

# Saint Lucia's National Adaptation Plan Stocktaking, Climate Risk and Vulnerability Assessment Report



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### Prepared under the guidance of:

Department of Sustainable Development

### With the support of:

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## Foreword

Saint Lucia's National Adaptation Plan (NAP) has been defined as a ten (10)-year process (2018-2028), consisting of priority cross-sectoral and sectoral adaptation measures for eight key sectors/areas and a segment on the 'limits to adaptation', complemented, incrementally, with Sectoral Adaptation Strategies & Action Plans (SASAPs). Priority sectors for adaptation action include: Tourism; Water; Agriculture; Fisheries; Infrastructure and spatial planning; Natural resource management (terrestrial, coastal and marine); Education; and Health. Other key sectors will be identified through a cyclical, iterative NAP process.

Saint Lucia's NAP process is spearheaded by the Sustainable Development and Environment Division (SDED) of the Department of Sustainable Development, currently housed within the Ministry of Education, Innovation, Gender Relations and Sustainable Development. The NAP process has benefitted from the inputs of multiple stakeholders, comprising public, statutory, academic and private sector bodies. Indeed, this process has involved State and non-State actors, such as media personnel, who play an important role in helping efforts to positively influence thinking, mould outcomes, change behaviour and instigate action across the populace, at all levels.

Saint Lucia's overarching NAP continues to be supplemented by several documents:

- *Saint Lucia's National Adaptation Plan Stocktaking, Climate Risk and Vulnerability Assessment Report*
- *Saint Lucia's National Adaptation Plan Roadmap and Capacity Development Plan 2018-2028*
- *Saint Lucia's Climate Change Communications Strategy*
- *Saint Lucia's Sectoral Adaptation Strategy and Action Plan for the Water Sector (Water SASAP) 2018-2028*
- *Saint Lucia's Sectoral Adaptation Strategy and Action Plan for the Agriculture Sector (Agriculture SASAP) 2018-2028*
- *Saint Lucia's Sectoral Adaptation Strategy and Action Plan for the Fisheries Sector (Fisheries SASAP) 2018-2028*
- *Saint Lucia's Portfolio of Project Concept Notes for the Water Sector 2018-2028*
- *Saint Lucia's Portfolio of Project Concept Notes for the Agriculture Sector 2018-2028*
- *Saint Lucia's Portfolio of Project Concept Notes for the Fisheries Sector 2018-2028*
- *Monitoring and Evaluation Plan of Saint Lucia's National Adaptation Planning Process*
- *Guidelines for the Development of Sectoral Adaptation Strategies and Action Plans: Saint Lucia's experience under its national adaptation planning process*

This process also supported a climate change website, an animated video and training for government entities and journalists in communicating about climate change. A NAP Assembly and Donor Symposium were also all made possible under this process, through the support of several entities.

Specifically, the process has benefited from the financial support of the United Nations Development Programme's (UNDP) Japan- Caribbean Climate Change Partnership (JCCCP). Technical and financial support for Saint Lucia's NAP process has also been provided through the United States (U.S.) In-Country NAP Support Programme (NAP-SP), implemented by the International Institute for

Sustainable Development (IISD). Technical support for the chapter on the 'limits to adaptation' in the NAP was provided under the IMPACT project, funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), as part of the International Climate Initiative (IKI). The IMPACT project is jointly implemented by Climate Analytics, the Caribbean Community Climate Change Centre (CCCCC), Secretariat of the Pacific Regional Environment Programme (SPREP) and Charles and Associates (CAA) Inc. The Department extends its thanks to all of the foregoing and takes this opportunity to recognise the consultant, Ms. Clara Ariza, for her tireless efforts in Saint Lucia's NAP process, under the able guidance of SDED.

Saint Lucia looks forward to forging partnerships and alliances that will assist in developing additional SASAPs and implementing the measures, programmes, projects and activities outlined in its NAP, SASAPs and other support documents. Saint Lucia is prepared to welcome support, that is, finance, technology transfer and capacity building, from a variety of sources, including public, private, bilateral, multilateral and alternative sources, all in an effort to help the country build climate resilience and address the seemingly insurmountable phenomenon of climate change.



