

World Bank/ OECS Emergency Recovery and Disaster Management Project.

National Emergency Management Organisation.

National Hazard Mitigation Council

The Saint Lucia Hazard Mitigation Plan

2003 version

Section SLU/NEMP-03-05 of the Saint Lucia National Emergency Management Plan

Draft for Revision

Version 1: August 1996

Version 2: January 2001

Version 3: December 2002

Version 4: June 2003 (Draft)

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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.

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.

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 the high population densities and the resource-intensive life style and development of Saint Lucia create a 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 are 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

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 the NEMO in December 2002 (3rd version) and this fourth version was revised and updated 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 the all the sectors consulted mentioned in Appendix C.

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

3.0 OBJECTIVES.

In order to bring to an acceptable minimum level the destruction and devastation resulting from hazards, the plan establishes objectives to be achieved through implementation of a number of hazard mitigation measures. The plan promotes increased coordination among Governmental, Non Governmental Agencies and officials; and proposes to integrate hazard mitigation capabilities and programs into everyday functions.

The objectives of the plan are :

- To improve understanding of the effects of hazards on the Island;
- To reduce loss of life (human and animal)
- To reduce losses/damage to property and infrastructure.
- To protect public health and safety;
- To improve the structural strength of buildings.
- To preserve natural and historic resources in vulnerable areas.
- To restrict development in areas of high risk.
- To encourage the use of local resources.
- To reduce the escalating cost of insurance and reinsurance.
- To provide fiscal incentives for incorporating mitigation elements in post-disaster rebuilding/recovery (e.g. Tax reductions)

4.0 KEY MEASURES

Some key measures to implement these goals include:

- Improved information for private and public planners and managers to avoid the consequences of future hazards;
- Hazard assessment and mapping
- Delimitation of vulnerable areas to specific hazards
- Structural and non-structural mitigation measures based on hazard maps.
- Land development according to hazard maps
- Enhancing communication among agencies to facilitate post-disaster recovery and mitigation;
- Improved hazard mitigation planning and coordination for harbor and coastal facilities;
- Enact and enforce the Saint Lucia Building Code.
- Improving designs and maintenance activities for drainage systems;
- Training to achieve the changed behaviors required for public and private organizations to implement these programs;
- Ensuring consistency of regulations, especially for insurance programs;
- Providing protection from hazards for critical facilities;
- Improve institutions ability to protect their resources;
- Increase public awareness

5.0 THE WAVE OF OCTOBER 26, 1996

The initial version of the Hazard Mitigation Plan was drafted in the immediate aftermath of Wave of October 26, 1996 that caused serious damage in the village of Anse la Raye and the town of Soufrière. 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.

6.0 HAZARDS IN SAINT LUCIA

6.1 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).

6.2 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 clayey 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 were 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 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;

6.3 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, however, 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 it 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, it is likely to have 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.

6.4 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 phreatic 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, phreatic explosions and small and moderate eruptions are more likely to occur.

6.5. 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 the two regions in the world that 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.

6.6 Fire

The history of Saint Lucia is dotted with fires. For 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. They may start by natural causes such as lightening. Arsonists or careless smokers may cause them, by those burning woods by for clearing a forest area.

6.7 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.

6.8 Effects of Global Climate Change.

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 harbor 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 fueled by latent ocean heat.

7.0 VULNERABILITY ASSESSMENT

7.1. 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 7.1 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 |
| Denmery | 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.

7.2 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.

7.3 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.

7.4

Assessment of Danger from Secondary Hazards

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

| SECONDARY > | land slip | blast | flash flood | fire | storm surge | dam fail | ship sink | power fails | Fuel cut off | H ² O fails | sea level rise | hazard material | phone fails | road fail |
|------------------------|-----------|-------|-------------|------|-------------|----------|-----------|-------------|--------------|------------------------|----------------|-----------------|-------------|-----------|
| PRIMARY √ | | | | | | | | | | | | | | |
| 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 | | * | | | * | | | | | | | * | | * |

7.5 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.

7.6 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.

7.7 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.

8.0 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.

8.1 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.

8.2 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. At the present time, data quality for mitigation faces difficulties in timeliness and relevance.

