

National Report of



**Integrating the
Management of
Watersheds and
Coastal Areas in St.
Lucia**

**Executed by the
Water Resources Management Unit,
Ministry of Agriculture, Forestry and
Fisheries**

Government of St. Lucia

July 2001

27 8'92

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List of Abbreviations

1. BSCR – Biodiversity Study Country Report
2. CARDI – Caribbean Agricultural Research and Development Institute
3. CAST – Caribbean Alliance for Sustainable Tourism
4. CBO – Community Based Organization
5. CEHI – Caribbean Environmental Health Institute
6. CIDA – Canadian International Development Agency
7. CMHI – Caribbean Meteorological and Hydrological Institute
8. CPACC – Caribbean Planning for Adaptation to climate change
9. CRIS – Coastal Resources Information System
10. CZMU – Coastal Zone Management Committee
11. GOSL – Government of St. Lucia
12. HTS – Hunting Technical Services.
13. HYDATA – Hydrological Data Analysis
14. MAFF – Ministry of Agriculture, Forestry and Fisheries.
15. MPDEH – Ministry of Planning, Development, Environment and Housing
16. NCA – National Conservation Authority
17. NEMO – National Emergency Management Organization
18. NGO – Non governmental Organization
19. NWSC – National Water and Sewerage Commission
20. OECS – NRMU – Organization of Eastern Caribbean States – Natural Resource Management Unit.
21. SIDA – Swedish International Development Agency

- 22.SLASPA – St. Lucia Air and Sea Port Authority
- 23.SMMA – Soufriere Marine Management Area
- 24.UNEP - CAR / RCU – United Nations Environment Programme-
Caribbean Regional Co-ordinating Unit.
- 25.UNFCCC – United Nations Framework Convention on Climate Change
- 26.WASA – Water and Sewerage Authority
- 27.WASCO – Water and Sewerage Company
- 28.WIBDECO – Windward Islands Banana Development Company
- 29.WMAF – Watershed Management Action Force

Foreword

This National Report on Integrating the Management of Watersheds and Coastal Areas in St. Lucia has been written as a result of the Regional Inception Workshop, held in Kingston, Jamaica, March 30-31, 2000. This workshop initiated the development of a major project on Integrating Management of Watersheds and Coastal Areas in Small Island States in the Caribbean. It is expected that the various national reports will be synthesized into a joint brief for the further development and submission of a proposal to the Global Environment Facility (GEF) for funding.

This report is intended to present the key issues that relate to watershed management and coastal area management activities. It is expected that solutions will be proposed to address concerns presented to assist in the improvement of watershed and coastal area activities and thus ensure the sustainability of their associated resources.

The key areas under consideration are : freshwater habitats and ecosystems, water resources (availability, supply, demand, quality), land use, climate change and natural disaster, coastal habitats and ecosystems, living and non living marine resource exploitation, pollution, tourism, health, data, information management and research, stakeholder participation, awareness and education, institutional frameworks.

The importance of integration of watershed and coastal areas management will be explored with specific consideration being given to legal and policy issues, institutional arrangements and financial issues.

This report was written according to guidelines set in the Outline for National Reports. A national working committee was formed comprising of the following individuals from various government departments to facilitate the preparation of this report:

1. Deborah Bushell - Ministry of Agriculture, Water Resources Management Unit. (Committee Chairperson)
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Chapter 1

1.0 Introduction

1.1 Geographic Location

1.2 Topography

1.3 Climate and Rainfall

1.4 Geology and Hydrogeology

1.5 Water Availability

1.6 Demography

1.0 Introduction

1.1 Geographic Location

St. Lucia forms part of an archipelago of islands located in the Eastern Caribbean at latitude 14 degrees north and longitude 61 degrees west as seen in Fig 1.0. It is 238 sq. miles (616 km²) in area, 27 miles (43.4 km) long and 14 miles (23.5 km) wide.



Fig 1.0 : Map of St. Lucia

1.2 Topography

The island is of volcanic origin and is very mountainous with lush green landscapes, comprising more than a dozen peaks and ridges over 2000 ft. (600m). There are mainly two physical regions : the northern half having been eroded to ridges and wide flat valleys, and the south and central regions consisting of steep walled valleys and mountain peaks [Towle et al, 1991]. The main drainage network emanates from the mountain peaks due to the rugged topography. As a result the river channels in the upper catchments are deeply incised into the volcanic terrain. Fig 1.1 illustrates the topography of the southern region of the island.



Fig 1.1 Topography of Southern Region of the Island

1.3 Climate and Rainfall

The island's climate can be described as tropical marine with an average temperature of 27 ° C and relative humidity of 75%. There are strong north easterly winds, which yearly, provide a cooling effect which facilitate the existence of microclimate, varying with height, location and orientation.

Rainfall is not evenly distributed thus resulting in a dry season from December to May and a wet season from June to November. This rainfall ranges from 1450mm at the coast (Hewanorra) to 3450 mm in the central region (Edmund Forest). The rainfall in the extreme north and south is the lowest and tends to be cyclonic in nature whereas the interior receives most of the rainfall most of which is orographic in nature. There is a high risk of hurricanes from June to early October and threats of tropical storms with high winds and heavy rains through to November. Fig 1.2 illustrates the distribution of average annual rainfall.

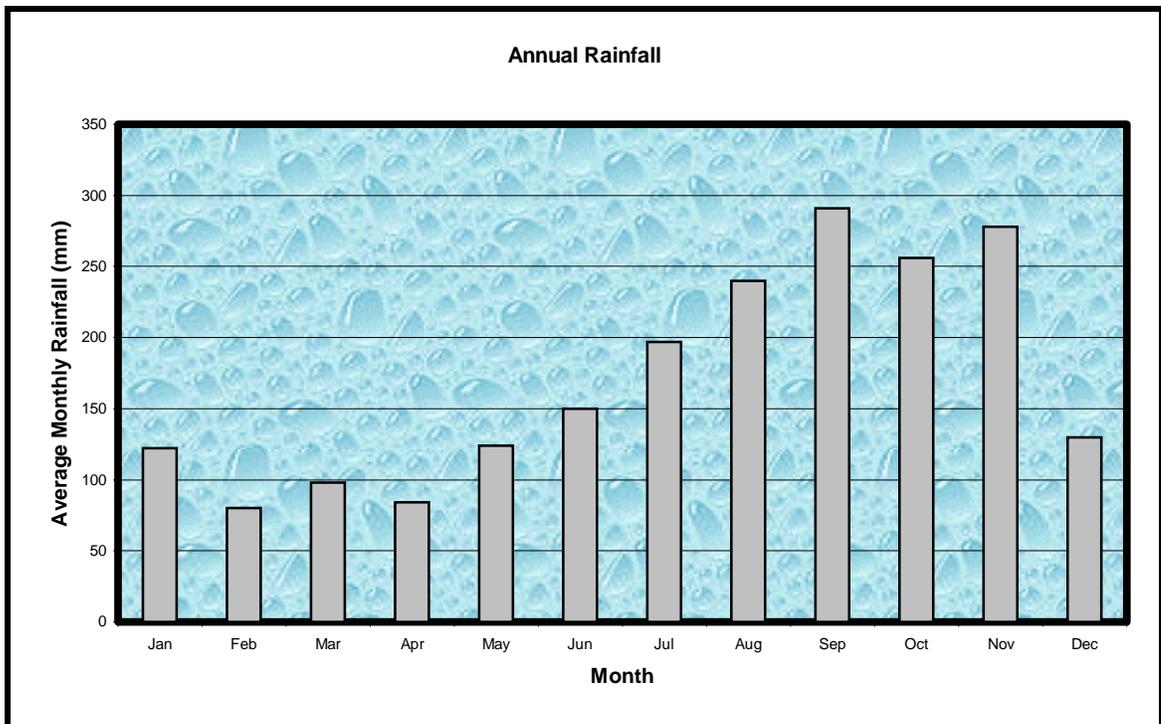


Fig. 1.2 : Average Monthly Rainfall [Source : Min. of Agriculture]

1.4 Geology and Hydrogeology

The island, as previously indicated is of volcanic origin with an active volcanic site comprising near surface hydrothermal hot spots with geothermal energy potential. St. Lucia can be described as geologically young not exceeding 50 million years with rocks such as rhyolite, andesite and various basalts [Towle et al, 1991]. Fig. 1.3 illustrates the geological classes found in St. Lucia.

The rock formations present are classified into three series as indicated by Newman 1965, shown below [Towle et al, 1991]:

- *Northern Series (Early Tertiary- Eocene) – older rocks predominantly basaltic in composition, heavily folded and of Eocene age. In some areas in the north one can find Andesite Porphyry and Rhyolite.*

- *Central Series (Middle Tertiary – Miocene / Pliocene) – the central ridge (Barre D'Iisle) and the rocks underlying the eastern coast were formed thirty to forty million years ago due to an extended sequence of volcanic activity which generated extrusions of younger andesite, basalts, agglomerates and tuffs.*

- *Southern Series (Mid to Late Pleistocene)- the southern region in the area of the pitons, the volcano as well as Mount Gimie (the highest peak) can be found the newest (geologically) dacite segment. The region near the volcanic crater evolved when there was volcanic activity with dacite and pyroclastics after a series of thirty-three consecutive eruptions, which triggered avalanches of andesite pumice on the adjacent slopes.*

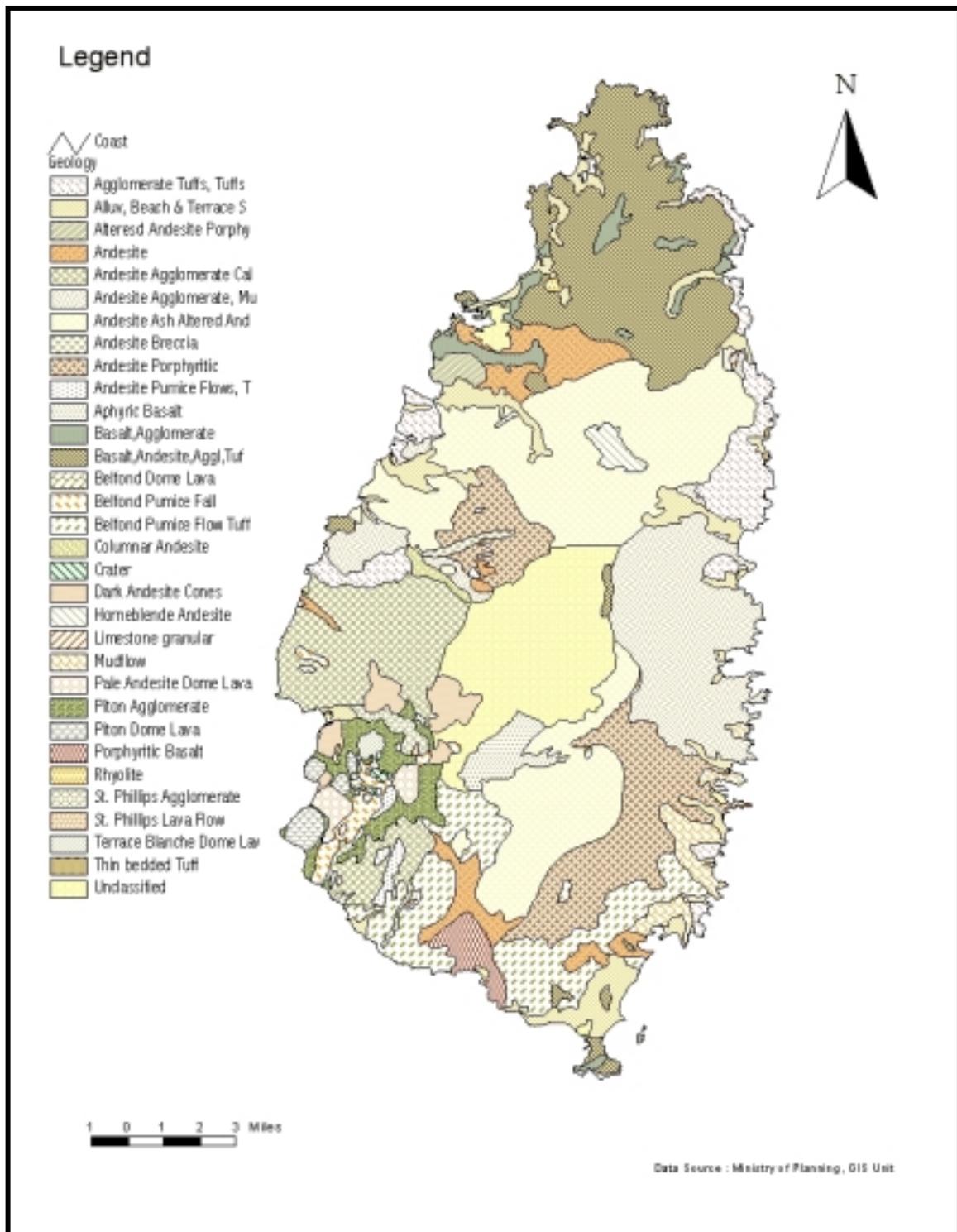


Fig. 1.3 : Geology

A study undertaken in 1986 indicated the following [Flynn et al, 1998] :

- Transmissive aquifers were likely to form from fractured and jointed lavas in some regions but siting of wells may prove difficult and should be supported by geophysical surveys. Poor water quality is expected in some areas.
- In some cases a clay type matrix was formed due to the decomposition of older basaltic and andesitic pyroclastics and can be considered to be an aquiclude.
- Near the volcano, in the Soufriere area, some pyroclastics are expected to be water bearing and with a good water quality.
- Productive aquifers can be found in many of the large alluvial plains.
- As a result of the whole island being tectonically tilted in recent geological times, with the west coast rising to sea level, an entrapment of saline water has developed in some alluvial plains on the western side.

1.5 Water Availability

Rainfall is the primary source of fresh water with 60% of the annual rainfall occurring between August to November. The uneven distribution tends to be problematic in the drier periods of February to April in the absence of adequate collection and storage facilities. The majority of the rainfall flows to the sea with very little percolating and being stored as ground water due to the rugged topography and the absence of intermediate collection points such as ponds and lakes.

In the dry season, the water available is due to river base flows as well as from limited dry season rainfall. The island tends to experience periods of drought especially in the southern region when the stream flows tend to fall below known historic base flows. As a result the entire residual flow of the sub catchment is used for water supply leaving the downstream segment completely dry.

1.6 Demography

The population of St. Lucia was 133,308 according to the last census in 1991 and is currently estimated at 154,452 for the year 2000 [Dept. of Statistics, GOSL]. The annual population growth rate is estimated about 1.64%. The population is concentrated in towns and villages along the coastal areas where most of the endangered species are found with about 66% residing in rural areas. The average household size is about 6 persons in rural areas and 4 persons in urban areas. Women head over 40% of the households, 46% being in urban areas and 38% in rural areas. The following tables give specific information regarding the distribution of population.

Table 1.0 - Settlements and Households in the Ten Demographic Districts of St.Lucia in 1998 [Dept. of Statistics, GOSL]

Demographic District	Settlements	Number of Households in Largest Settlement	Total Number of Households
Anse La Raye	16	462	1314
Canaries	6	279	504
Soufriere	39	812	1905
Choiseul	35	116	1491
Laborie	34	321	1677
Vieux Fort	25	989	3096
Micoud	30	805	3496
Dennerly	29	659	2760
Gros Islet	42	424	3656
Castries	96	617	13179

**Table 1.1 - Area and Population Density of the Major Regions in St.Lucia
(1994 - 1996) [Dept. of Statistics, GOSL]**

Regions	Area Sq. Km.	Population Density		
		1994	1995	1996
Gros Islet	101.5	140	142	147
Castries	79.5	686	698	722
Dennery	69.7	168	171	177
Micoud	77.7	198	202	214
Vieux Fort	43.8	315	320	331
Laborie	37.8	208	211	219
Choiseul	31.3	215	219	226
Anse La Raye/ Canaries	46.9	153	156	161
Total	539	265	269	273

Chapter 2

2.0 Current Watershed / Water Resources Management Issues

2.1 Freshwater Habitats and Ecosystems

2.2 Water Resources

2.2.1 Supply and Demand

2.2.2 Groundwater vis-à-vis Surface Water

2.2.3 Water Quality

2.3 Land Use

2.4 Climate Change and Natural Disaster

2.5 Pollution

2.6 Tourism

2.7 Health

2.8 Data, Information Management & Research

2.9 Stakeholder Participation / Awareness and Education

2.10 Institutional Frameworks

2.0 Current Watershed / Water Resources Management Issues

2.1 Freshwater Habitats and Ecosystems

There are thirty-seven (37) major watershed areas in St. Lucia as shown in Fig. 2.0 (refer to MAFF BSCR, 1998). At present, there are 7,500 hectares of forest reserve located along the central ridge that runs in a mainly north-south direction. With respect to water supply there are a total of seven important for water supply as follows:

- Marquis
- Roseau
- Cul-de-Sac
- Fond d'Or
- Troumasee
- Canelles
- Vieux Fort

Watersheds in the north-western corridor of the island, in particular the Choc and Castries Watersheds are characterised by their highly developed coastal areas which are significantly impacted by activities in the upper watershed. The Soufriere watershed is rich in coastal biodiversity which is also severely impacted by land-based anthropogenic activities.

The Forest Reserve includes a wildlife reserve wherein is located the rare and endemic St. Lucia Parrot (*Amazona versicolor*). Apart from the Forest Reserve **A System Plan of Protected Areas for St. Lucia** identifies the following management categories and management areas.

