

## EXECUTIVE SUMMARY

This Initial Communication was prepared in fulfillment of Grenada's commitments under the United Nations Framework Convention on Climate Change (UNFCCC). The preparatory process involved a series of consultation meetings and peer reviews by a wide range of stakeholders, aimed at validating the results of the technical analyses and providing inputs into the recommended strategies and actions.

The Initial Communication consists of:

- A description of National Circumstances;
- An Inventory of emissions of greenhouse gases by sources;
- A initial analysis of Grenada's vulnerability to the adverse impacts of climate change;
- Proposed national measures aimed at fulfilling Grenada's commitments under the UNFCCC. Some of these measures will be eligible for financing under the Global Environment Facility (GEF).

### 1. NATIONAL CIRCUMSTANCES

The independent State of Grenada consists of the islands of Grenada, Carriacou and Petit Martinique is located at 11° 58' North latitude and 61° 20' west longitude and lies between Trinidad and Tobago to the south and St. Vincent and the Grenadines to the north. It is the southernmost of the Windward Islands.

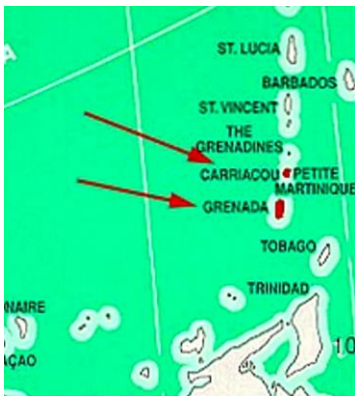


Fig 2. Location of Grenada

The island is internationally renowned as the Isle of Spice and as the home of the world famous Grand Anse beach.



Fig 1: The Tri-Island State

It was a British colony until 1974, when it became an independent state. It has retained a parliamentary democracy system of government within the Commonwealth, with the British monarch as head of state represented by a Governor General.

#### 1.1. GEOMORPHOLOGY

The Island of Grenada is 34 km (21 miles) long and 18km (12 miles) wide and the three islands taken together have a land area of 345 sq. km (133 sq. miles).

Generally, the country is characterised by mountainous terrain ringed by extensive coral reefs. The highest point, Mt. St. Catherine lies 833 meters above sea level. The other main peaks are Fedon Camp 767 meters, Mount Qua Qua 735 meters, Mount Lebanon 715 meters and Mount Sinai 701 meters. The highest points in Carriacou, High North and Mount Carre are both 291 meters.

The mountains rise steeply from the West Coast and descend more gently to the East Coast. Carriacou is characterized by a north to southwest mountain ridge.

On the islands of Grenada and Carriacou, approximately 77% and over 54% respectively of the land area has slopes exceeding 20°. Approximately 3% of the land area is at sea level and these include the main towns and many of the key socio-economic facilities.

## **1.2. COASTAL ECOSYSTEMS**

There are a variety of coastal and marine resources in Grenada - coral reefs, sea grass beds and mangrove swamps, which have proven to be of crucial importance in the formation and sustenance of other resources as well as near-shore fisheries. The sea grass beds and mangrove wetlands are highly dependent on the presence of coral reefs (hydrodynamic barriers that dissipate wave energy) as it enhances the structure of the sea grass and mangrove communities.

## **1.3. CLIMATE**

The country is characterized by humid tropical climate, with relatively constant temperatures throughout the year averaging 26 degrees centigrade. The mean maximum temperature is 31.4 degrees centigrade while the mean minimum is 24.0 degrees centigrade.

Over the last decade the annual rainfall ranged from 750 to 1400 mm. Two distinct rainfall patterns are evidenced. The dry season typically runs from January to May and the rainy season from June to December. Carriacou and Petit Martinique generally receive lower levels of rainfall and during the dry season can experience severe drought conditions.

Grenada lies in the path of the North East Trade Winds and although located south of the hurricane belt, the country is vulnerable to tropical storms, occasional hurricanes and storm surges. The hurricane season runs from June to November and Grenada was last hit by a major hurricane in 1955 (Hurricane Janet), which brought very extensive damage and resulted in the loss of over one hundred (100) lives.