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## 1. EXECUTIVE SUMMARY

Small island developing states are particularly threatened by climate change. They face the prospect of partial or total inundation by sea-level rise, more frequent and intense tropical storms, increased coastal erosion and saline intrusion, higher air and sea temperatures and more erratic rainfall conditions. These, and other potential impacts, exacerbate current vulnerabilities and pose serious challenges to their ecosystems, livelihoods and economies.

### **An Overview of the National Adaptation Plan Process**

The Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) has established the National Adaptation Plan (NAP) process as a way to facilitate effective mid and long-term climate adaptation planning. The NAP is a policy process leading to full integration of climate change adaptation into national development planning and budgeting. Through the NAP, countries iteratively assess their risks and vulnerabilities under climate change, build capacities to reduce these risks and tap into opportunities opened by the changing conditions and identify, rank, plan and implement national and sectoral adaptation measures. The NAP process involves inter-agency coordination and relies on the participation and engagement of all sectors of society.

During the initial and preparatory steps of the NAP process, representatives of all relevant stakeholders actively engage in creating a vision for the process and defining a framework, strategy and a roadmap for the formulation of the National Action Plan. This includes sequencing sectoral NAPs and a monitoring and evaluation plan for the process. Another major activity is a stocktaking exercise to determine the country's knowledge base and institutional and technical capacity to undertake the NAP. The weaknesses and gaps identified are recorded and addressed in the following steps of the process.

This document synthesizes the results of the stocktaking exercise conducted for Saint Lucia's NAP and includes key considerations raised during a stakeholder consultation meeting carried out in Castries on May 30<sup>th</sup> and 31<sup>st</sup>, 2017. The report identifies the information available on climate change impacts, vulnerability and past adaptation efforts in the country. It also analyses national strengths and weaknesses to engage in the NAP in terms of capacities, data and information and other required resources and identifies possible barriers to the planning, design and implementation of adaptation activities.

### **Climate Change and Sustainable Development in Saint Lucia**

Saint Lucia is highly vulnerable to climate change, mainly due to its small surface, geographic location in an area exposed to the impact of geological and hydro-meteorological hazards and its economic reliance on tourism and agriculture, which are climate-sensitive sectors. Other factors exacerbate Saint Lucia's vulnerability to climate change. These include a high density of population and infrastructure in coastal regions, poor land use and ongoing land and natural resource degradation processes, high levels of unemployment and the country's reliance on imported food and fuel.

Saint Lucia's climate is warming. Between 1960 and 2006, the mean annual temperature increased by ~0.7°C, at an average rate of 0.16°C per decade. Evidence suggests that since the 1970s, the rainy season has begun earlier in the year and that rainfall events have become more intense and longer. The windspeed has also increased, particularly between December and February.



The mean annual temperature is expected to continue rising. The increase could be of up to 0.8 °C by 2020; 1.7 °C by 2050 and 3.3 °C by 2080 (relative to the 1979-2009 average). More frequent hot days and hot nights are expected and cold days and cold nights could become something of the past. Along with warmer temperatures, yearly rainfall could decrease by 15mm/year by 2020, 19mm/year by 2050 and 37mm/year by 2080, increasing concerns on the scarcity of freshwater resources. Additionally, the intensity of hurricanes could increase. A major problem is sea level rise, which could reach 1.45m by 2100.

These changes have implications for the country's population, natural resources and economy, as almost every aspect of the island's life will be affected. In the absence of adequate and timely adaptation measures, dealing with climate change will become more expensive with time. For example, rebuilding tourist resorts damaged by sea level rise could cost more than USD 134 million by 2050 and up to USD 315 million by 2080 and banana production could drop by up to 32% by 2050, reducing export revenues. Importing food could also become more expensive, as climate change affects food producers elsewhere and the global demand for food grows.

Under the expected future climate conditions, Saint Lucia could see its freshwater resources dwindle; suffer from the effects of more intense floods and from a higher incidence of water, food and vector-borne diseases (such as dengue). The country's terrestrial and marine ecosystems and biodiversity will also suffer. Some visible examples will be extensive coral bleaching and the loss of turtle nesting sites. Additionally, coastal erosion, more frequent landslides, and flooding from intense seasonal rains and hurricanes will test the resilience of the island's infrastructure and livelihoods.

The stocktaking report offers a comprehensive overview of potential climate change impacts for key selected sectors.