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

9.1 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 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 from 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.

9.2 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.

9.3 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: the 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 needs 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. On a quarterly basis to provide regular maintenance of the equipment.
6. In the month of May, on an annual basis, provide a review of the Hazard Mitigation Plan as developed by the NHMC.
7. Collaborate with the relevant agencies such as the Ministry of Public Utilities, Telecommunication Companies, OECS Telecom Unit, et., and departments 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.

9.4 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 9.1 The Saint Lucia National Emergency Management Plan SLU/NEMP

| Section | Subsection | Name of section | Name of Sub-section |
|----------------|-------------------|--|--|
| 01 | 01 | The Saint Lucia National Emergency Management Plan | |
| 02 | | Policies & Guidelines | |
| | 01 | | Donations and Importation of Relief Supplies Policy |
| | 02 | | Emergency Shelter Management Policy |
| | 03 | | Emergency Housing Policy |
| | 04 | | Mitigation Policy |
| | 05 | | Travel Policy |
| | 06 | | Adequate Management and Disposal of Dead Bodies Policy |
| 03 | | National Plans | |
| | 01 | | The Saint Lucia National Hurricane Plan |
| | 02 | | The Saint Lucia National Earthquake Plan |
| | 03 | | The Saint Lucia National Volcanic Eruption Plan |
| | 04 | | The Saint Lucia Oil Spill Contingency Plan |
| | 05 | | The Saint Lucia Hazard Mitigation Plan |

| | | | |
|-----------|----|-----------------------|--|
| | 06 | | The Saint Lucia Stress Response Team Plan |
| 04 | | Sectoral Plans | |
| | 01 | | The Ministry of Communications, Works, Transport and Public Utilities Plan |
| | 02 | | The Saint Lucia National Emergency Health Sector Plan |
| | 03 | | The Hospitality Industry Crisis Management Plan |
| | 04 | | The Saint Lucia Private Sector Response Plan |
| 05 | | Specific Plans | |
| | 01 | | Mass Crowd Events Plan |
| | 02 | | Plan for Evacuation of Anse La Raye |
| | 03 | | Mode Plan for the District Disaster Committees in Saint Lucia |
| | 04 | | The Saint Lucia Prison Emergency Plan |
| | 05 | | The Port Authority Cruise Line Ships Plan |
| | 06 | | The Saint Lucia Seaports Contingency Plan |

The plan is available on the Internet at:

<http://www.geocities.com/slunemo/files/homepage.htm>

9.5 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. The policy will include a vision, goals, objectives and strategies. The Policy and the Plan will be compatible and congruent with each other. This process will finish in December 2003.

9.6 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 | MANAGUNG AGENCY |
|---|-------------------------|
| AGRICULTURAL/CROP DIVERSIFICATION | MINISTRY OF AGRICULTURE |
| REPAIRS TO FEEDER ROADS, SLOPE STABILISATION OF THE BARRE DE L'ISLE AND WEST COAST ROADS, | MINISTRY OF WORKS |

| | |
|---|-----------------------|
| DESILTING AND RETRAINING OF MAJOR RIVERS, RECONSTRUCTION OF DAMAGED BRIDGES AND CULVERTS | |
| 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.

10.0 MITIGATION GOALS

10.1 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. In addition, NEMO needs to encourage safe development practices and to advise on development 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.

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.

10.2 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. Developments 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, as such 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 development. 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.

10.3 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 development 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 development 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.

10.4 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 for past mistakes, for instance by retrofitting critical public buildings so that they will better withstand earthquakes or other hazards.

10.5 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.

10.6 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.

10.7 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, those 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.

10.8 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.

10.9 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.

11.0 MITIGATION PRIORITIES

11.1. Priorities.

Thus far, the Plan has identified the following critical hazards: wind damage from hurricanes, inland flooding, coastal flooding (including the long-term effects of global climate change), earthquake, volcanic eruptions and fire. This section of the Plan will identify major activities

(research, planning, training, and project implementation) keyed to the four major hazard mitigation measures:

- Monitoring, data and information;
- Standards and enforcement;
- Reconstruction;
- New construction.