Table 2.0 : Management Categories and Management Areas

Management Categories	Management Areas
Wildlife Reserve	(within other management areas)
Marine Areas	(within other management areas)
Nature Reserve	La Tourney Nature Reserve Roseau Nature Reserve Union Nature Reserve
National Landmark	River Doree National Reserve Pigeon Island Nature Reserve
Historic Area / Historic Site	Morne Fortune Historic Area Tapion Historic Area Vigie Historic Area Choc Historic Area Roseau Historic Site Morne du Don Historic Site Paix Bouche Historic site
National Park	Grande Anse National Park Pointe Sable National Park Qualibou National Park Canaries National Park
Protected Landscape	Anse Galet Protected Landscape Esperence Protected Landscape Fond d'Or Protected Landscape Praslin Protected Landscape Anse Ger Protected Landscape Piaye Protected Landscape Anse Cochon Protected Landscape Marigot Protected Landscape Bois d'Orange Protected Landscape Fairview Protected Landscape
National Trail	(within other management areas)

A number of components of the areas identified for protection, have to date, been vested in the St. Lucia National Trust as follows:

- Fous Islands, Lapins Islands (Esperance Protected Landscape)
- L'Islet a Ramier
- Rouche Island
- Des Bateaux Rocks (Fond d'Or Protected Landscape)
- Dennery Island, Fregate Islands (Praslin Protected Landscape)
- Liverpool Rocks (Anse Ger Protected Landscape)
- Maria Islands, Savannes Bay (Pointe Sable National Park)
- Choc Park (Choc Historic Area)
- Marigot Bay Nature Reserve (Marigot Protected Area)
- Morne Fortune: Prevost Park, Inniskilling Monument, Powder magazine, Guard Cells, Stables, Apostles Battery (Morne Fortune Historic Area).

The Trust is responsible for the management of all of those heritage and cultural sites which have been vested in it.

The major concerns with respect to management of watersheds are uncontrolled agricultural intensification, poor agricultural practices, inappropriate land use, (such as cultivation or construction on steep slopes and along river banks), and direct and or, indirect discharge of untreated effluent into waterways. The Vieux Fort water supply system for example suffers from water quality problems resulting in the intake having to be relocated in the upper reaches of the watershed. This however significantly reduces the available dry season water supply. Problems encountered result in the main from inadequate public education and participation in ecosystem conservation efforts.

The Heritage Tourism thrust also contributes to the pressure placed on sensitive water catchment areas and water supply systems as is the case in the Canaries watershed. Other river systems of touristic value include, Anse-la-Raye, Doree, The rapidly growing population with the attendant demands for land and water for income generation has led to significant encroachment of sensitive water catchment areas and in some instances to unregulated abstraction of water. Waste discharge too, (domestic, industrial, agricultural) is also not regulated resulting in poor water quality especially in the lower reaches of the river system. As the residual stream flows necessary to support aquatic biota has not been determined, it is possible that current abstractions may in some cases exceed that required to sustain environmental quality.

The unreliability of stream flow and other data, where available, as well as the inadequacy of current monitoring programs pose one of the greatest challenge to improved water resource management.

Of importance also are the many wetland areas or swamps that are found in both inland and coastal plains. These include:

- La Tourney Nature Reserve: Sixteen (16) hectares of flat marshy land along the Vieux Fort River threatened by overgrazing and trampling by cattle; solid waste disposal; squatting; and housing development.
- Roseau Nature Reserve: Forty-two (42) hectares south and west of the Roseau River.
- River Doree National Landmark: Nineteen (19) hectare corridor along the steepest most spectacular on the island;
- Marigot Protected Landscape: Includes a swampy woodland, mangrove and scrub vegetation.

- Bois d'Orange Protected Landscape: Ninety (90) hectares of flat, marshy, alluvial terrain. Provides a habitat for birds and juvenile fish.
- Fairview protected landscape: Thirty-seven (37) hectare of mostly alluvial tract that provides a habitat for land crabs and aquatic birds.

Wetlands provide important habitats for a very diverse group of flora and fauna and are thus important to the island's biodiversity. In addition they are also important as regulators of coastal water quality, thereby providing protection to coral reefs, sea-grass beds, offshore fisheries and beaches.

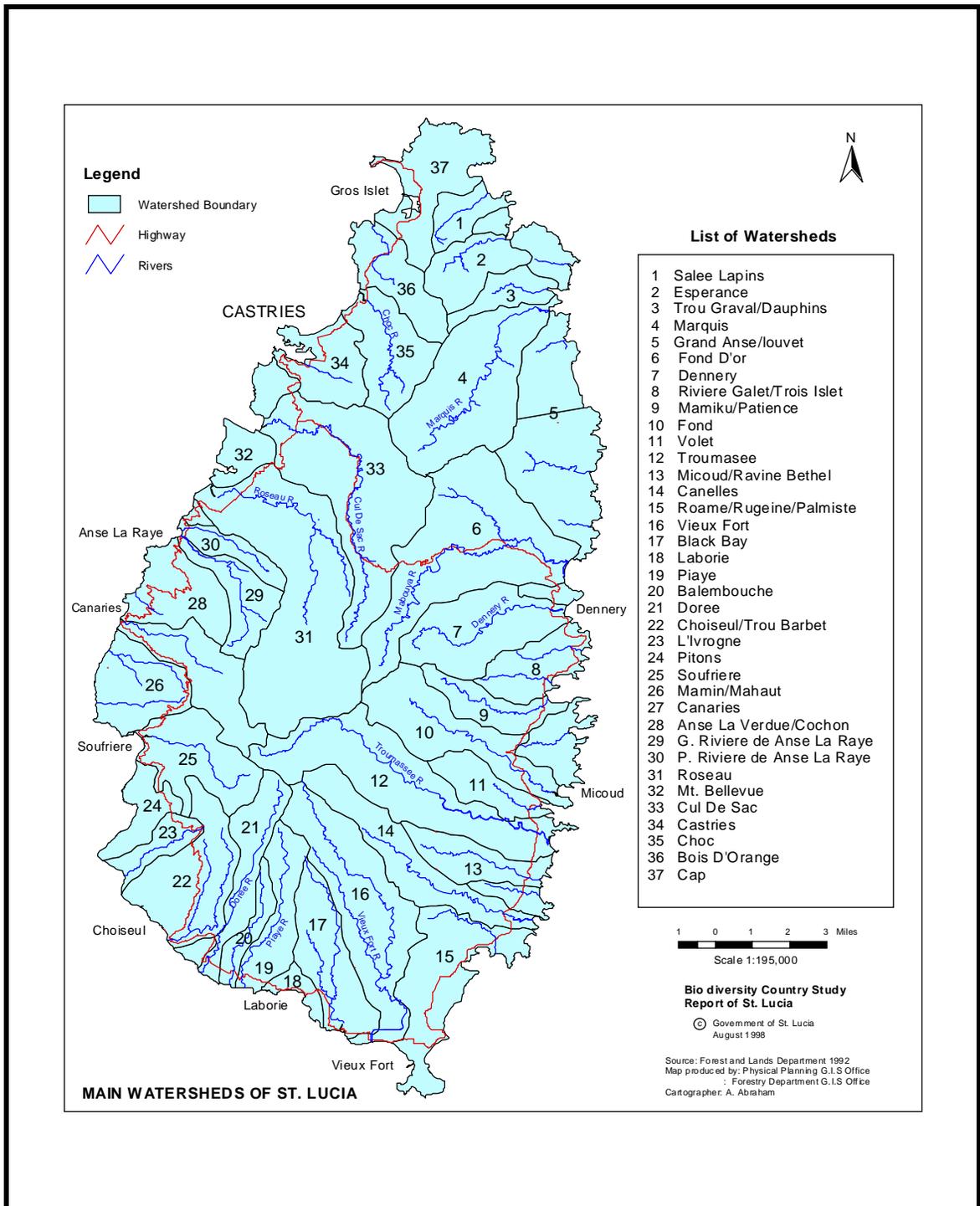


Fig. 2.0 : Location of Watersheds and Rivers

2.2 Water Resources

2.2.1 Water Availability, Supply and Demand

There are seven major watersheds in St. Lucia from which most of the water demand is met. These watersheds are: Marquis, Roseau, Vieux Fort, Canelles, Troumasse, Fond D'or and Cul de Sac as seen in Fig. 2.0.

In 1995, a new water supply system was developed to serve the northern half of the island, where the island's capital, and most of the tourism and commercial sectors are located. The system includes a 700 million gallon capacity dam on the Roseau River, a new intake weir on the Millet River (a tributary of the Roseau River), water transmission facilities, and a new Water Treatment Plant. This new facility is expected to provide a continuous supply for domestic, industrial, commercial, hotel and institutional users to 2025. The only setback currently experienced is the need to upgrade the existing distribution lines from the Treatment Plant.

With the exception of areas in the north, all other areas are supplied by surface water intakes located in the upper reaches of the watershed within which these are located. Treatment at the Dennerly, Canaries, Micoud and Anse-la-Rayé intakes comprise slow sand filtration combined with chlorination while for all the others minimal sedimentation and chlorination is the only treatment provided.

Prior to 1999, the Water and Sewerage Authority (WASA) was charged with the responsibility for water supply. Following the promulgation of new legislation (the Water and Sewerage Act (1999)), and the corporatisation of WASA, the Water and Sewerage Company (WASCO) is the first company identified to supply water to consumers under license.

The northern region benefits from the existence of the Roseau Dam (Roseau Watershed), a 2.6 Mm³ [Flynn et al, 1998] capacity structure commissioned in 1995. although there are still problems with the water supply, which mainly lie in the inadequacy of the distribution system due to poor infrastructure. The north - western region is essentially the main tourism belt of the island as well is the region of preferred settlement on the island. Over 60% of the population resides in the north and the current distribution network is unable to meet the growing demands of this region.

In the southern region the water supply situation is more critical. There, raw water as well as treated water storage facilities are totally inadequate to meet the growing demands especially in the dry season. Unofficial estimates indicate that disruptions in the water supply range between 50 to 150 days per year, for several hours per day [Lloyd et al, 1996]. It represents the most critical area on the island with respect to water supply. The south has been targeted for extensive development ranging from hotels to a sports stadium, development projects which depend heavily on the availability of a reliable supply of water

Water demand continues to change rapidly in certain regions for example the extreme north due to high infrastructural development and migration of people from other regions into areas in the north and other major centers of commercial activity in the south. According to HTS a, 1997, a study undertaken in 1994 revealed the following. The population as indicated in 1991 was 136, 900 with a growth rate of 2%, the 1994 population was estimated as 145,000. This resulted in a total demand of 15.88 Mm³ per annum assuming a per capita consumption of 300 liters per day. Industrial demand was estimated as 3 Mm³. Losses are estimated as 30% which when added to the previous values result in an overall demand of 25

Mm³ per annum or continuous flow of 800 l/s. Taking irrigation demands of 15 to 22 Mm³ per annum with concentration in the dry season that a 6 month period, this equates to a supply of 1.25 m³ /s continuous over the irrigation season. With this being considered the overall island demand was found to be between 34 and 41 Mm³ per annum. The following table illustrates the demand among the various sectors.

Table 2.1 : Demand distribution among sectors

Description	Percentage %	
	1987	2010
Domestic / Minor Commercial	48.6	53.0
Hotels	9.6	10.0
Government/ Institutional	7.0	6.7
Industrial	2.5	5.3
New Commercial	0	2.0
Unaccounted for	32.3	23.0

[Source : Flynn et al, 1998]

Table 2.2 : Water Availability and Supply from Water Catchment Areas

River and Catchment	Catchment Area (km ²) from GIS	% of Total Area in Use	Avg. Base Flow (l/s)	Av. Dry Season Base Flow (l/s)	WASCO Demand (l/s)
Marquis	30.55	100	240	150	53
Fond d'Or	40.12	100	470	225	17<25
Dennery	19.25	100	270	137	8<10
Fond	18.00	100	285	150	8
Troumasse	32.43	100	650	400	5<10
Cannelles	16.83	100	300	150	13
Vieux Fort	28.99	100	480	250	75
L'Ivrogne	5.56	100	95	65	10
Soufriere	15.73	100	440	200	8
Canaries	24.24	100	300	175	8
Anse La Raye	8.91	100	175	87	5
Roseau	48.08	100	1050	550	145
Cul de Sac	38.8	100	500	237	25
Choc	13.55	100	100	50	10

[Source: Lloyd et al, 1996]

The current tariff structure, which exists, has been inherited by WASA with increases made to offset the financial indebtedness of the new company WASCO. There is a certain degree of cost recovery but this has not been quantified in terms of medium to long term plans. A financial plan is being drawn up but no steps have been taken to determine the economic value of water. The following is a tabulation of the previous and existing tariff structure.

Table 2.3 : Previous and Existing Tariff Structure

		<u>RATES / 1000 GALLONS</u>	
		<u>Prior to 2000 (\$)</u>	<u>Current (\$)</u>
Domestic	less than 3000 gals	4.10	7.35
	more than 3000 gals	7.78	15.00
Commercial		10.28	20.00
Government		6.4	14.00
Ships		40	40.00
Hotels		11	22.00

With respect to water conservation and reuse very little attention is given. Hotels are often encouraged to install water saving devices throughout during the construction of their facilities as well as retrofit some of the older properties with such devices. On the domestic level very little is done in an effort to conserve water.

Irrigation is currently practiced privately and on a very small scale where private users abstract water directly from rivers downstream of water intakes as stipulated by law. However the need for irrigation systems in order to ensure stability and consistency of banana production for export is an issue that is currently being addressed by the Ministry of Agriculture. A total of 400 hectares have been targeted for irrigation by 2002.

2.2.2 Groundwater vis-à-vis Surface Water

Groundwater investigations in the 1960's indicated good reserves of water but due to problems associated with hardness, salinity and iron content, these reserves have never been exploited. Exploration for ground water began with a drilling program of 14 boreholes in the Union (North West). Of the boreholes drilled two were reported to have produced 7 liters per second (l/s), one of which had problems with the quality of water produced. A study undertaken in 1986 indicated the following [Flynn et al, 1998] :

- Fractured and jointed lavas were likely to form transmissive aquifers in some regions but siting of wells may be difficult and should be supported by geophysical surveys. Poor water quality should be expected in some areas.
- In some cases there was decomposition of older basaltic and andesitic pyroclastics into a clay type matrix and can be considered to be an aquiclude.
- In the Soufriere area near the volcano, some of the pyroclastics are expected to be water bearing and with good water quality.
- Due to the fact that the whole island has been tectonically tilted in recent geological times, with the west coast rising to sea level, this has caused entrapment of saline water in some alluvial plains on the western side.
- Many of the large alluvial plains contain productive aquifers.

The groundwater resources are restricted to the lower alluvial plains in most of the major watersheds such as Cul De Sac and Roseau. The reserves are estimated to be

inadequate for major use but could possibly support exploitation for small scale, domestic consumption. In cases where ground water was found there were many concerns with respect to water quality.

The primary source of fresh water is rainfall with approximately 60% of the annual occurring between August to November. This uneven distribution can be problematic in the drier periods of February to April in the absence of adequate collection and storage facilities.

As a result of the rugged topography and the absence of intermediate collection points such as lakes and ponds, the majority of this rainfall flows to the sea with very little opportunity for ground water storage. The natural forested areas make a significant contribution to the interception of this rainfall allowing infiltration into the sub surface thereby contributing to the sustaining of base flows beyond the rainy periods. In some cases springs are the source of supply as in the case of the Soufriere area. This available water increases in quantity during the periods of rainfall especially in the rainy season.

2.2.3 Water Quality

Sources of pollution originate from both domestic and agricultural sources. Water quality is a greater problem during the dry season as the dilution ratios are smaller. It should be noted that in the upper catchment areas where the water intakes are located, human settlements are often not present and thus contamination from domestic sources does not apply. Instead however contamination results mainly from agricultural activities in these areas.

River water quality is now critical due to unregulated agricultural expansion, especially banana cultivation in upland forested catchment areas, according to the

findings of the River Surveillance Monitoring Project by Lloyd et al. This research concluded that the most significant environmental variable affecting the reduction of diversity of the macro invertebrate (biological) community of St. Lucia's streams is the intensification of agriculture in combination with deforestation in the vicinity of the water supply stream intakes. This invariably leads to major deterioration in water supply quality and continuity. [Lloyd et al., 1996].

In the rainy season, the water quality problems are of a different nature. The floods induce high dilution ratios with respect to chemical contamination, but facilitate greater runoff washes of topsoil as well as debris into the river system. High sediment loading causes clogging of intakes, water treatment problems due to high turbidity, as well as changes in the biotic life of the river system. High turbidity frequently results in the complete shutdown of treatment plants, resulting in a suspension of water supply to consumers despite the high rainfall levels.

The following is an indication of activities contributing further to poor water quality [HTS a, 1997] :

- Washing of clothing in rivers
- People bathing in the rivers
- Washing of motor vehicles
- Seepage from water closets and septic tanks
- Contaminants from domestic refuse disposed of near rivers
- Contaminants from small industries, garages
- Debris from banana packing stations, including spillage of agro-chemicals

2.3 Land Use

Land capability is mainly determined by soil physical and chemical properties, climate and topography. Although these factors influence how capable the land is for certain activities, it does not affect the actual use of the land which is often determined by social, economic, legal and historical factors.

As indicated by the Ministry of Agriculture and Forestry thirty-five (35%) of the total land area i.e. 21,765 hectares is natural vegetation with 7550 hectares being Government Forest Reserves. Fifty-five (55%) (34,202 hectares) of that remaining is under agriculture while 9.5% (5,908 hectares) is surface water, urban use and exposed rock. The rainforest areas are dominantly the central regions of the island with cultivated areas surrounding these areas and extending outwards to the coastal regions.

Major crops cultivated in addition to bananas are : coconut, cocoa, fruit trees grown either in monoculture or on an intercropped basis. Secondary forest lands encompass non-agricultural land coverage, with rural settlement comprising clusters of rural housing with surrounding areas devoted to small gardens and orchards. Fig. 2.1 illustrates land use in St. Lucia and fig. 2.2 illustrates areas of banana cultivation on the island. The following table illustrates the categories of land use in all the watersheds.

Table 2.4 : Categories of land use in all the watersheds in St. Lucia.