### **Climate change data and information**

There is a significant amount data and information on Saint Lucia's climate, environment and socioeconomic conditions. There are also a good number of studies addressing sectoral vulnerabilities and expected climate change impacts and suggesting potential adaptation measures for the country. Although some of the information is outdated, in general, the knowledge base is sufficient for Saint Lucia to start its NAP process, understanding that in the mid and long term, information gaps should be bridged, additional data acquisition and analyses undertaken, and new and relevant information channeled into the NAP decision-making cycle.

One area of concern is the low in-country capacity for the systematic generation of climate change information on a demand or continuous basis. Whilst professionals with the capacities to undertake this work occupy some public offices, their obligations and work regulations do not facilitate the fulfilment of these roles on a rolling basis. As a result, many of the major reports and publications reviewed were authored by foreign academic institutions and researchers.

### **Policy and Planning Entry Points for National Adaptation Plan**

Saint Lucia has an active policy agenda in the field of climate change. Saint Lucia became a party of the United Nations Framework Convention on Climate Change (UNFCCC) in 1993, submitted its Initial National Communication to the UNFCCC in 2001, its Second National Communication in 2012 and is

currently finalizing its Third National Communication. Saint Lucia also submitted its Intended Nationally Determined Contribution (INDC) under the UNFCCC in 2015 and signed the Paris Agreement in 2016.

At the national policy level, the Government of Saint Lucia has made significant progress in mainstreaming climate change adaptation into national policies. Most recently and importantly, it launched in 2015, the Saint Lucia Climate Change Adaptation Policy (CCAP), built on the previous National Climate Change Policy and Adaptation Plan (NCCPAP). The CCAP is a perfect entry point for the NAP as it endorses a cross sectoral approach to climate adaptation. The CCAP concretely addresses: 1) adaptation facilitation- (appropriate policy, legislative and institutional environment); 2) adaptation financing (measures to ensure adequate and predictable financial flows) and, 3) adaptation implementation (concrete actions to prepare for or respond to the impacts of climate change). Furthermore, the CCAP gives the National Climate Change Committee (NCCC) the responsibility for the coordination of, and advising on, all climate adaptation activities in the country.

Attesting the importance, the Government of Saint Lucia has given to climate change adaptation are several sectoral policies and policy instruments including explicit climate change adaptation considerations. Also, various climate change adaptation measures are included in the current national budget. However, critical policy gaps remain and must be addressed in the NAP. The formulation of the successor of the Medium-Term Development Strategy (2012-2016) Sectoral Action Plan could be a key entry point for mainstreaming adaptation priorities at all levels and sectors and in the short-term.

#### **Priority sectors and areas of focus for the NAP**

Saint Lucia's National Communications to the UNFCCC, as well as other key national publications on climate change suggest that in the country, the most critical sectors in need of climate change adaptation interventions are agriculture, water, health, marine and terrestrial ecosystems and biodiversity, fisheries, infrastructure and the built environment and coastal tourism.

The National Climate Change Adaptation Policy and the Strategic Programme for Climate Resilience (SPCR) provide guidance on the adaptation measures that should be prioritized in the NAP. In fact, the SPCR offers a blueprint for climate change adaptation for most sectors and at all levels. The SPCR includes the views of a wide range of stakeholders and forms the blueprint for the NAP. Additional adaptation actions that respond to sectoral needs are available at the different vulnerability and capacity studies mandated for the elaboration of Saint Lucia's Second National Communication to the UNFCCC. In summary, the basis for prioritizing climate change adaptation measures to be included in the NAP already exists.

#### **Results of the SWOT and GAP analyses**

The results of the Strengths, Weaknesses, Opportunities and Threats (SWOT) and gap and barriers analyses conducted show that Saint Lucia is in a good position to start the NAP process, but also highlight some areas that require attention to prevent deviation from both its focus and on low levels of implementation. The analyses identified limited national funding and low levels of technical and institutional capacity as the main constraints for the NAP. Other constraints included data and information gaps, long periods awaiting policy approval, and weak enforcement of laws and regulations. The opportunities and strengths identified were the existence of a coordinating mechanism (NCCC) with a relatively long work history, supportive policy initiatives and instruments and the interest and support of international donors. A threat identified that requires maximum attention is the potential low levels of interest and engagement of the private sector and civil society.