The following matrix identifies how the general priority areas discussed below, fit into this general framework. It should be emphasized that this plan deals at a level of generality above individual projects. It identifies **priorities** that might be addressed by one or more projects, or a project could be designed to address two or more priorities.

Table 11.1. Priority Mitigation Measures.

| Hazards | Monitoring, Data and Information | Standards and Enforcement | Re-construct and operation | New Construction |
|---------------------------|---|---|---|--|
| Hurricane | Implement GIS for critical areas, damages and resources | Adopt a building code | Cleaning and channeling program | Intro of code |
| Inland Flood | Floodplain mapping | Incentive insurance | Cleaning and channeling program | Assess the performance of post Wave 1997 drainage systems |
| Coastal Flood | Increased availability of floodplain and damage maps | Planning on a watershed basis according to floodplain boundaries and elevations | Cleaning and channeling program | Assess the performance of post tropical storm Debby and Wave 1997 drainage systems |
| Earthquakes | Identify map and monitor critical natural areas | Incentive insurance | Cleaning and channeling program | Assess the performance of post tropical storm Debby and Wave 1997 drainage systems |
| Volcanic eruptions | Increased availability of floodplain and damage maps | Planning on a flood plain basis | Research disaster response for yachts | Construction according to building code |
| Fire | Development of earthquake scenarios | Building code enactment and enforcement | Relocation and Retrofitting | Construction according to hazard areas |
| | Design of disaster scenarios. | Planning according to hazard areas | According to past events and scenarios. | Construction according to hazard areas |
| | Identification of hazard zones | | | |
| | Create fire and | Adopt a building | Increased inspection | Intro of code |

| | | |
|--|-------------|---------------------|
| | damage maps | code |
| | | Incentive insurance |

12.0 MITIGATION ACTIVITIES.

12.1. General Mitigation Measures.

Identification and Mapping of Hazardous and Vulnerable Areas.

Mitigation activities cannot be totally effective if we do not know the characteristics of a specific hazard and the delimitation of specific vulnerable areas; hence the importance of mapping vulnerable areas to specific hazards.

These maps are extremely important for the for the identification, planning. Execution and evaluation of structural and non-structural mitigation measures: structures, retrofitting, land development, insurance, etc.

Recommendation: The National Hazard Mitigation Council will identify the areas vulnerable to hurricane impact (rainfall and wind), floods (delimitation and elevation), earthquakes, landslides and fires. Maps have to be designed showing the hazard characteristics (when applicable) the extent of damage and the delimitation of the impacted areas.

–

New Development Must Not Increase Vulnerability

This is a basic ingredient of any hazard mitigation program that should be established as a basic premise of the enforcement process and later code enforcement. The level of legal protection which currently exists may be sufficient to increase public and private security from hazards, if the inspectors and other enforcement agents are trained and supported in the application of the existing laws, and if that process is based on clearly understood principles.

Recommendation:

The Ministry of Physical Development should ensure that new development does not increase vulnerability.

Public Facilities Should Decrease Vulnerability

In application, this policy can be used to support added facilities in public buildings so that they become reliable public shelters during and after a disaster or to build redundant infrastructure to increase reliability or to build a higher construction standard to offer increased security and decreased damage during a disaster.

High Density Development Should Be Located in Areas of Relatively Low Hazard Vulnerability

The previous analysis has identified high-density development as a major element in vulnerability. This policy simply suggests managing density by paying special attention to high-density developments and cluster developments. These developments should be located in areas of relatively low risk. This policy can be implemented by increasing information available to developers and builders, and by training public agencies that have access to information on relative hazards of development alternatives to be more aggressive in sharing this information with the public.

12.2 Hazard Mitigation for New Development

Hazard mitigation for new development can substantially decrease the vulnerability areas to hazards over the long term. These priorities all include the four main general mitigation measures mentioned in 12.1 above:

- Identification and Mapping of Hazardous and Vulnerable Areas
- New Development Must Not Increase Vulnerability
- Public Buildings Should Decrease Vulnerability
- Locate High Density Development in Areas of Relatively Low Hazard Vulnerability

Implement Priorities for New Development

Recommendation

A building code for the island must be adopted and enforced

At various times in Saint Lucia's history building codes have been proposed, written, and edited. Such a document can be a major advance for disaster mitigation and would offer considerable increase in long-term cost savings from future disasters at modest current increases in construction costs.