Land Use Type	Category	Area (hectares)	Area (percentage %)
Natural	Forest	12,572	20.4
	Scrub Forest	7,515	12.2
	Mangrove	352	0.6
	Open Woodlands	1,302	2.1
	Sub Total	21,741	35.3
Farming	Intensive	17,576	28.5
	Mixed	16,205	26.3
	Eroded Land	234	0.4
	Sub Total	34,015	55.2
Others	Settlements	5,384	8.7
	Rock and Exposed Soils	426	0.7
	Water (Marina and Dam)	95	0.1
	Sub Total	5,905	9.5
	Total	61,661	100

Source : Biodiversity Country Study Report of St. Lucia, 1998

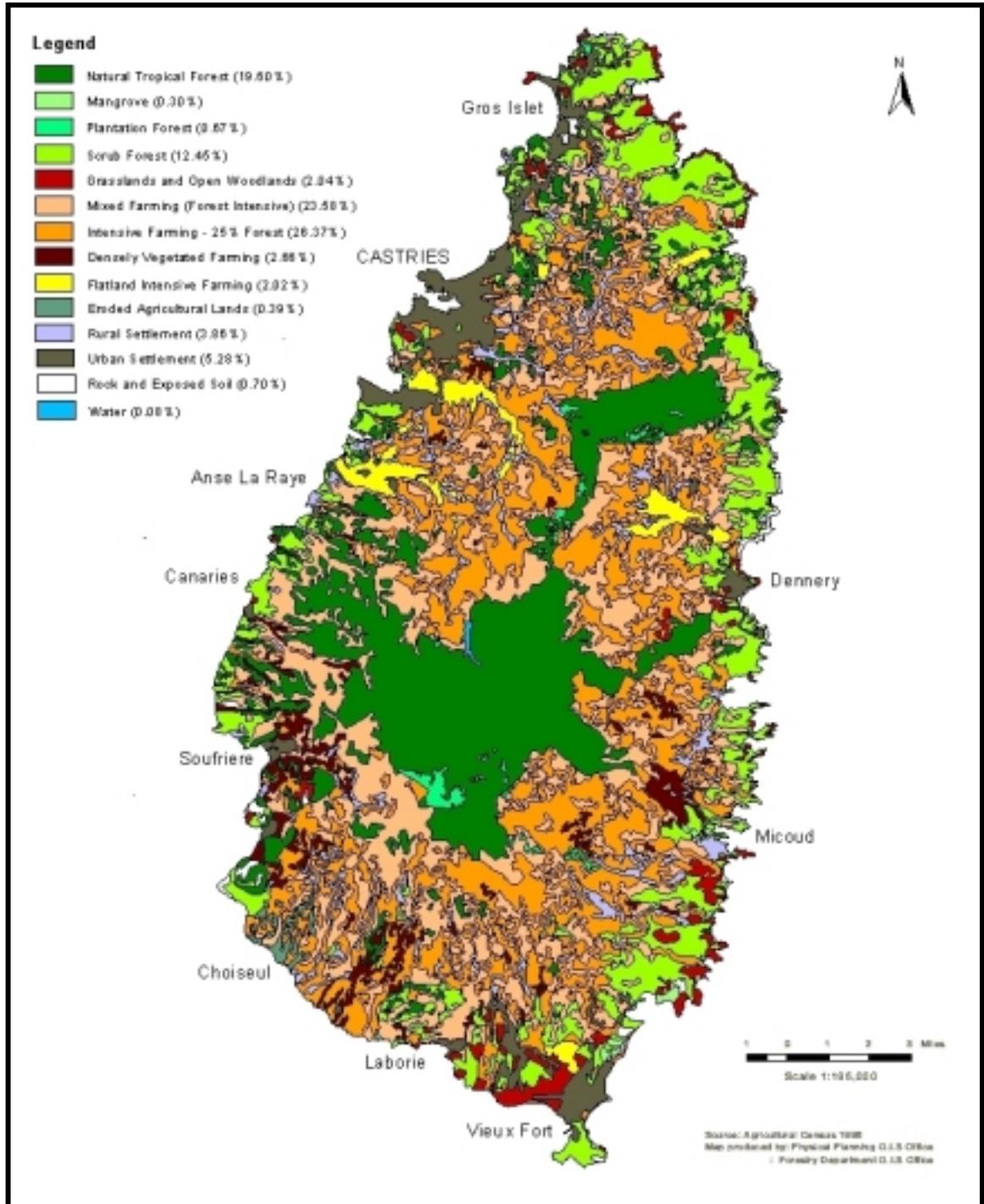


Fig 2.1 : Land Use Map of St. Lucia

[Source: Min. Agriculture, Forestry and Fisheries]

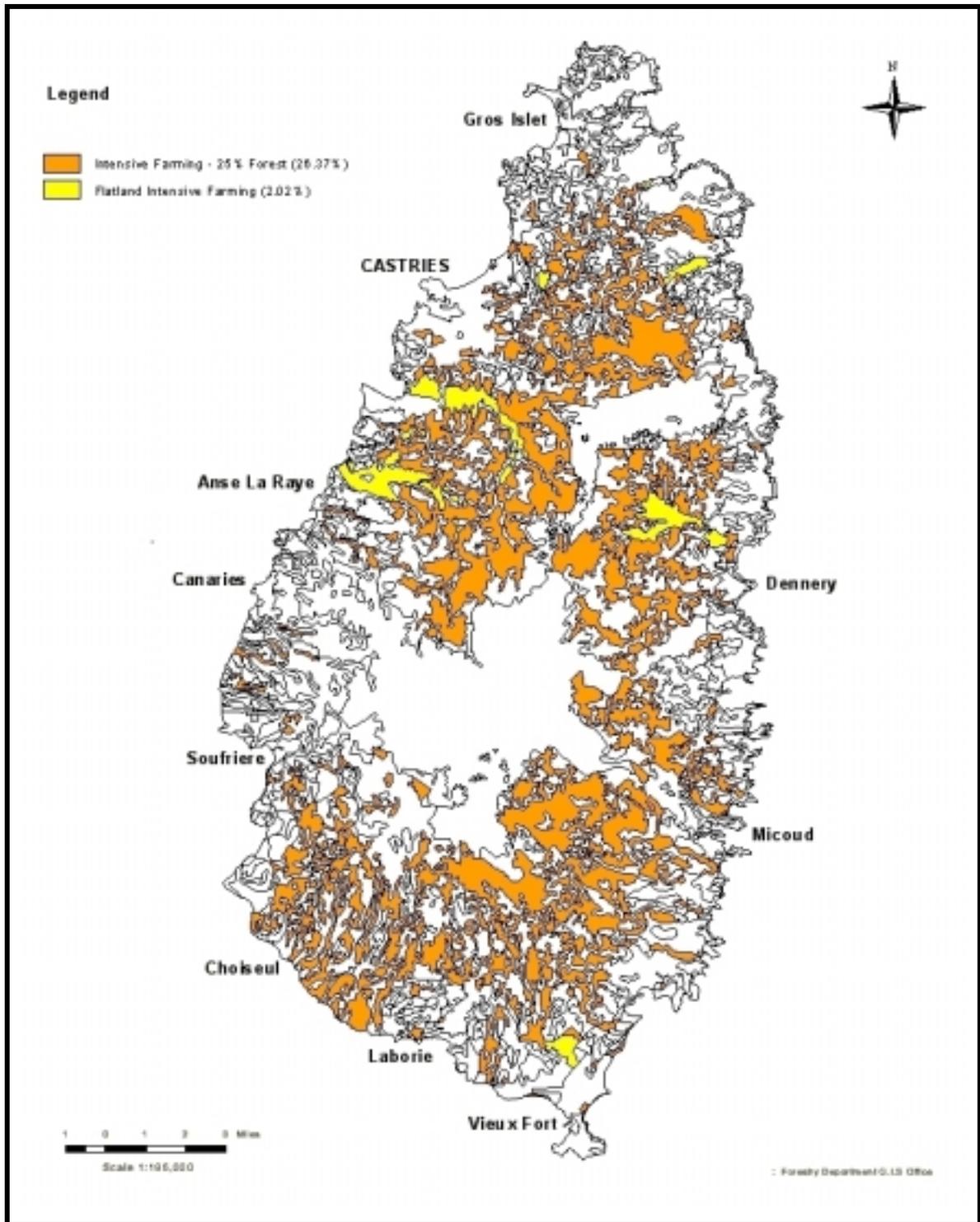


Fig 2.2 : Areas of Banana Cultivation in St. Lucia

[Source: Min. Agriculture, Forestry and Fisheries]

Soil erosion, the largest contributor to land degradation, is the single most important environmental problem facing the island both with respect to current economic losses (losses of topsoil, nutrients, concentration of run off and resulting flash flooding, damage to infrastructure) as well as future threats to other sectors (directly to tourism, indirectly through declining agricultural productivity and rural incomes, to the stability of the whole country). It is also estimated that 90% of the erosion which takes place in one year occurs sometimes within hours or at most over a few days [HTS a, 1997]. Soil erosion is indisputably a major problem in almost all watersheds. This problem is evident due to increased river siltation and reduction in water quality. Fig. 2.3 illustrates the varying degrees of soil erosion on the island.

In addition the following also contribute to land degradation in St. Lucia according to [HTS a, 1997] :

- **Loss of plant nutrients and nutrient imbalances** – it is estimated that 30% of nutrients applied to sloping land is lost through surface runoff. In an effort to compensate for this loss, farmers increase their application of fertilizers to sloping areas as opposed to flat areas thus making the situation worse. It has been noted that the bananas show better growth when cultivated in the foot of the slope rather than on upslope areas. Nutrient imbalances can be attributed to the use of high Potassium based fertilizers as opposed to a mixture of Nitrogen, Phosphorus and Potassium (N:P:K). This is an important consideration since different crops have different mineral requirements.
- **Soil Acidification** – this is a result of extensive use of fertilizer for banana cultivation over the past 20-30 years causing lowering of pH. Changes were observed in the pH from 5.8 to values of 3.8-4.8 as indicated in previous studies

(1966 & 1995). Trials carried out under the WEMP (1997) reveal pH values of 4.6 – 5.0.

- **Pesticide and Herbicide Use** – Monitoring of pesticide contamination by the Caribbean Environmental Health Institute (CEHI) seem to indicate that contamination by pesticides is not a major issue. Nematicides are the major pesticides used, with actual usage being on 60% of recommended rates as indicated the Harris (1995) report. The use of these agro-chemicals needs further monitoring, as there is potential for widespread use in large enough quantities to contaminate land and water resources.
- **Spoil Disposal** – Improper disposal of spoil material from landslides, results in accumulated silt in riverbeds.
- **Waterlogging** – This tends to pose a problem in alluvial flood plain areas. Drainage is reduced, due to clogging by silt carried during floods. This is a frequent occurrence and adversely affects banana yields.

Rural development is an issue that has growing importance over the last 10 years. The pressure to provide adequate housing has evolved into a major concern especially because of potential negative impacts such as deforestation, land degradation and subsequently water quality.

Many areas that were once occupied by forests natural vegetation are being cleared completely to provide area for housing. The result is the creation of impervious surfaces (concrete pathways, drains, roads) in high rainfall areas. This is fast becoming a serious problem due to the absence of adequate land use policy and legislation and subsequently land development zoning. Fig. 2.4 illustrates the location of settlements within the watershed areas.

A major problem regarding land use is the absence of an approved land use policy and subsequent appropriate land use legislation. This is in the process of being developed by the Ministry of Planning.

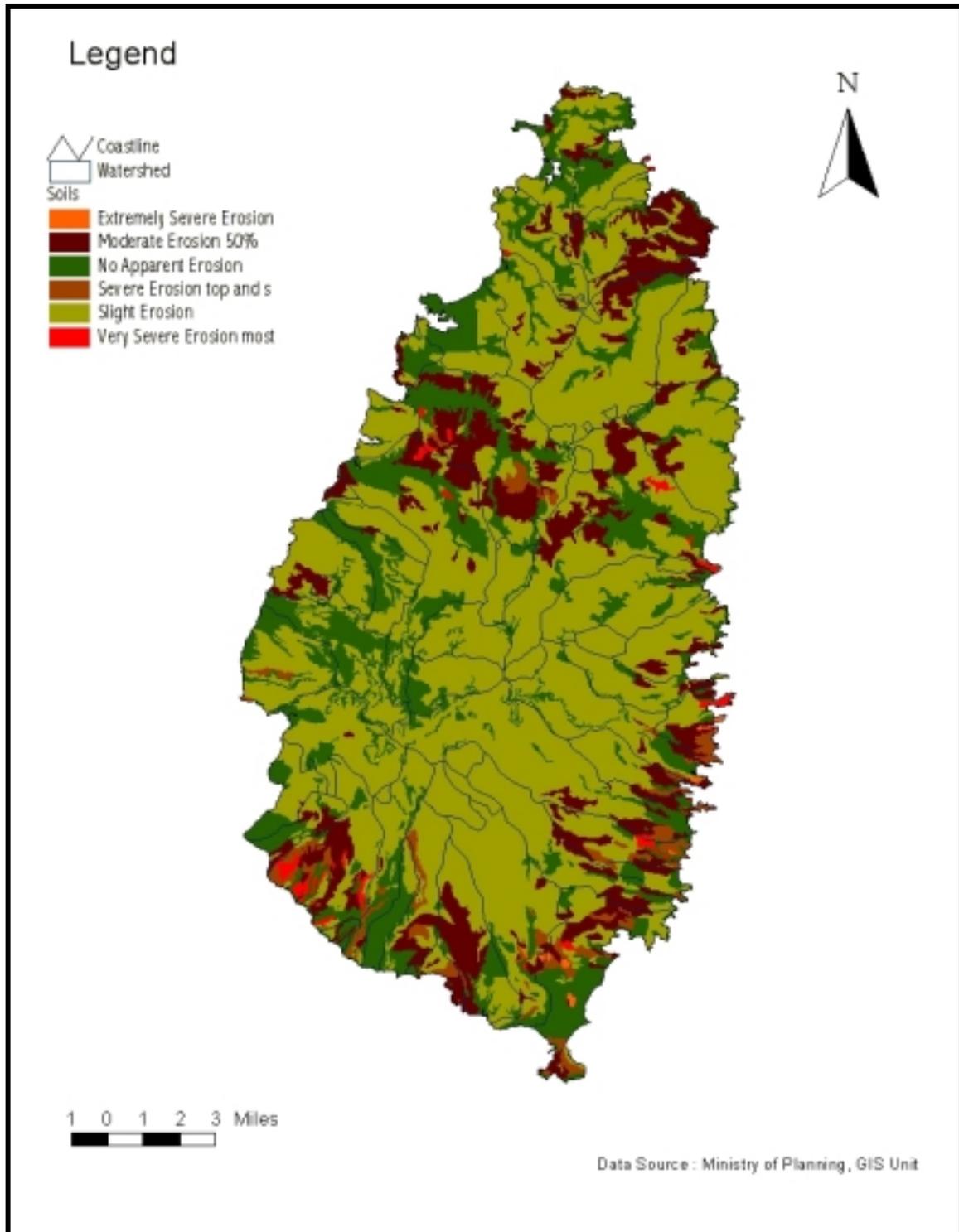


Fig. 2.3 : Varying Degrees of Soil Erosion

[Source: Min. Agriculture, Forestry and Fisheries]

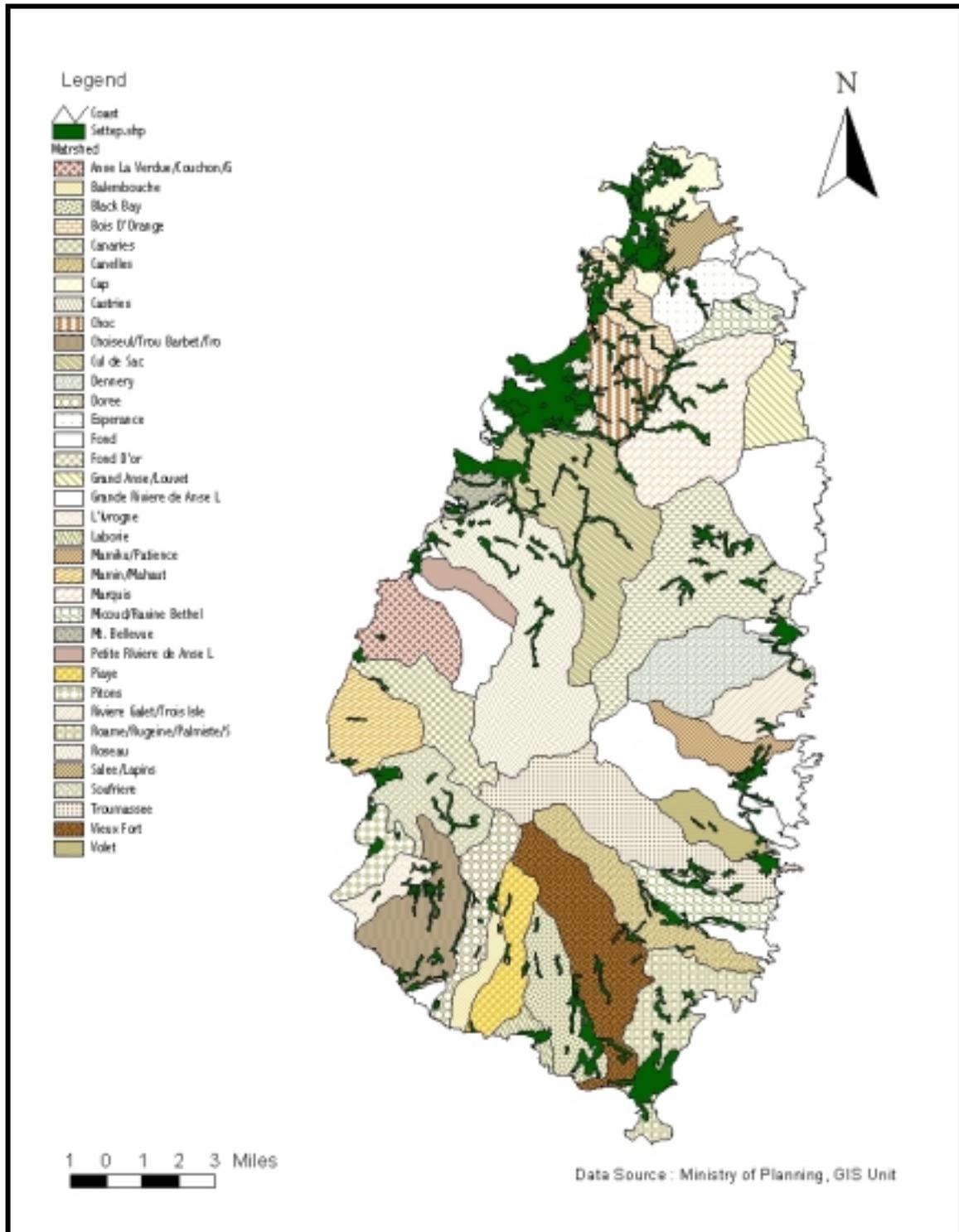


Fig. 2.4 : Settlement Within Various Watersheds

[Source: Min. Agriculture, Forestry and Fisheries]

2.4 Climate Change and Natural Disasters

Extreme weather events have had significant impact on the coastal regions of St. Lucia's watersheds, but there is no direct evidence to these having resulted from global climate change and sea level rise.