In 1999, the first major storm surge, as a consequence of Hurricane Lenny, caused severe infrastructural damage to the West Coast of the Islands and to Carriacou and Petit Martinique. In the intervening years, occasional storm damage has been experienced.



*Photo 1: Hurricane Lenny Storm Surge*

## 1.4. THE ECONOMY

In 1994, the Grenadian economy was based on agriculture and tourism. This began to change in the 1995 – 1998 period, as the Government pursued a strategy of economic diversification, based on consolidation of the existing sectors and the development of new ones – financial services and informatics.

Grenada's gross domestic product was US\$189.2M, with the main contributors being Transport, Wholesale and Retail trade, Agriculture, Communications, Hotels and Restaurants, Banks and Insurance and Construction.

This represented a GDP growth of 3.33% and followed two years of poor growth – 1.10% in 1992 and -1.22% in 1993.

## 1.5. SOCIO-ECONOMIC CONTEXT

### 1.5.1. Population

The last population census conducted in 1991 reported that 95,945 persons were resident in the country. Estimates by the Central Statistical Office (CSO) put the 1994 population at 97,793.

The population was fairly evenly distributed along gender lines, with 50 percent being males and 50 percent females in 1991.

The age distribution showed that 47 percent were less than 20 years old and 16 percent were 50 years and over.

The geographical distribution showed areas of dense population concentrations within the various parishes. 11 percent of the population lived in the five main towns, while 89 percent lived in villages and rural communities. 5.1 percent lived in the capital city, St. George's and 1.8 percent lived in the second largest town, Grenville.

### 1.5.2. Poverty

There was no official poverty data available for 1994. The per capita income was US\$1,935.

Table 1 – National Circumstances

CRITERIA	1994
Population	97,793
Relevant areas (square kilometers)	345
GDP (1994 US\$ )	189.2M
GDP per capita (1994 US\$)	1,935
Estimated share of the informal sector in the economy in GDP (percentage)	not applicable
Share of industry in GDP (percentage)	7
Share of services in GDP (percentage)	50
Share of agriculture in GDP (percentage)	11
Land area used for agricultural purposes	30,365 ac.
Urban population as percentage of total population	11
Livestock population	4368
- Cattle	13,052
- Sheep	7,004
- Goats	5,338
- Pigs	81,688
- Chickens	
Forest area	7,300 ac.
Population in absolute poverty	n.a.
Life expectancy at birth (years)	
- Male	69
- Female	72
Literacy rate	95%

### 1.5.3. Health

The main health indicators for 1994 are listed in **Table 2** and shows that Grenada has made progress in most of the critical areas.

### 1.5.4. Life Expectancy

The life expectancy was 69 years among males and 72 years among females.

### 1.5.5. Education

Grenada's education system provides services for children from six months onwards.

Compulsory education begins at age five and ends at age sixteen, but both private and government facilities provide day care services for children from six months, pre-school services for children from 3 years, primary school services for children from age 5 and secondary school services for children from ten years.

**Table 2 – Key Health Indicators**

<b>CRITERIA</b>	
Immunization Coverage (%):	
▪ DPT	91
▪ Polio	84
▪ Measles/MMR	87
Infant Mortality Rate (per 1000 live births)	14.6
Neonatal Mortality (per 1000 live births)	9.8
Perinatal Mortality (per 1000 live births)	8.9
<5 Mortality Rate (per 1000 live births)	0.6
% Pregnant Women (15 – 49) with anemia	14.5
% Births attended by trained persons	99.5
% Low Birth Weight Infants	10
Maternal mortality per 1000 deliveries	Nil
Incidence of malaria per 1000 population	Nil
Incidence of dengue per 1000 population	0.11
Incidence of TB per 1000 population	0.01
Incidence of AIDS per 1000 population	0.07

*Source: Ministry of Health*

Despite the provision of services, there are insufficient school places for the entire age cohorts in each grouping and in 1994, the gross enrolment ratios<sup>1</sup> at the various educational levels were:

- Day Care – 3%
- Pre-school – 79%
- Primary – 129%

**1.5.6. Literacy** - The official literacy rate is 95% (Central Statistical Office).

<sup>1</sup> Number of children enrolled as a percentage of applicable age cohort in country

## 2. GREENHOUSE GAS INVENTORY

The ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) is the "... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." <sup>2</sup> To this end, all Parties to the Convention have undertaken to "develop, periodically update, publish and make available to the Conference of Parties ... national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, using comparable methodologies agreed upon by the Conference of Parties" <sup>3</sup>

The Grenada inventory of greenhouse gas emissions and removals by sinks have been calculated for the base year 1994 using the Revised Intergovernmental Panel on Climate Change (IPCC) Guidelines (1996) for National Greenhouse Gas Inventories.