In 1997 a Draft Building Code was circulated for comment. Upon adoption the following schedule should be considered:

- For existing buildings: 90 % Compliance with the code within 5 years of its adoption;
- For existing buildings: 100 % Compliance with the code within 10 years of its adoption;
- For New buildings: Immediate compliance with the code;

Recommendation

The Utility Companies should investigate a number of energy efficient steps needed to be implemented to reduce dependence on the public power system in future disasters.

Among the new options that need to be encouraged, promoted or specified for new construction are:

- Requiring manual water pumps (gravity-feed systems, pitcher pumps or yacht-type pumps could be used) in kitchens and bathrooms for easier access to cistern water;
- Incentives for shutters;
- Incentives for back-up or passive solar systems for water heating and possibly low level lighting or fan applications;
- Solar panels for cellular phones and newer personal communications devices;
- Research other incentives for other feasible alternative energy systems.

Improved insurance programs will be essential to maintaining the confidence of residents and especially new investors.

Research and Plan for New Development

Recommendation

The National Emergency Management Office together with the Ministry of Physical Development and Ministry of Agriculture should identify priority measures for hazard mitigation measures relating to surface and groundwater resources.

For these purposes, the Water Resource Management Unit of the Ministry of Agriculture has the National Water Policy.

Recommendation

The National Emergency Management Office, Ministry of Physical Development, Ministry of Agriculture and the Ministry of Finance should study construction and development permitting activities (Coastal Zone, earth change, occupancy, etc.) to determine if consolidation and streamlining of the permitting process can be combined with improved mitigation incentives. By highlighting accountability, it should be possible to combine efficiency with improved protection of vital public interests.

Among the issues to be studied would be:

- Standards for subdivision regulation, storm water management, etc.;
 - Density management, including bonuses for clustering in new developments;
 - Enforcing of setbacks or buffer zones;
 - Protect natural mitigation features;
 - Introduction of building standards as they affect permits processing.
-

Recommendation

The Inland Revenue Department should investigate the need for a study of new real estate tax schedules that might be used to promote hazard mitigation as a complement to the insurance rate reforms.

Train and Build Institutional Capacity for New Development

The adoption of new building codes makes more acute the need for a **long-range training** and development program for those who will use the codes: **inspectors**, other public officials, private architects, draftsmen, developers and builders.

Recommendation

The Ministry of Physical Development should build its capacity to incorporate new hazard mapping and improved understanding of dynamic hazard processes into Coastal Zone permitting and other major permit programs.

Recommendation

Cumulative hazards mapping should be a priority concern for NEMO. These cumulative hazards would include issues ranging from geologic studies for landslide potential, land use/sedimentation rates, to long-term impacts on coasts resulting from the deterioration of fringing reefs.

12.3 Retrofitting of Public and Private Structures

Retrofitting public and private structures can substantially decrease the vulnerability of structures to hazards over a much shorter term. These priorities presented below all are congruent with the main general mitigation measures mentioned in 12.1, above.

- Identification and Mapping of Hazardous and Vulnerable Areas
- New Development Must Not Increase Vulnerability
- Public Buildings Should Decrease Vulnerability
- Locate High Density Development in Areas of Relatively Low Hazard Vulnerability.

Among the strategies to be considered for public facilities are:

- Design changes;
- Retrofitting community facilities;
- Hazard-proofing new community facilities to enhance survivability and to improve utility as public shelters;

- Improved **siting standards** to avoid hazards;

Retrofit Public and Private Structures

These projects can be ongoing, and added resources may be directed to address many of the most acute infrastructural problems leading to flood damages. Priorities include:

- Rebuilding public structures and facilities above the new construction standards to meet the policy of using public facilities to reduce vulnerability,
- Adding facilities to existing public structures such as baths and first aid rooms for improved secure shelter facilities,
- Building redundant critical facilities, such as communications systems,
- Improve the resistance of utility and communications facilities,
- Equipping facilities with back-up power and water systems.

