Environmental and Social Management Framework

Regional Communications Infrastructure Program(RCIP) Phase 1

Grenada, St Vincent and the Grenadines and St. Lucia (CARCIP)

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0.0 INTRODUCTION

1.1 BRIEF BACKGROUND

The Latin America and the Caribbean (LAC) region have seen important improvements to its ICT infrastructure over the past 10 years. Through telecommunications sector, liberalization and private participation, important investments have been promoted, most notably in the deployment of mobile telephone networks and the installation of numerous international submarine fiber optic cables that serve the region.

Within LAC, the Caribbean region has also benefited from these trends, but to a lesser extent, major gaps in access to ICT infrastructure are still prevalent. At the regional level, most countries in the region are currently served by only one alternative international cable, and some countries such as Haiti and Guyana were only recently connected to a cable. At the national level, major infrastructure gaps also exist, with very little investment in broadband networks venturing beyond the main urban centers, especially in the form of fiber backbone networks, which have very limited extension in the few countries that have one.

The World Bank has agreed to assist the region in addressing this problem through 'The Caribbean Regional Communications Infrastructure Program (CARCIP)'. It is a broad umbrella program focused on increasing access to, and reducing the cost of, ICT services, thereby facilitating the development of a wide range of ICT applications that allow for social and economic development in the region. The program will be implemented in phases; the first being Dominican Republic, Grenada, St. Lucia and St. Vincent and the Grenadines. Specific components are expected to be tailored to each country on the basis of the following broad Menu of Options: Connectivity infrastructure, ICT-led innovation, E-government standards, interoperability frameworks, E-government and M-government horizontal infrastructure and E-security infrastructure.

The Bank's environmental and social safeguards policies require that the recipient country prepare an Environmental and Social Management Framework (ESMF) (consistent with national laws, any applicable treaty concerning international waters, and OP 4.01) for any cables and associated equipment that may be laid as part of Government Connectivity Program or any cable through territorial waters and onto the national shores or contiguous shores. This safeguard document will be prepared, disclosed and consulted before appraisal. Once the specific sites are known, Environmental and Social Impact Assessments (ESIAs) Plans will be prepared as part of project implementation but before the infrastructure is put in place.

1.2 THE ESMF REPORT

This Report constitutes the Environmental and Social Management Framework (ESMF) for three of the above mentioned Countries included in the first phase of the Program - Grenada, St. Vincent and the Grenadines and St. Lucia. The main objective is to develop options for the implementation of an Environmental and Social Management Framework (ESMF) to be used for the environmental and social screening and assessment of activities relating to cable laying and construction of landing stations, as well as backbone and transmission telecommunications infrastructure development within the area.

1.4 SCOPE OF WORK

The activities being financed under the Program consist of: i) support for the development of broadband backbone and government networks; ii) expansion of the national connectivity to rural areas; iii) regional links; iv) promotion of the Information Technology (IT) industry; and v) support to training programs in the use of Information and Communication Technology (ICT) tools in order to increase the productivity and efficiency of public and private sectors.

The potential social and environmental impacts of such activities are expected to be minor and reversible. Nevertheless, appropriate safeguards instruments must be prepared to ensure that all project activities meet the requirements of the relevant national legislation and international conventions to which the region is a signatory, as well as World Bank Group environmental and social safeguard policies.

The exact locations of the backbone networks and possible regional links have not been determined, and it is therefore premature to undertake a site-specific Environmental and Social Impact Assessment (ESIA). Consequently, the Consultant will prepare an Environmental and Social Management Framework (ESMF) (consistent with national and regional laws, any applicable treaty concerning international waters, and OP 4.01). The purpose of the frameworks is:

(i) to provide as much information as possible about potential environmental and social impacts (including possible land acquisition and resettlement) at the project's current state of preparation;

(ii) to inform the project planning and design process by comparing the potential impacts of alternative locations, configurations, and construction techniques that are under consideration;

(iii) to describe the procedures for subsequent assessment of impacts and development of the appropriate impact management instruments (including associated mitigation measures) when the details of the project become available.

These management instruments are likely to be an Environmental and Social Management Plan (ESMP). The content of the ESMF and the general nature of the activities necessary to produce it are explained in Annex A. However, this report constitutes the Environmental and Social Management Framework (ESMF) for the islands of Grenada, St. Vincent and the Grenadines and St. Lucia. The activities of the ESMF for those islands are explained in Task 1.

1.0 DESCRIPTION OF PROPOSED PROJECT

2.1 OVERVIEW

The proposed project is comprised of four components: Connectivity Infrastructure, ICT-Led Innovation, E-Transformation and Implementation Support, all to be implemented in each of the above mentioned three Countries over a period of 4-5 years. Financing is expected to include a combination of several sources of financing - World Bank lending, donor grant funding, government own resources and substantial amounts of private sector investment. World Bank financing will be on the basis of an IDA credit (35 year loan, with 10 years grace period, zero interest rate, 0.75% service charge). The lending instrument is an Adaptable Program Loan (APL), which allows countries to join at different points in time, depending on interest and readiness.

Despite the similarity of project components for each Country, there is a slight variation in activities in some instances (See World Bank Project Appraisal Report for details). Their administrative mechanisms for implementation are also similar but the individual project costs will be different (See Table 1 for the associated activities and costs). In each Country, the Project will be implemented by the Ministry responsible for ICT. The administrative mechanism includes a Project Steering Committee, a Project Coordinator and the existing Project Coordination Unit (PCU) under the respective Ministries will be responsible for the day-to-day management of the technical and logistical aspects of the project.

Table1: Project component, activities and costs per Island

Project component & activity	**Cost per Country (US$)**		
	Grenada	St. Vincent	St. Lucia
1: Connectivity Infrastructure	**5.75m**	**3.25m**	**2.525m**
a) Government Broadband Backbone Network	*5.5m*	*2.725m*	*2m*
b) Internet Exchange Point	*0.25m*	*0.025m*	*0.025m*
c) *Rural connectivity*		*0.5m*	*0.5m*
2: ICT- Led Innovation	**3.75m**	**2m**	**1.725m**
a) Technology/Business Incubation Center	*2m*	*0.75m*	
b) *Skills Development and Certification Program*	*1.5m*	*0.75m*	
c) Venture Capital Fund for IT SMEs		*0.5m*	
3: e-Transformation (Largely accommodated under EGRIP)		***0m***	***1m***

4: Implementation Support. *(a) Establishment and hiring of core Project implementation staff.* *(b) Logistic support for Ministry and PCU (PCs, office equipment , operating costs, audits, monitoring and evaluation (M&E), and communication support)* (c) *Development of Project Implementation Manual (PIM*)	**0.5 m**	**0.75 m**	**0.75 m**
Total	**10m**	**6m**	**6m**

2.2 Activities with potential Natural and Human Environmental Impacts

The above mentioned project will no doubt have positive impacts on the entire population of the respective countries. Its implementation, however, will require laying of undersea cables between those islands and construction of infrastructure both at the points of entry and elsewhere. Components of the project that require those two activities are the main areas of focus in this exercise since, while creating employment, they are likely to have negative impacts on both the natural and human environment. The nature of impacts is largely dependent on the characteristics of respective environment.

3.0 DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

Although the proposed project activities have been already established, the exact location of the sites of the activities (laying of undersea cables and construction/ installation of on shore infrastructure) is not yet identified. In this regard, a summary of general description of the terrestrial and marine environment of the Countries within the study area is presented below (See Annex B for additional details).

3.2 PHYSICAL ENVIRONMENT

3.2.1 Location and Size

Grenada

Grenada is a tri-island State which includes the Islands of Carriacou and Petit Martinique and some smaller uninhabited Islands between. It is located at the southern end of the Windward Islands approximately 45 miles south of St. Vincent. The total area of these three inhabited Islands is 133 square miles, with Grenada (the main Island) being 120 square miles; Carriacou 13 square miles and Petit Martinique 0.9 square miles (See Annex B, section 3.1 for details on Grenada).

St. Vincent and the Grenadines

The territory of St. Vincent and the Grenadines (SVG) is located towards the southern portion of the Windward Island between St. Lucia to the north and Grenada to the south. It is comprised of approximately 32 Islands and Cays, eight of which are inhabited. Apart from mainland St. Vincent, the other inhabited Islands are: Bequia, Mustique, Union, Canouan, Prune (Palm), Mayreau and Petit St. Vincent. The total area is 150 square miles (388 sq. km), with St. Vincent (the main Island) being 133 square miles (344 sq. Km) (See Annex B, section 3.2 for details on SVG).

St. Lucia

St. Lucia is the second largest of the Windward Islands. It is 238 square miles (616 sq. km) in area and located 21 miles south of Martinique and 26 miles north of St. Vincent(See Annex B, section 3.3 for details on St. Lucia)..

3.2.2. Geology

The geology of the Islands within the study area from St Lucia to Grenada are all of volcanic origin consisting mainly of volcanic products and, to a lesser degree, of sedimentary rocks formed during the Miocene to the Quaternary period of their volcanic history. A common feature on the slopes in many parts is huge boulders formed from volcanic blasts. Those islands are also vulnerable to earthquakes and soil movement (see Annex B for detail).

3.2.3 Soil

The soils of those Islands can best be defined as being comprised of 3 different types of soil textures (sand, silt and clay). They are all suitable for some type of agriculture

(livestock or crop production) as well as for accommodating the required project facilities and infrastructure depending on location and design.

3.2.4 Topography and drainage

The topography of Granada, St. Vincent and the Grenadines and St Lucia is very rugged with some steep sloping lands, high ridges and mountains occupying over 80% of each them. The smaller islands are not as rugged, the peaks are lower and some are flatter. The gently sloping/flat lands ideal for development are limited. The majority is privately owned and located along the coastal areas of the Islands, in which case the respective Governments may have to purchase lands for the project use (see Annex B for detail).

The drainage pattern of each Island follows the natural land form into gullies, ravines and rivers which flow directly into the sea. The main concern here is about potential effects of soil erosion, landslides and flooding that may quite possibly be created by the implementation of the project.

3.2.5 Climate

The islands within the study area experience a tropical marine type climate with temperatures ranging between 25° Celsius and 27° Celsius. There are two seasons, the dry season, officially from June to December and the rainy season, for the rest of the year. The average annual rainfall varies between 460mm-1700mm in coastal areas and 4000mm - 7000mm in the mountainous regions. They are located within the hurricane belt and have suffered the brunt of several storms and hurricanes.

3.2.6 BIOLOGICAL ENVIRONMENT

3.2.6.1 Flora and Fauna

The Islands share many species among them and other Islands of the Caribbean but Grenada has more species that occur in the northern part of South America than the more northerly Islands and more localized species (*Caribbean Spice Island Plants: William G Hartshorne*).

The floral species along the coastal areas - dry scrub woodland and mangrove - are the ones that are most likely to be affected by the construction of the required project facilities and infrastructure. However, only the mangrove is listed as protected areas.

The wildlife species of those Islands include a variety of migratory birds, mammals, reptiles and insects, amongst them are the National Birds of each of those Islands, the Grenada Dove (*Leptotila wellsi*), the St. Lucia Parrot *(Amazona Versicolor)*, the St Vincent Parrot, *(Amazona guildingii)* and the whistling warbler, included also is the whales frequently sighted off Petit Nevis Island(see Annex B for detail).

The marine ecosystem is an area of concern. Three quarters of the sea between Grenada and St. Vincent is shallower than 50 m and supports the most extensive coral reefs and related habitats in the south-eastern Caribbean (*A Marine Space Use Information System for the Grenadine Islands by Kimberly Baldwin)* which include: seagrass and lagoon, areas of mangrove and a variety of patch, fringing and bank barrier reefs. It also has a wealth of marine resources (fish shell fish, reefs and dive sites) that are vital to the local economy of both Countries (See Annex B, section 3.2.1 for details and 3.4 for Prevailing Ocean Currents and Wave Action).

3.2.7 SOCIO-CULTURAL ENVIRONMENT

3.2.7.1 Population

The population of each of the island within the study area follows a ribbon type distribution pattern along the coastal areas with greater concentration in urban centres. However, there are some demographic variations between them. In the case of Grenada its estimated population in July 2011 was 108,419, 39% of which lived in urban areas in the year 2010. The population of St. Vincent and the Grenadines at the same time was estimated at 103,869 and the estimated urban population in 2010 was 49%. St. Lucia's population was estimated at 161,557 in July 2011 with 28% living in urban areas (see Annex B for detail).

3.2.7.2 Land use

The above mentioned physical environment and limited ideal development lands in Grenada, St. Vincent and the Grenadines and St. Lucia have resulted in a type of mixed land use. The urban centres and settlements are located along the coast with some settlements extending inland in a linear land use pattern along both sides of the road.

3.2.7.3 Source of livelihood

Tourism, agriculture and marine related activities are the main sources of livelihood for the people of Grenada, St. Lucia and St. Vincent and the Grenadines, particularly Carriacou, Petit Martinique and the Grenadines of St. Vincent. Fishing, transportation, tourism and boat building are the only meaningful sources of livelihood for a large majority of the population.

3.2.7.4 Community Structure

The communities have been traditionally agrarian**.** Most people were involved in agriculture and average family size was almost twice as large as it is today**.** This situation has changed significantly to more of a blue and white-collar job oriented community; many persons are now employed in the service and construction sectors. There has also been significant decline in traditional music, dance, language and community support systems (self help/maroon etc.)**,** except for St. Lucia where patois, (*Kweyol)* is very popular and Carriacou where most of the traditional customs and practices are still observed.

3.2.7.5 Cultural Priorities

There has been a growing interest among the population, in the preservation of buildings and sites of cultural value and places of interest to the people of that region. This has resulted in several conservation related initiatives lead by local community organizations, Government and Non-Governmental Organizations. The National Parks and Protected Areas are widely considered to be one of the most important of those initiatives.

3.2.7.6 Vulnerable population

St. Vincent and the Grenadines is the only island within the study area with an indigenous section of its population (people of Carib Amerindian decent). Unlike that of their colleges in other islands in the region, they are well integrated into the society and treated equally. In fact neither of those islands in the study area has regarded any part of their population as vulnerable to the extent that it is necessary to make special provisions for them. Less fortunate/Vulnerable communities and individuals usually benefit from various social programs implemented by Government, religious and other organizations.

4.0 ENVIRONMENTAL MANAGEMENT (Legal & Institutional Framework)

4.1 GENERAL OVERVIEW

This part of the report involves an analysis of the existing legislative and institutional framework for environmental management in Grenada**.** The main aim is to identify the environmental policy and regulations that are applicable to the proposed development**;** the agency (Government Department or other) that are responsible for enforcing those regulations and the relevant procedures to be followed**.**

All the islands within the study area have ratified several international environmental Agreements and Conventions and by their signature of the St. Georges Declaration (SDG) of 2001 have committed themselves to the Principles for Environmental Sustainability in the Organization of the Eastern Caribbean States (OECS). They all have in place several pieces of legislation and institutions to protect their environments; some of those legislations were originally enacted in the 1940's and amended in recent times.

The legal and institutional framework for environmental management in those islands have been influenced by Government's policies over the years and to a great extent, the policies of some donor agencies and regional and international agencies like the

World Bank, Caribbean Development Bank (CDB) the Organization of East Caribbean States and the United Nations.

Their main focus have been on the protection of sensitive and important natural resources, protection of public health and safety, and the encouragement of appropriate and feasible macroeconomic and sectoral policies, which promote sound environmental and natural resource management principles and practices. In fact, projects submitted to the World Bank or CDB for funding must include approved EIAs.

Such policies impact positively on a wide range of resources and issues that are of great importance to their economic development and the welfare of the society in general. Some of those resources and issues include the forest, mangrove swamps, marine ecosystems, historic buildings and sites, sustainable land use, wildlife protection, pollution abatement, solid waste management and waste disposal.

4.2 GRENADA

4.2.1 Relevant legislations

Grenada now has in place several pieces of legislation to protect its environment, some of which were originally enacted in the 1940's and amended in recent times. However, the most relevant Environmental Legislations to the proposed project are as following:

- The Physical Planning and Development Control Act, No 25, of 2002
- Fisheries Act of 1986, which provides for the protection of the marine resources in Grenada;
- Amendment to the beach protection act, prohibiting sand mining in the State
- National Trust Act set up for the protection of the cultural heritage of Grenada.

- National parks and Protected Areas Act of1991, for the designation and maintenance of National Parks and protected areas

- Litter Abatement Act of 1973, which has been supplemented by the passage of the waste management Act of 2001, addressing pollution control and abatement of litter

Despite their relevance, the Physical Planning and Development Control Act stands out for its overall responsibility for land use management in general**.** It makes fresh provision for the control of physical development, to continue the Land Development Authority, to require the preparation of physical plans for Grenada, to protect the natural and cultural heritage, and for related matters**.** The Physical Planning and Development Authority (PPDA) is set up under the Act with regulatory powers over any development taking place in, on, under or over the land**.**

Part 4 of the Act makes provision for the preparation of Environmental Impacts Assessment**.** The second schedule, (section 25(2), lists a total of 18 different types of developments for which an Environment Impact Assessment is normally required**.** However, numbers 15 – 18 are most relevant to the proposed project. They are as follows:

1. Hotels of more than 50 rooms
2. Sub-divisions of more than 10 lots
3. Residential development of more than 25 units
4. Any industrial plant which in the opinion of the Authority is likely to cause significant adverse environmental impact
5. Quarrying and other mining activities
6. Marinas
7. Land reclamation, dredging and filling of ponds
8. Airports, ports and harbours

9. Dams and reservoirs
10. Hydro-electric projects and power plants
11. Desalination plants
12. Water purification plants
13. Sanitary landfill operations, solid waste disposal sites, toxic waste disposal sites and other similar sites
14. Gas pipeline installations
15. Any development generating or potentially generating emissions, aqueous effluent, solid waste, noise, vibration or radioactive discharges
16. Any development involving the storage and use of hazardous materials
17. Any coastal zone development
18. Any development in wetlands, marine parks, conservation areas, environmental protection areas or other sensitive environmental areas.

According to the Act, the Minister may make regulations providing for:

(a) The criteria and procedures for determining whether a development is likely to significantly affect the environment and for which an Environmental Impact Assessment is required;

(b) The procedures for setting the scope of an Environmental Impact Assessment to be carried out by the applicant in respect of any development;

(c) The minimum contents of a report on an Environmental Impact Assessment;

(d) The qualifications, skills, knowledge or experience which must be possessed by persons conducting Environmental Impact Assessment for the purpose of this Act;

(e) The procedures for public participation in the Environmental Impact Assessment process and public scrutiny of any report on an Environmental Impact

Assessment submitted to the Authority;

(f) The consideration by the Authority of an application in respect of which an Environmental Impact Assessment is required, including the criteria and procedures for review of the report.

Another important part of the Act is its provision for preparing physical plans for Grenada (Part III section 13). Such plans are expected to cater for the economic, social, cultural and environmental needs, as well as addressing critical and sometimes very sensitive land use problems.

The previous lack of such legislation in support of this activity was a major development control disadvantage. That situation resulted in limited emphasis on the preparation of plans, environmental degradation; increased incompatible land use, depletion of natural resources and other associated problems in some areas.

The PPDA functions as the national service for the identification, protection, conservation and rehabilitation of the natural and cultural heritage in accordance with the United Nations Educational, Scientific and Cultural Organization**.** It is a convention for the protection of the World Cultural and Natural Heritage, to which Grenada is a party**.**

The staff of the Physical Planning Unit is deemed to be the staff of the Physical Planning and Development Authority for the purpose of the Act**.** The Authority meets at least once a month**.** It may delegate to any member of the committee, the Head or any other member of the staff of the Authority, or statutory body, the power and authority to carry out on its behalf such functions as the Authority determines**.**

Neither the Minister, any member of the Authority, any person co-opted to help the Authority in dealing with any matter, the Head or any other member of the staff of the

Authority is liable in any court for or in respect of any act or matter done, or omitted to be done in good faith in the exercise or purported exercise of any function or power conferred by this Act**.**

Despite the above, environmental control is still weak. Critical pieces of legislation are outdated. Legislation dealing with aspects of environmental management is dispersed among several different government agencies and often lacks enforcement powers or guidelines**.**

4.2.2 RELEVANT INSTITUTION

Government Departments

There are several different agencies involved in activities that impact on the environment, however only eight; (five Government Departments and three Statuary Bodies) are directly involved in environmental management activities on a daily basis:

- Physical Planning Unit, Ministry of Communication, Works and Physical Planning
- Forestry Department, Ministry of Agriculture Forestry and Fisheries
- Land Use Department, Ministry of Agriculture, Forestry and Fisheries,
- Environmental Health Department, Ministry of Health
- National Water and Sewage Authority (NWASA)

Statuary Bodies

The Statuary Bodies are as follows:

- Physical Planning and Development Control Authority
- Solid Waste Management Authority
- National Water and Sewage Authority

As is the case with the legislative framework, both the Physical Planning Unit (PPU) and the Physical Planning and Development Control Authority (PDA) stands out for their environmental/land use management responsibilities, which basically covers all the natural and cultural resources of the state.

Their strength is derived from their working relationship with each other. Through this relationship and powers of the PDA as spelt out in the above mentioned Act 25 of 2002, the PPU can address any environmental management matter once it constitutes development, regardless to whether or not it may also be the responsibility of another environmental management agency.

The Physical Planning Unit also seems to be most capable of carrying out the environmental and social safeguards of the project. Part of its normal responsibilities includes the review of EIA's and development applications as well as all other development control related matters, from inspection, to monitoring and enforcement. The Unit is also responsible for the preparation of Physical Development Plans (Land use zoning) and related environmental management guidelines for the country. However it may have to be assisted with the coordination of project activities.

4.3 ST. VINCENT AND THE GRENADINES

4.3.1. Relevant legislation

Like Grenada, St. Vincent and the Grenadines enacted several pieces of environmental management legislation in recent times with the main objective of protection, conservation, enhancement or restoration of the natural resources of the country. However the more relevant pieces of legislation to the proposed are:

- The Town and Country Planning Act No 45 of 1992;
- The Waste Management Act, No 31 of 2000 - it provides the framework for waste management planning and waste management operations in SVG.
- The Environmental Health Services Act, No 14 of 1991 – it makes provisions for

the control of emissions and effluent discharge into water bodies.