**Table 3** provides a national summary of the Greenhouse Gas Inventory, with the data disaggregated on a sectoral basis.

**Table 3 - Initial National Greenhouse Gas Inventories Of Anthropogenic Emissions By Sources And Removals By Sinks Of All Greenhouse Gases Not Controlled By The Montreal Protocol - 1994**

Greenhouse Gas Source and Sink Categories	CO <sub>2</sub>	CH <sub>4</sub>	N <sub>2</sub> O
<b>Total (Net) National Emission (Gigagram per year)</b>			
<b>1. All Energy</b>			
<i>Fuel combustion</i>	135	0.02	0.002
Energy and transformation industries	62		
Industry	4		
Transport	52		
Commercial-institutional	6		
Residential	10		
Other (Agriculture, Forestry and Fisheries)	1		
Biomass burned for energy	n.e.		
<i>Fugitive Fuel Emission</i>			
Oil and natural gas systems	n.a		
Coal mining	n.a		
<b>2. Industrial Processes</b>			
<b>3. Agriculture</b>			
<i>Enteric Fermentation</i>		0.00324	
<i>Manure Management</i>		0.00106	
<i>Solid Waste Disposal</i>		70	
<i>Agricultural Soils</i>			0.00108
<b>4. Land Use Change and Forestry</b>			
<i>Changes in Forest and other woody biomass stock</i>	(92)		
<i>Forest and Grassland Conversion</i>			
<i>Abandonment of Managed Lands</i>			
<b>5. Other Sources as appropriate and to the extent possible (please specify)</b>			

Notes: n.a. – not applicable; n.e – not estimated

<sup>2</sup> UNFCCC, Article 1

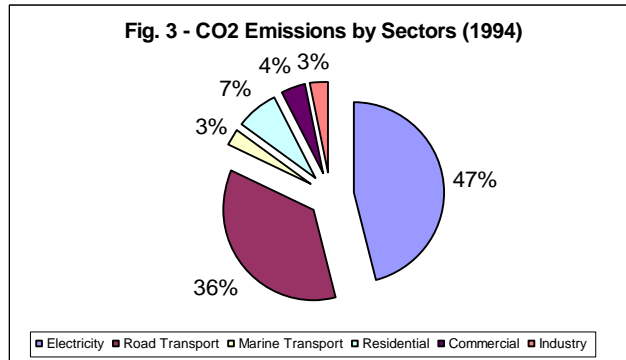
<sup>3</sup> UNFCCC, Article 4.1 (a)

## 2.1. PRIMARY EMISSION SOURCES

### 2.1.1. Carbon Dioxide

The analyses showed that Grenada emitted 135 Gg of carbon dioxide in 1994. This is equivalent to 1.38 tonnes of carbon dioxide per capita.

The key sources of these carbon dioxide emissions from the energy sector were from the combustion of liquid fossil fuel type, consisting of gasoline, jet kerosene, diesel oil, liquefied petroleum products (LPG), and lubricants. CO<sub>2</sub> emissions from fossil fuel, account for 100% of total emissions of carbon dioxide and 95.2 % of all greenhouse gases.