Hurricane Lennie and Tropical Storm Debbie are examples of such extreme weather occurrences impacting on watersheds. Tropical Storm Debbie caused major flooding in several low lying areas, landslides, forest destruction, crop destruction and loss of life with infra structural damage being estimated at approximately EC\$50- 60 million (US\$19-22), as well as losses in the agricultural sector of about EC\$150 million (US\$55) [HTS a, 1997].



Fig. 2.5 : Landslide after Tropical Storm Debbie 1994



Fig. 2.6 : Destruction to Millet Bridge after Tropical Storm Debbie

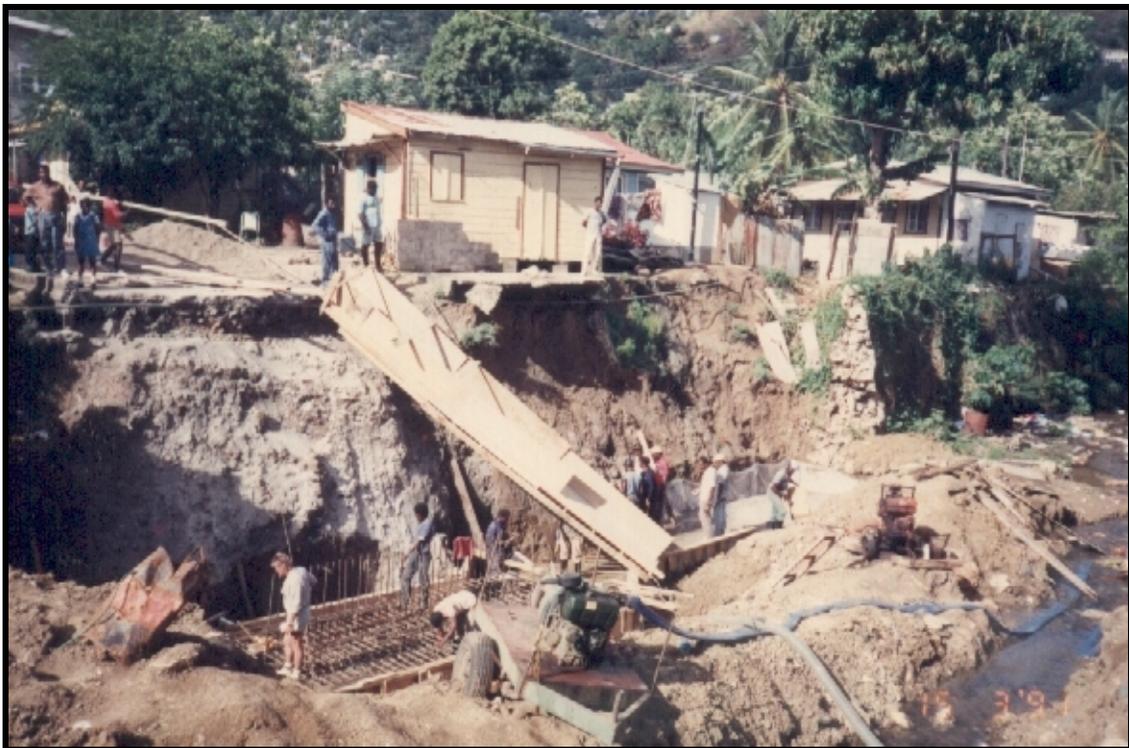


Fig. 2.7 : Bridge completely destroyed after Tropical Storm Debbie

Other rainfall events have caused similar floods, crop destruction and landslides with minor loss of life. Flooding resulted in large amounts of sediment and other pollutants being washed down from the land onto sensitive near shore habitats such as sea grass beds and coral reefs. Increased rainfall due to severe weather occurrences, caused extensive soil erosion from the upper watershed areas, dislodging of solid waste resulting in the blocking of drains and thus leading to further flooding and accelerated deposition of biological and chemical materials into streams and rivers. The north and western coasts of the island have experienced extensive damage due to severe storms such as that occurred with Hurricane Lennie in November 1999. Jetties, other infrastructure such as sea defense structures suffered significant damage, and beach erosion was extensive following battering by over 30 ft waves. Damage of more than \$1 million East Caribbean Dollars was registered.

There is a draft disaster management plan and a preparedness and response plan currently in place for natural disasters. In August, 2000 legislation was passed in the form of a Disaster preparedness and Response Act. The National Emergency Management Organization (NEMO) has an organizational structure in place to deal with natural disasters. The Physical Planning Section of the Ministry of Planning, Development, Environment and Housing give consideration to disaster preparedness and disaster mitigation in their Development Plan Systems. A Pilot Economic Valuation of Coastal Resources Project is presently underway for the northwest coast, with funding from the CPACC project. This is intended to determine the value of the resources that will be lost through sea level rise damage. Under the National Communications Project of the UNFCC for St. Lucia, vulnerability and mitigation assessments are being pursued to reduce the impacts of Climate Change on St. Lucia. A Natural Hazards Mapping training exercise funded by FAO in December '99 was executed and provisions are being made to develop

hazard maps with particular reference to landslides for the island. As well, the Ministry of Agriculture is developing a Disaster Preparedness and Mitigation Plan for the Agricultural Sector.

A Climate Change project and case study was carried out on St. Lucia recently, led by the University of Miami, Florida and commissioned by UNEP-CAR/RCU. It included a study of the ecological and socioeconomic impacts of global climate change on coastal and marine environments in the Wider Caribbean Region (WCR). This project demonstrated the importance of immediate integrated planning to protect coastal communities and valuable coastal resources from the effects of climate change. Such an Integrated Coastal Area Management Plan was formulated for the South East Coast of St. Lucia in 1995-1999 with funding provided by the Swedish International Development Agency (SIDA).

2.6 Pollution

2.6.1 Liquid Waste

Domestic sewage, effluent from agro processing industries, agricultural runoff, urban and storm drainage waters, ship sewage all constitute liquid waste which is a strong contributor to pollution of watershed areas. Problems such as eutrophication, diseases, and anoxic conditions created by improper treatment and disposal of this waste can be due to toxic compounds (e.g. heavy metals), harmful organisms (pathogenic organisms, faecal coliforms) in the effluent as well as decomposition of organic waste.

Domestic Waste

The current sewerage facility in the capital Castries is totally inadequate. It essentially consists of a collection network, which allows pumping of the sewage out to sea due to its coastal location with no form of treatment, primary, secondary or tertiary. This network does not even serve the entire population of Castries, only approximately 13% of the population (62,342 - Total) of this area is connected. Of the remaining population 31% have septic tanks, 49 % utilize pit latrine with the balance not having any other facility.

In the Gros Islet area in the north the situation is quite similar despite the presence of the Rodney Bay treatment facility. Only 13% (450 households) of the population of 14,014 people, are connected to the sewer system. Also connected are 12 hotels in the area, which have variable occupancy, the largest hotel in that area having a capacity of 300 rooms. No industries are connected to this system. According to the Department of Statistics, in this area 43% of the population have septic tanks and 45% still utilize pit latrines, the rest, not having any form of disposal.

In the south in the Black Bay area in Vieux Fort there is a small collection system serving 200 households. Of the population (14,838) of this area, 29% utilize septic tanks with 53% utilizing pit latrines. There is no existing sewerage network in any other area. The main form of disposal in these areas are septic tanks and pit latrines.

Agricultural Runoff

This is of general concern due to the extensive use of fertilizers, pesticides and herbicides. Improper use of these chemicals results in the contamination of the watercourses, groundwater and soil, which inadvertently affect human and marine ecosystems. In the past there have been incidents where dead fish and shrimp have been found in rivers, as well discolored riverbank vegetation has been observed.

Persons have reported cases of experiencing a burning sensation in their eyes after bathing as well as distinct chemical odors in certain rivers (MAFF, BCSR 1998).

Industrial and Commercial Waste

The sewage generated on the island of St. Lucia is predominantly of a domestic origin as industrial activities are very limited. Some of these industries have their own treatment facilities where effluent is treated before discharging into the environment, however the nature and quality of the waste produced by these industries vary significantly. . There are no existing standards and legislation in place to govern the quality of the discharged effluent and as such in some cases where no treatment facilities exist, the untreated effluent is discharged directly into the neighboring environment. Most of the hotels have their own sewage treatment facilities, however in cases where these facilities are inadequate or non functional it has been known that the effluent is discharged untreated. In the northern region where the Rodney Bay sewage treatment plant is located there are at least 12 hotels connected to the sewer system in that region.

The following industries contribute to the waste generated:

- Brewery
- Paper and Paper Product Manufacturer
- Distillery
- Dairy Processing Plant
- Meat Processing Plant
- Printery
- Hospital
- Funeral Parlor
- Agro Processing Plant

2.6.2 Siltation

This tends to pose a significant problem especially during periods of heavy rainfall. Uncontrolled deforestation and subsequent accelerated rates of soil erosion results in high sediment loads in water courses during rainfall events. This high turbidity not only affects water quality from the perspective of clarity but can also affect riverine and marine organisms as well as coral reefs.

2.6.3 Solid Waste

One of the more significant concerns in relation to solid waste disposal is that of leachate contamination of surface, ground and coastal water sources. Leachate results from the infiltration of water into a landfill in conjunction with biochemical decomposition of the waste. This is an expected problem especially in the cases of most of the existing dumpsites that are not lined, with no provision made for leachate collection and treatment. This is expected to be addressed in the commissioning, of the new sanitary landfills.

In some areas where rivers run throughout settlements it is common to see solid waste being transported by the rivers to coastal areas. In some cases this can pose serious aesthetic problems for beach front property, when transported by ocean currents. As well, depending on the nature of the waste, marine life such as turtles are adversely affected and coral reefs contaminated.

Disposal of solid waste has improved since the formation of the Solid Waste Management Authority. Islandwide collection systems have been instituted and a solid waste management plan is in place. A new sanitary landfill site is being constructed in Deglos, in the Cul De Sac area with the disposal site at Vieux Fort

expected to be upgraded. The following existing dumpsites are to be closed : Ciceron, Micoud, Dennery, Anse La Raye and Choiseul. Currently the lack of adequate separation of various wastes could pose a problem. Provisions are being made to give special consideration to the disposal of biomedical waste, toxic substances as well as ship-generated waste.

2.7 Tourism

The tourism industry in St. Lucia is largely dependant on the environment with water being a major product factor. The promise of lush rainforests, white sandy beaches with clear clean water, healthy reef ecosystems and biologically diverse mangroves are all major selling points. In addition, most of the hotels on the island are high priced and thus guests expect to enjoy all the conveniences of readily available clean pipe-borne water.

Tourism, on the other hand, must be adequately managed if its growth is not to adversely impact on watershed management. Currently hotels consume 15% of the total volume of pipe-borne water supplied by WASCO, the Water and Sewage Company, with an additional 5% being consumed by the cruise ships.

There are also the indirect impacts associated with tourism. St. Lucia is believed to have lost 50% (MAFF, BCSR, 1998) of its wetland area to urban development. In the inland areas, this loss is attributed primarily to conversion of land for agricultural use. However, loss of coastal wetlands has resulted primarily from the desire to exploit the adjacent beaches and in some cases mangrove areas have been filled and hotels have been constructed. In addition, as tourist arrivals increase the demand on a number of resources invariably increase.

2.8 Health

The possibility of occurrence of water related diseases by vectors such as mosquitos, sandflies is one that must be kept in mind. Malaria does not give cause for concern in St. Lucia as habitats for the malarial mosquito are not so common. On the other hand concern should be given to carriers of dengue fever and yellow fever which tend to be more common and can breed in water in open coconuts, discarded tyres or in collection bowls under flower pots. (HTS a, 1997). Bilharzia, a water washed disease, although once present in St. Lucia is not currently of major concern.

Sand flies are common in the coastal areas and tend to breed in very wet soil or shallow mud. Although these have the tendency to spread a number of fevers this is uncommon to St. Lucia. Water borne diseases such as diarrhea, viral hepatitis, dysentery and others are still important considerations and related to the incidence of poor water quality.

2.9 Data, Information Management & Research

The Ministry of Agriculture, Forestry and Fisheries collects rainfall data from a total of 33 stations. Of these, two are managed by the Meteorological Services Department, while two agro-meteorological stations are managed by WIBDECO Technical Services and CARDI. Rainfall data, of reasonable quality is usually available as daily, monthly and yearly totals with rainfall intensity data available for only one of the gauging sites.

The monitoring of stream flows and river water quality is quite inadequate at present. Since the 1980's, attempts were made to establish a system for river flow monitoring, but this has not been maintained and at present continuous river stage monitoring is no longer being undertaken. The Ministry of Agriculture, instead

takes spot measurements of river flow on a weekly basis through the year. Water quality monitoring also requires some improvement as the Ministry of Health and the Water and Sewerage Company, undertake testing for faecal coliform and a few other parameters. This program is however not a comprehensive one and in any case the focus is essentially on meeting the required health standards for drinking water.

Table 2.5 : Equipment utilized for the hydrological stations maintained by the MAFF

EQUIPMENT TYPE	DETAILS	NUMBER INSTALLED
Automatic weather station	Casella	1
Rain gauge with logger	Casella 0.2 mm Tipping Bucket	28
Stevenson Screen	(dry, wet and minimum temperatures; hygrograph)	2
Evaporation Pan	Class A, with hook gauge & stilling well.	3
Rain Gauge	Casella Snowdon	27
Rainfall Recorder	Casella Natural Syphon - Daily clock	2
Rainfall Recorder	Weekly runs	7
Anemometer	Cup counter	2
Sunshine Recorder	Campbell Stokes Sunshine autograph	1
Water level recorder	Stevens Type F	(none currently installed) - 8
Current meter	Braystroke	1

The Caribbean Meteorological and Hydrological Institute (CMHI), has historically provided support to both MAFF and the Meteorological Services Department, in the area of data collection and analysis. Also providing back-up assistance from time to time (to the MAFF), has been the Institute of Hydrology in the U.K.

Currently HYDATA a data management program developed by the Institute of Hydrology for hydrological data, is being utilized.

Apart from the afore-mentioned parameters, data on land-use patterns, socio-economics and other parameters where available, are not currently disaggregated on a watershed basis. The Ministry of Planning has, however a GIS database available for use which includes such parameters such as: roads, land use, rivers, watersheds, mangroves, settlement, banana cultivation, soil erosion, water intakes.

2.10 Stakeholder Participation / Awareness and Education

The Forestry Department has undertaken various programs to inform the public about watershed management. One of these programs involved River Conservation with school children and public sector officials being targeted. Field trips with public sector officials were organized to sensitize them to the impacts of human activities on the watershed including the effect of deforestation.

The Forestry Department has also catalyzed efforts to ensure that integrated watershed management is an integral aspect of planning and development on the island. Water resource management workshops held in each of its five ranges made reference to the need for better watershed management on the island. The Forestry Department also hosted a two-day National Consultation on Water Resources Management in 1999.

The Watershed Environment Management Project undertook a Pilot Project with a group of persons in the Dennery Watershed to enable them to better manage their watershed. The group was called the Dennery Watershed Management Action Force (WMAF). It undertook reconnaissance field trips in its community, various clean up

activities, some educational activities. The OECS-NRMU has recently provided funds to help the group implement activities as outlined in their Action Plan, with the assistance of the Forestry Department.

The OECS-NRMU conducted a Watershed Management Workshop on the West Coast in 1998 and a plan of action emerged for the area, produced by the communities.

The St. Lucia National Trust produced a video called *The Way of the Water*, after the passage of Tropical Storm Debbie in 1994 on the island. It focussed on effective and integrated watershed management as a solution to the prevention of similar impacts in the future.

The Water and Sewerage Authority (WASA), during its corporatization phase (to the Water and Sewerage Company (WASCO)) conducted extensive public sensitization activities during 1999 to educate the public on the importance of management of our water resources. Such activities were done via mass media programs and community consultations. A Public Relations Company was engaged for this purpose.

There are no studies or data existing on the impact of public awareness and education on the watershed. However generally groups would record the number of persons and groups that they sensitize. Five communities were targeted through the Forestry Department's public sensitization on the importance of water catchment areas, in the five ranges of the department. From these series of training workshops, water catchment groups in the communities were developed. Training in five different areas then ensued for these water catchment groups. The main function of these groups is to protect the water catchment in their communities through

community mobilization and sensitization. They were also supposed to write proposals for projects to help them better manage the water catchments. Currently two of the groups are still vibrant. One, the Talvern Water Catchment Group is engaged in active management of the watershed. This group is presently engaged in a riverbank stabilisation program using wattles in the Talvern watershed. The other is active in community mobilization and education. The water resources management projects by community groups are supported by OECS-NRMU, especially their Small Grants Project Funds.

Five communities in Soufriere and its environs were trained by the Forestry Department with the help of the Fisheries Department, (under the auspices of the French Mission Project) in monitoring river water quality by use of biological indicators. These community members will be provided with equipment so that they can undertake regular monitoring of their community rivers. Exhibitions, publications and other activities for sharing of the information with other members of the community and public are to be undertaken.