Recommendation

The Electrical Power Company (LUCELEC) should build back-up power systems, including a study of the feasibility of alternative power sources to keep critical facilities operating in the face of prolonged power losses and flooding.

Recommendation

The Electrical Power Company (LUCELEC) should design a series of incentives to encourage people to apply feasible low-energy solutions that will significantly enhance their ability to survive and prosper in the aftermath of a disaster.

Research and Plan to Retrofit Public and Private Structures

- Protection of **hospitals** is a special concern given extensive damages that have occurred to the hospitals in recent disasters (VH - Fire, Golden Hope and Soufrière Hospitals - Wave of '96). Hospital Administrators, Ministry of Health together with LUCELEC Authorities will need to discuss emergency power supplies. Also to be considered by Health Authorities are double roof systems, improved anchoring and ensuring access to supplies of repair materials to hasten restoration of services.

Recommendation

The retrofitting project started by OAS and executed by the National Research and Development Foundation and the Sir Arthur Lewis Community College should be continued on a wider scale.

Recommendation

The Ministry of Works and the Ministry of Finance will explore a new OAS initiative aimed at public buildings.

- Retrofitting options need to be studied for storm proofing the Water and Sewerage Company (WASCO) water distribution systems.
-

Recommendation

Mitigation priorities should include priorities for protecting and upgrading of public and private structures in areas of *National Historic Importance* while incorporating *design* features that extend and enhance the appearance of the area/structure.

Engineering studies of school facilities will identify options for the improvement of schools to protect essential services and shelter facilities, while applying less stringent and costly standards to non-critical areas such as walkways and basic classrooms.

Recommendation

There is a priority need for the WASCO in collaboration with LUCELEC to provide a new assessment of the current flood-proof status of the sewage treatment and in-take plants with a plan detailing the benefits and costs of upgrading these facilities. This study of alternatives will include cost/benefit calculations for the use of alternative energy systems to power these critical distribution systems.

This study should feed directly to the implementation priority above. This study will also include the costs and feasibility of consolidating multiple smaller sewerage systems.

Train and Build Capacity to Retrofit Public and Private Structures

There is currently no government-wide facilities planning function within the Government. Coordinated facilities planning create the possibility for much more effective hazard mitigation than the individual, uncoordinated actions of a dozen or more departments and agencies on three islands. A high priority is accorded to building a government-wide facility planning capability.

The adoption of a building code and construction standards for public and private construction would create the need for a long-range training and institutional development program for those who will use the codes-both public officials and private architects, draftsmen, developers and builders. There is a need for a professional development strategy for a new code, and other aspects of permitting and application processing for development related activities.

Other activities

- The study of new technologies and configurations to ensure more reliable telephone service in the event of a disaster is a major priority, made much more feasible by recent advances in fiber optic, cable and other communications technologies.
- Mooring systems and hurricane warning response systems for boats and marinas need to be studied to determine basic hazard mitigation steps to be taken for this sector. Given the possibility of high loss of life and the high environmental impacts of grounding and recovery activities in the coastal areas, this is a **high priority**.
- • Watershed planning activities for mitigation of disaster effects and pollution effects of natural hazards, such as increased sediment loads and pesticide runoff are a priority for hazard mitigation.

12.4. Research, Technical Assistance, Training and Education.

This plan takes a strong position that a major focus of the Hazard Mitigation Plan should be based on empowering individuals by providing them with improved and more accessible information about hazards. There are a variety of natural hazard research issues that need to be developed and translated into information products or educational tools that can be applied to hazard mitigation.

Implement to Disseminate Information

Recommendation

The skills of the Folk Research Centre should be harnessed in the dissemination of information.

Recommendation

The National Emergency Management Office with the assistance of the Government Information Service and the Ministry of Physical Development need to actively publicize "Best and Worst Construction Practices"

The private press can implement this priority, with only technical guidance from Government Offices. The point of this exercise should be that the purchaser can actively exercise control over the hazard mitigation capabilities of his own property, regardless of the formal (minimal) capabilities defined by nominal building standards.

Recommendation

The National Emergency Management Office with the assistance of the Sir Arthur Lewis Community College need to involve the private sector and the research and development community in the development of concrete research proposals.