On a sectoral basis, the main emissions sources, highlighted in **Fig. 3**, were as follows:

- **Power/Electricity Sector** - Grenada has one national electricity company, *Grenada Electricity Services Limited* (referred to as **GRENLEC**), which supplies electricity throughout the State of Grenada. **GRENLEC** is presently a privately owned company. Electricity generation accounts for approximately 47% of the total domestic supply of secondary energy. The resulting CO<sub>2</sub> emissions from this activity were 62 Gg, and represented 47% of total CO<sub>2</sub> emissions.
- **Road Transport** - This sector was responsible for 47.86Gg of CO<sub>2</sub> emissions, which represented 35.8% of total CO<sub>2</sub> emissions, and 34 % of total GHG emissions. This sector is privately owned and operated.
- **Marine Transport** - The Marine transportation sub-sector represented 4.6% of the total sectoral energy consumption, and produced 4.23Gg of CO<sub>2</sub> or 3.2% of total CO<sub>2</sub> emissions.
- **Manufacturing And Construction Industries** - CO<sub>2</sub> emissions from this sector accounted for 2.8% of the total emissions and were estimated at 4 Gg.
- **Residential, Institutional And Commercial Sectors** - The emissions from the above-mentioned sectors were estimated at 16.21Gg and accounted for 11 % of total CO<sub>2</sub> emissions.
- **Forest Reserves** – These emissions of carbon dioxide are mitigated by a 92 Gg carbon dioxide sink, composed mainly of a forest reserve of 7,300 ac. It must be noted that the acreage of forests used did not include non-forest trees, as the growth rate data necessary for the calculations were not available.

### 2.1.2. Other Greenhouse Gases

The only other significant emission of GHG in Grenada comes from the solid waste disposal landfill, which was estimated to emit 70 Gg of *methane* in 1994. The total emissions of methane were 71 Gg – 0.72 tonnes per capita.

Emissions of *non-methane volatile organic compounds (NMVOC's)* were estimated at 1 Gg, generated mainly by asphalt use and the production of rum, spirits, alcoholic beverages and other food production.

There were also small quantities of nitrous oxide emissions from the use of artificial fertilizers and the cultivation of leguminous crops.

Emission estimates for Oxides of Nitrogen (NO<sub>x</sub>), Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>), Sulphurhexafluoride (SF<sub>6</sub>), Hydrofluorocarbons (HFC<sup>s</sup>), and Perfluorocarbons (PFC<sup>s</sup>) were not calculated for the following reasons:

- The emitting activities addressed in the 1996 Revised IPCC guidelines, are not relevant to Grenada.
- For SF<sub>6</sub>, HFC<sup>s</sup>, and PFC<sup>s</sup>, imports of products containing these have only recently started.
- Chlorofluorocarbons (CFC<sup>s</sup>) are still being used, but calculations for such were not considered in this exercise, since these substances are being addressed by the Montreal Protocol.

### 2.1.3 ACTIONS FOR IMPROVING COMPILATION OF GHG INVENTORIES

In order to improve the quality of future GHG inventories, Grenada intends to take the following actions:

- Initiate appropriate measures to ensure that the information gaps identified are filled with the relevant and updated information/data. This could be achieved by the improvement of existing databases at the Customs & Excise Department, the Central Statistical Office and the Inland & Revenue Departments.
- Assess the options for capturing annual production and consumption data on primary fuels (firewood, charcoal, coconut and nutmeg shells, sugar cane products, and the like).

This assessment can be done by the Energy Unit, Ministry of Communications, Works & Public Utilities, working along with the Ministry of Finance (Central Statistics Department) and the Ministry of Agriculture. This can include a survey to determine with greater accuracy the levels of fuel wood and charcoal consumption, and the impact that this is having on Grenada's natural forest reserves.

- Collaborate with other regional countries in the development of emissions factors for activities that emit greenhouse gases, which will more accurately reflect the practices in the region. This will include a review of emissions factors for activities

already reported in this initial inventory, as well as the development of emissions factors for activities not included in this initial inventory.



### **3. VULNERABILITY ANALYSIS**

The National Vulnerability Statement assesses what is currently known about Grenada's vulnerability to the effects of climate change (rising temperatures, sea level rise and increase in extreme events), identifies existing gaps in the available information and makes recommendations on how such information gaps can be addressed.

As Vulnerability and Adaptation (V&A) analysis is a continuous process, it is anticipated that the quality of data would improve with time and that this statement would be complemented in the future by more informed analysis.