- The Noise Control Act, 1988 - it describes a code of practice for noise control at construction sites, which is enforced by the police
- The Fisheries Act No 8,1986 and Fisheries Regulations, 1987- The Act protects beaches and regulates the removal of sand, coral, stones, shingles, gravel and other materials from the shores of Saint Vincent and the Grenadines and adjoining sea-beds.
- The National Trust Act 1969 establishes the Saint Vincent and the Grenadines National Trust (SVGNT) as a corporate entity and mandates the Trust to make provision for the management of a range of natural and cultural resources
- The Wildlife Protection Act No 16, 1987;
- The Forest Resource Conservation Act, No. 47,1992;
- The Marine Parks Authority Act No. 33, 2002

The Town and Country Planning Act No, 45 of 1992 is the most important environmental management related legislation in SVG. The Act provides for the orderly and progressive development of land and the preparation of development plans and the development control. It also makes provision for the establishment of the Physical Planning and Development Board and for the submission of Environmental Impacts Assessment where it is:

(a) Aware that any person proposes to undertake in a prescribed area any enterprise, construction or development of a prescribed description or category; or

(b) Of the opinion that the activities of any enterprise, construction or development which has already been established or operational within such prescribed area

is causing or is likely to cause pollution or is otherwise having or is likely to have an adverse effect on the environment.

4.3.2 Relevant institution

Government Departments

1. The Physical Planning Unit which has the overall responsibility for environmental management, physical planning and development control in general. It also functions as the technical/ advisory arm of the Board.

2. The Environmental Health Unit of the Ministry of Health and Environment is responsible for regulating, monitoring, preventing and remediation of environmental pollution, including the management and disposal of solid, liquid and gaseous waste.

3. The Forestry Department of the Ministry of Agriculture, Forestry and Fisheries (MAFF) is responsible for the conservation and sustainable management of the nation's forest, wildlife and national park resources. The Department takes its legal mandate from The Forest Resources Conservation Act No. 47, 1992 and The Wildlife Act No. 16 1987.

4. The Fisheries Department is within the Ministry of Agriculture, Forestry and Fisheries and takes its authority from the Fisheries Act No. 8, 1986. The Division is responsible for promoting the management of fisheries in the territorial waters of SVG. The Fisheries Division (FD) is also responsible for implementing the Maritime Areas Act No 15, 1983; the Fisheries Regulations (SRO) No. 1 1987; the Fish Processing Regulations of 2001; the High Sea Fishing Areas Act of 2001; Marine Reserves, and for regulating research and other use activities within the territorial waters of SVG.

5. The Environmental Health Department of the Ministry of Health and the

Environment takes its mandate from the Environmental Health Services Act No. 14, 1991. Its primary responsibility is to control and abate pollution and to ensure that there is a clean and healthy environment in SVG.

Statuary Bodies

1. The Physical Planning and Development Board has the legal authority for carrying out the purpose and provisions of the Town and Country Planning Act.

2. National Solid Waste Authority-responsible for solid waste management in SVG.

3. The National Trust (SVGNT) is a corporate entity whose mandate is to make provision for the management of a range of natural and cultural resources. Section 4 of the Act sets out the objectives of the Trust which include the conservation of areas of natural beauty; the conservation of buildings and other assets of archaeological, architectural, artistic, historic, scientific, or cultural interest; the conservation of flora and fauna in areas of natural beauty and public education related to natural and historical assets; collection and allocation of funds to further the objects of the Trust.

   The Act No. 37, 2007 is an amendment to the principal Act, which would enable the Trust to designate any place, building or object ad “protected national heritage’. According to the provisions of this Act, the owner of any protected national conservation area or protected national heritage is respopnsible for its protection from any danger of destruction or removal or from damage by neglect or injudicious treatment.

3 The National Parks, Rivers and Beaches Authority (NPA) takes its mandate from the National Parks Act No. 33, 2002. It falls under the Ministry of Tourism and Culture. The primary responsibilities of the Authority are to preserve, manage, protect and develop the natural and cultural heritage of SVG, including the

historical and cultural heritage of the island. The Authority also has the mandate to establish and advance on matters of conservation; to educate the public; to regulate activities in national parks and the buffer zone; and to undertake restorative measures in marine areas. The NPA Board is a multi-sectoral body established by the Cabinet of Ministers.

Despite the above, the Physical Planning Unit seems to be most capable of carrying out the environmental and social safeguards of the project. Part of its normal responsibilities includes the review of EIA's and development applications as well as all other development control related matters, from inspection, to monitoring and enforcement. The Unit is also responsible for the preparation of Physical Development Plans (Land use zoning) and related environmental management guidelines for the country. However it may have to be assisted with the coordination of project activities.

4.4 ST LUCIA

.4.4.1 Relevant legislation

- The Physical Planning and Development Act(revised December 31 2005)
- The Forest, Soil and Water Conservation Ordinance of 1946
- The Forest, Soil and Water Conservation Ordinance of 1946 (as amended in 1957 and 1983)
- The Land Conservation and Improvement Act of 1992
- The Public Health Act of 1975
- The Wildlife Protection Act of 1980

As is the case with the other islands, the Physical Planning and Development Act(revised December 31 2005) is most relevant as it also makes provisions for

environmental impacts assessment (EIA), monitoring and development control. The EIA part of the Act covers the following:

Environmental Impact Assessment

(1) Without prejudice to the generality of Section 21, the Head of the Physical Planning and Development Division may require that an environmental impact assessment shall be carried out in respect of any application for permission to develop land in St. Lucia including an application for approval in principle, if the proposed development could significantly affect the environment.

(2) Unless the Head of the Physical Planning and Development Division otherwise determines, an environmental impact assessment shall be required in respect of an application for a development of any kind mentioned in Scheduled 4.

(3) The Head of the Physical Planning and Development Division shall not grant permission for the development of land under an application to which this section applies unless the environmental impact statement has first been taken into account.

(4) Without prejudice to the generality of section 56, the Minister in consultation with the Head of the Physical Planning and Development division may make regulations providing:

(a) the criteria and procedures for determining whether an activity is likely to significantly affect the environment so that an environmental impact assessment may be required in addition to the information that the applicant is ordinarily required to submit to the Head of the Physical Planning Development Division;
(b) the procedures for settling the scope of works of the environmental impact assessment to be carried out by the applicant in respect of nay development;

(c): the minimum contents of the environmental impact statement to be submitted to the Head of the Physical Planning and Development Division in respect of the environmental impact assessment carried out by the applicant;

(d): the qualifications, skills, knowledge or experience which must be processed by persons conducting environmental impact assessments for the purposes of this Act;

(e): the procedures for public participation in the environmental impact assessment process and public scrutiny of the environmental impact statement submitted to the Head of the Physical Planning and Development Division;

(f): the consideration by the Head of the Physical Planning and Development Division of an application in respect of which an environmental impact assessment has been required, including the criteria and procedures for review of the environmental impact assessment.

(5) Where the Head of the Physical Planning and Development Division notifies an applicant that an environmental impact assessment is required, the Minister and any other public agency, if requested by the applicant, shall enter into consultation with the applicant to determine whether that agency has in its possession any information which the applicant considers relevant to the preparation of the environmental impact statement and, if it does , the agency shall make any such information available to the applicant and allow the applicant to take copies thereof on payment of the cost of making the copies, provided that the agency shall not be required to disclose confidential information to the applicant.

(6) Where a notice is issued under this section notifying the applicant that an environmental impact assessment is required, the Head of the Physical Planning and Development Division may inform any agency or department of Government having responsibility for the issue of any licence, permit, approval, consent, or other document of authorization in connection with any matter affecting the development and such agency or department shall not grant such licence, permit, approval, consent or other document of authorization as aforesaid unless it has been notified that the notice has been complied with and that the Head of the Physical Planning and Development Division has granted permission for the proposed development.

Determination of Applications

(1) Where application is made for permission to develop land under section 19, the Head of the Physical Planning and Development Division shall have regard to the provisions of the physical plan for the area within which the land is situated, if any, and to any other material considerations he/she may, subject to subsection (2) , grant permission either unconditionally or subject to such conditions that appear to be fit, or may refuse permission.

(2) The Head of the Physical Planning and Development Division shall not grant permission for any development mentioned in Schedule 4 unless the application has been submitted to the Advisory Committee for review and the Advisory Committee has submitted its advice to the Head of the Physical Planning and Development Division in accordance with section 7(5).

(3) The Head of the Physical Planning and Development Division shall give the applicant notice in writing of the decision made under subsection(1) and, in the case of an application for permission to develop land where such permission is granted subject to conditions or is refused , the notice shall state the reasons for

that decision.

Schedule 4

Matters for which Environmental Impact Assessment is ordinarily required

1. Hotels of more than the number of rooms specified in the Regulations;
2. Sub-divisions of more than the number of plots specified in the Regulations;
3. Residential development of more than the number of units specified in the Regulations;
4. Any industrial plant which in the opinion of the Head of the Physical Planning and Development Division is likely to cause significant adverse impact on the environment;
5. Quarrying and other mining activities;
6. Marinas;
7. Land reclamation, dredging an filling of ponds;
8. Ports;
9. Dams and reservoirs;
10. Hydro-electric projects and power plants;
11. Desalination plants;
12. Water purification plants;
13. Sanitary land fill operations, solid waste disposal sites, toxic waste disposal sites and other similar sited;
14. Gas pipeline installations;
15. Any development projects generating or potentially generating emissions,

aqueous effluent, solid waste, noise, vibration or radioactive discharges;

16. Any development involving the storage and use of hazardous materials;

17. Coastal zone developments;

18. Development in wetlands, marine parks, national parks, conservation areas, environmental protection areas or other sensitive environmental areas.

4.4.2 Relevant Institutions

Responsibility for various aspects of environmental management is dispersed among several Government Ministries, statutory bodies and quasi-government agencies:

- The Forestry Department of the Ministry of Agriculture, Forestry and fisheries (MAFF) has a wide-ranging mandate in relation to the conservation and sustainable management of St. Lucia's forest reserves, terrestrial flora and fauna, forest communities and ecosystems. It is also concerned with catchment management in relation to public water supply and environmental education and awareness building. Its remit is restricted to lands, which have been officially designated as forest reserves, either, on government or private land.

- The Fisheries Department, which is also within the Ministry of Agriculture, Forestry and Fisheries, has a wide-ranging remit concerning environmental management of maritime areas and resources also certain aspects of freshwater/brackish water environments. It has considerable technical expertise and experience in these areas.

- The Department of Environmental Health within the Ministry of Health has the responsibility for monitoring and enforcing public health and sanitation provisions and the promotion of public awareness on matters relating to public health and the environment.

- The St. Lucia National Trust (SLNT) is a statutory quasi-governmental body, whose remit is the protection and management of sites of historical, cultural or biological significance, which have either entrusted to its care by Government or have been acquired. Pigeon island National Land Mark, the Maria Island and the Frigate Island Nature Reserves and the Praslin Protected Landscape are currently managed by the Trust. Flora and fauna protection functions are carried out in collaboration with the Forestry and Fisheries Departments of MAFF. The Trust is also responsible for promoting sustainable use of the island's natural and cultural resources.

- The St. Lucia Solid Waste Management Authority (SLSWMA) is a statutory body, and is charged with providing a co-ordinated and integrated system for the collection, treatment, disposal and recycling of wastes, including hazardous wastes. It is responsible for the management of sanitary landfills, and currently operates sites at Ciceron (just to the south of Castries) and at Vieux Fort

Like is the case with the other two islands, the Physical Planning Unit seems to be most capable of carrying out the environmental and social safeguards of the project. Its normal responsibilities and possible project coordination needs are also similar.

4.5 CAPACITY TO IMPLEMENT ENVIRONMENTAL/SOCIAL SAFEGUARDS

It is fair to say that all of the above mentioned Countries now have legislations in place to address current environmental and social issues within their respective jurisdictions. In each case the Physical Planning and Development Act is the most relevant legislation. Similarly, the Physical Planning Units/Departments have the legal authority under those Acts for environmental management in general and they have been doing so for some time now.

The limited and or lack of resources (trained personnel, monitoring equipment etc.) within those Departments to deal with such projects and the inadequate coordination

between Agencies with similar responsibilities are factors which can inhibit the capacity of the respective government agencies to address safeguard issues related to the implementation of the CASIP project. Usually, for projects of this nature, the Physical Planning Departments /Units would request assistance from the Fisheries Department to address marine related issues as they occur, an arrangement which can be problematic depending on its workload.

In order to address this problem it is necessary that the Physical Planning Departments /Units include someone from the Fisheries Department, preferably a marine biologist, to be part of the CASIP Environmental Management Team charged with the responsibility of environmental monitoring and implementation of related safeguards. The Team should be provided with the relevant equipment and training to enable it to carry out its function. It is expected that the basic requirement would be the use of a boat and equipment (dropcam etc) for monitoring the marine environment during and after project implementation. The team should be trained/retrained to use the equipment and to analyse the data collected. A one week training exercise is envisaged and a provisional sum of US$20,000.00 is suggested to pay for training and equipment.

4.6 Environmental and Social Issues

The information presented in the previous sections leads to the conclusion that the proposed project is not expected to create any significant negative physical, social or biological impacts. However the following are three key issues of concern which ought to be given due consideration, simply because projects of this nature usually have the potential to alter the marine and terrestrial habitat, become a public hazard and to create Noise and air pollution to the extent that they may become a serious environmental and social problem often without the awareness of the affected population:

1. Natural resource (marine and terrestrial ecosystems) conservation and environmental protection.

2. Occupational health and safety.

3. Public awareness /participation

There are concerns about radiation problem, hazardous waste contamination and potential antenna rig tumbling hazard in residential areas. The health and safety of workers are also issues of concern. In order to address the above concerns, the following sections are focused on identifying potential impacts associated with the implementation of the Proposed Project and providing a list of measures to minimising or eliminating them.

5.0 IDENTIFICATION AND ASSESSMENT OF IMPACTS

5.1 OVERVIEW

This part of the report is concerned with the identification and assessment of potential positive and negative environmental and social impacts of the proposed project. A combination of two criteria has been used to determine the environmental significance of predicted impacts: the intensity of the potential impact of the project component and the importance (value) of the environmental component (Table: 5.1). It should be noted however that the actual extent and intensity of impacts might be affected by the project planning and implementation procedures. A summary of the impacts is presented in Table 5.2, at the end of the assessment.

Table 5.1: Criteria Used to Determine the Significance of Environmental Effects

INTENSITY OF IMPACTS	VALUE PLACED ON THE COMPONENT		
	Legally protected	**Considered important but not legally protected**	**Considered not important**
MAJOR	Significant	Significant	Insignificant

MODERATE	Significant	Significant	Insignificant
MINOR	Significant	Significant/ Insignificant	Insignificant

The intensity of the impact has been qualified as: Minor, Moderate or Major. To make this judgment, the following factors were taken into consideration:

- Magnitude of project intervention;
- Frequency of project intervention;
- Irreversibility of impact of the intervention;
- Size of the area affected by the intervention.

The importance of the concerned environmental component is related to the value placed upon it by the public, environmental experts and the international community. It can be qualified as *legally protected, important or not important.* The importance placed on the environmental component may depend on:

- It's rare or unique nature;
- Professional /experts concerns;
- Public perception of its importance;
- It's current or potential use.

5.2 WORLD BANK SAFEGUARD POLICIES TARGETED

The project is expected to involve structural activities which are usually of minor negative environmental and social impacts. Consequently the main World Bank Safeguard Policies Triggered are: the OP 4.01 for Environmental Assessment and the OP 4.12 for Involuntary Resettlement.

The Safeguard Policy OP 4.01 requires that an Environmental and Social Management Framework (ESMF) be prepared for the overall program, followed by Environmental Management Plans (EMP) as necessary in line with the ESMF, once the exact locations

of those facilities have been identified. Both the ESMF and EMP have to be submitted for Bank Review and public disclosure in the affected Countries.

The Involuntary Resettlement Considerations of Safeguard Policy OP 4.12 will most likely be triggered by land acquisition for the project. In this regard the preparation of a Resettlement Policy Framework (RPF) for the overall program is required, followed by Resettlement Action Plans (RAPs) as necessary, in line with the RPF, once the exact locations of those facilities have been identified. Like the above, the RPF will be submitted for Bank review and publicly disclosed in the affected Countries

5.3 IMPACTS

The proposed project is predicted to have both positive and negative environmental and social impacts throughout the implementation and operation phases. All the impacts are considered to be significant, mainly because of the importance of the affected resources or other to the respective communities. The positive social impacts likely to occur during the operation phase are the only ones predicted to be major. The negative impacts are predicted to be both social and environmental. Despite their significance, they are not expected to be major. Some of them have the potential to be minor or moderate depending on sensitivity and nature of activities (see Table 2: Summary of impacts). Details of the predicted impacts are as follows:

5.4 POSITIVE IMPACTS

5.4.1 Economic growth and development

The positive impacts are expected to be significant and associated with the potential economic growth and development likely to occur as a result of the improvement in telecommunication services such as increased income and employment opportunities, improvement in the quality and standard of living through easier access to necessary information, resources and individuals etc. The respective local communities should also benefit from employment and income generating opportunities created during the implementation of the project. This is a significant and major impact.

5.5 NEGATIVE IMPACTS

The negative impacts are expected to be associated with each of the proposed activities including the operation and maintenance of the telecommunication systems as follows:

SOCIAL

5.5.1 Displacement of people

One can expect to be faced with various social issues and problems which may even extend to public obstruction and complicated displacement / resettlement problems if it becomes necessary to relocate people from their usual place of residence, cultural or of economic importance (prime fishing, tourist attraction and recreation area for example) to facilitate the implementation of the project. This impact is considered to be moderate. However it is also significant mainly because of the importance of the area to the community.

5.5.2 Occupational health and safety hazard

There are some potential hazards to the health and safety of workers and other persons in the area in the event of accidents or injury due to improper use, storage and disposal of hazardous materials and waste etc. Telecommunication towers may also be hazardous to air craft, birds and people depending on their location in relation to flight path of aircraft and migratory birds, and also due to the possibility of injury to persons caused by falling parts. This impact is ranked as minor to moderate; however it is also significant mainly because of the high level of concern and legislation for the protection of public health and safety.

5.5.3 Vibration and noise nuisance

The use of the vibration and / or noise producing equipment can be a potential nuisance to the local community depending on location. It may also create unacceptable disturbance to marine species. This impact is ranked as minor and significant mainly because of the people's intolerance to this type of nuisance.

5.5.4 Air pollution

The proposed site clearing and excavation activities and use of malfunctioning equipment and machinery can emit excessive levels of dust and carbon monoxide into the air which can be harmful to people. This impact is also ranked as minor and significant.

ENVIRONMENTAL

5.5.5 Pollution or destruction of the marine and terrestrial environment

The activities involved in the implementation of the project, particularly laying of the undersea cables through the Grenadines, will most likely interface with a pristine and possible fragile coastal and marine ecosystems, therefore the disposal of waste (oil, grease etc.) will pollute the area and quite possibly destroy some of the natural resources. This impact is ranked as moderate; it is also considered to be significant mainly because of the importance of the environment to the respective communities.

5.5.6 Soil erosion and landslip

Indiscriminate land clearing, excavation and poor drainage can result in soil erosion and landslides within steep sloping areas which may eventually result in siltation and pollution of the coastal areas. This impact is ranked as minor to moderate. It is also significant mainly because of the importance soil conservation and potential landslip risk.

5.5.7 Depreciation of the natural environmental

Air pollution and indiscriminate site clearing can result in the depreciation of the natural environment. The erection of telecommunication towers may also have a negative visual impact particularly if they are incompatible with the local environment.

Table 5.2: Summary of Impacts

Proposed Activities /Sources of impacts	Environmental Impacts	Social Impacts	Significance/ Remarks
Laying of undersea cables		**+**Employment and income generating opportunities **-** Vibration and Noise	Significant and moderate Significant and minor

		nuisance	
		- Displacement of people	Significant and minor -moderate
		-Occupational Health and Safety hazard	Significant and moderate
	Pollution or destruction of the Marine environment		Significant and moderate
Construction of on-shore and hinterland infrastructure		+Employment and income generating opportunities	Significant and moderate
		-Displacement of people	Significant and minor- moderate
		-Occupational health and safety hazard	Significant and minor
		-Vibration and noise nuisance	Significant and minor
		-Air pollution	Significant and minor
	Soil erosion and landslip		Significant and minor
Operation of telecommunication service		+Employment creation	Significant and major
		-Occupational health and safety hazard	Significant and minor
		-Vibration and noise nuisance	Significant and minor
		-Air pollution	Significant and minor

6.0 MITIGATION MEASURES

6.1 GENERAL CONSIDERATIONS

This section of the report is concerned with the identification of appropriate measures to be taken in order to minimize or eliminate negative impacts and to enhance positive impacts. In any event, the application of good operation and management practice is of paramount importance. Public consultation is also necessary. The affected persons should be informed of the potential problems and mitigation measures. Their concerns and suggestions should also be given due consideration. Wherever possible, employment should be provided for the local people. This will enhance cooperation and support for the project. Although most of the negative impacts are minor, the following mitigation measures are necessary because of their significance.

6.2 SPECIFIC CONSIDERATIONS

6.2.1 Displacement of people

- A resettlement policy should be developed which takes into account the relevant issues and provide for consultation with concerned persons.

- Public consultation must be held and alternative arrangements agreed upon before commencement of work

6.2.2 Occupational health and safety hazard

- The World Bank IFC Occupational Health and Safety Guidelines for telecommunication projects should be followed.

- An accident and emergency response plan should be prepared and approved before commencement of work.

- If telecommunication towers are required they should be erected in accordance with World Bank EHS guidelines and a maintenance plan should be prepared and implemented to avoid accidents.

6.2.3 Vibration and noise nuisance

- Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition, thus avoiding excessive vibration and noise

- Avoidance of vibration and noise-prone activities between the hours of 6 pm. and 6 am.