## **Recommendations**

Based on the documentation reviewed, the following recommendations are made to contribute to the NAP process formulation. Consistent with the objectives of the stocktaking exercise, the recommendations are mainly related to data and information availability and access, technical and scientific capacities in the country, policies and inter-institutional collaboration.

**Improving the knowledge base for climate change adaptation in Saint Lucia** by developing local climate extreme indices; yield projections under a wider range of climate scenarios and for a wider range of crops; modelling and mapping coastal flooding and erosion under sea level rise; modelling and mapping disease outbreaks; assessing climate change impacts on watersheds and river flows and developing wind hazard information. Beyond future climate data and information on sectoral climate change impacts, it is fundamental to generate information on the country's current socioeconomic conditions and natural resources. Updated water, forest and marine resource assessments are needed; digital high-resolution landslide and flood risk and erosion maps, updated land use maps and an updated poverty assessment would allow the identification and mapping of vulnerable groups. The latter is urgent for planning targeted adaptation measures.

### **Improving access to climate, socioeconomic and environmental data**

Creating a portal to centralize the necessary climate, environmental and socioeconomic data, as well as mapping resources and reports relevant to the NAP process would facilitate access to the existing information, which is currently scattered. Effort is required in compiling this information and data in a coherent and organized manner, including the new information generated during the NAP process and other adaptation initiatives. The portal could offer interfaces for dissemination of climate change-related information that is useful to various audiences.

**Investing in climate change communication and awareness raising efforts** is necessary to expand the coverage of previous and ongoing initiatives and to improve the basic understanding of climate change challenges and adaptation options at all levels of society. These efforts would be more effective if they receive guidance from science and social communicators and are integrated as short and long-term NAP activities.

**Building in-country climate change information generation capacity.** This is a long-term objective for the NAP that involves the engagement of universities and research institutions for the development and strengthening of academic scientific programs in areas of high relevance for the NAP (e.g. hydrology, climatology, marine biology, etc.). In the short-term, capacity could be built through the provision of scholarships for interested students to register in recognized programs in these areas in foreign universities.

**Alignment of the NAP Process with medium and long-term development planning.** Various policies that are currently under formulation or revision could be used as opportunities (entry points) for the NAP to mainstream climate change adaptation at the national level and into some sectors in the short and medium-term. The mechanism to incorporate national and sectoral NAP priorities into these policies is still to be defined. Designing general guidelines for mainstreaming adaptation into sectoral policies and planning processes could help in this effort.

**Ensuring an enabling policy environment.** Accelerating the formal approval of draft policies and regulations that are directly relevant to the NAP would facilitate the formulation of sectoral NAPs and the prioritization of NAP activities. This could also help to integrate adaptation considerations into the relevant sectoral budgets. Taking into account that policy approval processes take a long time in Saint Lucia, this could be considered a mid-term to long-term objective for the NAP process.

**Strengthening the NAP coordination mechanism.** The Climate Change Adaptation Policy calls for strengthening the NCCC. Assessing and addressing the technical capacity and membership needs of the NCCC to drive the NAP is a short-term priority of the process. It will help ensure that all development and society sectors are engaged in the iterative decision-making; create shared ownership of the process and provide opportunities for stronger inter-agency and inter-sectoral collaboration. The participation of members of the other sectoral coordinating mechanisms in the NCCC could be a strategy to strengthen inter-sectoral collaboration. Encouraging the active participation in the NCCC of the private sector, civil society, including men, women and vulnerable groups is recommended, to ensure that their interests and needs are reflected in the NAP.

## ACRONYMS

AR5	Fifth Assessment Report Climate Change
5Cs	Caribbean Community Climate Change Centre
CCAP	Climate Change Adaptation Policy
CDSF	Common Data Storage Facility
COP	Conference of the Parties
CUBiC	Caribbean Uniform Building Code
CZMAC	Coastal Zone Management Advisory Committee
ECLAC	Economic Commission for Latin America and the Caribbean
ENSO	El Niño Southern Oscillation
GCM	General Circulation Models
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
GoSL	Government of Saint Lucia
ICAO	International Civil Aviation Organization
IPCC	Intergovernmental Panel on Climate Change
J-CCCP	Japan-Caribbean Climate Change Partnership
LDC	Least Developed Countries
MEA	Multilateral Environmental Agreement
MIPST	Ministry of Infrastructure, Port Services and Transport
MTDS	Medium Term Development Strategy Climate Change Adaptation Policy
NAMAs	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NASAP	National Adaptation Strategy and Action Plan to Address Climate Change in the Tourism Sector of Saint Lucia
NBCC	National Biodiversity Coordinating Committee
NCCC	National Climate Change Committee
NCCPAP	National Climate Change Policy and Adaptation Plan
NEC	National Environment Commission
NEMAC	National Emergency Management Advisory Committee
NEMO	National Emergency Management Organisation
OECS	Organization of Eastern Caribbean States
PMU	Project Management Unit
QMS	Quality Management Systems
RCM	Regional Climate Model
RCP	Representative Concentration Pathway
SASAP	Sectoral Adaptation Strategy and Action Plan
SIDS	Small Island Developing States
SLR	Sea Level Rise
SPCR	Strategic Programme for Climate Resilience
SRES	Special Report on Emission Scenarios
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization

## 2. INTRODUCTION

Small Island Developing States (SIDS) are particularly threatened by climate change. They face the prospect of partial or total inundation by sea-level rise, more frequent and intense tropical storms, increased coastal erosion and saline intrusion, higher air and sea temperatures and more erratic rainfall conditions. These, and other potential impacts, exacerbate current vulnerabilities and pose serious challenges to local ecosystems, livelihoods and economies. In its Fifth Assessment Report (AR5), the Intergovernmental Panel on Climate Change (IPCC) emphasises that adaptation and mitigation can be understood as complementary components of the islands' response to climate change and that adaptation generates larger benefit to small islands when delivered in conjunction with other development activities.

Saint Lucia is vulnerable to climate change due to three main conditions: (a) its small geographical area, which accounts for the fact that disasters take country-wide proportions; (b) its location in one of the highest-risk areas of the planet. These risks include, high volcanic and seismic activity, being situated in the tropical cyclone belts, and direct exposure to the forces of the oceans; and (c) its dependence on few sources of income (agriculture and tourism sectors) for a substantial part of its gross domestic product (GDP). These sources of income have been severely reduced for months on end by single climate-related disasters. Another critical indicator of Saint Lucia's vulnerability, is its limited capacity to reactivate the development process after a devastating weather event.<sup>1</sup>

The cost of inaction on climate change in Saint Lucia has been calculated to be at 12.1% of GDP by 2025, rising to 24.5% by 2050 and 49.1% by 2100.<sup>2</sup> Recent extreme climate events have highlighted the vulnerability of the country to climate hazards and provided an indication of some of the additional future costs of climate change for Saint Lucia. For example, the impact of Hurricane Tomas (2010) had a total cost of 43.4% of the island's GDP.<sup>1</sup> It caused a total estimated USD 336 million in damages to housing, infrastructure and economic sectors, mainly agriculture and tourism, and claimed seven lives. In 2013, an unseasonal low-level trough system passed over the island and produced greater than 224mm of rainfall in a matter of two to three hours. The system impacted 2,600 persons directly, killed six, destroyed forty-seven homes and caused USD 89.2 million in damages. Additionally, Saint Lucia has experienced drought conditions each year since 2012, resulting from a decline in both the total annual and temporal distribution of rainfall. The entire island has been periodically placed on water rationing.<sup>3</sup>

The Government of Saint Lucia recognizes the challenges that climate change poses to its population, the country's natural resources and economy and has taken considerable measures at the policy and action level to identify and address, to the extent of its possibilities, current and future climate risks. Various sectoral policies now address climate change and a wide range of interventions have been put in place or designed as adaptation measures; often facilitated or supported by international donors and also, often executed as one-off projects. The NAP process offers the possibility to ensure that such efforts take place in an integrated manner and become embedded in national level planning, addressing critical priorities and making use of existing and future synergies. This document reviews the progress made by Saint Lucia in the field of climate change adaptation and establishes the building blocks for the NAP process, in terms of information, capacity, policy and institutions.