#### **3.1. CLIMATE CHANGE SCENARIOS FOR GRENADA**

Climate change is a threat to mankind. Although no one is certain about the future effects or severity of climate change, there is conclusive evidence of four (4) changes, viz:

- an increase in temperature,
- an increase in CO<sub>2</sub> concentration,
- a rise in sea level, and
- an increase in the frequency and severity of extreme events.

There are no specific climate change scenarios available for Grenada and pending more accurate regional data on variation in climate, and a consensus on a regional climate change scenario, the scenarios adopted for temperature changes and sea level rise are based on the IPCC (1995) accepted and recommended scenarios i.e. temperature rise of 1.0°C to 3.5°C and sea level rise of 15 cm to 95cm by 2100.

In addition, mean global precipitation is predicted to increase by 3% to 7% by the year 2100 using 8 GCMs with IS92a forcing scenarios. This synthetic scenario is used in the absence of more data being available.

In the case of Grenada, a positive or negative variation of 5% to 20% in total precipitation by the year 2100 may be considered. Shrivastava (1997) reported that annual precipitation would increase by approximately 6% in the Western Caribbean and decrease by 4% in the Eastern Caribbean. Wetter wet seasons and severer and longer droughts during the dry seasons are predicted.

An increase in the frequency of extreme events may also be experienced. It is predicted that by the year 2100, there will be a 5 to 10 percent increase in the wind speeds of tropical storms worldwide for a Sea Surface Temperature increase of 2.2 °C (Knutson et al. 1998)

These projected changes are expected to be updated in time, with improvements in models and increased understanding of the science.

#### **3.2. POTENTIAL EFFECTS OF CLIMATE CHANGE (CC)**

This analysis of the potential impact of Climate Change in Grenada is constrained by two factors, viz:

- Firstly, there is uncertainty about the interaction of all the global processes - natural and man-made - and the socioeconomic dynamics.
- Secondly, the data sets necessary for rigorous analysis, through simulations of the natural processes are incomplete and therefore restricts how the extent to which the results from initial analyses may be interpreted.

This means that efforts would be needed to begin the collection of as much of the baseline data as possible, in order to improve future analyses to guide national planning and development.

### **3.2.1. Impact on Water Resources**

#### (a) Water Availability

Shrivastava (1997) reported that *annual precipitation would increase by approximately 6% in the Western Caribbean and decrease by 4% in the Eastern Caribbean. Wetter wet seasons and severer and longer droughts during the dry seasons are predicted.*

Increased temperatures and reduced precipitation would lead to enhanced evapotranspiration and lower surface runoff, reduced mean available soil-water, reduced rates of groundwater recharge and reduced opportunities for filling of rainwater cisterns in Carriacou. To sustain adequate soil-water and groundwater recharge water conservation techniques would have to be strengthened.

#### (b) Water Quality

Saltwater intrusion from sea level rise would reduce the available groundwater on the main island Grenada. In Carriacou and Petit Martinique, where the 27 major open wells are within 100m of the shoreline, high salinity would lead to abandonment of such traditional wells.

### **3.2.2. Impact on Agriculture and Fisheries**

#### (a) Agriculture

The impact of global climate change on agriculture has been studied extensively for various crops at many different scales. However, studies on the major crops of Grenada - nutmeg, cocoa, bananas and spices are not available.

The impact of the combined elements of climate change on agriculture, especially tropical crops is not quite clear but would be complicated by other socioeconomic activities such as commodity prices, labour availability and labour cost.

#### (i) Crop production

Agricultural crop production would be influenced by changes in soil moisture for bananas, cocoa and nutmeg. Higher temperatures would increase evapotranspiration, while CO<sub>2</sub> enrichment could boost productivity in C3 plants. This includes tree-crops (nutmegs and

cocoa), cassava, maize, yams, bananas, coconut, sweet potatoes, pigeon peas, and beans (Wittwer 1992). Greenhouse-grown type vegetables can produce large fruit size, and larger fruit numbers and can show yield increases of 10 to 70% (Wittwer 1992).

Nonetheless, the impact of climate change with reduced annual rainfall by itself would be negative on crop yield. For example, both nutmeg and banana production are positively correlated to annual precipitation.