Some of the obvious **topics of concern** (with a special eye to the lessons of TS Debby and Wave of '96) include:

- Detailed studies of roofing materials and construction systems, which seem to have failed under severe weather conditions;
- Micro-models of "tornado" generation or wind funneling effects in the valleys, as a guide to improved structure siting;
- Re-evaluation of the cost/benefit function of hardened waterfront bulkheads;
- Methods to minimize "fratricide" among boats in crowded anchorage;
- Restudy "life-cycle costs" of major development and infrastructure programs, in the light of recent damages;
- Studies of improved methods for ensuring better compliance with established standards-creating incentives for better enforcement;
- Establish or analyze the results of beach, mangrove and salt-pond monitoring programs;
- Location of landslide hazards, information currently exists concerning the identification of regions or sites most susceptible to landslides however with each incident involving rain new sites emerge;
- Tsunami construction and mitigation standards;
- A large training and communication element to communicate the lessons learned by these researches.

It is especially important that these studies and dissemination activities be applied by individuals and agencies with intimate knowledge of the conditions of small tropical islands in general and Saint Lucia specifically. Too many studies waste too much money teaching the researchers the reality of life in small islands.

Recommendation

The National Emergency Management Office must assist with the protection of libraries and government archives as a special priority for Saint Lucia for its unique history, culture and natural environment.

Archival materials are extremely important for effective management of hazard mitigation activities. In the past, and continuing; disaster response and recovery activities have been retarded because of the inability to locate essential public records, reports or studies. This problem has been especially acute with the destruction of many key Offices. A high priority should be placed on **building and protecting repositories** of public records including those backup and ancillary collections maintained by non-governmental organizations.

The National Emergency Management Office has held preliminary consultations with Agencies involved in this area and with further meetings pending the following has emerged:

- The need for a group insurance policy coverage. Many of the items are priceless and irreplaceable and thus premiums are high, however insurance coverage will allow for the sourcing of copies;
- The need for a disaster management plan. The Museum Association of the Caribbean (MAC) has developed a model plan. This has been circulated with supporting data to agencies with such responsibilities;

Plan and Research to Disseminate Information

Recommendation

Special environmental monitoring should be conducted for the sites entrusted to the Saint Lucia National Trust and the Archaeological and Historical Society.

These studies will help to assess both storm effects and the interaction of environmental stress and long-term damages to environmental resources that are known to mitigate disaster effects.

Train and Build Capacity to Disseminate Information

The present lack of public access to geographic information is a major on-going problem in discussing and planning mitigation. GIS efforts in the Saint Lucia, though recent is progressing at an acceptable rate.

Cost recovery based on the economies of scale possible for a centralized data facility (e.g. Survey and Mapping Unit) will permit data and map products to be made available at reasonable cost, while permitting full funding of an effective center.

Plan and Research for Hazard Warnings

The National Emergency Management Office together with the Met Services, Ministry of Education and the Chamber of Commerce has been studying the adequacy of warnings to determine if they were adequate. A revised system has been proposed see Appendix A.

12.5 Financing Issues.

Finance Hazard Mitigation

There is a need for new Private-Public Partnerships for hazard mitigation. This plan is based on the proposition that government is the junior partner in league with business for development. Only when business can actively pursue its development goals can government secure the

funding to support services necessary to promote the welfare of all. At the same time, even as a junior partner, government brings special capabilities to the partnership. This is especially true in the case of hazard mitigation, where government is at the nexus of an enormous web of information and recovery and mitigation resources that can be used to promote the welfare of all.

Train and Build Capacity to Finance Hazard Mitigation

A major constraint on mitigation management in the aftermath of a natural hazard is the inability to estimate economic and Government fiscal effects resulting from the loss of economic resources and tourist markets. There is a priority to implement economic and fiscal forecasting models.

National Emergency Management Office, in association with a variety of non-governmental resources and private sector organizations, is committed to an open dialogue with the business and development communities to maintain the best possible use of hazard mitigation information and resources throughout the island. As part of the mitigation program National Emergency Management Office intends to seek active partnerships with private groups to promote information exchange and technical assistance.

13.0 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.