- Noise generating sources should be located away from residential or noise sensitive receptors to meet the noise emission levels provided in World Bank IFC's General EHS Guidelines

- Use of noise suppression shields and mufflers

6.2.4 Air pollution

- Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition

- Dust prone areas and material should be covered

. ENVIRONMENTAL

6.2.5 Pollution or destruction of the Marine and terrestrial environment

- Wherever feasible, arrangements should be made to use existing undersea cable route and infrastructure.

- Encroachment on sensitive /fragile ecosystems should be avoided

- Oil, grease, toxic substances and waste should not be disposed off in the sea or streams, rivers or places where they can eventually end up in the sea

- An implementation plan should be prepared and approved by the relevant Authorities when the exact location of proposed project activities is identified. It should indicate the precise location of the cables in relation to existing environmental resources and implementation process. It should also include: a spill Prevention and Control Plan; a Waste Management Plan and a Hazardous Materials Management Plan

6.2.6 Soil erosion and landslip

- Indiscriminate land clearing and excavation should not be permitted
- Appropriate drainage system should be implemented

6.2.7 Depreciation of the natural Environmental

- Oil, grease, toxic substances and waste should not be disposed off in streams, rivers or places where they can eventually get into the water system

- Indiscriminate land clearing and excavation should not be permitted

- Wherever possible, existing telecommunication towers and other infrastructure should be use.

Table 5.3: Summary of impacts and mitigation measures

Activity	Predicted impacts	Mitigation measures
Laying of undersea cables	Displacement of people	• Public consultation must be done and alternative arrangements agreed upon before commencement of activities. • A resettlement policy should be developed which takes into account the relevant issues and provide for consultation with concerned persons
	Occupational Health and Safety risk	• The IFC Occupational Health and Safety Guidelines for telecommunication projects should be followed. • An accident and emergency response plan should be prepared and approved before commencement of work.

	Pollution or destruction of the Marine environment	• Wherever feasible, arrangements should be made to use existing undersea cable route and infrastructure. • Encroachment on sensitive /fragile ecosystems should be avoided • An implementation plan should be prepared and approved by the relevant Authorities indicating the precise location of the cables in relation to existing environmental resources and implementation process. It should also include: a spill Prevention and Control Plan; a Waste Management Plan and a Hazardous Materials Management Plan • Oil, grease, toxic substances and waste should not be disposed off in the sea or streams, rivers or places where they can eventually end up in the sea • Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition
Construction of on-shore and hinterland infrastructure	Displacement of people	• A resettlement policy should be developed which should take into account the relevant issues and provide for consultation with concerned persons. • Public consultation must be done and alternative arrangements agreed upon before commencement of work
	Occupational health and safety risk	• The IFC Occupational Health and Safety Guidelines for telecommunication projects should be followed. • An accident and emergency response plan should be prepared and approved before commencement of work. • If telecommunication towers are required they should be erected in accordance with EHS guidelines and a maintenance plan be prepared and implemented to avoid accidents.
	Vibration and noise nuisance	• Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition, thus avoiding excessive noise • Avoidance of noise-prone activities between the hours of 6 pm. and 6 am. • Noise generating sources should be location away from residential or noise sensitive receptors to meet the noise emission levels provided in IFC's General EHS Guidelines • Use of noise suppression shields and mufflers
	Air pollution	• Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition • Dust prone areas and material should be covered
	Soil erosion and landslip	• Indiscriminate land clearing and excavation should not be permitted • Appropriate drainage system should be implemented
Activity	**Predicted impacts**	**Mitigation measures**

	Depreciation of the natural Environmental	• Oil, grease, toxic substances and waste should not be disposed off in the sea or streams, rivers or places where they can eventually end up in the sea • An implementation plan should be prepared and approved by the relevant Authorities indicating the precise location of the cables in relation to existing environmental resources and implementation process. • Indiscriminate land clearing and excavation should not be permitted • If telecommunication towers are required they should be erected in accordance with EHS guidelines and a maintenance plan be prepared and implemented to avoid accidents.
Operation of telecommunication service	Occupational health and safety risk	• The IFC Occupational Health and Safety Guidelines for telecommunication projects should be followed. • An accident and emergency response plan should be prepared and approved before commencement of work. • If telecommunication towers are required they should be erected in accordance with EHS guidelines and a maintenance plan be prepared and implemented to avoid accidents.
	Vibration and noise nuisance	• Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition • Avoidance of noise-prone activities between the hours of 6 pm. and 6 am.
	Air pollution	• Regular inspection of machinery and equipment used in the operation to ensure that they are in good working condition • Dust prone areas and material should be covered Dust prone areas and material should be covered

7.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

7.1 BRIEF BACKGROUND

Environmental management is concerned with the implication of the recommended mitigation measures. Unless those measures are fully implemented, the primary function of the EIA cannot be achieved. In order to be effective, environmental management must be fully integrated with the overall project management effort at all levels. In this regard, this Environmental and Social Management Plan is focused on the establishment of the roles and responsibilities of the respective agencies in order to ensure a successful implementation of the mitigation measures and also to identify and address unidentified impacts of the Project.

7.2 ROLES AND RESPONSIBILITIES

7.2.1 Project Management

Although each of the Islands concerned with the project (Grenada, St. Lucia and St. Vincent and the Grenadines) has the legislative and institutional framework for environmental management in general, it is necessary to first of all appoint a Committee made up of representatives from the respective Physical Planning Units; relevant None Government Organizations (NGO's) and the respective Telecommunication Authorities.

The primary responsibility of the Committee is to ensure a successful implementation of the mitigation measures and also to identify and address unidentified impacts of the Project. A project coordinator should also be appointed who would be responsibility for the implementation of the mitigation measures and the coordination of environmental management activities (monitoring, enforcement, audits and inspection) of the Project. Details are as follows:

The Committee

a) Preparation / approval of the Terms of Reference for the Project coordinator
b) Conduct a review of regulations, guidelines and procedures of their respective Islands with the view of compiling a list of the most appropriate ones to be applied in this instance.

c) Establish acceptable working relationship between the respective PPU's in order to achieve desired environmental management goals

The Project Coordinator

The Project Coordinator will have to:

a) Convene a meeting with representatives from the respective Physical Planning Units, Physical Planning and Development Control Authorities / Boards and relevant None Government Organizations (NGO's) the respective Telecommunication Authorities and interested parties for the purpose of identify existing and potential environmental management problems and means of addressing them.

b) Prepare a Project Environmental Management Manual (PEMM) for approval by the Committee. The PEMM would include among other things, the above mentioned approved regulations, guidelines and procedures; necessary actions to be taken; by whom and at what time; support agencies and their roles; necessary requirement (personnel, equipment etc.); monitoring, audit and inspection procedure.

c) Public awareness and dissemination of information including the PEMM

d) Ensure that the contractor prepare and submit a Project Implementation Plan to the Committee for approved. It should indicate the precise location of the cables and other infrastructure in relation to existing environmental resources and implementation process. It should also include: a Spill

Prevention and Control Plan; a Waste Management Plan; a Hazardous Materials Management Plan and an Accident and Emergency Response Plan.

e) Assist the PPDA in ensuring strict compliance with all relevant legislation, approved management plans as well as any new environmental mitigation measures that may be recommended by the relevant Authority.

7.2.3 Safeguard procedure

This section is focused on identifying the procedure to be followed in order to complete safeguards preparation after the details of the project have been defined. In any event, the Physical Planning Units of the three Countries (Grenada, St. Vincent and the Grenadines and Lucia) are legally responsible for environmental management and all EIA related activities from screening to approval. As such they will continue to play a key environmental management role.

7.2.4 Screening procedure

The first step of the screening procedure will be the preparation / provision of a screening form designed to capture the necessary information about potential environmental and social impacts associated with the proposed activities. It should also cater for similar information about land acquisition and involuntary resettlement. The screening form will have to be completed by the Proponent and submitted to the PPU for review. In accordance with normal procedure, copies of the above will then be submitted to the relevant official/authority by the PPU for review also.

7.2.5 Scoping and field appraisal

This is the next step of the process where based on the information provided in the screening form, a decision will be made by the reviewers as to the necessity of conducting a more detailed survey of the study area and interviews with the affected communities in order to obtain relevant information on the environmental

and social significance of the area/ resources and their value to the community. This would assist in clearing up doubts and in establishing a more accurate identification and assessment of impacts. In this regard the Proponent will have to identify the major stakeholders/community groups within the affected area that are likely to be impacted.

7.2.6 Assessment and classification of impacts

At this stage of the process, the impacts would be classified based on their risk category, and a decision made as to what is required. The high risk situations will obviously require an EIA study and/or RAP. Impacts that are not significant and can be easily addressed through the implementation of a mitigation and management plan during construction and operation of the subproject may only require an EMP. Impacts that are considered minimal may not require any safeguard measures.

7.2.7 Submission and approval of EIA

Arrangements for incorporating EIA conditions into project design

It is customary to include EIA mitigation measures as conditions in approvals granted by the respective Physical Planning and Development Authorities for permission to carryout development. In which case the Proponent is required by law to implement those recommendations/conditions or face serious consequences. In fact, approvals are not granted without confirmation that required considerations have been incorporated into the designs. This is about the best arrangement currently available and it has been working fine except for some minor monitoring problems, therefore there is no reason why this arrangement should not be used for the Project.

Arrangements for formulation of contract clauses to establish enforceable

obligations for the mitigation and monitoring measures that are contractors' responsibilities;

It is quite possible that while design considerations would automatically form part of the contract, this may not be so for the EIA conditions. The former will involve changes to some structural elements of the design which will be reflected in the drawings that is an integral part of the contract. However except special arrangements are made, the Authorities can be faced with a situation where they may be rightfully demanding the Contractor to comply with EIA conditions that are not part of his contract particularly if both the contract and EIA conditions are administered by different Ministries.

In order to avoid the occurrence of this problem a Project Protocol should be developed which would make it mandatory for the Project Coordinator to ensure that the Environmental and Social Impacts Assessment Conditions be included or, like elements of the drawings, be interpreted as an integral part of the Contract before signing.

Public consultation and dissemination of information

The above mentioned Project Protocol should also include provisions for the Project Coordinator to organize public consultation forums with the affected communities, interested organizations and individuals as often as is necessary. A Public Consultation Plan should be prepare by that person and approved by the relevant Authority which among other things, identifies the target groups, schedule, information to be disseminated (safeguard instruments etc.) how and where it would be disseminated. In accordance with Word Bank's procedures, both the Project details and safeguard instruments will be publicly disclosed prior to project appraisal. Arrangements would also have to be made for collecting and addressing public comments.

ANNEX A

Terms of Reference for Individual Consultant

Technical Assistance to prepare the Environmental and Social Management Framework and the Resettlement Policy Framework for the Caribbean Region with emphasis on Grenada, St. Lucia and St. Vincent and the Grenadines

(The Caribbean Regional Communications Infrastructure Program - CARCIP)

Background

The Latin America and the Caribbean (LAC) region has seen important improvements to its ICT infrastructure over the past 10 years. Through telecommunications sector liberalization and private participation, important investments have been promoted, most notably in the deployment of mobile telephony networks and the installation of numerous international submarine fiber optic cables that serve the region.

Within LAC, the Caribbean region has also benefited from these trends, but to a lesser extent, with major gaps in access to ICT infrastructure still prevalent. At the international level, most countries in the region are currently served by only one alternative international cable, and some countries such as Haiti1 and Guyana2 were only recently connected to a cable. At the national level, major infrastructure gaps also exist, with very little investment in broadband networks venturing beyond the main urban centers, especially in the form of fiber backbone networks, which have very limited extension, in the few countries that have one.

The Caribbean Regional Communications Infrastructure Program (CARCIP) aims to contribute to increase access to, and reduce the cost of, ICT services and thereby facilitate the development of a wide range of ICT applications that allow for social and economic development in the region. The first phase of the program will be implemented in the Dominican Republic, Grenada, St. Lucia and St. Vincent and the Grenadines.

The Bank's environmental and social safeguards policies require that the recipient country prepare an Environmental and Social Management Framework (ESMF) (consistent with national laws, any applicable treaty concerning international waters, and OP 4.01) and a Resettlement Policy Framework (RPF) for any cables and associated equipment that may be laid as part of Government Connectivity Program or any cable through territorial waters and onto the national shores or contiguous shores. These safeguards documents will be prepared, disclosed and consulted before appraisal. Once the specific sites are known, Environmental and Social Impact Assessments (ESIAs) and Resettlement Plans will be prepared as part of project implementation but before the infrastructure is put in place.

This document outlines the terms of reference for consulting services to develop Environmental and Social Management Framework (ESMF) and Resettlement Policy

Framework (RPF) for the project. This consultancy will be financed from the Korean Trust Fund. The result of the consultancy is expected to be validated, together with a broader Latin America regional study, which is being funded through the SFLAC.

Objectives

The main objective of this study is to develop options for the implementation of Environmental and Social Management Framework (ESMF) and a Resettlement Poli Framework (RPF) to be used for the environmental and social screening and assessment activities relating to cable laying and construction of landing stations as well as backbone a transmission telecommunications infrastructure development within the Caribbean region.

Scope of Work

The activities being financed under the Program consist of: i) support for the development broadband backbone and government networks; ii) expansion of the national connectivity rural areas; iii) regional links; iv) promotion of the Information Technology (IT) indust and v) support to training programs in the use of Information and Communicati Technology (ICT) tools in order to increase the productivity and efficiency of public a private sectors. The potential social and environmental impacts of such activities a expected to be minor and reversible. Nevertheless, appropriate safeguards instruments mu be prepared to ensure that all project activities meet the requirements of the relevant natio legislation and international conventions to which the region is a signatory, as well as Wo Bank Group environmental and social safeguard policies.

The exact locations of the backbone networks, and possible regional links have not be determined, and it is therefore premature to undertake a site-specific Environmental a Social Impact Assessment (ESIA) and a Resettlement Plan (RP). Consequently, t Consultant will prepare an Environmental and Social Management Framework (ESM (consistent with national and regional laws, any applicable treaty concerning internatio waters, and OP 4.01) and a Resettlement Policy Framework (RPF) consistent with OP 4.1 The purpose of the frameworks is: (i) to provide as much information as possible abo potential environmental and social impacts (including possible land acquisition a resettlement) at the project's current state of preparation; (ii) to inform the project planni and design process by comparing the potential impacts of alternative locatio configurations, and construction techniques that are under consideration; and (iii) to descri the procedures for subsequent assessment of impacts and development of the appropria impact management instruments (including associated mitigation measures) when the deta of the project become available. These management instruments are likely to be Environmental and Social Management Plan (ESMP) and Resettlement Plan (RP).

The content of the ESMF and the RPF and the general nature of the activities necessary produce it are explained below. The consultant is expected to add any tasks or top required for the fulfillment of the above objectives, subject to their professional judgme and experience.

Task 1 - ESMF

The consultant will prepare a brief description of the CARCIP, focusing on thc components and activities that could have positive or negative impacts on the natural a human environments.

Description of the Environment

The Consultant will assemble and evaluate baseline data on the environmental and soc characteristics of the area that would be impacted by project activities such as t government connectivity programs and laying of the undersea cable as required. The scope this description should emphasize those aspects of the natural and human environments tl could be affected by the project, including but not necessarily limited to the following:

- physical environment: geology (general description for overall study area); oceanography (water depths, beach characteristics and profiles, tides and currents, wave action, typical storm patterns, etc.); topography; soils and erosion patterns. The area with potential to have undersea cable under the CARCIP project would be between Grenada and St. Vincent and the Grenadines including the small islands of Carriacou and Petite Martinique which could lead to more direct connectivity between the two countries. There may be potential for additional cables in the region;

- biological environment: flora, fauna, rare or endangered species within or in areas adjacent to project-related development sites; sensitive habitats, including marine or terrestrial parks or reserves, significant natural habitats within or near project-related development areas;

- socio-cultural environment: population, land use; sources of livelihood (including offshore fisheries); community structure; cultural properties (e.g., archaeological and historically significant sites); vulnerable populations, including, where applicable, indigenous peoples and traditional tribal lands.

Legislative and Regulatory Considerations

The Consultant will describe the relevant national/regional legislation in the relev countries, as well as the World Bank policy requirements governing environmental a social assessment, environmental quality, public health and safety, protection of sensiti areas and endangered species, protection of physical cultural property, and requirements consultation and disclosure. The Consultant will also list and describe the requirements relevant international conventions or treaties, global or regional, to which the select countries (and region) are signatory.

Determination of the Potential Impacts of the Proposed Project

Although the precise designs, locations, and construction techniques of project facilities ha not been determined, the Consultant should be able to identify in general the significa impacts on the natural and human environments that the project is likely to cause. T analysis should include environmental and social impacts for both the construction a operation phases of the project. These may include, but not be limited to: socio-econon benefits; loss of natural habitat and vegetation; disruption of drainage and cultivatic obstruction of access by people using project development sites; loss of land/displaceme noise; social disruption, including increased risks of HIV/AIDS , as a result of tempora labor-forces. The analysis should include an evaluation of the likely significance of t potential impacts, based on their intensity or severity, area affected, duration, and whetl they are reversible or not. For the undersea cable, consultant will describe i) the potent route of the cable, including a map, with as much accuracy as possible, given availal information, ii) the geology of the sea floor underneath the cable from its starting point Grenada or St. Vincent to its endpoint, iii) any key issues with regard to oceanograpl including current, sandwaves, sediment abrasion, and cable "strumming", v) the biologi environment in the sea, and vi) applicable laws and regulations for surveying and laying t cable both in territorial waters and the international waters off the coast of the Caribbea The ESMF will examine potential impacts during the following periods of impacts of t undersea cable: marine survey, installation, and repair/recovery, including: Noise, Generati of waste, Gas emissions from vessels, Surface and sub-surface ocean traffic/shipping rout Night-time operations, Vibration, Heat, Radiation, Water pollution from effluents a discharges, Disruption of bottom sediment or water movement, Ecological/economic impa terrestrial, marine, fisheries, Other issues.

For each impact during each period, the ESMF will describe mitigation measures to redu impacts during the surveying and laying of the cable in the sea and in international waters the case may be. It will also identify gaps in any environmental regulations, permitting, a licensing that may need to be rectified before the cable can be laid.

Analysis of Alternatives

The ESMF should include an analysis of reasonable alternatives to meet the ultimate proj objectives. This analysis should suggest designs that may be sounder from an environmen or social perspective than the originally proposed project. Alternatives should inclu alternative routes and sites; alternative designs; and alternative methods of construction.

The Consultant will compare the alternatives in terms of:

- potential social and environmental impacts; capital and operating costs;
- suitability under local conditions (e.g., skill requirements, political acceptability, public cooperation, availability of parts, level of technology, access to national and international waterways); and
- institutional, training, and monitoring requirements.

Identification of Mitigation and Monitoring Measures

For the likely alignments, designs and construction methods, the Consultant will recomme the feasible and cost-effective measures that are typically used to prevent, minimize mitigate to acceptable levels the potential negative impacts that have been identifi Measures to enhance project benefits should also be presented. The Consultant will inclu measures to address emergency response requirements for accidental events. The consult will also identify the typical activities required to monitor both the environmental and soc impacts and the effectiveness of the mitigation measures as indicated above.

The Consultant will estimate the typical costs of the mitigation and monitoring measures and the staffing and training requirements, and other necessary support services to implement them.

Definition of Environmental and Social Impact Management Procedures, Guidelines and Responsibilities

The ESMF will specify the process to be followed to complete safeguards preparation af the details of the project have been defined. This will include:

- procedures for screening the project to determine the nature of the environmental and social impact instrument to be prepared for it – e.g., a full ESIA for the individual country connectivity, an ESMP, or simply a set of standard procedures to be incorporated in construction contracts and operating manuals (unless national regulations are more stringent and require a full ESIA).
- arrangements to incorporate environmental and social considerations in the engineering designs;
- arrangements for formulation of contract clauses to establish enforceable obligations for the mitigation and monitoring measures that are contractors' responsibilities;
- arrangements for public consultation and disclosure of the safeguards instruments;
- definition of responsibilities to implement the foregoing steps; and
- design and implementation of an environmental and social capacity building and awareness raising program.

Task 2 Support the Preparation of a Resettlement Policy Framework (RPF)

The Consultant will work very closely with the Governments in the preparation of Resettlement Policy Framework (RPF) for CARCIP. The purpose of the RPF is to guide t development of specific Resettlement Plans (RPs - OP 4.12) during project implementati in order to address the following losses associated with land acquisition: (i) loss of land other assets, (ii) loss of dwellings and other structures, or (iii) loss of income or livelihoods

The RPF will clarify the principles and procedures that will be followed to compensate a assist the affected landowners and other occupants or users of the land that will be requir by the construction of the communications infrastructure to be financed under the Program.

The Consultant will facilitate the production of the RPF through activities designed with tl

purpose, such as workshop or similar activities, and the collection of country-speci information. In particular, the Consultant will evaluate the existing procedures for Right Way (RoW) acquisition for the installation of fiber optic cables in the countries where the investments are being planned, and will recommend modifications to the procedures, necessary, to meet the requirements of World Bank Operational Policy on Involunta Resettlement.

The RPF will include the following elements:

(a) Description of Project activities that will require land acquisition or Right of Way (RoW) acquisition for the installation of fiber optic cables and ancillary facilities: the RPF will describe these activities and their anticipated impacts (such as loss of assets, relocation of people who occupy existing RoW or RoW that need to be acquired, loss of income sources and loss of livelihoods), based on the information available to date. The RPF should include a timetable for RP preparation for the activities that involve land acquisition and an explanation of why a RP cannot be prepared by project appraisal to address the impacts of these activities.

(b) Principles and objectives governing the preparation and implementation of RPs. The RPF should clearly define the principles for compensating the affected landowners and other affected people and for addressing other losses, such as loss of shelter or income sources.

(c) Process for preparing RPs: Although the exact locations of project activities are not known at this time and will not be known at the time of project appraisal, the RPF should describe the process for preparing and approving RPs, and for monitoring and evaluating their implementation.