In the case of a 10% to 20% reduction in precipitation, banana production - now mostly rainfed - would require irrigation schemes for sustainability. The effect of increased temperatures would further exacerbate the situation through increased evapotranspiration and reduced soil water.

**The extent to which carbon dioxide enhancement and natural plant adaptation would dampen these effects are not known and should be researched.**

(ii) Livestock

Carriacou accounts for 30% of the total livestock population of Grenada. Livestock production in Carriacou is most vulnerable to weather conditions since it experiences less rainfall than anywhere else in Grenada during drought conditions. Past experiences have demonstrated this susceptibility, as losses in some extreme events like the droughts of 1984 and 1992 caused stock losses of 20% to 40% respectively. Recovery from these losses can take many years.

(iii) Fisheries

There are no available studies, published or unpublished, on fish production and climate in Grenada. However the breeding ground of 17 of the main species of demersals, which provides about 43% of the total fish catch in Grenada, may be negatively affected where mangroves, reefs and other mud banks are affected by climate change and sea level rise.

Preliminary analysis of data provided by the Fisheries Division, Ministry of Agriculture showed a relationship between fish production and the El Nino phenomenon. In the year preceding El Nino (the 4 strongest El Ninos since 1980 were 1982/83, 1986/87, 1991/92 and 1997/98) fish production was reduced by 25% to 60% of the average. Similarly at the onset of La Nina production was 30% to 50% higher.

During 1999, algae bloom caused significant demersal "fish kill" creating a scarcity of the domestic supply of fish. This algae bloom was associated with environmental changes, including warmer sea temperatures and turbidity and enhanced eutrication from continental flushout due to heavy rainfall. During the 3 months of the "fish kill", fisher-folk who fall into the lower socioeconomic strata were unemployed for 3 to 4 months. The overall lost earnings for these people and the cost to government in the form of financial support are unpublished but are expected to be significant.

### **3.2.3. Impact on the Coastal Zone**

Grenada has been selected as one of the pilot sites for the Coastal Zone Vulnerability and Adaptation Component of the CPACC Project. The results of this pilot project are not yet available and, when available, will further inform the analysis in this section.

The preliminary results however indicate that there could be serious adverse impacts on coastal communities and infrastructure, from flooding and inundation, especially during storm surges. The experience of Hurricane Lenny in 1999 is instructive in this respect. There is also significant potential for salt water intrusion into the water supply in Carriacou.

Some parts of the main commercial center of St. George's (e.g. the Carenage, Melville Street) and the tourist areas in the southwest peninsula are also susceptible to flooding during periods of high seas and heavy precipitation. Serious disruption of social and economic life in these areas could be expected to occur as a result of sea level rise.

Coastal erosion from sea level rise and extreme events would also disrupt coastal villages like Gouyave, Grand Mal, Duquesne, Soubise and Marquis.

Roads through these communities and other unsettled areas (e.g. Airport road, Carriacou, and a number of sections of roads on the Western Coast) are practically at sea level and below sea level in some cases. These roads could experience flooding, become impassable during high tides and experience severe damage during storm surges.

#### **(b) Beach Erosion**

The earliest *Beach Monitoring* in Grenada dates back to 1985 with a coastal monitoring programme in response to severe erosion problems identified in Grand Anse and other beaches (Cambers 1996). Early studies showed that the erosion had greater seasonal variation (up to 34% beach profile area) than long-term variation (up to 10.5% beach profile area), particularly in the West Coast. For Grand Anse, annual erosion was about 11% during 1984 to 1986.

Application of the Bruun rule to beach erosion analysis shows that for a 50 cm rise in sea level, up to 60% of Grenada's beaches would disappear in some areas (Peters, 2000). These beaches include Grand Anse, Morne Rouge, Harvey Vale and Paradise all of which are important tourist attractions.

#### **(c) Sandy Islands And Reefs**

Sandy Island, White Island and a number of Keys, which are one to two meters above sea level, could be wiped out as a result of submergence during storm surges. In the past 25 years, Sandy Island on the west coast of Carriacou, has lost about 60% of its area, while small sand banks that existed for hundreds of years between Carriacou and Petite Martinique have disappeared completely.