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 coordination 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 - Soufrière 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 |

SECTORS TO BE CONSULTED IN 2003 CONSULTATION

| | | |
|--|---|---|
| <p><u>NEMO:</u></p> <ol style="list-style-type: none"> 1. National Chairmen of NEMO (11 members) 2. District Chairmen of NEMO (18 members) 3. Director of NEMO 4. Deputy Director of NEMO 5. National Emergency Management Council (NEMAC) 6. Government Liaison officers (20) 7. Community Development Officers (18) | <p><u>Unions:</u></p> <ol style="list-style-type: none"> 1. Saint Lucia Teachers Association 2. Principal Associations 3. Saint Lucia Civil Service Association | <p><u>Christian Associations:</u></p> <p style="text-align: right;">Saint Lucia Christian Council SDA - Relief Agency CARITAS Antilles</p> |
| <p><u>Private Sector:</u></p> <ol style="list-style-type: none"> 1. Water and Sewerage Company (WASCO) 2. Saint Lucia Electricity Services (LUCELEC) 3. Telecommunication Companies: Cable and Wireless, 4. Digicel, 5. ATT 6. Saint Lucia Banana Corporation 7. Tropical Quality Fruits 8. JQ 9. Julian's, | <p><u>Associations:</u></p> <ol style="list-style-type: none"> 1. Chamber of Commerce 2. Chamber of Agriculture 3. Small Contractors 4. Medical & Dental Association 5. Saint Lucia Association of Architects 6. Saint Lucia Association of Engineers 7. Saint Lucia Association of Information Resource Services 8. Saint Lucia Town and Country Planning Association 9. Saint Lucia Media Association 10. Saint Lucia Hotel Tourism Association 11. Saint Lucia Bar Association 12. Saint Lucia Association of Social Workers 13. Minibus Association. | <p><u>Authorities:</u></p> <ol style="list-style-type: none"> 1. National Conservation Authority. 2. Saint Lucia Solid Waste Management Authority. <p><u>Service Groups:</u></p> <ol style="list-style-type: none"> 1. Rotary 2. Kiwanis 3. Lions 4. Toastmasters |
| <p><u>Government Ministries/Agencies:</u></p> <ol style="list-style-type: none"> 1. Prime Minister's Office 2. Ministry of Physical Development, Environment and Housing. 3. Ministry of Communications, Works, Transport and Public Utilities. 4. Ministry of Health 5. Ministry of Education 6. Ministry for External Affairs 7. Ministry of Agriculture, Forestry, and Fisheries. 8. Ministry of Public Service 9. Ministry of Tourism 10. Ministry of Local Government | <p><u>Regional Organisations:</u></p> <ol style="list-style-type: none"> 1. Organisation of American States 2. Caribbean Disaster Emergency Response Agency. 3. Organisation of eastern Caribbean States. 3. OECS/NRMU. 4. Caribbean Development Bank 5. Office of Foreign Disaster Assistance (OFDA) 6. Caribbean Electric Utility Services Corporation (CARILEC). | <p><u>NGO's:</u></p> <ol style="list-style-type: none"> 1. National Council of Disabled 2. National Council of Senior Citizens (Club 60) 3. Insurance Council 4. Saint Lucia Red Cross 5. Saint Lucia National Trust 6. Saint Lucia National Archives 7. Folk Research Centre 8. National Research and Development Foundation 9. St. John's Ambulance. 10. Saint Lucia Animal Protection Society. 11. Archaeological and Historical Society. |