(d) Affected Population: The RPF should provide a reasonable estimate of project-affected populations (PAPs) and identify likely categories of displaced persons, to the extent feasible.

(e) Eligibility: The RPF will define criteria, including relevant cut-off dates, for determining the eligibility of displaced persons for compensation and other resettlement assistance.

(f) Legal Frameworks: The RPF will include a general review of the applicable legal frameworks in the countries, and will establish overall guidelines for the detailed legal framework review to be conducted as part of the development of country-specific RPs. The RPF will identify relevant national laws, especially with regards to the acquisition of RoW for the installation of fiber optic cables and related facilities and the valuation of losses suffered by landowners as a result of the establishment of the RoW and the installation of the cables. The RPF will also discuss similarities and differences between the World Bank requirements and national legal requirements, and propose measures to bridge any gaps. The RPF should explicitly state that if there are discrepancies between World Bank requirements and government

requirements and will explicitly state that Bank policies will prevail.

(g) Valuing Assets: The RPF will include a general description of method(s) that will be used to value the losses of landowners and other affected people related to the establishment of RoW or the acquisition of land for other project facilities.

(h) Delivery of Compensation: The RPF will identify the procedures for the delivery of compensation and other entitlements and describe the role of the responsible parties for this delivery.

(i) Implementation Process: The RPF will describe the implementation arrangements (how RPs will be carried out, how compensation will be paid, how will resettlement implementation be linked to the initiation of civil works, etc.).

(j) Grievance Redress Mechanisms: The RPF will describe the mechanisms available to affected people for filing complaints and resolving disputes and identify parties responsible for dispute resolution.

(k) Funding: The RPF will describe the likely arrangements for funding resettlement, including the preparation and review of cost estimates, the flow of funds, and contingency arrangements.

(l) Consultation: The RPF will describe the mechanisms for consultations with, and participation of, persons affected by RoW acquisition and other land acquisition for project activities. Also, as part of the preparation of the RPF, meaningful consultations must be carried out with a broad array of stakeholders, including government officials, and people who may be the beneficiaries of, and affected by, typical program activities. The draft RPF will be circulated to interested parties, and their views and concerns will be taken into account before finalization of the document. The RPF should have an annex containing a record of all such consultations.

(m) Monitoring: The RPF will describe how RPs will be implemented, monitored and evaluated. This should include the monitoring and evaluation (M&E) arrangements in the implementing agency, including frequency of monitoring.

Task 3 Consultation and Disclosure of ESMF and RPF

The Consultant will work with other Consultants being selected for a broader regio feasibility study, as well as with relevant Governments in carrying out appropri consultation activities with stakeholders during the preparation of the ESMF and R Stakeholders include interested Government agencies such as the Environmental Protecti Agencies, local governments, non-governmental organizations, and civil society.

Manage preliminary consultation

The Consultant, in collaboration with other consultants mentioned above, will manage t preliminary consultation through stakeholder contacts such as the Ministries of ICT, a Environmental Protection Agencies. The consultant will incorporate any comments from t World Bank and other stakeholders in the draft ESMF/RPF prior to submission to t Governments and the Bank for review and clearance for disclosure. The Consultant w prepare the draft ESMF and the RPF in English.

Disclosure and Finalization

When the ESMF and RPF are completed in final draft form and cleared for official pub disclosure, the Consultant will prepare public notices, ensure that electronic copies of t ESMF and the RPF are available for consultation, and prepare hard copies to be placed locations accessible to the public in the project-affected areas. The Consultant will provi support at any events held for public consultation and comment on the final draft – at le one stakeholders meeting at the regional level (more may be required under natio legislation) – and will document in an annex to the final ESMF/RPF, the dates a attendance lists, the comments and questions received, and the disposition of those comme and questions in the ESMF/RPF. The consultant will make any revisions necessary in t ESMF/RPF based on the stakeholder inputs and submit the final ESMF/RPF document.

Organization

The consultant will work with the Ministries of Information and Communication. T estimated effort for this assignment is about 40 person-days spread over an eight-we period. The majority of the work should be completed within 4 weeks from the date contract signature, by which time a draft should be available for the three Governments a World Bank review. The consultant will revise the draft based on comments received, a assist the Governments in making the disclosure. Stakeholders will be given a maximum 14 days to review the final draft ESMF/RPF, at the end of which the consultant will wo with SFLAC consultants support the Government in conducting at least one stakeholde meeting (more may be required under national legislation

Reports and Schedule

All reports will be submitted for review to the Governments and the World Bank. Fi versions of these documents must incorporate amendments agreed during consultations a be approved by the relevant government authorities.

The Consultant will have to speak English and submit all documents in English. Five paper copies and one electronic copy will have to be delivered for all reports/notes.

Consultant Profile

The consultant for the study will be an environmental and social specialist with at least sev (7) years of experience in this type of work, preferably with experience working in t Caribbean.

7. Additional Tasks

Depending on the result of the initial tasks carried out by the consultant, and subject satisfactory performance in the initial assignment and as part of a natural continuation work carried out, the consultant selected may be asked, in a separate contract, to continue tl assignment in order to prepare the Environmental and Social Impact Assessment (ESIA) a the Resettlement Plans (RPs) for the CARCIP Program as needed, before any constructi begins.

ANNEX B

3.0 DESCRIPTION OF ENVIRONMENT

INTRODUCTION

This section of the report is focused on assembling and evaluating baseline data on the environmental and social characteristics of the area within the territories of the three islands–Grenada, St. Vincent and the Grenadines and St. Lucia - which would be impacted by the proposed project activities. They form part of the southern end of the chain of Islands which make up the Windward Islands.

Although the proposed project activities have been already established, the exact location of the sites of the activities (laying of undersea cables and construction/ installation of on-shore infrastructure) is not yet identified. In this regard, a summary of general description of the terrestrial and marine environment of each of island is presented below, starting with Grenada.

Fig:1

3.1 GRENADA

PHYSICAL ENVIRONMENT

Location and Size

Grenada is a tri-island State which includes the Islands of Carriacou and Petit Martinique and some smaller uninhabited Islands between. It is located at the southern end of the Windward Islands, approximately 45 miles south of St. Vincent. The total area of these three inhabited Islands is 133 square miles, with Grenada (the main Island) being 120 square miles; Carriacou 13 square miles and Petit Martinique 0.9 square miles.

Geology

The general geology of Grenada consists of 13 different categories ranging from Great River Beds to Tufton Hall Formation (Figure 1). Carriacou is comprised of 11 different categories ranging from alluvial and superficial deposit to windward limestone (Figure 1.1). Similar information on the geology of Petit Martinique is not available. However, they are of volcanic origin consisting mainly of volcanic products and, to a lesser degree, of sedimentary rocks formed during the Miocene to the Quaternary period of the Island's volcanic history. A common feature on the slopes in many parts of those Islands is huge boulders formed from volcanic blasts.

The volcanic blasts are from high energy explosive eruptions usually producing basalts and andesites. The rocks are high in iron and magnesium oxides and are dark in colour (mafic). These boulders gather over many eruption cycles forming fields of angular rock usually in Grenada's case, Basalt/Andesite/Dacite group. The major minerals are olivine with pyroxene and plagioclase fine crystals. These boulders are very dense and hard, therefore weathering processes are slow with them.

Accompanying these volcanic blasts are cinder, ash and pyroclastic flows. The

amount and types varies from site to site, volcanic episode to volcanic episode. Over time, cinder, ash and pyroclastic flows weather and disintegrate into soil.

They occur as domes, flows and as a wide variety of pyroclastics related to eruptions with varying degrees of explosivity. Agglomerates and ashes, in varying degrees, are the dominant components of the pyroclastic rocks. The lava flow and rocks from eruption blasts are andesitic and basaltic in nature. (*R.J. Arculus 1973, 1976*).

Within those categories are numerous geological fault lines scattered throughout the Island. They are defined as planer brake in rock along which one side has moved relative to the other. This movement can affect the stability of the soil above and cause structural failure to buildings, walls and roads. However, this is not an issue of concern for the none-structural elements of the project.

Fig:1

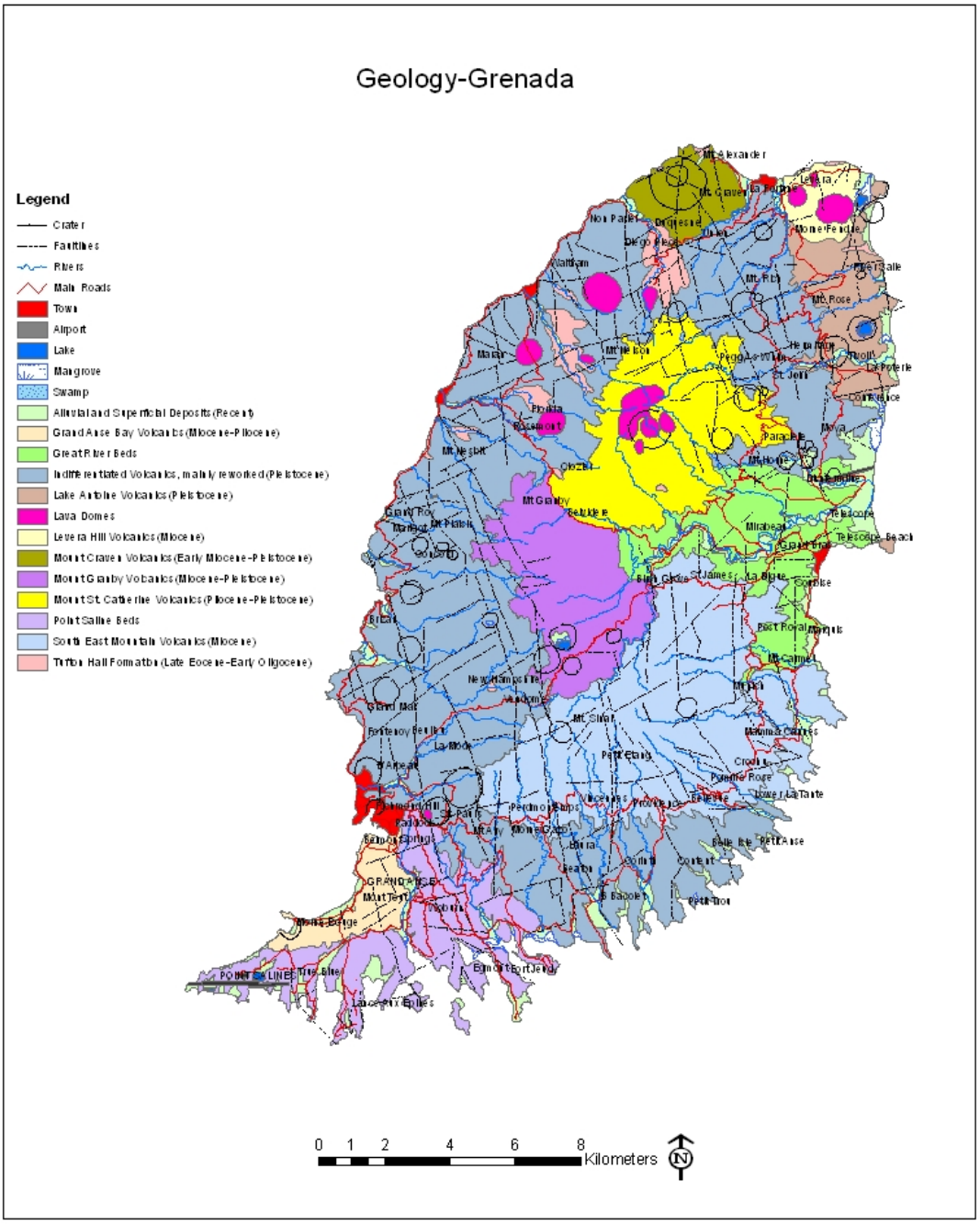
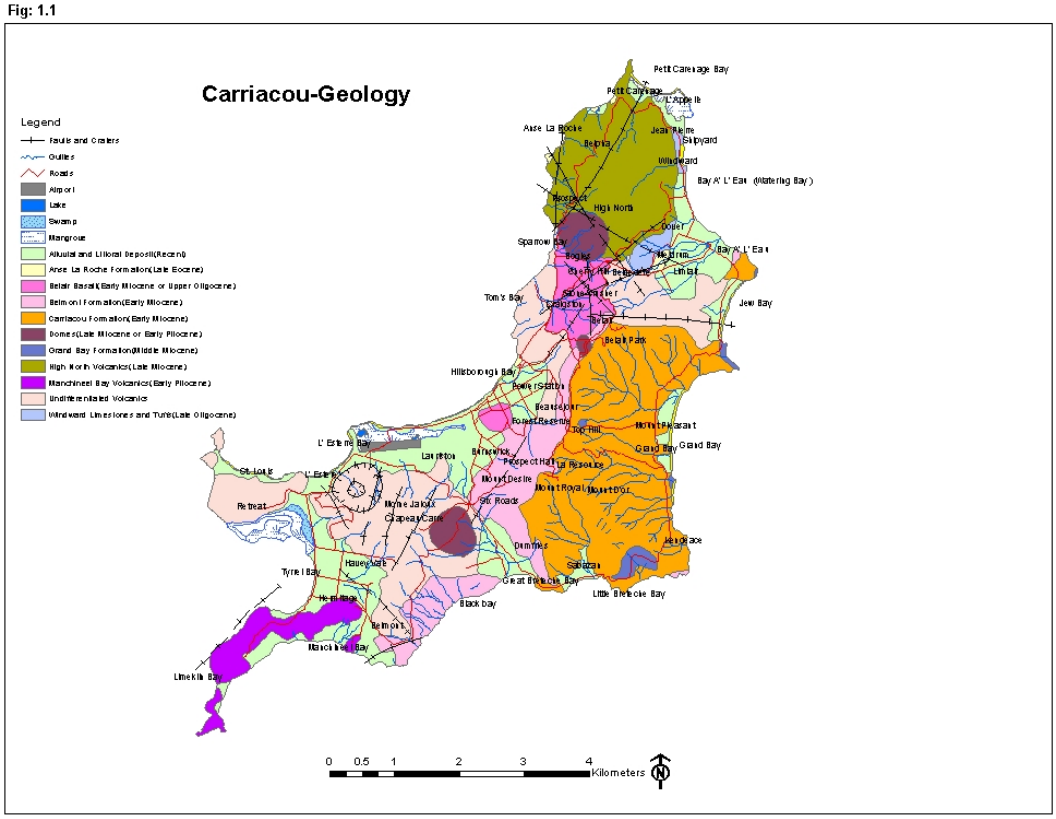

Geology-Grenada
Legend
Crater
Faultlines
Rivers
Main Roads
Town
Airport
Lake
Mangrove
Swamp
Alluvial and Superficial Deposits (Recent)
Grand Anse Bay Volcanics (Miocene-Pliocene)
Great River Beds
Indifferentiated Volcanics, mainly reworked (Pleistocene)
Lake Antoine Volcanics (Pleistocene)
Lava Domes
Levera Hill Volcanics (Miocene)
Mount Craven Volcanics (Early Miocene-Pleistocene)
Mount Granby Volcanics (Miocene-Pleistocene)
Mount St. Catherine Volcanics (Pliocene-Pleistocene)
Point Saline Beds
South East Mountain Volcanics (Miocene)
Tritton Hall Formation (Late Eocene-Early Oligocene)
0 1 2 4 6 8
Kilometers
N

Fig: 1.1



Soil

There are 3 different types of soil textures in Grenada and Carriacou namely sand, silt and clay and 4 different types of soils based on textural classification namely, clay, clay loam, sandy loam and loamy sand. Loam is basically a mixture of sand, silt and clay. Although soil data for Petit Martinique is not available, from observation the soil texture seems to be similar. The percentage range for each texture is clay -7 to 27%, silt 28-50%, and sand 23-52%.

Clay soil is one that comprised of at least 40% clay particles. It may have a maximum of 40% silt or 45% sand. Sandy loam is loamy soil in which sand is the dominant particle. Loamy sand is sandy soil in which clay and silt are the dominant particle.

Clayey soil tends to hold much water for long periods and is also subject to swelling when wet and shrinking when dry. Continuous fluctuation can affect structures in the area.

Sandy soils drains very rapidly and, during the process, particles tend to disintegrate from each other because of rapid drainage property.

Clay loam has lower water holding capacity than clay and better drainage property. It is the most favourable soil for construction since it is not subjected to continuous fluctuation as clay and more stabled soil than sand.

The above is divided into 12 different categories, ranging from Belmont Clay Loam to Woodlands Clay Loam (Figure 2) and 10 in Carriacou, ranging from Belair Stony Clay to Woburn Clay Loam (Figure 2). The properties of those categories of soils are as follows:

- Capital Clay Loam – fine textured moderately well to well drainage reddish soils of variable depth.
- Belmont Clay Loam – fine textured moderately well to well drainage brownish soils of variable depth.
- Woburn Clay Loam – fine to medium textured well to excessively drained dark brown to gray moderately deep soil.
- Clay Soils – very deep soils drowned from alluvial or colluvial deposits on mainly flat to undulating land.
- Other Soil types – consist of loamy sand and sandy loam. They are medium to coarse textured well-drained soils.

Any of the above mentioned soils can support some form of agriculture (livestock or crop production). However, some crops/livestock thrive better than others in different areas depending on climatic condition, rainfall, topography, soil fertility etc. Nutmegs, for example, can grow in most areas but it favours the

mountainous region of Grenada where there is high rainfall. Carriacou and Petit Martinique, on the other hand, seems to favour seasonal crops and crops that can withstand arid climatic condition due to the low rainfall experienced on those Islands.

Fig:2

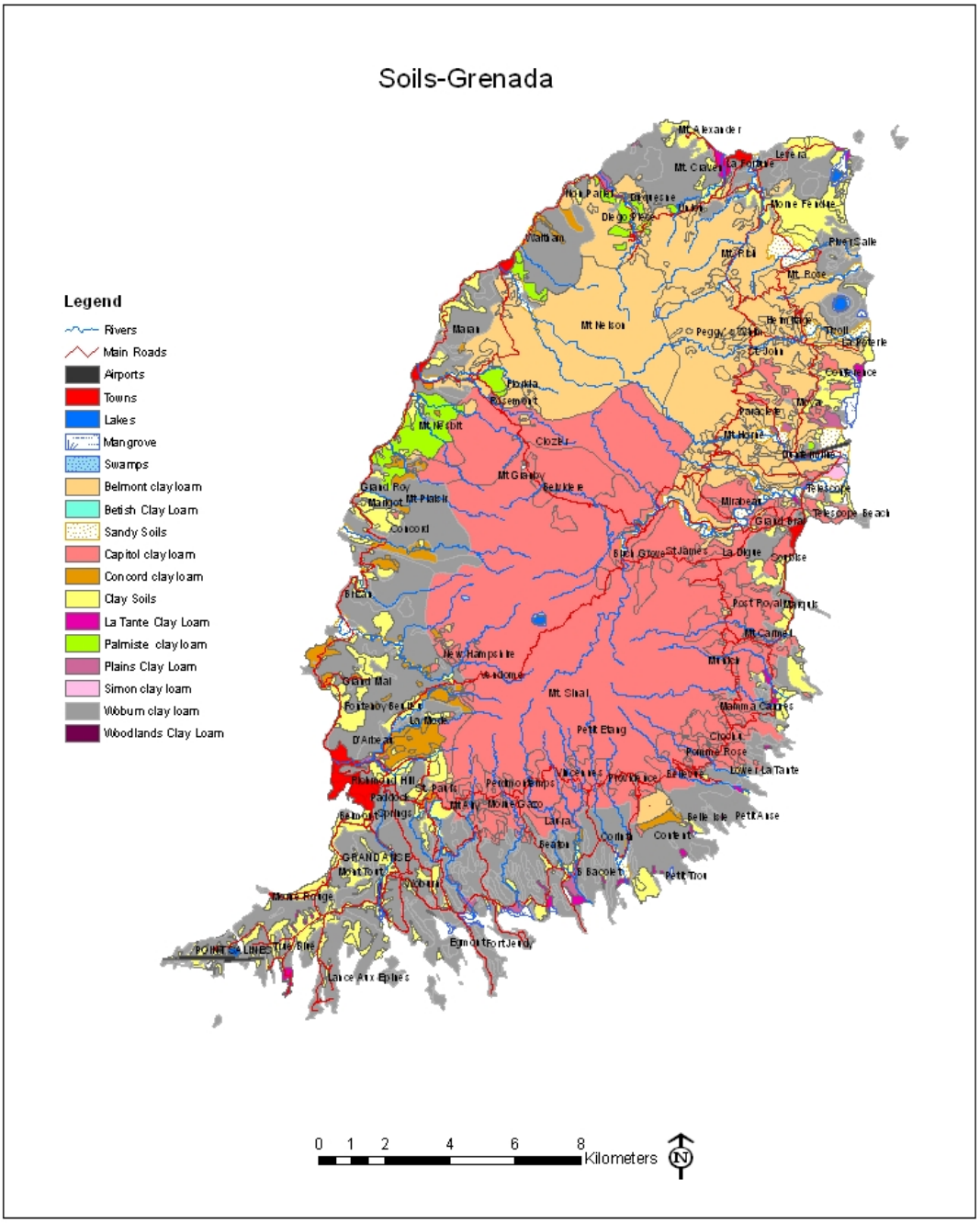
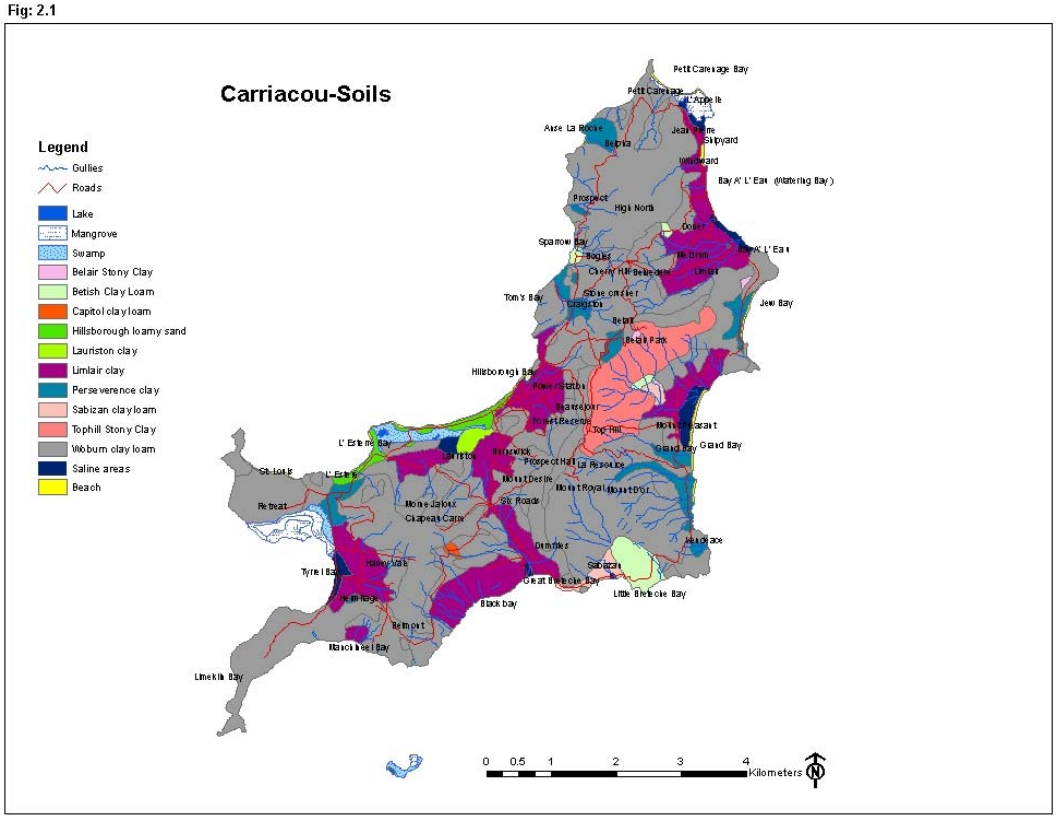

Soils-Grenada
Legend
Rivers
Main Roads
Airports
Towns
Lakes
Mangrove
Swamps
Belmont clay loam
Betish Clay Loam
Sandy Soils
Capitol clay loam
Concord clay loam
Clay Soils
La Tante Clay Loam
Palmiste clay loam
Plains Clay Loam
Simon clay loam
Woburn clay loam
Woodlands Clay Loam
0 1 2 4 6 8
Kilometers
N

Fig: 2.1



Topography and drainage

The topography of Granada is very rugged with some steeply sloping lands, high ridges and mountains, the highest mountain being Mt. St. Catherine, 2707 feet above sea level. Approximately 1.6 % of the island is within the 0˚-2˚ slope category and 3.4% within slope category 2˚-5˚. Most of the gently sloping/flat lands are located along the Eastern side of the Island close to the sea (Figure 3).