### **3.2.4. Tourism**

The impact of climate change and sea level rise on tourism would be mostly indirect. As climate in the higher latitudes would be milder, Grenada could be a less desirable climate-influenced destination.

Another possible negative impact on tourism could be the loss of beaches, or the deterioration of the beaches due to erosion from natural phenomena and/or climate change. Water sports, which is currently a rapidly growing sub-sector of tourism, would become less attractive in the absence of quality beaches.

Higher temperatures would increase the operating costs of hotels, as there would be greater per capita water consumption and power consumption for air conditioning. A good analogue of the impact of temperature rise on power consumption can be seen in the annual variation of mean temperature and power usage.

An analysis of the historic power and temperature data for a small tourism plant shows that for a 1.1°C variation in average monthly temperature, there is 25% variation in power consumption. July to September 1999, was one such period on record, with a 0.9°C above average temperature causing an 11% increase in power consumption.

### **3.2.5. Human Health**

The major effects of climate change on global human health are caused by heat stress, air pollution, alterations in the incidence of communicable diseases, under-nutrition and inundation. (WHO 1990). The ability to assess the human health impacts of climate change is at a very early stage of development (Balbus et al, 1998), with the impact being more complex than on other sectors.

In Grenada the main effect is likely to be caused by the increased incidence of vector-borne communicable diseases for which the vectors are currently resident, or are likely to be imported. Respiratory diseases associated with regional dust storms during the hurricane seasons are also likely.

Preliminary analysis of the three most common diseases, influenza, viral conjunctivitis and gastro enteritis shows correlation between annual and July precipitation and these diseases. Significant positive correlations are observed for the incidence of viral conjunctivitis and influenza and August precipitation -  $R=0.70$  and  $R=0.62$  respectively. **This is an area where further research is required.**

## **4. INSTITUTIONAL ARRANGEMENTS**

### **4.1. ENVIRONMENTAL MANAGEMENT**

The current approach to Environmental management in Grenada is sectoral in nature. The Ministry of Health and the Environment has the primary responsibility for the environment along with some twenty agencies, inclusive of Government departments, non-governmental organisations (NGOs) and statutory bodies (Physical Planning Unit – Draft Sectoral Report on the Environment, 2000).

## **4.2. LEGISLATIVE FRAMEWORK**

The legislative framework for environmental management reflects the fragmentation of the institutional framework. A review of the environmental legislation in Grenada (Alexis, 2000) concluded that "... most of the laws ... are sectoral and decentralized ... while they have environmental application, they were not legislated to address those concerns and are mainly incidental to environmental management."

The review cites forty-nine (49) separate pieces of legislation that are applicable to one or more of the issues related to Climate Change and that can be applied in the context of climate change.

## **4.3. POLICY FRAMEWORK**

There is no coordinated policy framework for the management of the environment in Grenada. Even in cases where there is clear sectoral responsibility, clear-cut policy frameworks are few and far apart.

A small number of initiatives to remedy this situation has been initiated since 1994, the most significant being the institutionalization of the Grenada Solid Waste Management Authority in 1996 and the development of a Forestry Policy and Strategic Plan in the 1997 – 2000 Period. The elaboration of a Biodiversity Strategy and Action Plan in 2000 has also been a significant development in this regard.

## **4.4. INITIAL COMMUNICATIONS PROJECT**

The Initial Communications Project is managed at the local level by the same Steering Committee that is responsible for the CPACC Project. The day-to-day project activities are managed by a National Coordinator and Administrative Officer, specifically contracted by the Project. Consultants were subcontracted for the Sectoral analyses required by the Project and these were supervised and coordinated by the National Coordinator.

## **5. NATIONAL RESPONSE MEASURES**

The national response measures described in this section are based on the foregoing analyses of greenhouse emissions and vulnerability to climate change impacts, in the context of the projections for the socio-economic development of Grenada into the medium term.

The measures recognise the critical need for Grenada to expedite the analysis and implementation of its options to adapt to the adverse impacts of climate change, while fulfilling its obligations under the Convention to reduce greenhouse gas emissions.