| <ul style="list-style-type: none"> 11. Government Information Service 12. Attorney General's Chambers 13. Met Office 14. Saint Lucia Fire Department 15. Royal Saint Lucia Police Force 16. Library Services 17. Saint Lucia Tourist Board | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>Hazard Mitigation Council</p> <ul style="list-style-type: none"> 1. Minister of Works Chairman 2. Deputy Chair Permanent Secretary, Ministry of Physical Development 3. Permanent, Secretary Ministry of Education 4. Permanent Secretary, Ministry of Health. 5. Permanent Secretary, Ministry of Agriculture. 6. Chairperson. Emergency Works Committee. 7. Representative Chamber of Commerce. 8. Coordinator. Crisis Management Unit. | <p>Policy Development Committee Members:</p> <ul style="list-style-type: none"> 1. CPC Consultant. 2. Ministry of Education* 3. LUCELEC* 4. Sustainable Development Unit.* 5. NEMO* 6. Ministry of Agriculture* 7. Ministry of Physical Development* 8. Institute of Construction 9. Saint Lucia Port Authority* 10. Poverty Reduction Fund <p>* Already mentioned in the NPIC or in a previous category.</p> | <table border="0"> <thead> <tr> <th style="text-align: left;">National Implementation (NPIC)</th> <th style="text-align: left;">Project Committee</th> </tr> </thead> <tbody> <tr> <td>1. Mr. Herbert Regis Ministry of Communications</td> <td></td> </tr> <tr> <td>2. Mr. Peter Calderon Ministry of Communications</td> <td></td> </tr> <tr> <td>3. Dr. Mc Donald Chase Ministry of Health</td> <td></td> </tr> <tr> <td>4. Mr. Fillan Nicholas SALCC</td> <td></td> </tr> <tr> <td>5. Mr. Vaughn Charles Ministry of Agriculture – Fisheries Dept.</td> <td></td> </tr> <tr> <td>6. Mr. Michael Bob Ministry of Agriculture – Forestry Dept.</td> <td></td> </tr> <tr> <td>7. Mr. Julius Polius Ministry of Agriculture – Agriculture Dept.</td> <td></td> </tr> <tr> <td>8. Mr. Sylvester Chastanet Ministry of Agriculture – Field Scientist</td> <td></td> </tr> <tr> <td>9. Mr. Trevor Louisy/Victor Emmanuel LUCELEC</td> <td></td> </tr> <tr> <td>10. Ms. Tanya Warner Ministry of Tourism</td> <td></td> </tr> <tr> <td>11. Ms. Rosemarie Harris GIS</td> <td></td> </tr> <tr> <td>12. Mr. Daune Heholt Ministry of Physical Development</td> <td></td> </tr> <tr> <td>13. Ms. Cynthia Oulah Ministry of Physical Development</td> <td></td> </tr> <tr> <td>14. Ms. Judith Ephraim Ministry of Physical Development</td> <td></td> </tr> <tr> <td>15. Ms. Joanna Raynolds Ministry of Physical Development</td> <td></td> </tr> <tr> <td>16. Mr. Laurinus Lesfloris Saint Lucia Solid Waste Management Authority</td> <td></td> </tr> <tr> <td>17. Ms. Diane Smith Insurance Council of Saint Lucia</td> <td></td> </tr> <tr> <td>18. Mr. Bonaventure Jn Baptiste Ministry of Education</td> <td></td> </tr> </tbody> </table> | National Implementation (NPIC) | Project Committee | 1. Mr. Herbert Regis Ministry of Communications | | 2. Mr. Peter Calderon Ministry of Communications | | 3. Dr. Mc Donald Chase Ministry of Health | | 4. Mr. Fillan Nicholas SALCC | | 5. Mr. Vaughn Charles Ministry of Agriculture – Fisheries Dept. | | 6. Mr. Michael Bob Ministry of Agriculture – Forestry Dept. | | 7. Mr. Julius Polius Ministry of Agriculture – Agriculture Dept. | | 8. Mr. Sylvester Chastanet Ministry of Agriculture – Field Scientist | | 9. Mr. Trevor Louisy/Victor Emmanuel LUCELEC | | 10. Ms. Tanya Warner Ministry of Tourism | | 11. Ms. Rosemarie Harris GIS | | 12. Mr. Daune Heholt Ministry of Physical Development | | 13. Ms. Cynthia Oulah Ministry of Physical Development | | 14. Ms. Judith Ephraim Ministry of Physical Development | | 15. Ms. Joanna Raynolds Ministry of Physical Development | | 16. Mr. Laurinus Lesfloris Saint Lucia Solid Waste Management Authority | | 17. Ms. Diane Smith Insurance Council of Saint Lucia | | 18. Mr. Bonaventure Jn Baptiste Ministry of Education | |
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| | | 20. Mr. Martin Renee The Institute of Construction (Saint Lucia) |
| | | 21. Mr. Trevor Bristol Chamber of Commerce Insurance & Agencies |

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