
NEOC	-	National Emergency Operations Center
NEMAC	-	National Emergency Management Council
NEMO	-	National Emergency Management Organisation
NHMC	-	National Hazard Mitigation Council
OECS	-	Organisation of Eastern Caribbean States.
PM	-	Prime Minister
SITREP	-	Situation Report
SOP	-	Standing Operating Procedures
TS	-	Tropical Storm
WASCO	-	Water and Sewerage Company
WB	-	The World Bank

Appendix C

Information to be Placed on Hazard Maps

Guidelines for Consultants

The map information indicated below is to be included on all maps.

Each map should be presented according to the following layout. It is understood that the exact layout may not be possible due to map size etc. In such cases modifications to the layout should be made only after discussion with the respective client (CDB or CDERA).

Title – must be specific to the map (see comments for individual hazards) and must be placed at the top of the map sheet

Latitude and longitude are to be included.

Place names

- Flood hazard – main watersheds, rivers, roads, main settlements, high hazard areas
- Landslide hazard – topography with indicated contour interval, rivers, roads, main towns, high hazard areas
- Coastal erosion hazard – rivers, towns, high hazard areas, bays examined, topography (for pilot site)
- Wind/wave/storm surge maps

If one map is presented on more than one map sheet, the individual map sheets are to be labelled e.g., for a map comprising three sheet, the sheet should be labelled map sheet 1 of 3, map sheet 2 of 3 and map sheet 3 of 3.

MAP LAYOUT

Upper Left Quadrant; Middle of Top to Centre of Map Sheet

- Scale - linear (miles and/or metres) and numeric; Belize maps – use miles
- Cardinal points – north point

Centre Right

- Legend:
    - Should be colour coded to reflect the three hazard categories viz. high, moderate and low hazard; distinct colours should be used for each hazard categories so that the categories my be easily distinguished
    - Non-technical descriptions of hazard categories should be included as close as possible to the legend ;

- A section titled "Map Use and Limitations" should be included immediately below the legend. This section should be approximately one paragraph long and should include non technical jargon. This description should include an example or examples of how the map may be used. It would be useful to refer to a specific instance indicated on the map (e.g. it is recommended that development located in high risk areas, such as at … should ……; See attached for examples arising out of the National Hazard Map Review Workshops)

Bottom Left Corner

- Map projection data
- Date of map
- Author: name of person or organization only; company logos are not to be included.

Bottom Right Corner

- logos of collaborating partners; each logo of ½ inch diameter on x by x map sheet
- six logos are to be placed on one line in the following order:
    - for wind/wave/storm surge, flood and landslide hazard, the order should be: respective government (St. Lucia or Belize), CDB, CDERA, USAID, OAS, CIDA
    - for coastal erosion hazard, the order should be: respective government (Grenada or Belize) CDERA, CDB, OAS, CIDA, USAID

- the following text should be added immediately below collaborating partner logos:

  St. Lucia Maps
  "This map forms part of a suite of hazard maps, prepared to enhance the National Hazard Mitigation Plan of St. Lucia. The project to harmonise the national hazard mitigation policy and plan for St. Lucia is collaboration between the Government of St. Lucia, the Caribbean Disaster Emergency Response Agency through its Caribbean Hazard Mitigation Capacity Building Programme and the Caribbean Development Bank through its Disaster Mitigation Facility for the Caribbean".

C. T. Rogers
January 20 2006

Table 1

Example of text: Map Use and Limitations
(extracted from Notes of National Hazard Map Review Workshop Series)

Text may be modified, rephrased, enhanced as necessary.

The hazard maps identify areas that are associated with a high, moderate or low hazard.

The hazard map suite prepared at 1: 25,000 mapping scale are designed primarily for use in land use planning and zonation and public education. In general the maps may be used to:

(a) guide future development away from high hazard zones;
(b) flag areas currently under development for which priority will have to be given to minimize risk associated with the indicated high hazard through the incorporation of structural (including retrofitting), economic, socioeconomic and environmental mitigation measures; (high hazard zones)
(c) flag areas where more detailed mapping and investigation will be required prior to sitting approval, especially where existing or future development /communities may be threatened (high and moderate hazard zones)
(d) identify areas where development is highly unlikely to be affected by a given hazard (low hazard).

Due to scale of mapping, pockets of high hazard may be associated with a high, moderate or low hazard.

The maps are not intended for use in emergency planning. For this use detailed maps prepared at a mapping scale of 1:5000 or greater is required. The maps may be seen as a preliminary step to such detailed mapping as the high hazard areas indicated areas where more detailed attention should be assigned.

The map output is only as accurate as the quality of the input data and analysis method. Limitations of input data were a concern in the preparation of all hazard maps.