The topography of Carriacou is also rugged with some steep sloping lands. Approximately 2 % of the island is within the 0˚-2˚ slope category and 16% within slope category 2˚-5˚. Like Grenada, most of the gentle sloping/flat lands are located along the coast. The greater portion of those lands is along the south-western side of the island. The land rises from an elevation of between 0 and 10 feet along the coast to the central mountain range up to an elevation of 774 feet

at Top Hill in the south and 955 feet at High North in the north, the highest peak on the Island (Fig. 3.1).

Petit Martinique has a much different topography. The flatter area is very small and located on the north western side. From the coast line it rises smoothly to an elevation of 257 feet at Sugar Hill in the north and 738 feet at Piton in the south.

Those types of topography leaves very limited ideal locations for mechanize farming, physical development and infrastructure. This situation, coupled with the increasing demand for lands with good development potential, is perceived to be a recipe for land use conflicts and other social issues which often result in land acquisition by Government for public use, as the only option. This may also be the best option for sections of the project which may require the use of privately owned lands.

The drainage pattern follows the natural land form into gullies, ravines and rivers which flow directly into the sea. The main concern here is about potential effects of soil erosion, landslides and flooding that may quite possibly be created by the implementation of the project.

Fig:3

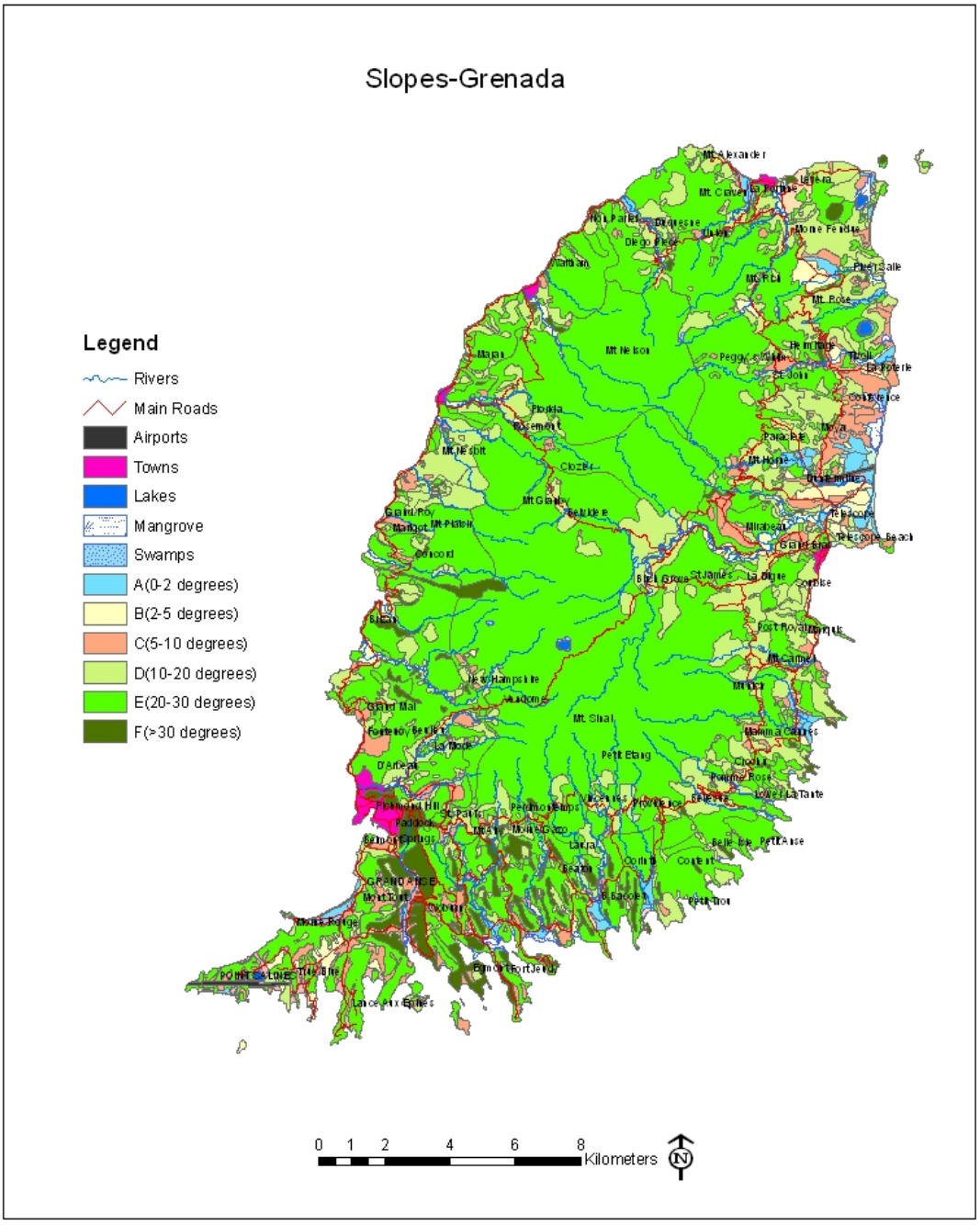
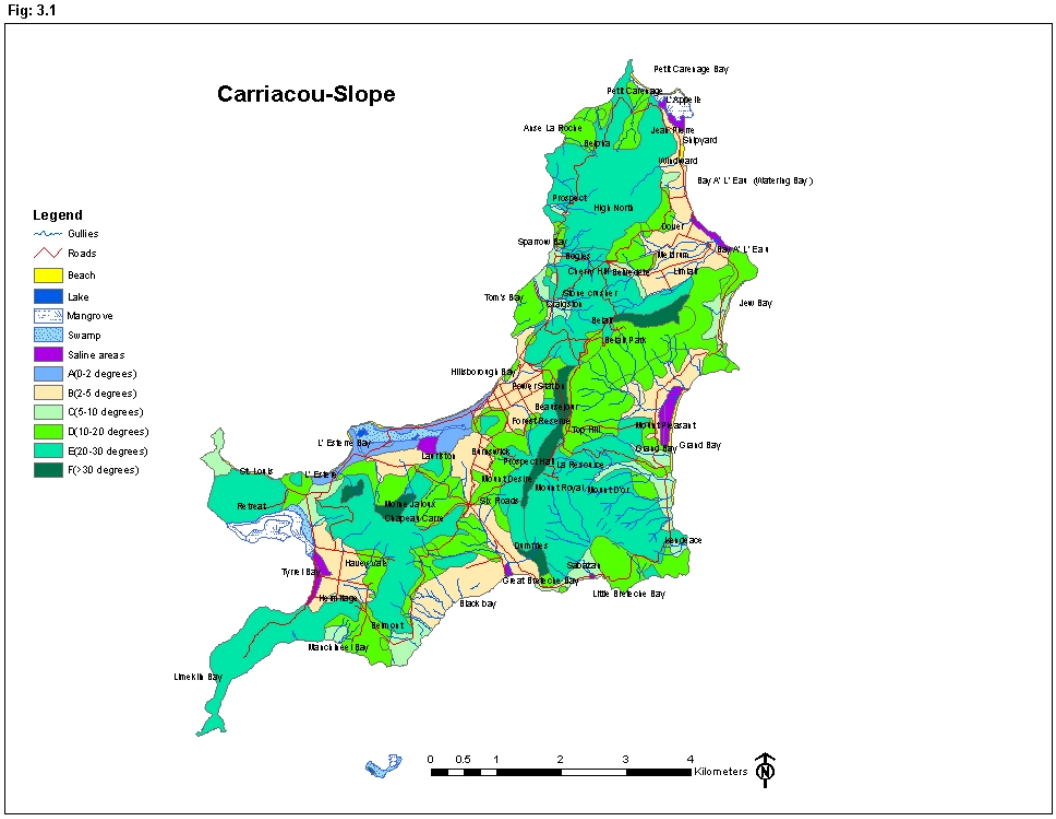

Slopes-Grenada
Legend
Rivers
Main Roads
Airports
Towns
Lakes
Mangrove
Swamps
A(0-2 degrees)
B(2-5 degrees)
C(5-10 degrees)
D(10-20 degrees)
E(20-30 degrees)
F(>30 degrees)
0 1 2 4 6 8
Kilometers
N

Fig: 3.1



Climate

Grenada climatic condition varies between13 different locations referred to as Climatic Zones ranging from A1 to E2 (Fig. 4). The climatic condition of Carriacou and Petit Martinique are different. It only comprises 3 climatic zones, F1, G1 and H1 (Fig. 4.1) which varies between warm to very warm areas that have a very short growing period (150-180 days). Details are as follows:

AREAS HAVING A CONTINUOUS GROWING PERIOD (>365 DAYS)

A1: Moderately warm to warm - the mean annual temperature and the temperature during the growing period is between 20°C and 22.5°C. Rainfall is extremely high - more than 4000 mm/year - and there is no dry season, that is, the mean number of relatively dry months per year is less than one.

A2: Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is extremely high - more than 4000 mm/year - and there is no dry season, that is, the mean number of relatively dry months per year is less than one.

A3: Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is no dry season, that is, the mean number of relatively dry months per year is less than one.

A4: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is no dry season, that is, the mean number of relatively dry months per year is less than one.

AREAS HAVING AN EXTREMELY LONG GROWING PERIOD (330-365 DAYS)
B1: Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is a very short dry season, that is, the mean number of relatively dry months per year is one to two.

B2: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is a very short dry season, that is, the mean number of relatively dry months per year is between one and two.

B3: Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a very short dry season, that is, the mean number of relatively dry months per year is one to two.

B4: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a very short dry season, that is, the mean number of relatively dry months per year is between one and two.

AREAS HAVING A VERY LONG GROWING PERIOD (300-330 DAYS)

C1a: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a short dry season, that is, the mean number of relatively dry months per year is between three and four.

C2: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate - between 1500 mm and 2000 mm/year - and there is a short dry season, that is, the mean number of relatively dry months per year is between three and four.

AREAS HAVING A LONG GROWING PERIOD (270-300 DAYS)

D1: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate - between 1500 mm and 2000 mm/year - and there is a short dry season, that is, the mean number of relatively dry months per year is between three and four.

AREAS HAVING A MEDIUM LONG GROWING PERIOD (240-270 DAYS)

E1: Very warm - the mean annual temperature is between 25°C and 27.5°C while the temperature during the growing period is just over 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, that is, the mean number of relatively dry months per year is between five and six.

E2: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate -

between 1500 mm and 2000 mm/year - and there is a medium long dry season, that is, the mean number of relatively dry months per year is between five and six.

AREAS HAVING A MEDIUM LONG GROWING PERIOD (210-240 DAYS)
F1: Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, i.e. the mean number of relatively dry months per year (*defined as rainfall being less than half potential evapo-transpiration)* is between five and six.

AREAS HAVING A SHORT GROWING PERIOD (180-210 DAYS)
G1: Very warm - the mean annual temperature is between 25°C and 27.5°C while the temperature during the growing period is just over 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, that is, the mean number of relatively dry months per year is between five and six.

AREAS HAVING A VERY SHORT GROWING PERIOD (150-180 DAYS)
H1: Very warm - the mean annual temperature and the temperature during the growing period is just over 27.5°C. Rainfall is very low - between 700 mm and 1000 mm/year - and there is a long dry season, that is, the mean number of relatively dry months per year is between seven and eight.

Fig:4

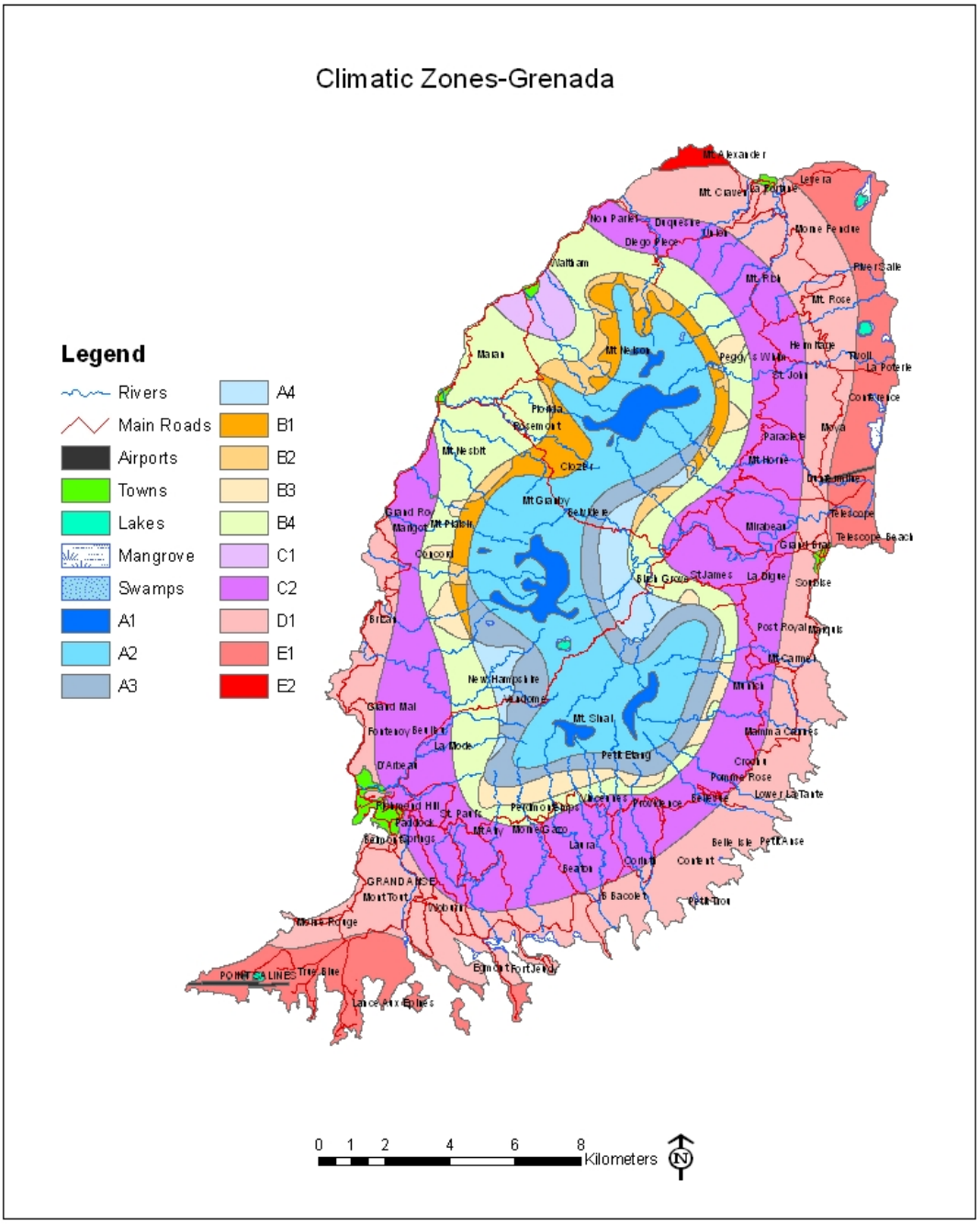
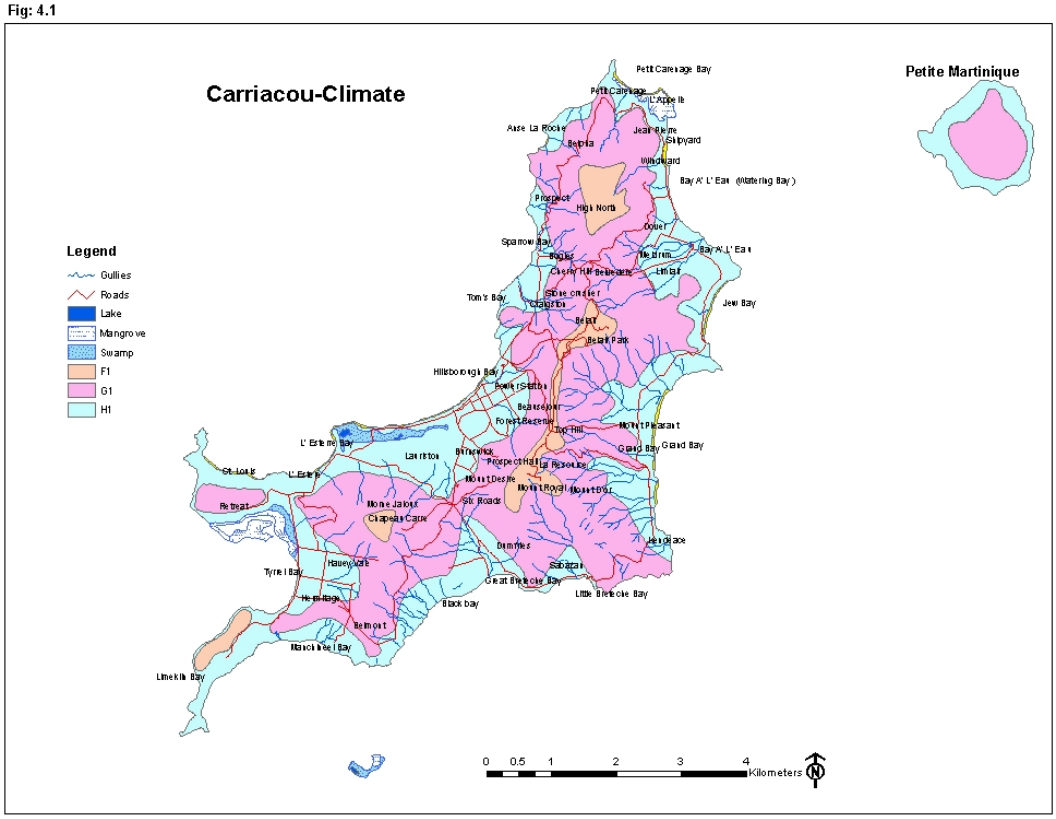

Climatic Zones-Grenada
Legend
Rivers
Main Roads
Airports
Towns
Lakes
Mangrove
Swamps
A1
A2
A3
A4
B1
B2
B3
B4
C1
C2
D1
E1
E2
0 1 2 4 6 8
Kilometers
N

Fig: 4.1



BIOLOGICAL ENVIRONMENT

Flora and Fauna

Grenada shares many species with the other islands of the Caribbean but has more species that occur also in the northern part of South America than the more northerly islands in the Caribbean. It also has more localized species (*Caribbean Spice Island Plants: William G Hartshorne*).

Flora

The floral species are classified into 7 categories (Figure 5) as follows:

1. Montane thicket, Palm Brake
2. Elfin woodland
3. Lower montane (=Sub-)rain forest
4. Rain forest
5. Secondary rain forest

6. Dry Scrub woodland
7. Mangrove

The flora species along the coastal areas - Dry Scrub woodland and Mangrove - are the ones that are most likely to be affected by the construction of the required infrastructure within coastal areas. However, only the Mangrove is listed as protected areas (*national Parks and protected areas*).

Those species can be considered as both salt and drought tolerant. Very large communities comprised species that are deciduous (plants which shed all their leaves seasonally), others are semi-deciduous and a small percentage can be considered evergreen.