They represent a mix of strategies and actions that will be kept under constant review and will be revised and adapted based on evolving circumstances in each of the relevant sectors and in the overall scenario of climate change.

A wide range of policies and measures are proposed in the Initial Communication, a number of which have been prioritized for immediate action. The focus of the short list is to establish the institutional framework for a sustainable approach to addressing climate

change at the national level. It is not a restrictive listing, but rather, an indicative outline of the approach that Grenada intends to pursue.

## **5.1. PRIORITY ACTIONS**

The proposed short list of priorities is:

1. *Strengthening of the Institutional Framework.* This will include:
  - the establishment of a coordination mechanism for environmental management, including climate change;
  - the strengthening of the legal frameworks, including the Building Code to provide for management of climate change issues;
  - the development of a policy framework on climate change with full stakeholder participation; and
  - the strengthening of the technical capacity within the country to address climate change issues, through training of appropriate personnel.
2. *Strengthening of the data collection and monitoring systems to facilitate the collection and analysis of data relevant to climate change.* This will be applicable to all sectors of the economy that are sensitive to the impacts of climate change.
3. *The development and implementation of a National Energy Plan,* with emphasis on increased *energy efficiency* and the use of *renewable technologies*.
4. The provision of *tariff and fiscal incentives* for the use of *renewable technologies*.
5. The development of *national standards for vehicle and industrial emissions,* minimum efficiency ratings on domestic appliances and industrial equipment, as well as a mechanism for ensuring the implementation of these standards.
6. The implementation of the Solid Waste Authority's plans aimed at *reducing the volume of waste* that has to be accommodated in the landfill.
7. The elaboration and implementation of a *Land Use Policy*.
8. The implementation of the *Forestry Policy*.
9. Initiation of *research into flood control technologies* that can be used in the flood prone areas.
10. *Compulsory inclusion of climate change considerations into all national projects being developed in the sensitive sectors.* The climate change considerations will be a component of the Environmental Impact Assessments which will be required for these projects.
11. *Public Awareness and Education on the climate change in general and the role of the individual in mitigating and adapting to climate change.* These programs will be done in conjunction with all the sensitive sectors – water, health, energy use, coastal zone management. The activities will include:

- General public education programs
  - In-community education and mobilization
  - Inclusion of Climate Change into the social studies and science curricula at the primary and secondary levels.
12. *Continuation of the analysis of Grenada's vulnerability to the adverse impacts of climate change with the objective of informing policy response measures.* This will include:
- completion of the coastal vulnerability analysis being conducted under the regional CPACC project and implementation of the recommendations;
  - strengthening of systematic monitoring and observation systems e.g. monitoring the actual sea level rise that is being experienced;
  - participation in the development of climate change scenarios, impact models and methodologies relevant to Grenada and the Caribbean, that will facilitate better understanding of the potential impacts of climate change;
  - data collection and analysis aimed at closing the information gaps and improving the understanding of the identified impacts of climate change;
  - improving the accuracy of Grenada's greenhouse gas inventories through the development of local emission factors for activities that are generic to Grenada and the Caribbean.
13. *Strengthen Grenada's participation in the UNFCCC negotiation process,* in order to strengthen the developing country lobby for the provision of resources to cope with the adverse impacts of climate change.

## 5.2. FINANCING

The small size of Grenada's economy makes it impossible to generate the necessary financing from internal resources in order to respond to the threat of climate change.

The Convention on Climate Change in Article 4.3. specifies that "*The developed country parties and other developed Parties included in Annex II shall provide new and additional financial resources to meet the agreed full costs incurred by developing country Parties in complying with their obligations under Article 12, paragraph 1<sup>4</sup>. They shall also provide such financial resources, including for the transfer of technology, needed by the developing country Parties to meet the agreed full incremental costs of implementing measures ...*".

Grenada will therefore rely heavily on this commitment by its international partners in order to access financing to meet the costs of responding to climate change. In this regard, it must be noted that the Conference of Parties has made various decisions regarding the provision of resources to developing countries.

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<sup>4</sup> This Article refers to the preparation of National Communications



Grenada intends to access these resources as a matter of priority in order to commence the development and implementation of its climate change action plan.