2.11 Institutional Frameworks

Responsibilities within the Water/Watershed Management Sector are shared by a number of Public Sector agencies and one private company. Historically these have operated as fragmented units and there has been no coordinated thrust towards a holistic management of water/watersheds. Some of these agencies, their general responsibilities and the enabling legislation are presented below:

Table 2.6 : Agencies, Responsibilities and Enabling Legislation

AGENCY	ENABLING LEGISLATION	RESPONSIBILITY
Department of Forestry, MAFF	Forest, Soil and Water Conservation Act (1946)	<ul style="list-style-type: none"> ➤ Management of Forest resources ➤ Establishment of forest reserve and protected forests ➤ Protection of Forest, Soil and Water. Wildlife resources ➤ Management of water catchments
Department of Forestry, MAFF	Wildlife Protection Act, 1980	<ul style="list-style-type: none"> ➤ Conservation of wildlife; ➤ Designation of wildlife reserves
Development Control Authority, Ministry of Planning, etc.	Land Development (Interim Control Act (1971))	<ul style="list-style-type: none"> ➤ Regulation of development
Department of Agriculture, MAFF	Agricultural Small Tenancies Act, 1983	<ul style="list-style-type: none"> ➤ Enforcement of regulations requiring sound soil and water conservation practices on small holdings
Ministry of Agriculture, Forestry & Fisheries	Land Conservation & Improvement Act, 1992	<ul style="list-style-type: none"> ➤ Provision for better land drainage conservation
Department of Agriculture, MAFF	Pesticides Control Act, 1975; Pesticides Control Regulations, 1987	<ul style="list-style-type: none"> ➤ Establishment of Pesticide Control Board; ➤ Control of import, use, labelling and storage of pesticides; ➤ Registration of and licenses for use and storage of pesticides
Department of Agriculture, MAFF	Plant Protection Act, 1988: Regulations SI, 1995	<ul style="list-style-type: none"> ➤ Control of pests and diseases injurious to plants ; ➤ Prevent the introduction of

		potentially harmful exotic species
Ministry of Health	Public Health Act, 1975	<ul style="list-style-type: none"> ➤ Regulatory oversight of sewage, industrial and solid waste disposal; ➤ Regulatory oversight of domestic water supply
National Solid Waste Management Authority	St. Lucia Solid Waste Management Act, 1996	<ul style="list-style-type: none"> ➤ Responsibility for solid waste disposal
St. Lucia National Trust		<ul style="list-style-type: none"> ➤ Management of Parks and protected areas; ➤ Preservation of buildings and other objects of historic and architectural value
National Water and Sewerage Commission	Water and Sewerage Act, 1999	<ul style="list-style-type: none"> ➤ regulate the granting of licenses ➤ development and control of water supply and sewerage facilities and related matters
Parks and Beaches Commission		
National Conservation Authority	National Conservation Authority Act (1999)	<ul style="list-style-type: none"> ➤ Establishment of an authority for the care and management of public parks and beaches

The National Water and Sewerage Commission, established through the Water and Sewerage Act, 1999, “to” has been delegated the following tasks:

- to see to the orderly and co-ordinated development and use of the water resources,
- to conserve and protect the water resources,

- to issue licenses with a view to providing a safe, adequate and reliable supply of water, and dependable public sewerage services,
- to promote a national policy for water in St. Lucia,
- to ensure conservation, augmentation of water resources,
- to ensure distribution and proper use of water resources,
- to preserve and protect gathering grounds,
- to (collect), treat, and dispose of sewerage and other effluents,
- to collate and publish information for the assessment of water demands,
- to collate and publish information for the assessment of the water resources.

The Water and Sewerage Company (WASCO) is identified as the “First Company” under the afore-mentioned Act, and its first license to be granted for a twenty-five (25)-year period for the following:

- a) “to provide the people of St. Lucia with an adequate water service and other incidental service or facilities;
- b) to provide the service for the removal of sewage by means of the sewerage system or any part of the sewerage system including services incidental to it, and permitted under this Act.

WASCO is given responsibility for:

- carrying out Government policy in relation to water supply;
- providing the public with a safe, adequate and reliable supply of water;
- carrying out Government policy in relation to sewerage and providing with dependable sewerage services.

The Company is also required in consultation with the NWSC, “to take action as may be necessary or expedient for the purpose of conserving, redistributing or

otherwise augmenting water resources in St. Lucia”. This includes maintaining records with respect to water availability and consumption patterns, planning for future demands and the preparation of water management plans.

The Forest, Soil and Water Conservation Ordinance of 1957 also makes provision for water resources conservation, a responsibility which is delegated to the Forestry Department of the *Ministry of Agriculture, Forestry and Fisheries (MAFF)*. The Fisheries Department in turn, through the Fisheries Act of 1984 has responsibility for the environmental management of maritime areas and their resources. The Department of Agriculture has historically maintained the hydrological data base (said to be neither extensive or reliable) for the island. Recently (April, 2000), the MAFF initiated a Water Resource Management Project and assigned to the Project, responsibility for hydrological data monitoring and other aspects of water resources management. The assumption of this function is meant to serve the Ministry’s efforts at identifying and sustaining sources of irrigation water for the agricultural sector.

The Ministry of Health through the Public Health Act, 1975 and the Public Health (Water Quality Control) Regulations established under the Act, addresses such issues as the quality of domestic and industrial water supplies, the construction of water supply systems and the construction and location of wells.

Chapter 3

- 3.0 Current Coastal Area Management Issues**
 - 3.1 Coastal Habitats and Ecosystems**
 - 3.2 Living and Non-living Marine Resource Exploitation**
 - 3.3 Climate Change and Natural Disasters**
 - 3.4 Transboundary Threats**
 - 3.5 Land Based Pollution**
 - 3.6 Tourism**
 - 3.7 Health**
 - 3.8 Data, Information Management and Research**
 - 3.9 Stakeholder Participation/Awareness and Education**
 - 3.10 Institutional Frameworks**

3.0 Coastal Zone Management Issues

3.1 Coastal Habitats and Ecosystems

Beaches

Beaches along the West Coast of St Lucia are washed by the relatively calm waters of the Caribbean Sea, while those of the East Coast are washed by the much rougher waters of the Atlantic Ocean. The topography of these two (2) coasts differs significantly due to the aforementioned factor, in addition to other climatic and geological factors. During an inventory of beaches, which was conducted in 1996-7, sixty (62) beaches were recorded along the West Coast and forty-two (42) beaches along the East Coast. In total, beach length accounted for about 16.78% of the shoreline of St Lucia.

Two (2) glaring problems affecting many beaches, especially along the East Coast, are sandmining and waste (tar balls and garbage) accumulation. Many beaches along the East Coast have become prime target sites for sandmining activities since they are often located in remote areas. This makes surveillance activities by relevant enforcement agencies difficult. The inventory of beaches conducted in 1996-7, revealed that 14.3% of beaches along the East Coast were being sandmined, as opposed to 6.5% of beaches along the West Coast. A number of efforts have been made to curb sandmining practices, including focusing on alternate aggregate sources such as pumice, importation of sand, enactment of legislation (Beach Protection Act of 1967 and Beach Protection (Amendment) Act of 1984) and a number of public awareness programs. In spite of the high demand for aggregate material and in the absence of surveillance and monitoring of mined beaches and enforcement of existing legislation, these efforts have had some impact on sandmining activities. According to Cambers (1990), the total beach length in St

Lucia is 32.625km, with forty three percent (43%) of this beach length being mined for sand. However, the inventory of beaches (1996-97) showed total beach length in St Lucia to be 34.88km, with 12.5% being mined for sand. The East Coast beaches accounted for 72.8% of this latter figure.

With regard to waste accumulation, the rough waters of the Atlantic Ocean constantly wash driftwood, seaweed, seagrass, and boat and land generated waste onto the East Coast beaches. In contrast, litter on West Coast beaches is mainly land generated. In addition, the calmer waters of the Caribbean Sea make West Coast beaches ideal for recreational activities, and thus approximately twenty-six percent (26%) of these beaches have hotel and/or restaurant facilities located on them, as opposed to only seven percent (7%) of East Coast beaches. The management of these facilities therefore controls waste on these beaches. It is worth noting that just over ninety percent (90%) of these facilities are located on beaches along the North West Coast.

The West Coast is more likely to be affected by coastal development, since its shores are considered by most to be 'touristic' in nature and thus beachfronts are considered prime property for hospitality industry investors. Beaches along this coastline are more readily accessed via land or sea. These beaches in particular play a vital role in St Lucia's economy. Apart from water-based activities and unique features such as the Pitons, beaches are one of the island's main tourist attractions. The high demand for flat, wide yellow sand beaches sometimes leads to beach re-nourishment exercises at times when beaches are naturally eroding due to sea conditions, or the creation of new sandy beach areas, in order to satisfy the tourism market.

The inventory of beaches (1996-97) further revealed that a high amount of sand loss had been lost from beaches around the island, but more significantly along the West Coast. This sand loss was probably caused by the effects of rough waters resulting from the passage of storms through the region just prior to this inventory. Beach monitoring has shown that beaches are not recovering fully from natural disasters. This is probably due to anthropogenic activities such as sandmining and poorly controlled coastal development.

Mangals

According to the St Lucia's Environmental Profile (1991), mangroves account for about 179.30 hectares, which represents 0.29% of the island's landmass. This source further states that because these systems are dynamic, growing systems, this total area may be as much as twenty (20) hectares too low. However, with the many threats facing these systems today, the Department of Fisheries believes that this stated figure is generous.

Mangal systems in St Lucia, though comparatively small on an international scale, play a vital role in coastal stability, and serve as fish breeding and nursery ground, avifauna habitat, silt trap and nutrient exporter. Mangal systems of St Lucia range from a few scattered scrub patches to the more diverse riverine and/or fringing mangal systems. There are four (4) species of mangrove found in St Lucia: *Rhizophora mangale* (Red Mangrove), *Laguncularia racemosa* (White Mangrove), *Avicennia germinans* (Black Mangrove) and *Conocarpus erecta* (Buttonwood).

Compared to the East Coast, very few mangroves are presently found along the West Coast. This is probably due to the high level of tourism-related infrastructure (such as hotel and restaurant facilities) and other developments directly along this coastline. Devaux (1988) states that St Lucia has already lost forty percent (40%) of

its wetlands and the remaining sixty percent (60%) is under severe stress from a variety of human activities.

Major threats to mangroves include coastal development and to a lesser degree, clear-cutting for charcoal production. The view that mangal systems are 'just mosquito infested swamps' posing a health threat to nearby residents, is another reason for deforestation of these systems. Solid waste build-up and excess siltation in mangroves are yet further issues negatively impacting on these systems. To date, a number of efforts have been made to prevent destruction of these coastal habitats and in 1986, a number of mangroves on the island were declared Marine Reserves. However, monitoring and surveillance of activities within mangrove areas are difficult, since marine reserves have never been legally delineated and ownership often lies in private hands.

Table 3.0 Status of the Main Mangrove Wetlands in St Lucia

Name	Type of Mangal	Status
Bois d'Orange	Basin	<ul style="list-style-type: none"> ▪ Species present: <i>L. racemosa</i> ▪ Size: 2.59ha (1985)/only 10-15 trees, about 25 square meters(1997) ▪ Ownership of lands: Private ▪ Values: Fisheries, wildlife ▪ Other: Large associated wet land plays an important role in flood protection. Good diversity of bird species, may be nesting site of herons and zemida dove; legally declared marine reserve ▪ Proposed IUCN category: IV
Cas en Bas (3 distinct patches)	Riverine (plus 2 small scrub mangals)	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, <i>L. racemosa</i> and <i>C. erecta</i> ▪ Size: 5.44ha (1985)/about 1.5ha (1997) ▪ Ownership of Lands: Part Crown and part private ▪ Other: Wildlife impoverished, deforestation; legally declared marine reserve
Choc <ul style="list-style-type: none"> ▪ North ▪ South 	<ul style="list-style-type: none"> ▪ Basin ▪ Riverine 	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i> ▪ Size: 12.95ha (1985)/about eight (8) trees in the north and three (3) trees in the south (1997) ▪ Ownership of lands: Private ▪ Other: The northern mangal has been adopted by an environmental club of a near by school; serious problems of deforestation; legally declared marine reserve

Dennerly	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 6.0ha (1985)/ <0.5ha (1997) ▪ Ownership of lands: Crown ▪ Other: System severely degraded due to from deforestation
Esperance	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 17.35ha (1985)/about the same in 1997 as in 1985 ▪ Ownership of lands: Private ▪ Values: Erosion control, wildlife; ▪ Other: Low abundance of bird fauna, stopping lace for migrants; deforestation; legally declared marine reserve ▪ Proposed IUCN category: IV (Wild life-Reserve-like)
Fond D'Or	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>A. germinans</i>, <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 21.0ha (1985)/<0.5ha (1997) ▪ Ownership of lands: Crown ▪ Values: Erosion control, fisheries ▪ Other: Under management by the Mabouya Valley Development Committee; wild life impoverished; legally declared marine reserve ▪ Proposed IUCN category: IV (Wild life-Reserve-like)
Grande Anse	Basin	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: Figures for 1985 are not available/<0.5ha (1997) ▪ Ownership of lands: Crown ▪ Other: Deforestation; high level of sandmining on beach area; legally declared marine reserve
La Sorciere	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>A. germinans</i>, <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size:5.18ha (1985)/<1.0ha (1997) ▪ Ownership of land: Crown ▪ Other: Potential threats from deforestation
Louvet	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 17.35ha (1985)/ about the same in 1997 as in 1985 ▪ Ownership of lands: Private ▪ Other: Potential threats from deforestation due to uncontrolled development; wildlife impoverished; legally declared marine reserve.
Man Kote	Basin	<ul style="list-style-type: none"> ▪ Species present: <i>A. germinans</i>, <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 39.37ha (1985)/ about the same in 1997 as in 1985 ▪ Ownership of land: Crown ▪ Value: Erosion control, wildlife ▪ Other: Largest mangrove on the island; currently being managed through a collaborative arrangement among the DOF, a non-governmental organization (NGO) – Caribbean Natural Resource Institute and a group of local charcoal producers who have been trained and educated on sustainable harvesting of wood from mangrove areas; lands vested in the National Development Corporation and currently being considered for hotel development; legally declared marine reserve. ▪ Proposed IUCN category: II (Park-like)
Marigot	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, <i>A. germinans</i> and <i>L. racemosa</i> ▪ Size:6.22ha (1985)/ about 0.7ha (1997) ▪ Ownership of lands: Crown ▪ Value: Erosion control; fisheries ▪ Other: Deforestation due to poorly controlled development; pollutants in harbor; legally declared marine reserve. ▪ Proposed IUCN category: IV (Wild life-Reserve-like)

Marquis	Riverine	<ul style="list-style-type: none"> ▪ Species present: <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 2.59ha (1985)/about 1.5ha (1997) ▪ Ownership of land: Private ▪ Other: Good diversity and abundance of bird species, threats from deforestation; legally declared marine reserve. ▪ Proposed IUCN category: IV (Wild life-Reserve-like)
Micoud	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>A. germinans</i>, <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 1.29ha (1985)/about 1.0ha (1997) ▪ Ownership of lands: Private ▪ Other: Potential threats from deforestation .
Praslin	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>A. germinans</i>, <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 17.35ha (1985)/ about the same in 1997 as in 1985 ▪ Ownership of lands: Private (a small section also falls on Crown lands) ▪ Other: Deforestation due to uncontrolled development and poor agricultural practices ▪ Proposed IUCN category: IV (Wild life-Reserve-like)
Savannes	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>C. erecta</i>, <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: 24.61ha (1985)/ about the same as in 1985 (1997) ▪ Ownership of lands: Crown ▪ Value: Erosion control; fisheries; wildlife ▪ Other: Potential threats from poorly controlled development; legally declared marine reserve. ▪ Proposed IUCN category: IV (Wild life-Reserve-like)
Trou-masse	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: Figures for 1985 are not available/<0.2ha (1997) ▪ Ownership of lands: Crown ▪ Other: Mangal system severely degraded due to deforestation and sand mining activities
Volet	Fringe	<ul style="list-style-type: none"> ▪ Species present: <i>R. mangale</i>, and <i>L. racemosa</i> ▪ Size: Figures for 1985 are not available/about 1.5ha (1997) ▪ Ownership of lands: Private (coastal fringe is on Crown Lands) ▪ Value: Erosion control; fisheries; wildlife ▪ Other: Potential threats from uncontrolled harvesting of wood and poorly controlled development.

Source: Biodiversity Country Study Report of St Lucia, 1998

Coral Reefs

Reefs along the West and East Coasts differ considerably due to the different climatic and geological features of these coastal areas. Reef systems along the West Coast are more diverse in terms of coral species than those of the East Coast. In general, fringing reefs are located mainly along the South East (Anse des Sables), Central West (off the districts of Anse la Raye, Soufriere and Laborie), and North West Coasts (Choc Bay)

Reefs along the North West Coast of the island have been subjected to negative impacts caused by pollution from inadequately treated liquid waste and poorly planned development. Presently, the healthiest and most diverse reefs are found along the Central West Coast off Soufriere. Reefs off the East Coast have a comparatively higher algal cover and coral colonies are generally small.

The island's reefs, though limited in size, are extremely important for the water-based tourism industry and nearshore fishery. However, over the years these resources have been subjected to a number of negative human-induced impacts and natural disasters. Uncontrolled Development and poor management of the use natural and human resources are the main factors leading to negative impacts on nearshore reefs.

Many efforts have led to the creation of marine reserves, marine management areas, and fisheries laws which seek to control damage to coral, destructive fishing practices, anchoring, and unsustainable use of marine/coastal resources. However, siltation due to uncontrolled development and clearing of lands for agricultural purposes, discharge of liquid waste and physical contact with the reef by divers and snorkelers all continue to take their toll on marine habitats. Many marine reserves, though declared by law, remain without demarcation and monitoring programs in place.

Seagrass Beds

Seagrass beds are common along St Lucia's coastline (although the species diversity is low) and comprise *Thalassia testudinum* (Turtle Grass), *Syringodium filiforme* (Manatee Grass) and to a lesser extent *Halodule wrightii* (Shoal Grass) species. Interspersed between seagrass are benthically-rooted algae such as *Avrainvillea*, *Udotea*, *Penicillus*, *Halimeda*, *Amphiroa*, *Caulerpa* species. In general, larger and

denser seagrass beds are found off the East Coast, compared to the infrequent and sparsely covered seagrass patches along the West Coast.