Along the fringe or seacoast lies a community of species whose leaves are covered with a protective wax which repels the high salt concentration. This community comprises of species such as Sea grape (*Coccoloba uvifera)*, Seaside mahoe (*Thespesia populnea)*, Almond (*Terminalia catappa)*, Manchineel (*Hippomane mancinella)*, Yellow Elder (*Tecoma stans)*, Torch wood (*Jacquinia merrilii*,*)* Frangipani (*Plumeria glabra)*, Tantacayo (*Albizia niopoides)*, Lowland Gommier/Naked Indian (*Bursera simaruba),* Coconut (*Cocos nucifera*), Agave and Cactus.

The areas close to the coastline where the soil is relatively dry, shallow and rocky are mostly dominated by Acacias/brier (***Vachellia farnesiana)*,** and Leucaenea (*Leucaenea leucocephala)*. Other species which constitutes this ecosystem includes Campache' (*Haematoxylon campechianum),* Tamarind (*Tamarindus indica)*, Bollie (*Crescentia cujete)*, Glory Cedar (*Gliricidia sepium*), Saman (*Samanea saman)*, Strangling fig/Figuier *(Ficus citrifolia),* Cyp (*Cordia spp.),* Devil's Root/Bois bande' (*Chiococca alba)*, Moringa (*Moringa oleifera)*, Bread and Cheese (*Pithecellobium unguis-cati)* (Beard et al: *Grenada Land Information*

System 1949; Hawthrone , W. Jules, D and Guido Marcelle. 2004: Caribbean Spice Island Plants – Trees, shrubs and climbers of Grenada, Carriacou and Petite Martinique).

Fig:5

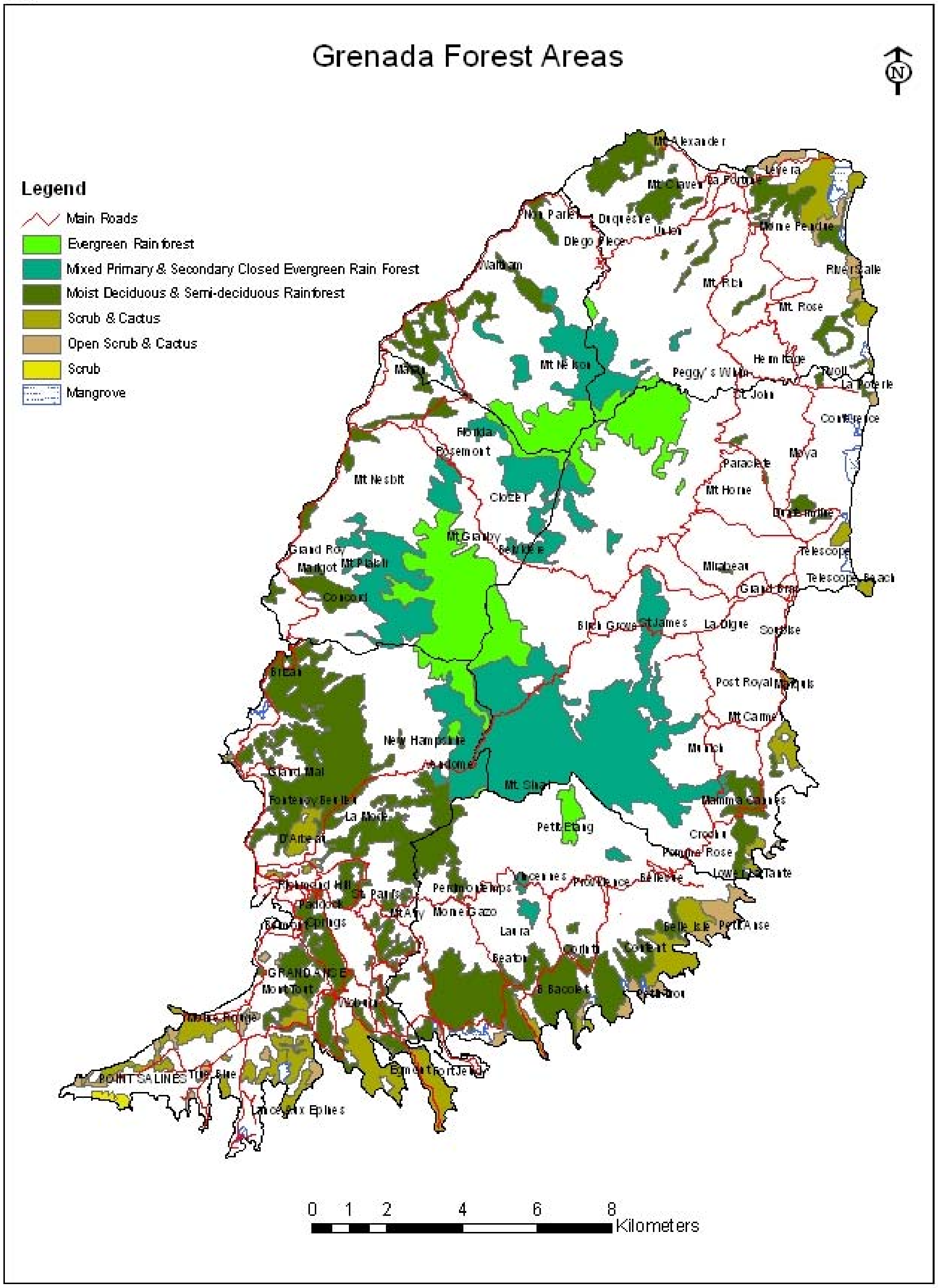

Grenada Forest Areas
N
Legend
Main Roads
Evergreen Rainforest
Mixed Primary & Secondary Closed Evergreen Rain Forest
Moist Deciduous & Semi-deciduous Rainforest
Scrub & Cactus
Open Scrub & Cactus
Scrub
Mangrove
0 1 2 4 6 8
Kilometers
Mt Nesbit
New Hampshire
Grand Mal
Concord
Mt Sinai
St. John
Post Royal
POINT SALINES
GRAND ANSE
Petit Etang
Paraclete
Mt Granby
Mirabeau
Mt Horne

Fig 5.1

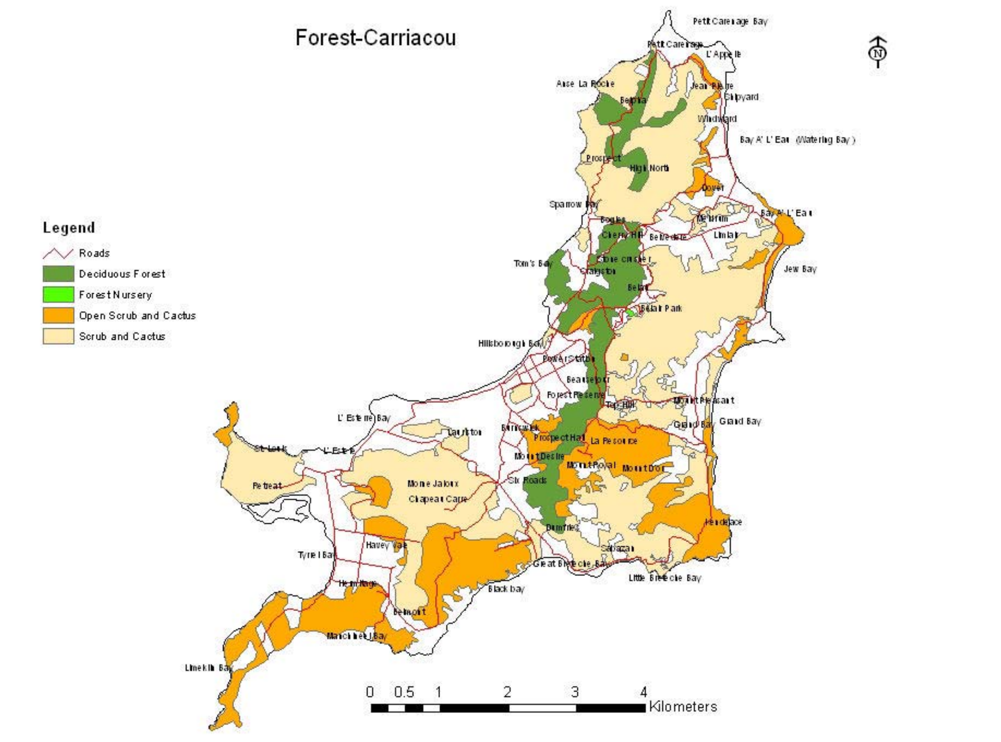
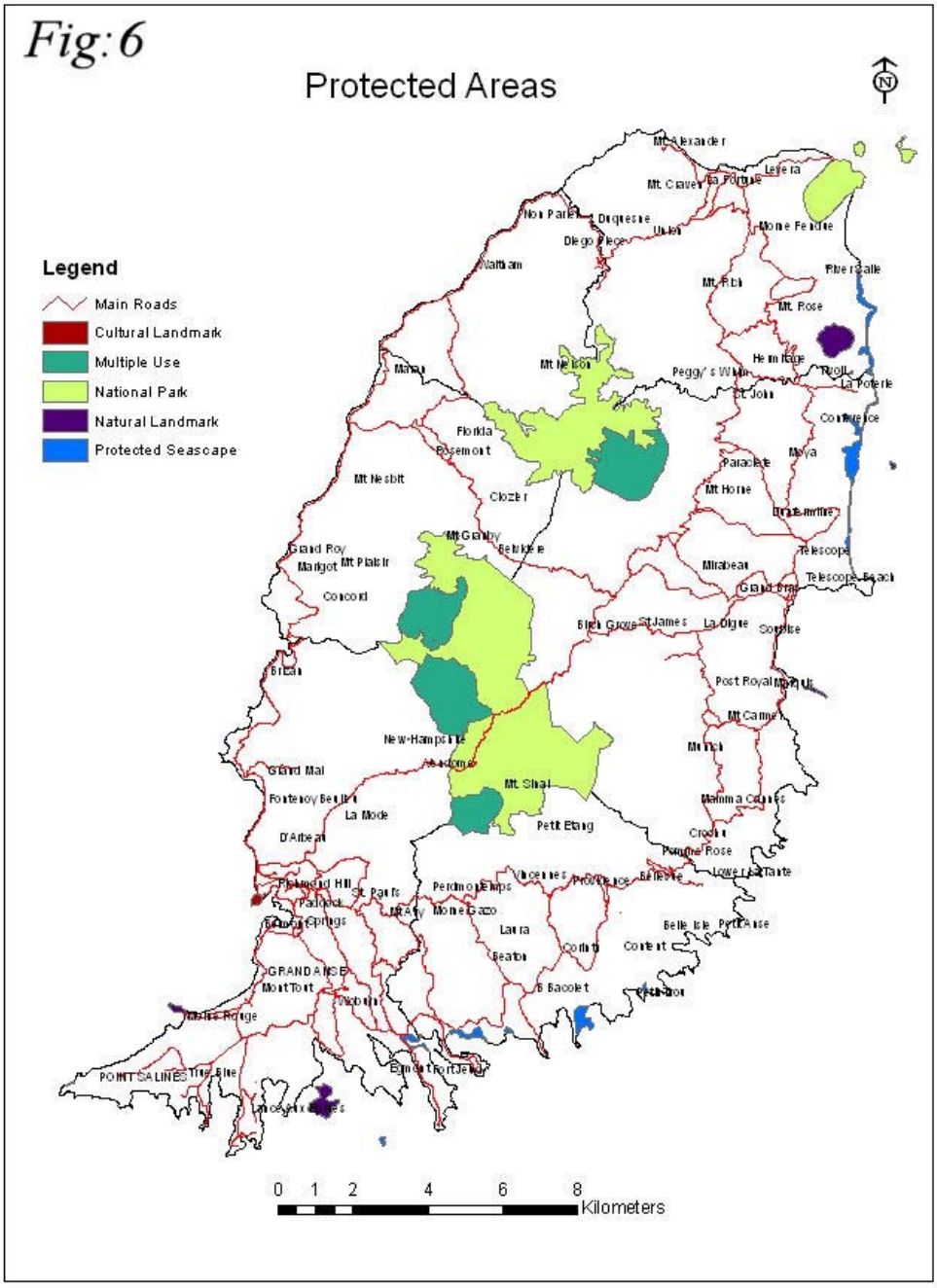

Forest-Carriacou
Legend
Roads
Deciduous Forest
Forest Nursery
Open Scrub and Cactus
Scrub and Cactus
N
Petit Carenage Bay
L' Appelle
Anse La Roche
Shipyard
Windward
Bay A' L' Eau (Watering Bay)
Prospect
High North
Dover
Sparrow Bay
Cherry Hill
Limlair
Tom's Bay
Jew Bay
Belair
Belair Park
Hillsborough Bay
Beausejour
Forest Reserve
Top Hill
Mount Pleasant
Grand Bay
L' Esterre Bay
L' Esterre
Lauriston
Prospect Hall
La Resource
Mount Desire
Mount Royal
Mount D'or
Retreat
Morne Jaloux
Chapeau Carre
Six Roads
Dumfries
Harvey Vale
Tyrrel Bay
Great Breteche Bay
Little Breteche Bay
Black bay
Belmont
Manchineel Bay
Limekiln Bay
0 0.5 1 2 3 4
Kilometers

Fig:6


Protected Areas
N
Legend
Main Roads
Cultural Landmark
Multiple Use
National Park
Natural Landmark
Protected Seascape
Mt Alexander
Mt Craven
La Fortune
Levera
Morne Fendue
Diamond
Diegos Piece
Union
Waltham
Mt Rich
Mt Rose
Hermitage
Troll
La Poterie
Peggy's Walk
St John
Concord
Florida
Rosemont
Mt Nelson
Mt Nesbit
Clozier
Paradise
Maya
Mt Horne
Mt Granby
Belmont
Grand Roy
Margot
Mt Plaisir
Concord
Telescope
Telescope Beach
Mirabeau
Grand Bras
Black Grove
St James
La Digue
Soubise
Brizan
Post Royal
Mt Carmel
New Hampshire
Grand Mal
Mt Sinai
Fonteney
La Mode
D'Arbeau
Petit Etang
Mamma Cannes
Crochu
Pomme Rose
Lower La Taste
Belvedere
Providence
Perdmontemps
Paddock
St Pauls
Morne Grazo
Laura
Belle Isle
Petit Anse
Content
Beaton
GRANDANSE
Mont Tout
Victoria
Marigot
Point Salines
Tivoli
Bonnet
Fort Jeudy
0 1 2 4 6 8
Kilometers

Fauna

Grenada's wildlife species include a variety of migratory birds, mammals, reptiles and insects such as Broadwinged Hawk- *Buteo platypterus* Rednecked Pigeon (Ramier) *Columba squamosa,* Zenaida Dove (Mountain Dove) Ground Dove *Columbigallina passerine,* Emerald Throated Hummingbird - *Sericotes holosericeus,* Tree Lizards - *Anolis aeneus*, Anole or Wall Lizard - *Anolis richardii,* Common House Gecko (*Hemidactylus mabouya*), the Iguana (*Iguana iguana*), Wood slave - *Thecadactylus rapicaunda,* Garman's ground lizard - opossum, mongoose, rat, tree boa or Serpent - *Corallus grenadensis,* the Cane Toad (*Bufo marinus*), Large frog -*Bufo marinus and* Highland Piping Frog (*Overview of Biodiversity in Grenada by Augustus Thomas, Forest Conservation Officer, Ministry of Agriculture , Forestry Lands and Fisheries*).

The Grenada Dove (*Leptotila wellsi*) - a medium-sized New World tropical dove - is the National Bird of Grenada. It is endemic to the Island and considered to be one of the most critically endangered doves in the world (Bird Life International 2000). It's originally known as the Pea Dove or Well's Dove. This bird is a protected species and so is its habitat at Mt Hartman in the south east of the Island and Perseverance in the South West, both in the Parish of St. George.

SOCIO-CULTURAL ENVIRONMENT

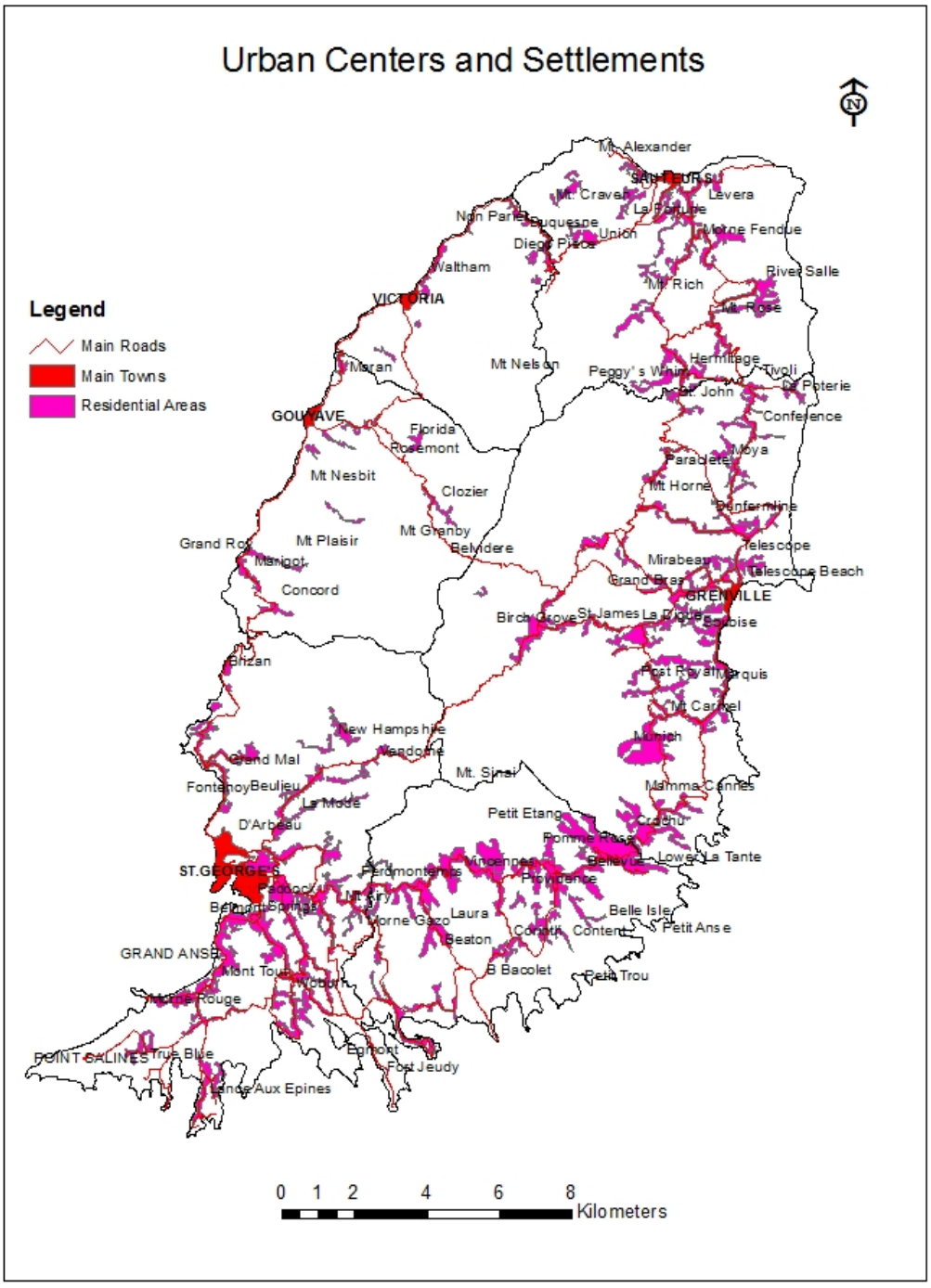
Population

Grenada's estimated population in July 2011 was 108,419, 39% of which lived in urban areas in the year 2010. 25.4% of the population is under the age of fifteen, 65.7% between the ages 15-64 and 8.9% age 65 and over. 39% percent of the population lives within the urban areas.

Land use

The above mentioned physical environment and limited ideal development lands have resulted in a type of mixed land use, mainly residential, commercial and agricultural, in most coastal areas and within areas with development potential,

and forest reserve in the steeper central region. The urban centres and settlements are located along the coast with some settlements extending inland in a linear land use pattern along both sides of the road (Figure 6). The improvement in telecommunication has resulted in the installation of a number of antenna rigs extending in most instances way above the natural vegetation which has become more of a permanent landscape feature in all the Islands.


Urban Centers and Settlements
N
Legend
Main Roads
Main Towns
Residential Areas
Mt. Alexander
Mt. Craven
Levera
La Fortune
Non Pareil
Duquesne
Union
Morne Fendue
Diego Pitea
Waltham
Rivers Salle
Mt. Rich
VICTORIA
Mt. Rose
Hermitage
Tivoli
Peggy's Whim
Moran
Mt Nelson
St. John
La Poterie
Conference
GOUYAVE
Florida
Rosemont
Moya
Paradise
Mt Nesbit
Mt Horne
Clozier
Fonfern Nine
Mt Granby
Grand Roy
Mt Plaisir
Belvidere
Telescope
Mirabeau
Mariqot
Telescope Beach
Grand Bras
Concord
GRENVILLE
Birch Grove
St James
La Digue
Babise
Bhizan
Post Royal
Marquis
Mt Carmel
New Hampshire
Munich
Grand Mal
Fontenoy
Beulieu
Mt. Sinai
Mamma
Cannes
La Mode
Petit Etang
D'Arbeau
Crochu
Pomme Rose
Belvue
Lower
La Tante
ST.GEORGES
Ferdmontenna
Providence
Paddock
Mt Fory
Belmont
Santas
Belle Isle
Morne Gaco
Laura
Petit Anse
Beaton
Content
GRAND ANSE
Mont Tout
Woburn
B Bacolet
Petit Trou
Morne Rouge
POINT SALINES
True Blue
Egmont
Fort Jeudy
Grande Aux Epines
0 1 2 4 6 8
Kilometers

Source of livelihood

Grenada is heavily reliant on its marine resources, tourism and agriculture as major sources of livelihood, particularly to the people of the Carriacou and Petite Martinique. Fishing, transportation, tourism and boat building are the only meaningful sources of livelihood for most of the residence of those Islands, including the St. Vincent Grenadines. The beaches and marine environment, not only cater for the livelihood of the coastal communities in general, but also, for recreation. Any unacceptable disruption of the use of those resources can therefore result in serious negative consequences for both the affected communities and the project developer. They are also the prime tourism product / attraction of both countries.