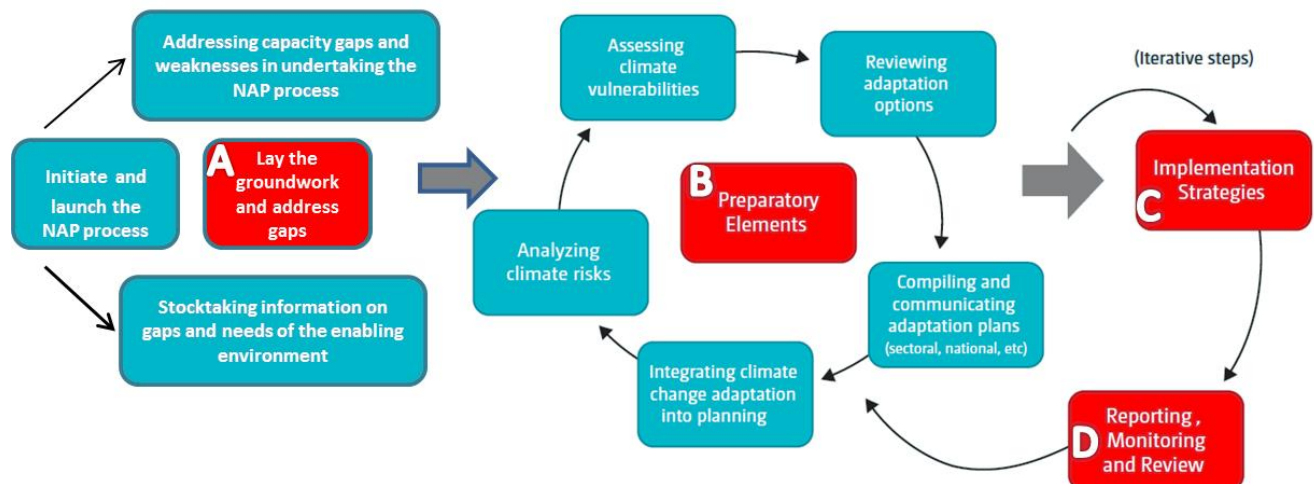
## 2.1. INTRODUCTION TO THE NAP PROCESS

The Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), has acknowledged national adaptation planning as an opportunity for developing and least developed countries to assess their vulnerabilities, to mainstream climate change risks and to address adaptation and has established the National Adaptation Plan (NAP) process as a way to facilitate effective adaptation planning.

According to the UNFCCC, the two main objectives of the NAP process are:

- To reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience; and,
- To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes, and activities – in particular development planning processes and strategies - within all relevant sectors and at different levels, as appropriate.

A NAP, as defined in the LDC Expert Group's *Technical Guidelines for the National Adaptation Plan Process* (LEG Guidelines), is a policy process leading to full integration of climate change adaptation into national planning and budgeting and involving inter-agency coordination, climate risk and vulnerability assessments, capacity-building efforts and identification and ranking of national priorities (including those reflected in relevant national documents, plans and strategies). The NAP process allows countries to conduct comprehensive medium- and long-term climate adaptation planning in an iterative and ongoing way (see Figure 1).



**Fig. 1.** Schematic representation of the NAP Process. The main elements are presented in red and the suggested steps in blue. *Illustration adapted from the LEG Guidelines*

Although the LEG Technical Guidelines propose four elements as building blocks for the NAP process, NAPs are flexible and non-prescriptive, allowing countries to start the process at the element that is more suitable to the national circumstances. Countries can choose and apply, from a series of steps and indicative activities suggested for each element, those that add value to their planning process and sequencing.

The four elements of the NAP process are:

**Element A. Laying the Groundwork and Addressing Gaps.** Includes stocktaking of needs, opportunities, entry points, and key resources for adaptation in the country. Frequently, it also means establishing an institutional home for the NAP process within government and a legal or administrative mandate to legitimize the process.

The stocktaking identifies the information available on climate change impacts, vulnerability and adaptation measures already taken to address climate change in the country, as well as assessing the gaps and needs of the enabling environment (policy and institutional frameworks) for the NAP process. The stocktaking also supports the identification of barriers to adaptation design and implementation and to establish potential solutions.

**Element B. Preparatory Elements.** Includes analytic activities to fill information gaps identified in the previous stocktaking effort. For example, planners might commission a national climate vulnerability assessment or develop a set of future climate scenarios if these did not yet exist. They also might synthesize existing adaptation plans from line ministries or sub-national governments and set procedures for integrating adaptation into key economic sectors.

**Element C. Implementation Strategies.** This element focuses more concretely on who will do what, and how. Planners use information and criteria from Element B to set priorities and decide on the sequence of activities. They also might focus on how to finance adaptation, build needed capacities, and establish roles and responsibilities for coordinated implementation.