Like coral reefs, these habitats have been subjected to stress resulting from silt laden waters due to poor management of human and natural resources, and development.

3.2 Living and Non living Marine Resource Exploitation

Over the years, the dependence of the island's economy on agriculture, fisheries and tourism has placed considerable stress on coastal and nearshore resources. As such, management authorities have put in place a number of conservation and protection measures. For instance, in 1986 a number of marine reserves were declared and these included some beaches and major mangrove and coral reef systems. In 2000 this list was updated. Currently, there are 20 marine reserves in St Lucia; however, many of these reserves remain without management plans and are under constant threat from activities such as sand mining, pollution, illegal fishing and infrastructural development.

Further, although national management authorities recognize the ecological, social and economic benefits of coastal habitats such as mangrove wetlands; the attractiveness of large-scale tourism development makes major infrastructural developments, such as hotels, enticing to the political directorate. It has been estimated that the island has already lost over 50% of its mangrove wetlands to development and the remainder are under constant threat. Over the past decade the Mankote Mangrove, the largest on the island and a marine reserve, has become

a prime target for proposed development in the hospitality industry. Two main factors contribute to this focus:

1. The location of the mangrove wetland: an economically depressed region (when compared to the north of the island), and
2. The lands are crown property vested in the National Development Corporation.

As a result there has been, and continues to be, considerable pressure from Government to develop this area under the hospitality sector. In fact, to date, several proposals from foreign investors have been entertained.

The increasing demand for fish by the general public, hotels and restaurants has led to significant increases in the exploitation of finfish, shellfish, and marine algae. Unfortunately, this has led to a reduction of bio-diversity in some eco-systems and a significant fall in population of some commercially important fish species, such as groupers and turtles. It has been this level of exploitation that has necessitated the establishment of fishing regulations to control of removal of fish from local populations.

The following describes various types of exploitation of coastal resources:

- Nearshore resources such as the white sea urchins and a variety of reef fishes, are under considerable stress from pollution and loss of habitat, and this stress is compounded by fishing pressures.
- Although recreational spearfishing has been banned, illegal spearfishing activities continue to put pressure on nearshore reef fish stocks.
- The legal mesh size for traps used in 'pot fishery' is 1 1/2 inches, but some fishers continue to fish using illegal mesh sizes.

- It is generally not believed that conch and lobster populations are on the decline, but there is still concern that insufficient data exists to fully support this belief.
- Although a moratorium has been declared on turtles and all turtle products since March, 1996, there is some consideration being given to the reopening of this fishery. Despite the moratorium illegal harvesting of turtles and their eggs is still a concern.
- Despite attempts to get marine algae harvesters involved in cultivation of this resource wild stocks are currently on the decline. The reason for this is possibly because the cost of harvesting wild marine algae is lower than that for cultivation of the product.
- Illegal exploitation such as fishing in marine reserves, collection of coral souvenirs, and use of illegal fishing methods result in loss of both species and habitat diversity.
- Legal and illegal sand mining activities on beaches and in river mouths are forms of exploitation that have arisen due to the high demand for construction aggregate. These activities cause considerable degradation to coastal habitats.
- Harvesting of mangrove trees for charcoal production has sometimes led to clear cutting of mangrove areas. The Department of Fisheries, in collaboration with other agencies, has encouraged the sustainable use of mangrove for charcoal production. Management efforts have led to co-management arrangements between relevant agencies and some charcoal producers, but some persons continue to clear-cut mangrove areas with no consideration being given to sustainable harvesting methods.

To supplement local marine fisheries and relieve some of the fishing pressure on nearshore resources, the Department of Fisheries has encouraged the development

of aquaculture. However, aquaculture is still relatively undeveloped in St. Lucia with a total of sixteen acres of land being under cultivation. Most of the aquaculture activities occur in freshwater ponds and involve the production of tilapia and prawns. There are just two or three large farms (between five and seven acres) most of which are located several miles inland. There are no ponds directly on the beach and most farmers possess just one or two ponds. Aquaculture feeds are produced locally using farm and fish wastes as well as a few additives such as hormones and antibiotics. The use of disinfectants is almost non-existent and controls are in place to regulate the faecal and algal content of pond effluent.

Marine algae culture is the only form of mariculture currently in place in St. Lucia. Most of the marine algae plots are located along the south and south-east coasts of the island in areas that are not often used for recreation. Marine algae culture, as it exists, has little or no adverse impact on coastal areas and may actually be beneficial to the environment by regulating coastal nutrient levels, which may become elevated due to river outflows. Notably mariculture was introduced to decrease exploitation of wild stock of marine algae, but some level of harvesting of wild stocks still occurs.

3.3 Climate Change and Natural Disasters

Due to the mountainous interior of the island, the main settlement areas are located along the coast, and many of these communities along the coast experience severe flooding following heavy rainfall. Every year the loss to agriculture, private, public and commercial property increases. The cost of establishing and maintaining coastal development has thus increased significantly over the years, as is evident from

increases observed in insurance premiums and rental rates. Protection for agricultural produce has also become an expensive venture.

Some of the greatest negative impacts being experienced along coastal areas are due to storms and hurricanes. Increased rainfall has led to massive soil erosion in inland upland areas, the dislodging of solid waste and the leaching of biological and chemical materials into streams and rivers. As a consequence, reefs and other coastal areas become inundated with sediment, plastics, bacterial, industrial and agro-chemical pollutants. For instance, in 1994, Storm Debbie resulted in very heavy rainfall which caused high sediment levels in the nearshore. As a result, some reefs off the fishing village of Anse la Raye along the west coasts lost about 50 percent of their coral cover. In 1999, Hurricane Lenny caused a loss of over 50 percent of coral cover on some reefs within the SMMA.

To a limited extent, assessments of the areas most vulnerable to flooding, coastal erosion and storm surge are continuously being made by the island's disaster-preparedness unit in collaboration with agencies within the agriculture, tourism, health, fisheries, planning and community development sectors. Where possible, efforts are being made to relocate homes and businesses, develop and implement mechanisms to reduce the pollution of waters and the severity of flood incidents. Disaster response mechanisms have also been established for flooding and storm surge. Management programs to assist in the mitigation of adverse impacts of storms have been developed in relation to town planning, solid waste disposal, agriculture, and the use, conservation and safety of freshwater. However, factors such as poor farming practices, for example, cultivating on steep slopes, deforestation on slopes and river banks and over-fertilization of crops continue to be a major problem area.

Limited flat lands has led to construction of houses and other structures on hillsides, and without appropriate retaining structures, there is high erosion on sloping lands. This practice has significantly contributed to the degradation of nearshore habitats. The placement of septic tanks, pit latrines, and solid waste disposal sites in areas prone to flooding or in areas where leaching of material can affect waterways and coastal waters, also contribute to the negative impacts of natural disasters. Many buildings are still being constructed far too close to the “wet zone” of coastal areas. This reduces the capacity of a sandy beach to naturally retreat and expand during the year and increases the risk of damage to infrastructure. In a country like St. Lucia where beachfront access is important to economic development, this problem is becoming increasingly worse. The altering of rivers (specifically straightening and removal of river-bank vegetation), the filling-in of mangrove areas and other wetlands that act as silt traps and flood protection areas along the coast, the destruction of fringing reefs either by unregulated exploitation from fishing and/or by tourism activities, and the removal of beach vegetation for hotel or home construction are all factors contributing to the island's likely inability to adjust to climate changes.

Sand mining is yet another major issue which gives cause for concern, as this contributes significantly to beach erosion. The Ministry of Communication and Works has the mandate to control all mining on the island and in its national waters. As such, this Ministry grants permits for removal of sand from specific areas. For example, permits are given to mine sand from river mouths to prevent upstream flooding. Such activity is clearly not monitored carefully as sand mining presently occurs in some river mouths as well as on several of the island's beaches.

From the issues discussed in this section, it is clear that as a small island depending heavily on its limited coastal resources, St Lucia is extremely vulnerable to the

impacts of climate change. Coastal and marine resources are currently under severe stress from several factors and thus their ability to cope with other stressing factors such as climate change is severely reduced. However, the severity of climate change impacts can be significantly reduced if sustainable land-use practices and waste disposal mechanisms are put into effect, but due to limited space issues such as setbacks will present a major challenge for authorities.

3.4 Transboundary Threats

The impacts of land-based pollution can be far-reaching for St. Lucia as part of a chain of islands that are closely related geographically. For example, in July and August of 1999, the nearshore fisheries of Trinidad, Grenada, St. Vincent, and Barbados experienced fish kills. Investigations indicated that bacteria associated with freshwater outflows from the Orinoco and Amazon Rivers on the South American continent were primarily responsible for the fish kills. It is believed that the effects of el nino caused a change in current patterns in the area resulting in the freshwater being carried down from these systems shifting to a more westerly direction than usual. Fortunately, St Lucia suffered no noticeable ill effects, but the potential for future problems from such anomalies clearly exists.

A further issue is that of shared stocks. For example, some turtle species found in St Lucia waters do not reside there but move among the islands of the Lesser Antilles, and thus, although a moratorium exist on turtles in St Lucia the species are still being harvested by neighboring islands. To ensure effective management of these resources there is a need to consider entering into bilateral and or multilateral agreements with the relevant parties.

3.5 Land Based Pollution

3.5.1 Siltation

Siltation of nearshore areas is a major problem facing the island today. As stated earlier, many of the island's reefs have been severely degraded and the aesthetics of once pristine coastal areas, destroyed. High levels of sediment are deposited in bays via river systems which themselves have been degraded due to poor land-use practices. Deforestation along riverbanks and slopes, and uncontrolled and/or poorly controlled construction in coastal are common occurrences.

3.5.2 Liquid Waste

As mentioned previously, liquid waste consists of domestic and ship sewage, industrial and agro processing effluent, and urban drainage water. Treatment and disposal of sewage is an issue that needs to be reviewed closely. In some areas such as the city of Castries, there is a sewer system that serves the immediate suburbs of the city center. But, it should be noted that this system is essentially for collection and disposal; i.e. there is no treatment of this sewage. The collected effluent is pumped directly into the Castries Harbor. Marine resources in this area and its environs have thus suffered immensely.

In the north, the situation has improved slightly over the years. This improvement can be attributed to the Rodney Bay Sewage Treatment Plant which was established to serve the north of the island. Currently, a number of households are connected to this system in addition to 12 hotels in the immediate vicinity. In the past these hotels utilized their own treatment plant with subsequent disposal of the partially treated effluent in the neighboring waters. In some cases the extent of acceptable treatment of the effluent was questionable. But, in recent times, due to the

alternative form of disposal, the north coast has shown improvements in water quality. Despite this improvement, not all of the hotels in the north are connected to this sewage system and the occasional complaint from persons in the north regarding water quality still exists. In addition, impacts of seepage from septic tanks along this coast are yet to be investigated, as the majority of residential houses are still not serviced by the aforementioned treatment plant.

St Lucia is not heavily industrialized, however, many of the existing industries do not have adequate treatment and disposal facilities and are still sources of pollution to coastal areas. For example, the company St Lucia Distillers currently disposes of wastes containing yeast and other materials into the Roseau Bay. This bay is a prime fishing site for seine fishers of the areas, and fishers as well as residents using the area for recreation continue to complain about some of the more obvious negative impacts (such as odor) of this waste. Also, liquid wastes leaving the copra factory and entering into the Soufriere River has been linked to fish kills experienced on occasion in the Soufriere Bay and the river.

3.5.3 Solid Waste

Solid waste reaching in the coast comprises natural (e.g. coconuts, logs) and man-made (e.g. plastic bags and bottles, tin cans, used diapers) materials. Fairly recently, plastic bottles used in the soft drink industry have become particularly problematic as there is no recycling facility for these containers on the island. After heavy rains high numbers of these plastic bottles can be observed clogging river mouths and in nearshore areas. Although fairly recent legislation has been enacted to address the issue of solid waste and a Solid Waste Management Unit has been established, limited land adequate for dump sites and the lack of formal recycling facilities for

plastic bottles or other such materials on the island continue to present problems for coastal and marine management authorities.

3.6 Tourism

Like many small island tropical states, St Lucia's main selling point is sand, sea and sun. Thus, the island depends heavily on tourism and a significant part of the tourism package relies on dive and snorkel tours, beach bathing and yachting. The use of all aspects of coastal resources (particularly use of beaches and coral reefs) is rapidly and steadily increasing as the tourism industry continues to grow. The rapid growth of the tourism industry has led to conflicts between traditional users and the tourism sector. The high demand for dive and snorkel sites has also taken its toll on coral reefs. The negative impact on reefs caused by high number of divers and snorkelers is further compounded by fishing activities, indiscriminate anchoring of vessels and poor water quality.

Initiatives such as the establishment of marine management areas, controls placed on the number of divers and snorkelers in an area, the establishment of artificial reefs to divert dive stress away from natural reefs, establishment of fish aggregating devices in offshore areas to encourage offshore fishing, training of fishers in offshore fishing techniques, and replanting of river banks, go a long way in arresting many of the problems faced in coastal zone management today. However, it has long been recognized that an integrated and holistic approach to natural resource management and development is essential if St Lucians are to continue to benefit from the island's natural wealth; but issues such as poor water quality due to high amounts of sediment and sewage (partially and untreated) reaching the nearshore continue to hamper the effectiveness of these efforts.

3.7 Health

There is no comprehensive monitoring program for fresh or marine waters. However, the Ministry of Agriculture and the Ministry of Health have conducted studies to ascertain water flow rates and volume and to monitor pesticide, heavy metal and micro-organism content, but these studies are limited in terms of time frame and area covered.

Ongoing monitoring includes rainfall data collected daily by the Ministry of Agriculture and the Meteorological office, and assessment of river flow rates and changes due to bank erosion and river sand mining is collected by the Ministry of Agriculture through its Engineering Division.

The potential negative impacts of water quality (fresh and marine water) on human health and the environment due to the lack of a comprehensive monitoring program for water quality present an area of grave concern. Consistent monitoring of water quality would allow for an action plan to be put in place in the event of water contamination that poses a risk to recreational or other activities in both coastal waters and rivers. Such monitoring would further allow for action to be taken before the situation reaches critical levels.

The Ministry of Agriculture, Forestry and Fisheries, the Ministry of Health, the Caribbean Environmental Health Institute (CEHI) and the Water and Sewage Corporation possess, to varying degrees, water quality testing and monitoring equipment. However, it should be noted, that the Ministry of Health has the mandate for water quality testing (both fresh and marine waters), but due to limitations such as the lack of a laboratory and trained staff, little monitoring is carried out. In general, coastal waters are not monitored, except in cases where

CEHI is contracted by hoteliers and other persons to carry out monitoring in specific areas. Recently, the Department of fisheries and the Ministry of Health (Environmental Unit) met to discuss the possible implementation of a joint water quality monitoring program using the laboratory facilities at the Department of Fisheries and the expertise of the Ministry of Health.

3.8 Data, Information Management and Research

A large amount of the data pertaining to the coastal zone is collected under finite projects. Such data, though important, particularly as baseline information, is limited by its time frame. In addition, ongoing programs tend to target only a few sites and are often plagued by problems such as the lack of human and financial resources, resulting in gaps in the datasets. Further, no one agency is responsible for collecting information on the coastal area, but the Ministry of Planning houses a large amount of relevant data in their geographical information systems database. In general though, information on coastal areas is scattered throughout a number of agencies. The fragmented nature of the sources for existing data makes it difficult to allow this information to be effectively disseminated and used in the decision-making process.

The following gives lists the types of data collected by various agencies:

St Lucia Air and Sea Ports Authority

- Licensing and registration information for vessels used for hire.
- Data regarding ports (such as depths, berthing capacity, etc.).

Department of Fisheries (Ministry of Agriculture, Forestry and Fisheries)

- 1996/7 beach inventory: data collected consisted of a physical description including vegetation, coastal usage, major coastal concerns, total length of beach, profiles along some beaches and an estimate of the area of the beach (surface area of sandy region).
- Beach profile data (1990-present: only for a few sites and major gaps in the data)
- Reef Fish and Coral Communities Survey: Fish censuses and status of reef in SMMA and CAMMA carried out since 1994/5 by Dr Callum Roberts of York University, and his assistants in collaboration with the Department of Fisheries.
- Size frequencies and density of white sea urchins in Laborie and Anse de Sable Bays (carried out in collaboration with CANARI).
- Fish catch and effort data.
- Biological data on lobster, conch and a few select other reef and bank species.
- Registration of fishermen and fishing vessels.
- Licensing of fishing vessels.
- Registration of SCUBA and snorkeling establishments.
- Registration of sport fishing establishments.
- Licensing of sport fishing vessels.
- Registration of speargun users (note: only commercial fishermen are issued with permits).

Caribbean Natural Resource Institute

- Status of select reefs in Soufriere.
- Size frequencies, densities and maturity data for white sea urchins (Laborie and Anse de Sable).
- Data on charcoal production in the Mankote Mangrove and sliviculture experimenting.

Caribbean Environmental Health Institute

- Water quality of some coastal areas.

Ministry of Agriculture, Forestry and Fisheries

- Water flow rates and volumes (for select areas).
- Data collected during the second phase of Northwest Coastal Conservation Project (including information on beaches, river water quality, river sediments, bay water, bay sediments for both the Rodney and Choc coastalsheds).

Soufriere Marine Management Association

- Information regarding studies carried out by University students in the SMMA (including coral reef status, sedimentation rates, migration of fish in and out of marine reserves).

Ministry of Planning

- The GIS database of this Ministry is used to store information such as physical infrastructure (buildings, roads etc), and natural resources (such as forests, beaches, reefs, etc). Most of the data on natural resources has been compiled from data sourced from the Departments of Forestry and Fisheries.
- Information obtained from environmental impact assessments carried out at the request of the Ministry.

3.9 Stakeholder Participation/Awareness and Education

Although a number of agencies use and encourage the use of public participation in the management of resources, there is no formal requirement for the involvement of the public in the general decision making process. However, there are plans to

develop an integrated approach to development planning and it is hoped that through this effort the public will play a greater role in the decision making process.