Community Structure

The Grenadian community has been traditionally agrarian**.** Most people were involved in agriculture and average family size was almost twice as large as it is today**.** Currently very few people rely on agriculture as their main source of income**.** The employed population is mainly involved in blue and white-collar jobs within the service and construction sectors. This trend reflects a change in traditional values as it relates to family and community structure**.** It also brings to focus the issues of changing cultural values resulting in a rapid decline in traditional music, dance and community support (self help/ maroon etc.)**.** Most of those traditions are still well preserved in Carriacou and Petit Martinique.

The youth of the population is reflected in the growing popularity of western culture and the slow disintegration of the traditional culture. Only a few elderly people in the countryside can speak the French-based Creole (in patois, *Kweyol)* language. However, literary activists are campaigning to expose schoolchildren to the Creole language.

Cultural Priorities

Despite the above, there are some buildings and sites in Grenada and Carriacou that are preserved because of their archaeological and historical significance, thanks to the efforts of The Willy Redhead Foundation and The Historic Society of Carriacou. The colonial/ fish scaled tile roof brick buildings in the Town of St. George, the Forts and other historic buildings in Grenada and Carriacou and Pearls Amerindian Archaeological Site, are the most significant ones. Apart from St. Georges in the South and Pearls in the North Eastern part of Grenada, neither of the other sites is located along the coastal area.

Vulnerable population

Grenada does not regard any part of its population as vulnerable to the extent that it is necessary to make special provisions for them, such as lands and other services that are provided for the indigenous people in some other islands. Unlike those islands, no member of the indigenous people still resides in Grenada.

3.2 ST VINCENT AND THE GRENADINES

PHYSICAL ENVIRONMENT

Location and Size

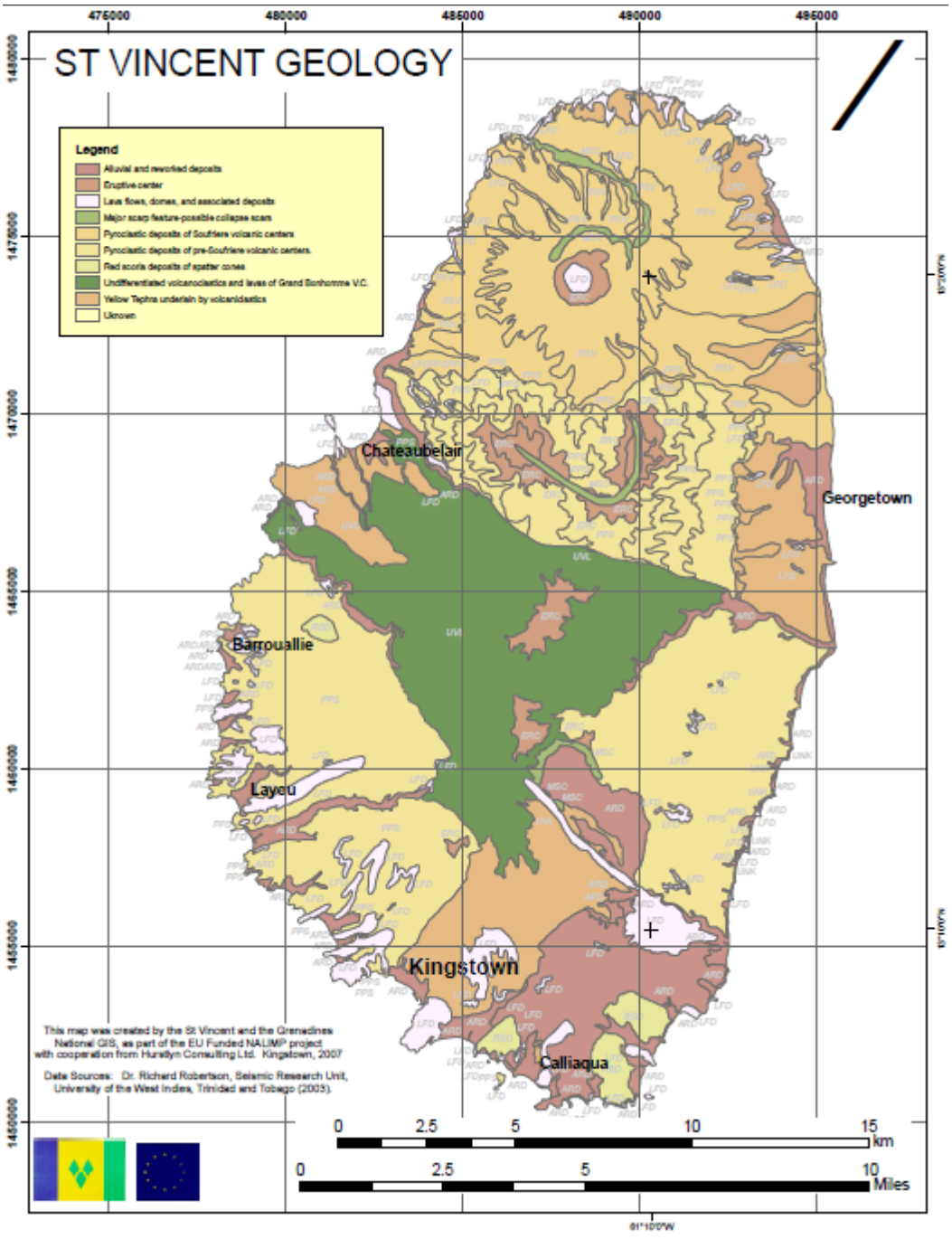
The territory of St. Vincent and the Grenadines is located towards the southern portion of the Windward Island between St. Lucia to the north and Grenada to the south (Annex B1). It is comprised of approximately 32 Islands and Cays, eight of which are inhabited. Apart from mainland St. Vincent, the other inhabited Islands are: Bequia, Mustique, Union, Canouan, Prune (Palm), Mayreau and Petit St. Vincent.

The mainland St. Vincent measures 18 miles (29 km) long and 11 miles (17.7 km) wide with an area of 133 square miles (344 sq. km). In combination with the Grenadines 17 square miles (44 sq. km), the total area covers 150 square miles (388 sq. km). The largest islands of the Grenadines are Bequia (7 sq. miles, 18

sq. km) Mustique (1.9 sq. miles, 5 sq. km) Canouan (3 sq. miles, 7.5 sq. km) Mayreau and Union Island (3.5 sq. miles, 5.5 sq. km).

Geology

The geology of St Vincent is composed entirely of volcanic ejecta (mainly phyroclastics) ranging in age from Pleistocene to Recent (Talbot, 1983). Soufriere volcano happens to be the more recent with major activities occurring a few years ago. The Grenadine Islands was formed in the late Oligocene Period. However, they sank or eroded away during the Pliocene and were completely submerged during the Pleistocene Period. Since that time a regional uplift of the sea floor has raised the Islands above sea level *(St Vincent and the Grenadines Environmental Profile).* According to information obtained from the Physical Planning Department, the general geology of St Vincent consists of 9 different categories ranging from Alluvial and Removable Deposits.



Soil

The soils of St Vincent are derived mainly from volcanic ash and rock fragments, most of which are relatively young and immature (*St Vincent and the Grenadines Environmental Profile*). They are usually defined in 3 major groups as follows:

- Recent volcanic ash soil.

This is an unconsolidated, immature, course-textured and porous soil with generally good potential fertility. They occupy roughly the northern third of the Island, especially the slopes of Soufriere Volcano, and are highly vulnerable to erosion.

- High-level yellow earth soils

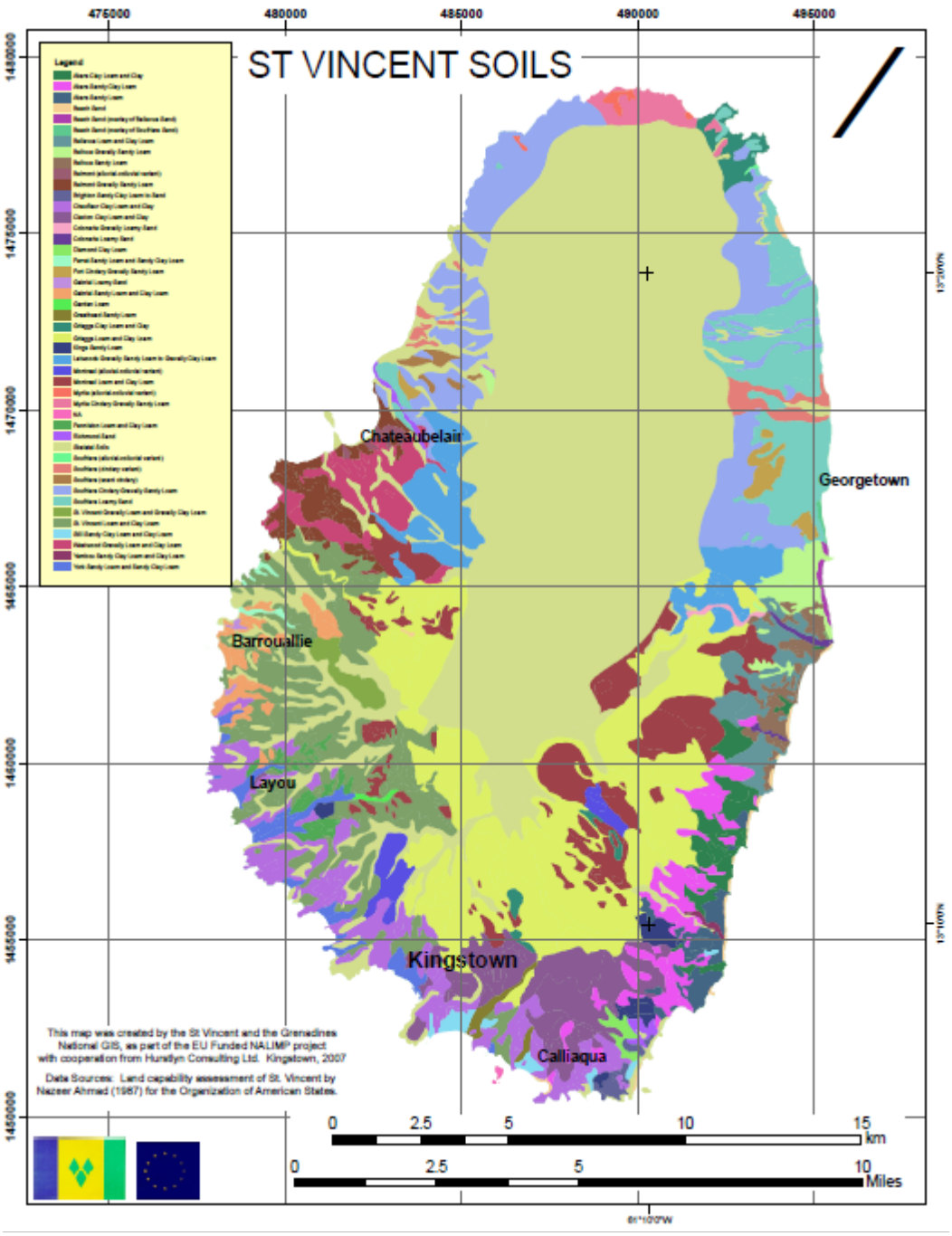
This is mainly found above the 600-foot contour. These are “zonal” soils with impeded drainage. They are deeply weathered, leached and highly acid due to their occurrence in high rainfall areas.

- Low-level yellow/brown earth soils

This is mainly found below the 600-foot contour. These are “intrazonal soils” less leached and more freely drained. The brown earth is transported soil which is generally more fertile, and occurs on gentler slopes.

Sandy soils drains very rapidly and during the process particles tend to disintegrate from each other because of rapid drainage property.

Clay loam has lower water holding capacity than clay and better drainage property. It is the most favourable soil for construction since it is not subjected to continuous fluctuation as clay and more stabled soil than sand.

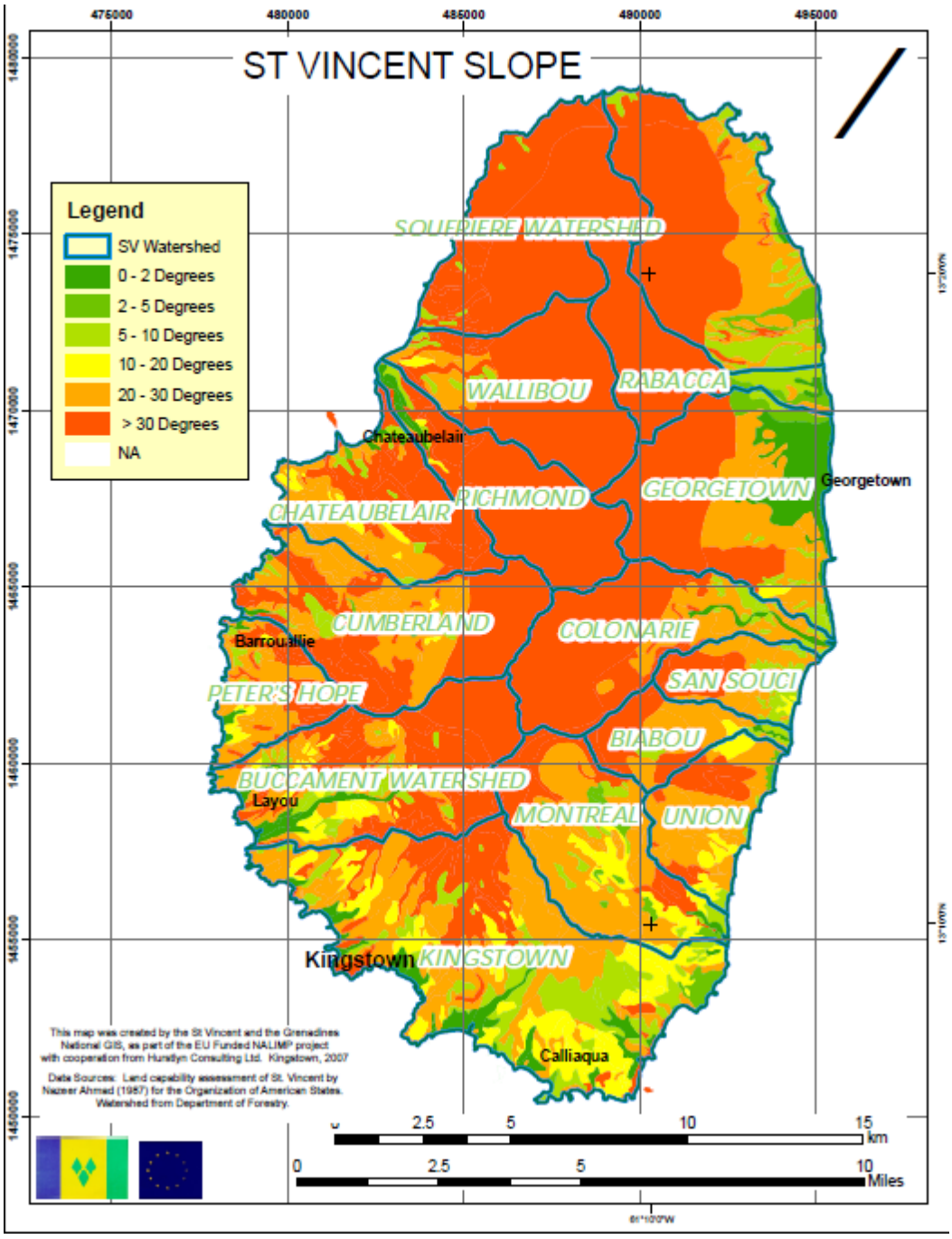


Topography and drainage

The topography of St. Vincent is very rugged, especially the interior portion of the island. Approximately 50 percent of the entire island is comprised of slopes of 30º or more, and only 20 percent has slopes less than 20º (Environmental Profile). There are 6 major peaks within the central mountain range beginning with Mt.

Soufriere (3,864 ft.) the highest peak, located in the northern end of the island. Next in line are Richmond Peak (3,533 ft.) and Mt. Brisbane (3,058 ft.), followed by Grand Bonhomme (3,181 ft.), Petit Bonhomme (2,481 ft.), and Mt. St. Andrew (2,413 ft.), the major peaks in the remainder of the central mountains from north to south.

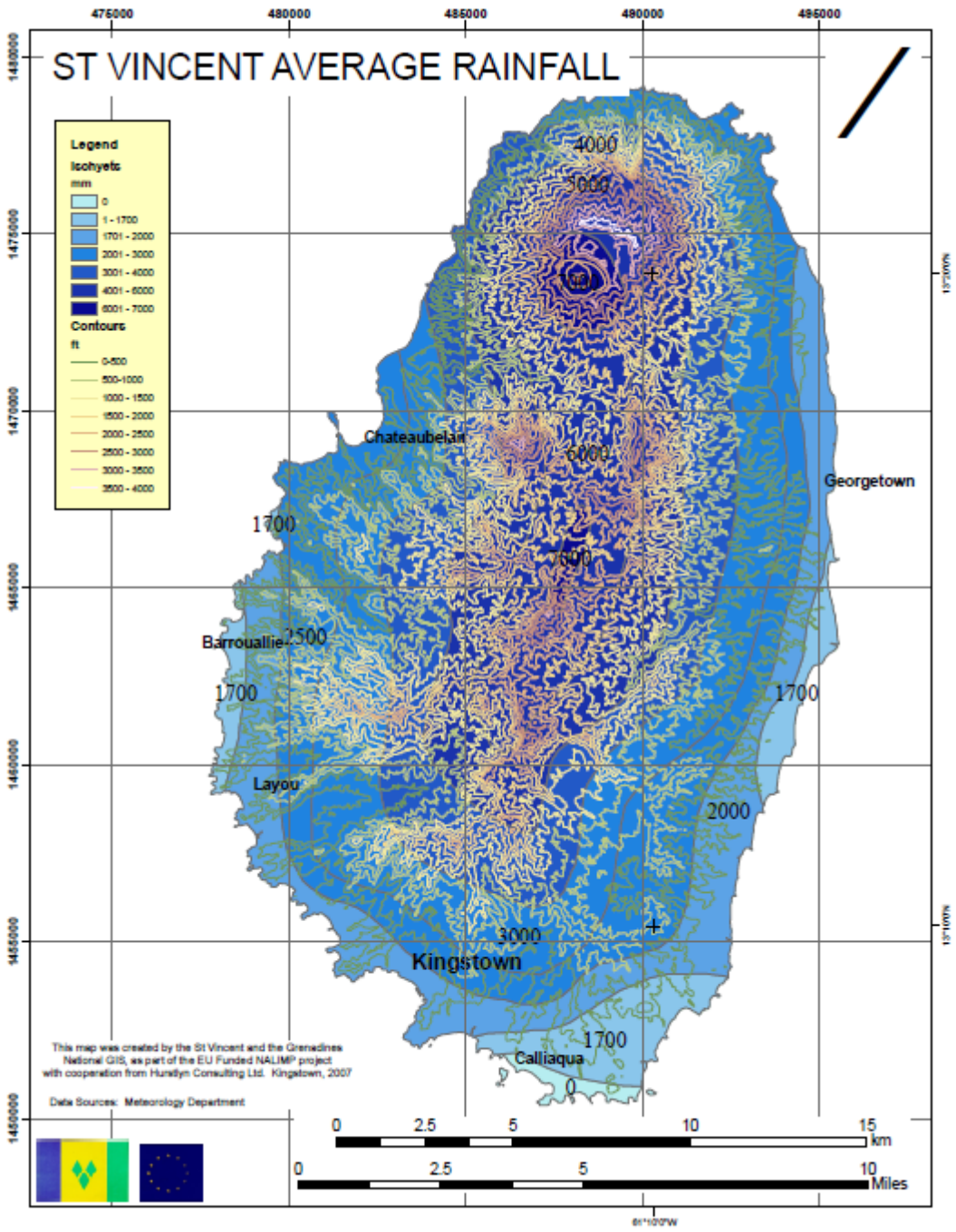
The topography of the remainder of the island is characterized by numerous sharp lateral ridges running from these steep ridges of the central range and deep-cut valleys and high vertical coastal cliffs on the leeward side of the island. The valleys on the windward side are wider and flatter, falling to a fairly flat coastal plain.



Climate

St. Vincent and the Grenadine experience a tropical climate with the average yearly temperature being between 26° Celsius (79° Fahrenheit) and 27° Celsius (81° Fahrenheit). The coolest month of the year is January with an average

temperature of 35° Celsius (77° Fahrenheit). The average yearly rainfall varies between locations from 0-1700 mm along the coast to 6001- 7000mm in the mountainous areas. However, the Grenadines may have as little as 460 mm. The average annual rainfall recorded on Bequia and Canouan is 1,412 mm and 955mm, respectively (Gumbs, 1992). The annual mean temperature at sea is 26.7° Celsius, with a maximum of 31° Celsius). There is little seasonal, diurnal or locational variation, due to the damping effect of the surrounding ocean. The country is within the hurricane belt and has suffered the brunt of several storms and hurricanes.



BIOLOGICAL ENVIRONMENT

Flora and Fauna

There are many species of flora and fauna in St. Vincent and the Grenadine that are similar to that of the other islands of the Caribbean. The floral species are classified into 7 categories as follows(*Caribbean Spice Island Plants: William G Hartshorne*):

- Montane thicket, Palm Brake
- Elfin woodland
- Lower montane (=Sub-)rain forest
- Rain forest
- Secondary rain forest
- Dry Scrub woodland
- Mangrove

The flora species along the coastal areas - Dry Scrub woodland and Mangrove - are the ones that are most likely to be affected by the construction of the required infrastructure within coastal areas (Figure 3.5). Those species can be considered as both salt and drought tolerant. Very large communities comprised species that are deciduous (plants which shed all their leaves seasonally), others are semi-deciduous and a small percentage can be considered evergreen.