One of the major challenges associated with the management of coastal habitats is the regulation of human activities within these areas. Fishing, snorkeling, scuba diving, yachting and sea bathing are the primary activities that must be carefully regulated if these resources are to survive. Often, users of a resource resent the placing of restrictions on the use of this resource. Restrictions are often perceived as having an adverse impact on income generation and / or recreational activities. In the past much of the management measures put in place by authorities entailed enactment of legislation. But, with little financial resources to enforce such legislation and the lack of awareness, education and sensitization of users and the general public, such efforts were largely ineffective.

To facilitate greater compliance of laws, some authorities have focused on education, awareness and sensitization of the public as well as their participation in decision-making. In addition, greater efforts have been made to involve the stakeholders in the management of coastal and marine resources. These efforts are based on the view that user participation is positively correlated to compliance, and past experience has supported this view.

One renowned case study, the Soufriere Marine Management Area (SMMA), has been deemed a major success and acts as a pilot for other stakeholder participation initiatives. In 1994, a number of agencies (government and non-government) in St. Lucia joined management forces to resolve user conflicts (mainly tourism investors versus the traditional fisherfolk) and mitigate negative impacts from uncontrolled use of coastal resources of the town of Soufriere. As a direct result, the SMMA was established out of a series of consultations among stakeholders. These consultations

ensured a wide-scale, multiple representation of interest groups (such as fishermen, divers, yachters, hoteliers and government and non-government management bodies). The output of this consultative process was an agreement which apportioned the shore and nearshore areas in such a manner that allows for a myriad of desired coastal activities to coexist, catering to all users. In effect, the eleven kilometres of coast was divided into five zones, namely marine reserves, fishing priority areas, yacht mooring areas, multiple use areas and recreation areas. The legal base for the SMMA resides in several government bodies such as Ministry of Agriculture Forestry and Fisheries, Ministry of Finance, Planning and Sustainable Development and the St. Lucia Air and Sea Ports Authority. However, the overall co-ordination and integrated planning of the area was carried out by a Technical Advisory Committee (TAC) on which all stakeholders were represented. The TAC approach allowed for continued input from all persons concerned. This allowed potential conflicts to be addressed before they reached a critical point. Further, constant monitoring of the coastal resources in the area have shown that in 1997, there was generally an overall striking increase in the commercially important fish species within the SMMA and coral reef health is on the incline. The management area was given international recognition when it became the recipient of the British Airways Tourism for Tomorrow (IUCN Special Award) 1997, for National Parks and Protected Areas.

In 1997 the TAC requested a review of the SMMA's institutional arrangements. This process of review officially began in November 1997 and was funded under the Fonds Francais pour l'Environnement Mondial (FFEM) Project. The first phase of the process involved the review of the SMMA, including its strengths and weaknesses and the second phase involved the formulation of a more efficient structure for the management of the Soufriere Marine Management Area.

Following the institutional review of the SMMA, which involved much consultation and discussion, the Cabinet of Ministers approved a new agreement to manage the Soufriere Marine Management Area. As part of this agreement, the Soufriere Marine Management Association was formed under the Companies Act Number 19 of 1996 and currently has the responsibility of overseeing the overall management of the SMMA. This Association is guided by the 'Agreement to Manage the Soufriere Marine Management Area.' The parties which entered into this agreement comprise the Board of Directors for the Association and include the following:

- Ministry with responsibility for Fisheries.
- Ministry with responsibility for Planning, Development and the Environment.
- Ministry with responsibility for tourism.
- St Lucia Air and Sea Ports Authority.
- National Conservation Authority.
- St Lucia Dive Association.
- St Lucia Hotel and Tourism Association.
- Soufriere Fishermen's Cooperative.
- Soufriere Regional Development Foundation.
- The Soufriere Water Taxi Association.

Further, according to the Agreement, a Stakeholder Committee which includes a broad membership to ensure representation of stakeholders, acts as an advisory body to the Board of Directors, and as such, all major proposals for management and development produced or being considered by management agencies of the Association, and related to the SMMA, must be presented to the Stakeholder Committee for advice.

The success of the SMMA has led to the formation of another marine management area which encompasses the coastal area of the two villages, Anse la Ray and Canaries, which are located immediately north of Soufriere. The day-to-day management of this new area is also overseen by the Soufriere Marine Management Association but supported by rangers from these two villages.

Despite the SMMA experience and other success stories, problems such as the lack of human capacity and financial resources for adequate surveillance and enforcement programs, as well as consistent monitoring, presents some major challenges for management authorities.

The following briefly outlines some of the other various initiatives and activities carried out to involve the public in the decision-making process and promote awareness and sensitization of coastal resource issues.

- Public sector consultations occurred during the Northwest Coastal Conservation Project, which concluded in March 2000, and these focused on disseminating the findings of environmental quality study of the North West Coastal Conservation Project. A social impact assessment of the Choc Bay watershed was also done and this revealed the need for more intense education and sensitization of the public on coastal management issues. In addition, promotion of the project was undertaken to create awareness of key coastal issues, one of the results being the production and dissemination of bumper stickers on coastal protection. In an effort to sensitize and educate the public, exhibits with a coastal management theme were displayed as part of the National Independence Exhibitions in 1999 and 2000, and the World Environment Day National Exhibition in 1999.

- A brochure was designed to promote coastal protection, with special reference to coastal issues for the north west coast, and will be disseminated by the Coastal Zone Management Unit which has been proposed for the near future as a unit under the Department of Fisheries. Numerous publications have also been produced and disseminated to the public schools, user groups and the public at large by the Department of Fisheries on various aspects of coastal conservation.

- The Department of Fisheries has engaged in extensive public awareness and sensitization education activities on various coastal management issues over the years. These have focused on conch, turtle, lobster and sea urchin conservation, coral reef protection, mangrove conservation and protection, mariculture of marine algae (seamoss) and general awareness of fisheries related laws. Most of these activities target schools, tourism related agencies (e.g. tour guides), law enforcement officers and a host other interest groups.

- The Department of Fisheries has also held various community consultations on various issues affecting the fisheries sector and further worked with the dive sector for coral reef conservation. Noteworthy, is that the Fisheries Regulations #9 of 1994 and the Fisheries Management Plan were developed through a national public consultative process.

- Through the Annual Teacher Training Workshop conducted by the Forestry Department, teachers from various levels (preschool to secondary school) of the education system have been trained in an environmental education methodology which focuses on the conservation and protection of rivers, mangroves, sea turtles and coral reefs. To date, about two hundred persons (including school children) have been trained.

- Various students from the Division of Teacher Education and Education Management of the Sir Arthur Lewis Community College have undertaken studies on the coastal issues as part of their project requirements for their Social Studies course towards the completion of their UWI Certificate in Education. In addition, school based assessments (SBA) for Caribbean Examination Council (CXC) examinations also focus on coastal resources conservation and thus various agencies such the Department of Fisheries and the Forestry Department assist student in completing these assessments. These Departments also give school presentations that cover pertinent sections of school syllabuses.

- The Caribbean Planning for Adaptation to Climate Change (CPACC) Project which is a regional project, has provided training for public sector officials in economic valuation of coastal resources and is presently engaging officials in providing data for a newly designed database, the Coastal Resources Information System (CRIS). The Economic Valuation of Coastal Resources, a pilot study in St Lucia under the CPACC Project, focuses on the stretch of coast from Rat Island to Wyndham Morgan Bay Hotel and is designed to value coastal resources in this area, as well as provide training for persons in the methodologies used for economic valuation of resources.

- Since its inception, the SMMA has been involved in public awareness and education regarding the sustainable use of marine resources. This Association has aslo been the source of a number of brochures and videos highlighting the SMMA and its role in coastal conservation. In the past, the Association has also sponsored community events such as school activities and a carnival band which had a marine resources conservation theme.

- The St. Lucia National Trust has undertaken sensitization exercises on various aspects of coastal management, including the impacts of sand mining. They have been engaged in annual Kids Summer Safari programs since 1994. During these Safaris students are introduced to coastal management issues and agencies such as the Department of Fisheries, Forestry Department and SMMA provide resource persons.

- The Caribbean Alliance for Sustainable Tourism (CAST) has been training hoteliers in the methodology of making their facilities demonstrate better environmental management. UNEP produced a Caribbean regional training manual for Integrated Coastal Area Management for the Tourism Industry in January 1999. This manual was designed to assist in the development of institutional capacity in the region for the tourism sector to better be able to compliment coastal zone management efforts. Participants representing a cross-section of public, private and academic institutions involved in different aspects of tourism and coastal environment issues were trained. In addition, the OECS-NRMU has trained some stakeholders on the island in sustainable tourism strategies related to integrated coastal area management.

- Under the auspices of the Department of Fisheries and in collaboration with Forestry Department and the Caribbean Natural Resource Institute, the Aupicon Charcoal Producers have been engaged in sustainable harvesting of mangrove for charcoal production. The latter mentioned group has also invested in a form of eco-tourism establishing trails for tours through the Mankote Mangrove and erecting a bird watch tower to enhance the tour experience.

- The St. Lucia Naturalists Society has been conducting sea turtle watches and monitoring exercises since 1984 with the collaboration of the Department of Fisheries. However, these activities are focused on one beach, the Grande Anse Beach, which is the main nesting site for leatherback turtles in St Lucia. Further, these activities are carried out only once a week and mainly during the nesting season. This Society, in collaboration with the Department of Fisheries, has also sensitized the public on the need to conserve beaches and turtles. Recently, the St Lucia Heritage Tourism sponsored a project for the Grande Anse area. This project is facilitating the training of persons from nearby communities (Garrand and des Barras) to conduct turtle watches. Under the project these persons will conduct more regular monitoring of turtle nesting activities on the Grande Anse Beach.

3.10 Institutional Frameworks

The Development Control Authority of the Ministry of Planning has overall planning authority. However, the Department of Fisheries, the National Conservation Authority and the St. Lucia Air and Sea Port Authority (SLASPA) have some responsibility for coastal zone management. A Coastal Zone Management Unit (CZMU) is proposed to be established within the Department of Fisheries. This unit will be an implementing and coordinating body for the management of coastal resources and will be advised by a multi sectoral Coastal Zone Management Committee (CZMC). The committee will comprise of representatives of several relevant agencies such as the Ministry of Planning, Department of Forestry and the Water Resources Unit. In the initial stages, this Unit will prioritize and implement recommendations from the recently concluded North West Coastal Conservation Project. It is envisaged that this unit will

eventually develop and implement a comprehensive program for the management of coastal resources in St Lucia.

There is no comprehensive legislation for the management of coastal resources in St Lucia; however, a number of existing legislation contain sections relevant to coastal resources management:

- Fisheries Act 1984 and Regulations, 1994.
- Forest, Soil and Water Conservation Ordinance (1946).
- Beach Protection Act 1967 and Beach Protection (Amendment) Act 1984.
- Land Development (Interim) Control Act (1971).
- Oil in Navigable Water Act (Cap 91).
- National Conservation Act 1999.
- Crown Land Ordinance (1946).
- Public Health Act (1975).
- Pesticides Control Act (1975).
- Solid Waste Management Authority Act (1996).
- The Maritime Areas Act (1999).
- Water and Sewage Act 1999.
- Wildlife Conservation Act (1980).

In general, government policies highlight optimal but sustainable use of coastal resources and encourage research, monitoring, public education, legislative review and enforcement of existing legislation. These policies, when properly implemented, are designed to compliment coastal resource management efforts.

Despite the current sectoral approach to management and development in St Lucia, there are efforts under way to review existing legislation to facilitate the development of an integrated institution that would provide for a more holistic approach to management and development. Already some institutional arrangements such as the SMMA allow for the collaborative management of coastal resources.

Table 3.1 : Agencies responsible for management of coastal areas/ waters in St. Lucia.

Agency	Mandate	Role
Ministry of Agriculture, Forestry and Fisheries: Department of Fisheries	Management of living marine resources	Research, monitor, establish management strategies for the use of fish species and their ecosystems
CEHI (Caribbean Environmental Health Institute)	Monitoring of water quality (when contracted)	Monitor coastal and inland water quality, make appropriate recommendations for improvement in quality.
Ministry of Health, Family Affairs, Human Services and Women	Management of the water resources to safeguard public health	Monitor coastal and inland water quality. Establish and implement control measures for water safety.
Ministry of Legal Affairs, Home Affairs and Labor: Marine Police	Enforcement of Marine related and other national laws.	Surveillance and monitoring of activities within coastal and marine waters, and enforcement of related legislation.
NCA (National Conservation Authority)	Conservation and management of coastal habitats, primarily the beaches.	Monitor and regulate anthropogenic use of beaches. Maintain clean beaches.
Ministry of Planning, Development, Housing and the Environment: Development Control Authority	Management of coastal and offshore development for sustainable economic growth.	Monitor, advise and regulate all beach, coastal and river construction including building and other infrastructure alterations.

Chapter 4

4.0 Integrating Watershed and Coastal Area Management

4.1 Legal and Policy Issues

4.2 Institutional Issues

4.3 Financial Issues

4.0 Integrating Watershed and Coastal Area Management

As is the case in all small island states, watershed management and coastal area management issues in St. Lucia are inextricably linked.

The most obvious signs of the effects of poor watershed management practices on the coastal areas are the to be seen after moderate to heavy rainstorms, when turbidity of the nearshore waters is visibly increased in most bays, because of high sediment loads in the rivers that discharge into the bays. High sediment loads in rivers are associated with high levels of soil erosion often caused by poor land management practices. This scenario has been observed in all larger watersheds in St. Lucia and their related coastal areas, but the Choc and Castries watersheds and their respective bays have been the objects of most concern because of the direct effect of river sedimentation on economic activities in the bays.

In the case of the Choc Bay, where two major hotels are located, the nearshore waters become unattractive for bathing, and this has been known to lead to complaints by hotel guests. This has also hindered the establishment of additional touristic developments along Choc Bay.

In the case of the Castries Bay, the heavy sedimentation has a negative effect on the operations of St. Lucia's main seaport, which is situated within the bay. The large quantities of sediment deposited in the bay lead to the expenditure of significant sums of on dredging, which is required to maintain the draught needed by the many large ships served by the port.

Additionally, during most rainstorms, significant amounts of solid waste, particularly plastic containers, find their way into the Castries Bay via the Castries River. This is not only of concern to the St. Lucia Air and Sea Ports Authority, but also to the residents of Bannanes Bay and Tapion, where such waste accumulates to create health hazards and unsightly environments.

These scenarios illustrate the clear linkage between watershed management issues and coastal area management issues in St. Lucia and they serve to highlight the need to integrate consideration of these sets of issues as part of the island's sustainable development thrust. Further, given the importance of watershed and coastal areas to the economic and social development of this small island state, the process of integrating watershed management and coastal area management issues should be given priority.

It is therefore proposed that a process aimed at integrating watershed management and coastal area management be undertaken as a matter of priority, with the overall goals of contributing to sustainable development and improving the environmental quality of watershed and coastal areas.

In considering proposals for the integration of watershed and coastal area management, the three broad issues to be considered are:

- I. Legal and Policy Issues
- II. Institutional Issues; and
- III. Financial Issues

These issues shall be discussed in detail in the following sections.

4.1 Legal and Policy Issues

In order to implement a sustainable and comprehensive programme aimed at the integration of watershed and coastal area management, it is necessary to develop clear policies that would, among other things, provide guidelines on how the integration process is to be conducted and outline the linkage between the process and other national development initiatives.

Currently, there are no policies that comprehensively address watershed management or coastal area management. As such, a completely new set of policies needs to be developed to govern the process of integrating watershed and coastal area management.

Such policies should be supported by strong, enforceable legislation that would ensure the sustainability of the integration process. While a significant body of legislation covering many aspects of watershed management and coastal area management currently exists, many gaps, overlaps and inconsistencies have been identified among these laws. In addition, several emerging international issues are not addressed within the current legal framework, and local laws do not adequately reflect the provisions of multi-lateral agreements to which St. Lucia has acceded. Further, the general lack of enforcement of the existing laws has been identified as a major deficiency of the current institutional and legal frameworks. As such, in the formulation of any new legal framework, particular attention should be paid to issue of enforcement.

Problem Identification

Lack of comprehensive policy and legal frameworks to support the integration of watershed management and coastal area management activities.

Goal

- The formulation of a comprehensive policy aimed at the integration of watershed and coastal area management activities and the establishment of a corresponding legal framework to facilitate the integration process.

Assumptions

1. Government's :

- Willingness to formulate a policy aimed at integrating watershed management and coastal area management issues.
- Commitment to establishing the legal framework proposed as a result of the policy formulation process.

Constraints

- Inadequate financial and human resources to develop policies and laws.
- Public apathy and/or resistance to policies and laws.
- Lack of political will to adopt policies and pass laws.

4.2 Institutional Issues

Within the current institutional framework for watershed management and coastal area management, a number of governmental agencies and a few non-governmental agencies are involved in the execution of several programmes and project in a largely uncoordinated manner. This situation reflects the condition of the institutional

framework for environmental management in general. In an effort to address the situation and to improve the overall institutional framework for environmental management, the Ministry of Planning has requested assistance from the Organisation of Eastern Caribbean States (OECS) to develop an institutional framework for enhanced environmental management. The exercise aimed at developing this framework is currently ongoing. However, it has already been recognised that the inter-relationships between institutions involved in environmental management in St. Lucia are complex. Also, in several instances, the mandates of certain agencies overlap, and such overlaps result in conflicts that hinder sound environmental management. This is also applicable to the fields of watershed management and coastal area management, which are fundamental components of the overall environmental management framework in St. Lucia.

In addition, manpower constraints and the absence of adequate facilities are often cited as major impediments to the fulfillment of the mandates of institutions involved in watershed management and coastal area management. Therefore, as part of the integration process, there shall be need to address institutional capacity issues with a view to ensuring that the relevant institutions are provided with the required resources to fulfill their mandates and to contribute to the integration process.

Of particular significance in the consideration of institutional issues, is the involvement of Community-based Organisations (CBOs) and Non-governmental Organisations (NGOs). Such organisations play critical roles within the institutional framework and the extent of their involvement in efforts aimed at integrating watershed and coastal area management shall determine the levels of success of the integration process. There is therefore need to specifically address the roles of NGOs and CBOs in the integration process. Also, there is need to develop and

implement appropriate initiatives that would provide support to such organisations to allow them to fully contribute to the integration process at the national level and at the watershed and community levels.

Related to the increased involvement of CBOs and NGOs are the issues of public awareness and education and information dissemination. These issues must be given particular attention in the integration process, as they are the means through which stakeholders shall be motivated to contribute to the process.

Problem Identification

Inadequate institutional capacity to address watershed management and coastal area management issues and lack of coordination between relevant institutions and stakeholder organizations.

Goal

- To strengthen the relevant institutions in order that they may be able to fulfill their mandates and to institutionalise linkages among the relevant governmental and non-governmental agencies and community-based groups for the management of activities within the watersheds and coastal areas.

Assumptions

- Institutions are willing to participate in integration process.
- Availability of persons capable of receiving training
- Availability of finance
- Sufficient capacity at watershed and community levels to participate in and contribute to integration process.

Constraints

1. Availability of skilled and trained personnel.
2. Financial support for implementation of required initiatives.
3. Public participation and willingness to implement actions.

4.3 Financial Issues

Most major projects and programmes related to watershed and coastal area management are undertaken by the Government of St. Lucia, and to a large extent, the greater part of the funding for these projects and programmes is sourced from external agencies. However, the operational costs of most of the agencies involved in watershed and coastal area management are borne by the Government of St. Lucia, which also provides counterpart funding for the major projects and programmes.

Inadequate financial resources, is often cited as a constraint to the implementation of effective watershed management and coastal area management programmes and projects. This constraint should therefore be addressed as part of the process of integrating watershed and coastal area management.

It should be recognised however, that little attention has been given to the development of a comprehensive regime of appropriate economic instruments to promote responsible environmental management practices by the private sector and the general public.

In 1999, the Government of St. Lucia introduced an environmental levy on a wide range of imported goods, with the intention of using the revenue generated from

this levy for the preservation and conservation of the environment. However, a direct relationship has been established between the funds generated from this levy and expenditure on environmental programmes. The identification of a particular fund arising from the imposition of the environmental levy may however provide an opportunity for accessing some of the financial resources required to facilitate the process of integrating watershed and coastal area management. Additionally, consideration should be given to the economic benefits to be derived from the integration process and the manners in which such benefits may in turn be applied to assist the process and to contribute towards its sustainability.

Problem Identification

Lack of adequate financial resources to achieve policy objectives.

Goal

- To obtain financial resources required from national, regional and international sources.
- To develop and implement appropriate economic instruments to promote responsible action in relation to watershed management and coastal area management.

Constraints

- Willingness to institute cost recovery measures proposed in National Policy.
- Inadequate funding from regional and international sources.

Chapter 5

5.0 National Action Program (NAP) for Integration of Watershed and Coastal Area Management

5.1 Legal and Policy

5.2 Institutional

5.3 Financial

5.0 National Action Programme (NAP) for Integration of Watershed and Coastal Area Management

Having identified in Chapter 4, the major issues to be addressed in the process of integrating watershed and coastal area management in St. Lucia, a National Action Programme (NAP) can now be developed. This plan is to be devised to ensure attainment of the goal of full integration of watershed management and coastal area management activities in St. Lucia in support of national development goals. The components of the plan shall be grouped under the main headings identified in Chapter 4, namely:

- I. Legal and Policy
- II. Institutional; and
- III. Financial

5.1 Legal and Policy

Based on the previous analysis of the legal issues, the NAP is to address the following:

- 1. The development of a comprehensive policy aimed at fostering the integration of watershed management and coastal area management issues.**

This policy is to be formulated within the framework of broad environmental management and sustainable development goals already established at a national level, and it will address, among other things, the legislative, institutional, financial, social and cultural dimensions of watershed management and coastal area management.

In addressing this issue, consideration will be given to the current initiative of the Ministry of Planning, Development, Environment & Housing (MPDEH) to develop

an updated institutional framework in support of environmental management in St. Lucia. As part of this initiative, the Organisation of Eastern Caribbean States (OECS) is currently providing assistance to the Ministry of Planning, which will lead to the preparation of a report on a proposed institutional framework for enhanced environmental management in St. Lucia. Recommendations from this report are expected to cover legal, policy and institutional issues of direct relevance to the process of integrating watershed and coastal area management and as such form a necessary preliminary step toward integration.

A number of regional and international conventions and agreements that bear some relationship to watershed management and coastal area management, have been signed, ratified, or acceded to, by St. Lucia. Consideration will be given to the ways in which the provisions of the relevant conventions and agreements can be used to promote and facilitate the integration process, and to the means by which the St. Lucia's obligations under these conventions and agreements, can be fulfilled.

Another important initiative, also being led by the MPDEH, and which lends itself to the integration process, is the development of a national land policy. During the consultative process on the integration of watershed and coastal area management issues, it was agreed that the principles of integration should be immediately factored into the Land Policy initiative. This will be achieved by members of the Steering Committee for this initiative, being invited to sit on the Land-use subcommittee.

In addressing these policy issues, major emphasis will be placed on the use of particular watersheds to serve as demonstration areas. Specific activities to be undertaken are as follows:

- i. Identification of relevant agencies and interest groups;

- ii. Public consultations
- iii. Public Sensitisation and Awareness
- iv. Finalisation of national land policy with particular emphasis placed on the integration aspects.

2. The establishment of a legal framework for integration of watershed management and coastal area management.

This framework is to be based on the outcome of the policy formulation process outlined in Item 1 above. Further, the report on the proposed institutional framework for environmental management in St. Lucia is also expected to address certain legal issues of relevance to the process of integrating watershed and coastal area management. However, the following major issues must of necessity be addressed within the proposed legal framework relating to watershed and coastal area management:

- Overlaps among existing laws
- Conflicts between laws
- The complete absence of laws to cover certain critical issues
- Inappropriateness of certain existing laws
- The need to improve the capacity of relevant authorities to enforce the laws
- The need to sensitise the judiciary on the relevance of the laws to social and economic development.
- The need to introduce new laws or to amend existing laws, as necessary, to fulfill obligations under regional and international agreements and conventions relating to watershed management and coastal area management.

In addition, with the privatization of services in the water and sewerage sectors, the issue of licensing and permitting for water abstraction and discharge of wastewater

is becoming increasingly important. As such the appropriate legal and institutional arrangements are to be put in place to regulate water abstraction and the discharge of wastewater. Consideration shall therefore be given to these issues in the development of the new legal and institutional frameworks.

5.2 Institutional

The component of the NAP that is to address institutional issues, is to comprise the following elements:

1. The appointment of an implementing agency. The Sustainable Development Unit of the MPDEH has been identified as being best placed to function in this capacity. Specific components will subsequently be undertaken by designated agencies.
2. The establishment of a coordinating mechanism to facilitate linkages between national institutions involved in watershed management and coastal area management.

In that regard, it is proposed that a National Committee on the Integration of Watershed and Coastal Area Management be established. This committee would comprise members of the existing Steering Committee expanded to include NGO and CBO and private Sector Representatives, and would be primarily responsible for promoting and facilitating the integration of watershed and coastal area management initiatives at the national level. As part of this broad mandate, the committee would be responsible for promoting the programmatic approach to the development and implementation of watershed and coastal area management activities to ensure cohesion and compatibility between the respective work programmes and budgets of the agencies involved in these

activities. In addition, the committee would be responsible for exercising oversight over the implementation of the pilot projects to be discussed later. At any rate, the mandate of this committee would be clearly defined within the policy and the related legal instruments, as appropriate. Significantly, however, the committee will be charged with the responsibility of promoting a more programmatic approach to the implementation of activities. To this end, with the advent of the Coastal Zone Management Unit, this committee will be given responsibility for technical advice to this and the Water Resources Management Unit.

Bearing in mind that a new institutional framework is likely to be established for the coordination of environmental management, programmes and projects at the national level, the mechanisms to facilitate the integration of watershed and coastal area management should fit into the broader framework in a seamless manner.

The idea of the revitalisation of the National Environmental Commission is being considered as part of the broader national framework. If such a Commission is established, it would be appropriate for the National Committee on the Integration of Watershed and Coastal Area Management to be made a sub-committee of that Commission. In that way, the objective of the integrating watershed and coastal area management could be realised within the framework of broader initiatives aimed at coordinating environmental management initiatives at the national level.

3. The strengthening of national institutions and organisations involved in watershed management and coastal area management.

The Ministry of Agriculture has agreed to initiate the process of integration through joint programming where possible, of its Water Resources Management Unit (WRMU) with one of its newest initiatives, the Coastal Zone Management Programme (CZMP). The joint implementation of Information Management and Water quality monitoring programmes are the main activities to be initially undertaken by these two units.

In addition, Public Sensitisation, Education and Awareness programmes are to be fundamental components of the integration process, as the success of this process shall to a large extent depend on the widespread understanding of watershed management and coastal area management issues, and public appreciation of the need to integrate these issues. As such, institutional strengthening initiatives shall involve consideration of institutional requirements in relation to Information Management, Environmental Monitoring and Public Education and Awareness.

Institutional Capacity building is to be achieved through recruitment of staff, training of existing staff, and improvement of facilities as appropriate. The regulatory framework for the water sector is currently being addressed under the Water Sector Reform Technical Assistance Project that is being undertaken with assistance from the World Bank and the Caribbean Development Bank. This project is to address, among other things, the requirements for implementation of the licensing and permitting regimes for water abstraction and wastewater discharge.

4. The development of frameworks for the integration of watershed management and coastal area management activities at the watershed and community levels.

Such frameworks should promote integrated local action to address localised issues while being consistent with principles established in the National Policy.

In that regard, efforts will be made to increase the involvement of NGOs and CBOs in decision-making processes, including the development of policies on the integration of watershed and coastal area management, and the formulation of related legal instruments. As such, NGOs and CBOs should be represented on the proposed National Committee on the Integration of Watershed and Coastal Area Management.

Additionally, the integration of watershed and coastal area management in a practical manner shall of necessity require the active involvement of NGOs and CBOs at the watershed and community level. Pilot projects within specific watershed/coastal area shall be undertaken to develop methodologies and approaches for integration of watershed and coastal area management in a practical manner.

A proposal has been prepared for the implementation of a pilot project to develop appropriate mechanisms for integrating watershed management and coastal area management in the Choc watershed and coastal area. (see Appendix A). The Choc watershed represents a typical area in transition, in which traditional land uses centered around agricultural production have been and shall continue to be replaced by a mixture of land uses related to urban sprawl, economic diversification and population growth. It is also proposed that a related pilot project be implemented in another watershed within St. Lucia that unlike Choc, has not yet been subject to significant changes in land-use. In such a case, consideration could be given to the Canaries and L' Ivrogne watersheds. The implementation of pilot projects in such differing watersheds will provide opportunities for comparing approaches to the integration process based on the

different physical, social and economic features of the watersheds. The lessons learnt from the implementation of the pilot projects in St. Lucia will prove to be useful in planning the development of other watersheds in St. Lucia, the Caribbean Region and developing countries worldwide, that are expected to undergo similar changes, not only in St. Lucia, but also in the wider Caribbean region and other developing countries.

Meanwhile, concurrent with the implementation of the pilot projects, programmes will be developed to promote the formation of NGOs and CBOs (Local Area Management Authorities (LAMAs)) in communities where such organisations may be required for the effective integration of watershed and coastal area management. Additionally, in areas where such organisations already exist, it will be necessary to provide technical and financial support to enable them to undertake the required initiatives at the watershed and community levels. There is one such ongoing initiative aimed at the strengthening the capacities of NGOs and CBOs in the implementation of environmental programmes. The St. Lucia National Trust is undertaking this project with financial assistance from the Global Environmental Trust Fund.

5.3 Financial

Financing for the NAP will be made available in the first instance, through some measure of re-direction of focus of on-going programs / projects. At the same time mechanisms will be put in place to access both funding from both local and external sources. These measures are outlined as follows:

1. The existing budgetary allocations for the Ministry of Planning (Sustainable Development and Environment Unit) and the relevant departments of the

Ministry of Agriculture, Forestry and Fisheries (Water Resources Management Unit, Forestry Department, Coastal Zone Management Unit) will be utilised to finance specific activities.

2. An important item involved in the regularization of the legal framework is the formulation of an appropriate regime of economic instruments to promote responsible environmental management, particularly appropriate watershed management and coastal area management practices. This set of economic instruments (license fees, permits, penalties etc.) is to be developed through widespread consultation with private sector organisations, relevant public sector agencies, CBOs and NGOs. As part of this process, a critical analysis of the effectiveness of the environmental levy should be undertaken to determine its future within the new regime of economic instruments.
3. The identification of the specific financial constraints experienced by the major agencies involved in watershed management and coastal area management, and the preparation of proposals to address these constraints. This may involve the identification of new revenue generating activities that may be undertaken.
4. The identification of external funding sources of funding for future programmes in watershed management and coastal area management.

Summary of NAP

Based on the programme described above, the activities to be undertaken and the associated initial cost estimates are provided in the following tables.

Table 5.1 Legal and Policy Component of NAP

Action	Lead Agency for Implementation	Initial Cost Estimate (US\$)		
		GEF funding	Counterpart / Local funding	TOTAL
1. Institutional Framework for Enhanced Environmental Management (CIDA/OECS)	Ministry of Planning		50,000	50,000
2. Development of Land policy: (Inclusion of relevant bodies: consultations)	Ministry of Planning		50,000	50,000
3. Legislative and Policy Realignment	Office of the Attorney General / MPDEH	200,000	150,000	350,000
TOTAL		275,000	200,050	475,050

Table 5.2 Institutional Component of NAP

Action	Lead Agency for Implementation	Initial Cost Estimate (US\$)		
		GEF funding	Counterpart / Local funding	TOTAL
1. Establishment and operation of National Committee on Integration of Watershed and Coastal Area Management: Administrative Expenses	MPDEH	20,000	20,000	40,000
2. Public Awareness and Education	MAFF (WRMU /CZMP)	100,000	500,000	600,000
3. Information Management	MAFF	50,000	50,000	100,000
4. Capacity Building	MPDEH	100,000	50,000	150,000
5. Environmental Monitoring	WRMU / CZMP	200,000	50,000	250,000
6. Demonstration Projects: 5.1 Choc Watershed 5.2 Canaries / Delcer		439,400	528,000	967,400
TOTAL		909,400	1,198,000	2,107,400

Table 5.3 NAP Total Cost

Action	Lead Agency for Implementation	Initial Cost Estimate (US\$)		
		GEF funding	Counterpart / Local funding	TOTAL
1. Legal and Policy	MPDEH	275,000	200,050	475,050
2. Institutional	MAFF (WRMU /CZMP)	909,400	1,198,000	2,107,400
TOTAL		1,184,400	1,398,050	2,582,450

Based on the above, the total cost estimate for the NAP is US\$ 2,582,450.

Table 5.4 GEF SIDS PDF B INCREMENTAL COST ASSESSMENT

PROJECT COMPONENT	PROJECT OUTPUT	Baseline	Baseline	Alternative	Alternative
		Cost	Benefit	Cost	Benefit
		\$	\$	\$	\$
1. Legislation and Policy					
	A. Institutional Framework for Enhanced Environmental Management	50, 000	100,000	70,000	250,000
	B. Development of Land policy: (Inclusion of relevant bodies: consultations)	50,000	500,000	75,000	1,000,000
	C. Legislative and Policy Realignment	0	0	350,000	750,000
2: Sensitisation, Awareness and Education					
	1. Establishment and operation of National Committee on Integration of Watershed and Coastal Area Management: Administrative Expenses	8 000	60 000	35 000	190 000
	2. Public Awareness and Education	5 000	20 000	50 000	170 000
	3. Capacity Building	210 000	560 000	35 000	130 000
	4. Information Management	0	0	0	0
	5. Environmental Monitoring	4 000	10 000	10 000	30 000

4. Rationalisation of Socio-Economic Linkages					
	A.National Sustainable Development Plans				
	B.Guidelines for Economic Transition				
	C.Concept of Ecosystem Protection into Policy				
	D. Poverty-Environment Linkages into NCD Policies				
5. Realignment of Technology					
	A. Addressing Inappropriate Technologies and Practices				
6. Regional Programme Assessment, Info Database and Network					
	A. Continuity of Environmental Assessment Programmes				
	B. Dissemination Of Data				
	C. Monitoring of Project				
	D. Cross-Linkages to other Projects				
7. Long-Term Project Sustainability					
	A. Finance Mechanisms				
	B. Demo Projects and Donors				

Chapter 6

6.0 Recommended Inputs to Regional Action Programme

6.0 Recommended Inputs to Regional Action Program

Based on the issues raised in the preceding Chapters, it is recognised that a number of activities should be implemented at the Regional level in support of local programmes. The Regional Action Programme should therefore include the following:

1. The development and implementation of Train the Trainers programs in the following areas:
 - Freshwater and Coastal Water Quality Monitoring
 - Data Management
 - Certification of Operators
 - Integrated Coastal Management
 - Community-based Monitoring of Environmental Conditions
 - Co-management Approaches in support of the Integration of Watershed and Coastal Area Management.
2. Assistance in setting up of decision support systems.
3. The development of appropriate material for use in local Public Sensitization and Education programmes.
4. The promotion of the adoption of Regional Standards on effluent discharge and related issues.
5. The development of mechanisms and procedures for addressing transboundary issues.

6. Minimize duplication and overlap of activities of organizations/institutions with ministerial mandates.
7. Identification of appropriate regional agencies to undertake activities to reflect linkage at relevant level.
8. Provision of assistance to develop and establish updated policy, legal and institutional frameworks to support environmental management.
9. Provision of support in the negotiation of new regional and international environmental agreements, treaties and conventions.
10. Provision of assistance in enabling individual states to fulfill their obligations under regional and international environmental agreements, treaties and conventions that have already been signed or ratified.
11. Provision of assistance in assessing and responding to the impact of Global Trade Issues on environmental conditions in the Caribbean Region.
12. Promotion and facilitation of information-sharing activities among territories of the region and other SIDS.