Along the fringe, or seacoast, lies a community of species with leaves that are covered with a protective wax which repels the high salt concentration. This community comprises of species such as Sea grape (*Coccoloba uvifera)*, Seaside mahoe (*Thespesia populnea)*, Almond (*Terminalia catappa)*, Manchineel (*Hippomane mancinella)*, Yellow Elder (*Tecoma stans)*, Torch wood (*Jacquinia merrilii*,*)* Frangipani (*Plumeria glabra)*, Tantacayo (*Albizia niopoides)*, Lowland Gommier/Naked Indian (*Bursera simaruba),* Coconut (*Cocos nucifera*), Agave and Cactus.

The wildlife and marine species are also similar to the neighboring Islands. They include a variety of migratory birds, mammals, reptiles and insects. Among those species are whales frequently sighted off Petit Nevis Island and the endangered St Vincent Parrot, Amazona guildingii, which has been adopted as the national bird and the whistling warbler - another bird that is unique to St. Vincent and the Grenadines.

SOCIO- CULTURAL ENVIRONMENT

Population

The population of St. Vincent and the Grenadines was estimated at 103,869 in July 2011 with 24.5% (male 12,824 and female 12,638) being under the age of 15; 67.4% (male 36,042 and female 33985) between age 15-64 and 8.1% (male 3,807 and female 4,555) over the age of 65 years. The majority of the population is concentrated mostly in towns and villages along the Eastern, Western and Southern coasts.

Land use

Like most of the islands in that region, the above mentioned physical environment and limited ideal development lands have resulted in a type of mixed land use, mainly residential, commercial and agricultural, in most coastal areas and within areas with development potential, and forest reserve in the steeper central region. The urban centres and communities are located along the coast with some communities extending inland in a linear land use pattern along both sides of the road. The improvement in telecommunication has resulted in the installation of a number of antenna rigs extending in most instances way above the natural vegetation which has become more of a permanent landscape feature.

Source of livelihood

St. Vincent and the Grenadines as a whole is heavily reliant on its marine resources, tourism and agriculture as major sources of livelihood, particularly to the people of the Grenadines. Fishing, transportation, tourism and boat building are the only meaningful sources of livelihood for most of the residence of those islands. The beaches and marine environment, not only cater for the livelihood of the coastal communities in general, but also for recreation. Like Grenada, any unacceptable disruption of the use of those resources can result in serious negative consequences for both the affected communities and the project developer. They are also the prime tourism product/attraction of both countries.

Community Structure

The community of St. Vincent and the Grenadines has been traditionally agrarian**.** Most people were involved in agriculture and the average family size was almost twice as large as it is today**.** This situation has changed significantly to more of a blue and white-collar job oriented community. Many persons are employed in the service and construction sectors. This trend reflects a change in traditional values as it relates to family and community structure**.** It also brings to focus the issues of changing cultural values resulting in a decline in traditional music, dance and community support (self help/ maroon etc.)**.**

Cultural Prioritise

There has been a growing interest among the population, in the preservation of buildings and sites of cultural value and places of interest to the people of St. Vincent and the Grenadines. This has resulted in several conservation related initiatives lead by Community, Government and Non-Governmental Organizations. The National Parks and Protected Areas are widely considered to be one of the most important of those initiatives. It identifies the respective protected area and legislation to ensure their protection.

Vulnerable population

An estimated 2% of the population of St. Vincent and the Grenadines comprised of people of Carib-Amerindian decent. Although they may be considered to be vulnerable, special provisions are not usually made for them like is the case of the indigenous people of Dominica. They are expected to benefit from the various initiatives implemented by Government, religious and other organizations designed to assist vulnerable/less fortunate persons.

3.2.1THE GRENADINES

Description

The area of concern here is between the main islands of Grenada and St. Vincent known as the Grenada Bank (Figure3.5.1). This area is where the

undersea cables will most likely be placed. It extends to 120 km and contains an area of approximately 3,000 km2. There are over 30 islands, islets cays and beautiful white sand beaches in that area. Nine (9) of those islands have permanent settlements and two are privately owned/leased resort islands (*A Marine Space Use Information System for the Grenadine Islands by Kimberly Baldwin).*

Grenada's territory extends up to Petit Martinique; the remaining area is part of the territory of St. Vincent and the Grenadines. There are a total of ten (10) protected sites within this area, one of which (the Sandy Island Oyster Bed in Carriacou) is within the territory of Grenada and the others (spread between the islands of Bequia, Pigeon Island, Mustique, Canuoan, Myreau and adjacent Islets, Union and Palm Islands and Petit St. Vincent) are within the territory of St. Vincent and the Grenadines (Figure 3.6).

Those protected sites are managed by separate community based organizations under the supervision of the respective Governments. In the case of Carriacou, the protected site is managed by a local committee called the Sandy Island/Oyster Bed Management Board, under the supervision of the Ministry of Carriacou and Petit Martinique Affairs.

Those in St. Vincent and the Grenadines are managed by The National Parks, Rivers and Beaches Authority. There is also another community NGO based in Union Island called the Sustainable Grenadine, charged with the responsibility of addressing environmental issues of the islands from Carriacou up to Benue.

Brief overview of status and use of the Marine environment

Three quarters of the sea in that area is shallower than 50m and supports the most extensive coral reefs and related habitats in the south-eastern Caribbean ((*A Marine Space Use Information System for the Grenadine Islands by Kimberly Baldwin)* which include: sea grass and lagoon, areas of mangrove and a variety

of patch, fringing and bank barrier reefs. It also has a wealth of marine resources (fish shell fish, reefs and dive sites that are vital to the local economy of both Countries.

The main source of employment and income in the Grenadines are fishing, transport and marine tourism related activities (SCUBA and snorkel dive operations, bareboat charter and live-aboard cruisers day charters etc.). Those activities have been attracting large numbers of visitors to the area. Despite territorial boundaries, the area is used by people from both Countries for fishing, recreation, tourism and trade without any major problem. In fact, there is an apparent much stronger relationship among the people of the Grenadines than that which exists between them and the respective mainland.

Figure 1. Geographic location and detail of the trans-boundary Grenadine Islands of the Grenada Bank (Copied from Kimberly Baldwin Report).

3.3 ST. LUCIA

PHYSICAL ENVIRONMENT

Location and size

St. Lucia is the second largest of the Windward Islands, located between 60° 53' and 61° 05' West longitude and 13°43' and 14°05' North latitude. This puts it 21 miles south of Martinique and 26 miles north of St. Vincent. It is approximately 27 miles in length and 14 miles wide, a total of 238 square miles (616 sq. km) in area.

Geology and soil

St. Lucia is a very mountainous volcanic island with the main ridge running almost through its entire length reaching its highest point at Mt. Gimie which is 3,145 feet above sea level. Two unique topographic features are the famous and spectacular mountain peaks called the Pitons which rise straight out of the sea near the town of Soufrière, Petit Piton at 2,461 feet and, in the village of Choiseul, Gros Piton at 2, 619 feet, both along the west coast. St. Lucia's mountainous interior is an ideal setting for hikers, bird watchers or those who enjoy the challenge and beauty of the outdoors.

Saint Lucia, like the other islands of the Lesser Antilles, evolved out of a series of volcanic eruptions which occurred over millions of years ago. The volcanic centres are divided into 3 broad groups based on age and geographic distribution as follows:

Group 1: Eroded basalt 1 and andesite 2 centres (a revision of the 'Northern Series' of Newman, 1965). This group is made up of 3 different categories.

Group 2: Dissected andesite centres (called the 'Central Series' by Newman, 1965).Thisgrouponly has 1.

Group 3: The Soufrière Volcanic Centre (a revision of the Southern Series of

Newman, 1965) This group only has 6.

The eroded basalt and andesite centres are the oldest rocks on Saint Lucia and are located in the northern and southernmost parts of the island (see map above). Age dates for the centres in the north range from 18 - 5 Ma3 (Briden et al., 1979; Le Guen de Kerneizon et al., 1983). The centres in the south, including Mt. Gomier, Morne Caillandre/Victorin, Moule a Chique/Maria islands, Savannes, Beauséjour, St. Urbain and Mt. Tourney, have published ages ranging from 10.1 Ma (lava near De Mailly) to 5.2 Ma (lava from Savannes). The age of these eroded centres indicates that they are unlikely to erupt again.

The dissected andesite centres comprise the central and eastern part of Saint Lucia and are somewhat younger than the eroded dominantly basaltic centres to the north and south. Age dates for these centres range from 10.4 Ma (lavas west of Dennery) to 2.8 Ma (lavas from Derriere Dos). These old ages indicate that these centres are unlikely to be the site of future volcanic activity. The youngest volcanic activity in Saint Lucia produced the rocks of the Soufrière Volcanic Centre.

Topography and drainage

The topography of St. Lucia is very rugged, especially the interior portion of the island. There is a south-central mountain cluster rising to an elevation of 3,117 feet (950m) above sea level at Mount Gimie, its highest peak and extending to the northeast and southwest.

There are three separate and distinct physiographic regions: an “old part” (to the north and east), a “new part” in the mid-west “pitons” coastal area, and, in the far south-western corner, an old part modified by an overlay of new material spilled over from the nearby “new part.”
The topography of those areas are as follows:

(1) The topography of the northern, central and eastern parts of St. Lucia has a softened, rounded quality to it. This quality reflects its age and the long history of geological erosion and weathering that has worn down the original stark landscape generated by flowing lava, pyroclastic muds and other volcanic ejecta which formed the island when it first emerged from the sea. Clear traces of individual volcanic centres are difficult to identify, and peaks in the north barely exceed 60 metres. There are four mountains in this older sector:

- La Sorciere (2,221 ft., 677m)
- Piton Flore (1,850 t., 564m)
- Mount Lacombe (1,485t., 453m)
- Piton St. Esprit (1,919 ft., 584ft).

(2) On the west and southwestern edge of the country, the newer, more dramatic, more geologically active section of St. Lucia is shaped like a four sided schooner mainsail. Starting just south of Roseau Valley , the boundary line extends inland and east along the line of the Anse La Raye River to the ridge, then south passing about a mile east of Mount Gimie and along the ridge to Mount Magazin and then turning west towards the Gros Piton and the sea. The topography of this mid-western, younger part of the island is more mountainous with some of the highest and most precipitous mountains in the island. Among these are:

- Mount Gimie, (3117 ft., 950 m)
- Piton Canarie (3,012 t., 918m)
- MountPaix Bouche (2,445t., 745m)
- MountTabac(2,224 ft., 678m)
- Mount Parasol (2010 ft., 613 m)
- MountHouelmon (2,094 ft., 638 m)

- Mount Grand Magazin (2,117 ft., 645 m)
- The Petit Piton and Gros Piton (at more than 2,000 feet, 750 m).

These “Pitons” of Soufriere Bay are especially dramatic because they are especially dramatic because they are situated directly on the coastline and their steep, almost sheer, western slopes rise directly out of the sea. The region also contains the remnants of the island’s last massive caldera and the only active “Soufriere” or sulfurous steam and water vent, located just south of the village by the same name.

(3)The extreme south-western area is the smallest and is wedge-shaped with its boundary extending from Grois Piton inland and east to Mount Grand Magazin and then south down the Vieux Fort River to the sea. The most notable topographic feature is a huge fan-shaped glacis sloping gently seaward, spreading around and almost inundating several older isolated hills.

Climate

St. Lucia, like the other islands, experiences a worm tropical climate throughout the year with the average yearly temperature being between 25° Celsius (77° Fahrenheit) and 27° Celsius (81° Fahrenheit). The driest period of the year is usually from February to May and the wet season for the rest of the year. The average yearly rainfall varies between locations

BIOLOGICAL ENVIRONMENT

Flora and Fauna

There are many species of flora and fauna in St. Lucia that are similar to that of the other islands of the Caribbean. The floral species are classified into 7 categories as follows(*Caribbean Spice Island Plants: William G Hartshorne*):

- Montane thicket, Palm Brake

- Elfin woodland
- Lower montane (=Sub-) rain forest
- Rain forest
- Secondary rain forest
- Dry Scrub woodland
- Mangrove

The flora species along the coastal areas - Dry Scrub woodland and Mangrove - are the ones that are most likely to be affected by the construction of the required infrastructure within coastal areas (Annex 9). Those species can be considered as both salt and drought tolerant. Very large communities comprised species that are deciduous (plants which shed all their leaves seasonally), others are semi-deciduous and a small percentage can be considered evergreen.

Along the fringe or seacoast lies a community of species with leaves that are covered with a protective wax which repels the high salt concentration. This community comprises of species such as Sea grape (*Coccoloba uvifera)*, Seaside mahoe (*Thespesia populnea)*, Almond (*Terminalia catappa)*, Manchineel (*Hippomane mancinella)*, Yellow Elder (*Tecoma stans)*, Torch wood (*Jacquinia merrilii,)* Frangipani (*Plumeria glabra)*, Tantacayo (*Albizia niopoides)*, Lowland Gommier/Naked Indian (*Bursera simaruba),* Coconut (*Cocos nucifera*), Agave and Cactus

The wildlife and marine species are also similar to the neighboring Islands. They include a variety of migratory birds, mammals, reptiles and insects. Among those is the St. Lucia Parrot *(Amazona Versicolor* which is the national bird of St. Lucia.

SOCIO- CULTURAL ENVIRONMENT

Population

The population of St. Lucia was estimated at 161,557 in July 2011, 28% of which lived in urban areas in the year 2010. 22.8% (male 18,925 and female 17,945) of

the population is under the age of fifteen, 67.5% (male 52,859 and female 56,173) between the ages 15-64 and 9.7%(male 7,074 and female 8,581) age 65 and over.

Land use

Like most of the islands in that region, the above mentioned physical environment and limited ideal development lands have resulted in a type of mixed land use, mainly residential, commercial and agricultural in most coastal areas and within areas with development potential, and forest reserve in the steeper central region. Like the other Islands, the urban centres and settlements are located along the coast with some communities extending inland in a linear land use pattern along both sides of the road. The improvement in telecommunication has resulted in the installation of a number of antenna rigs extending in most instances way above the natural vegetation which has also become more of a permanent landscape feature.

Source of livelihood

The main sources of livelihood for many people in St. Lucia are tourism, agriculture and construction. The beaches and marine ecosystem also cater for the livelihood of the coastal communities and the population as a whole through their recreational and tourism related use. Like Grenada and St. Vincent and the Grenadines, any unacceptable disruption of the use of those resources can therefore result in serious negative consequences for both the affected communities and the project developer.

Community Structure

The community of St. Lucia is agrarian**.** Most people were involved in agriculture and average family size was almost twice as large as it is today**.** This situation has changed significantly to more of a blue and white-collar job oriented community, many persons employed in the service and construction sectors.

This trend reflects a change in traditional values as it relates to family and community structure**.** It also brings to focus the issues of changing cultural values resulting in a decline in traditional music, dance and community support (self help).

3.4 PREVAILING OCEAN CURRENTS AND WAVE ACTION

Surface currents in the Southern Windward Islands

Generally surface currents flow in a westerly direction (in conjunction with the NE trade winds). However, current velocities are variable between 1kt and 4kts. The latter speeds are achieved when the westerly current is reinforced by a west-going tidal stream.

Once currents come in contact with the shallow continental shelf, the predominantly east–south east current (on the eastern side of the islands) is diverted to the north- west and south- west as the currents spreads (splits) to the north and south. Here, velocity varies between 1 kt and 3 kt with periodic reversals of velocity of 0.5 kts with tidal changes.

On the western side of the islands prevailing currents are in north westerly direction (that is, away from the islands) shifting to generally westerly sometime, with a velocity of up to 2 kts. During the fall and winter months in the north, the islands are periodically affected by “winter swells” (or surges). During those episodes, the islands are subjected to unusually strong high energy wave action especially in the west and north.

Wave action in the Southern Windward Islands

The land masses of the islands have similar effects on the prevailing coastal water movements. Ordinarily (that is, during calm weather) the western side of the islands experience gentle swells offshore, this being the Caribbean Sea. The fact that the continental shelf of the western side is narrow, accounts for the calm

water, even close to shore. Onshore waves vary from between the north- west and south- west and impact on the shoreline with very little long-shore drift.

However, during winter, swells or surges (locally called “ground sea”), occasioned by storms in the north Atlantic, the islands experience strong high energy waves impacting on the coastline from the north generally. Thus, the western and northern sides of the islands would experience destructive impacts resulting in beach erosion and, in very severe situations, destruction to coastal infrastructure.

On the eastern sides of the islands, the continental shelf is more extensive. The eastern side is the Atlantic side and is normally much rougher than the western side. This roughness is exacerbated when incoming waves from the north east and east come in contact with the relatively shallow continental shelf. This results in the creation of even rougher high energy waves constantly impacting the eastern coasts with resulting coastal erosion. Long-shore drifts occur when these in-coming waves are diverted (split) to the north and south resulting in erosion of areas of the coast and accretion in others.

Status of coral reefs and sea grass cover (benthic communities)

Caribbean coral reefs are judged to be highly at risk (Reefs at Risk & the World Resource Institute) largely as a result of anthropogenic factors. The Southern Windwards have fringing reefs along their east coasts which play a critical role in protection against coastal erosion especially during storm conditions.

Generally, there are over 33 species of hard corals (i.e. reef building) and over 400 associated fish species, not to mention invertebrates. However, corals throughout the region face a number of threats to their continued survival and the ecosystem services they provide. These threats include:

- Negative impacts of shallow reefs from run-off from the land resulting

in eutrophication (algal blooming as a consequence of nutrients), and siltation

- Coral bleaching as a result of sustained high sea surface temperatures in excess of 29°C (this event, affecting mostly shallow reefs occurred Caribbean wide in 1984, 1987, 1998 and 2005). This is a result of global warming.
- Macro alga over-growth as a result of pollution
- Over fishing
- Reduced water quality

These and other threats have resulted in reduced health and productivity of coral ecosystems throughout the region. Coral mortality, especially in areas adjacent to coastal developments has been high. Unless more aggressive measures are taken to protect coral communities (such as the creation of more MPAs) the outlook for Caribbean reefs appear grim.

Sea grasses form ecosystems that are associated with both mangroves and coral reefs have also become impacted by coastal developments, pollution and siltation. Generally (because they photosynthesize) water quality, especially clarity, is critical for the proper functioning of sea grasses. In areas of the region where there are significant freshwater outflow from the land, increased soil turbidity (during heavy rains) caused by silt loading, sea grasses have negatively impacted. Observations have shown that in areas of rapid coastal flushing the negative impact is lessened by the rapid removal of silt by ocean currents.

Sea grasses do not appear to be heavily impacted as coral reefs. However, the occurrence of a non-native sea grass in Dominica, St. Lucia, St. Vincent and Grenada (*Halophilia stipulacea*) may be cause for concern. This sea grass specie is native to the Red Sea and other parts of the Mediterranean and its

effect on local species is yet to be studied.

Mangroves and wetlands

Until relatively recent, these ecosystems were treated with scant attention to the ecosystem services they offer. With greater understanding of their natural roles and with the advent of the Convention on Wetlands (RAMSAR, 1971) more care is exercised with respect of clearing and backfilling these areas.

Several once- import mangroves and wetlands in the region were destroyed to make way for marinas and resorts. These cannot be reclaimed. Significant mangroves were lost in Union Island when an attempt was made to construct a naval base there some years ago. Other islands have all lost wet lands to a greater or lesser extent.

In Grenada a recent study of mangroves has determined that mangroves in the south east of the island may account for more than 60% of demersal/shell fish stocks in the lower Grenadines. Currently mangroves and other wetlands (such as coastal lagoons) are threatened by the following:

- They are targeted in national development plans for resort and mariner developments
- Poor watershed management has allowed excessive inflow of freshwater containing pollutants and silt to almost overwhelm some systems
- Some systems suffer from prolonged drought and diversion of freshwater flow from the land away from the wetlands.

FAO document depository on mangroves trends in St. Lucia, St. Vincent & the Grenadines and Grenada shows the following:

Trend (change in ha coverage)

- St. Lucia……. Little change between 1980 and 2002
- SVG…….. Loss of about 5 ha between 1980 and 2000

- Grenada…….Loss of about 66ha between 1980 and 2000

Estuaries

Information on this ecosystem is not readily available probably because of their small sizes and they do not attract significant human settlements; although in limited instances developments even go up to the river mouth. However, the river mouth as an ecosystem has not been particularly targeted except on a subsistence level (small scale fishing: e.g. Titiree) and harvesting of gravel and sand.

Pelagic environment

Our tropical waters are noted for their clarity. This is because they are nutrient-poor (as compared to temperate waters which always appear murky due to high planktonic and nutrient content). Hence, the annual flooding by the Great Rivers of South America (Orinocco, Amazon, Esiquibo) play an important role in nourishing our coastal waters. Sometime the influx of nutrients is so great (the rivers drain vast agricultural and industrial areas) that it results in eutrophication and fish kill.

A trans-boundary concern that is being currently addressed by the Caribbean Large Marine Ecosystem (CLME) project is that of the spread of pollutants (especially heavy metals such as lead and mercury) from mining and other industrial processes occurring in the watershed of these great rivers. These pollutants can have very negative impacts on our water quality and fish and ecosystems at certain times.

However, most of the pelagic species which are important to the Windward Islands are migratory and so are not normally affected when there is a fish kill, although tunas and mackerels are known to harbour mercury in their tissues). On the other hand, the small coast pelagics (scads etc – commonly called jacks), although, they too are pelagics and are capable of moving away, do sometimes

undergo mass mortality. In any event the question of water quality might be the most pertinent as far as the pelagic environment is concerned.

3.5 CONCLUSION

The above mentioned environmental characteristics of the study area points to the economic and social importance of the natural environment, particularly the marine ecosystem; to the entire population and its vulnerability to natural disaster; and to the negative effect of incompatibility developments/land use, such as landslide, soil and beach erosion, destruction of natural and cultural resources, though they are of prime importance to the social and economic development of those islands.

Although the types of soils in the study area can accommodate almost any type of structure depending on design, it is of paramount importance that geological investigation be carried out before construction in order to determine the appropriateness of the design and avoid potential negative impacts. In the context of the proposed project activities, appropriate legal and institutional framework for environmental management will be of great importance in ensuring an environmentally sustainable project implementation.

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