**Element D. Reporting, Monitoring, and Review.** Planners set up systems to track their NAP's progress. This often means choosing effectiveness criteria, setting up a review timeline, and establishing a reporting and outreach plan.

### 3. STATUS OF THE NAP PROCESS IN SAINT LUCIA

Substantial progress has been made in Saint Lucia in the fields of climate change adaptation policy, institutional arrangements, capacity building and concrete sectoral and cross-sectoral projects on the ground; setting a good start for the country's NAP process.

The NAP process is currently in its early stages of development and is led by the Department of Sustainable Development, at the Ministry of Education, Innovation, Gender Relations and Sustainable Development. The Ministry has expressed its interest in linking sectoral adaptation plans to the NAP, as funding for their elaboration becomes available. Each sectoral adaptation plan will include priority actions within specific thematic areas and an investment plan for implementation.

In the framework of the Japan-Caribbean Climate Change Partnership (J-CCCP), UNDP is providing technical support to the Government of Saint Lucia for the preparation of a comprehensive National Adaptation Plan. The support encompasses the preparation of this report, which sets the knowledge base for developing the NAP process, as well as a series of subsequent activities which will be guided, to the extent to which it is relevant for Saint Lucia, by the elements and steps proposed in the LEG guidelines. The activities to follow will facilitate the prioritization of sectoral adaptation actions, the development of a national adaptation roadmap, inclusive of a capacity development plan, the formulation and elaboration of Saint Lucia's National Adaptation Plan document and a monitoring and evaluation (M&E) plan for the NAP. Additionally, the J-CCCP support includes the development of the sectoral adaptation strategy (sectoral NAP) and investment plan for the water sector.

In parallel to the work of the J-CCCP, the NAP Global Network has recently joined the efforts of Saint Lucia's government and is currently providing, technical support for the elaboration of a communications strategy for the NAP and for the development of the sectoral adaptation strategy and investment plan for agriculture and fisheries. The development of sectoral NAPs and investment plans for the remaining priority sectors will be undertaken as funding becomes available in the future.

Recently, St. Lucia has established a time frame and a vision statement for its NAP. A multi-stakeholder consultation workshop was held in Castries in May 2017. The stakeholders concurred that Saint Lucia's National Adaptation Plan should be designed for a period of ten years (2018-2028) and agreed on the following vision statement:

Saint Lucia's NAP vision statement:

*"Saint Lucia and her people, their livelihoods, social systems and environment are resilient to the risks and impacts of climate change through continuous, coordinated and effective adaptation efforts."*

#### 4. STOCKTAKING METHODOLOGY

To set the knowledge base for developing Saint Lucia's NAP, the identification, compilation and analysis of available information on climate change impacts, vulnerabilities and progress made in the country in terms of climate change adaptation was conducted. Following the recommendations of the LEG Guidelines, this stocktaking process also entailed establishing potential entry points and linkages between current sustainable development policies, strategies and budgeting and the NAP process, as well as identifying, through SWOT and GAP analyses, areas that require strengthening for the country to successfully undertake the NAP process.

In the last five years, various comprehensive reviews of the climate change adaptation context in Saint Lucia have been produced in the framework of activities towards the elaboration of: Saint Lucia's Third National Communication to the UNFCCC; the National Adaptation Strategy and Action Plan to Address Climate Change in the Tourism Sector of Saint Lucia; the Strategic Programme for Climate Resilience (SPCR), Saint Lucia's State of the Environment Report (SOER) and the baseline report under the Japan-

Caribbean Climate Change Partnership (J-CCCP); with these reviews and processes entailing lengthy consultations with country stakeholders at multiple levels.

This stocktaking report is based on an extensive desktop review. It builds on the findings and recommendations presented in previous reviews and complements these analyses with supplemental and relevant global, national and sectoral information; including the information and data provided to the consultant by the Project Focal Point at the Ministry of Education, Innovation, Gender Relations and Sustainable Development and by the J-CCCP Project Management Unit (PMU) within UNDP Barbados and the OECS sub-regional office. As mentioned in the previous section, the main findings from the stocktaking exercise were discussed and validated with national stakeholders during a consultation workshop conducted on May 30<sup>th</sup> and 31<sup>st</sup>, 2017 in Castries.

Building on the recommendations provided by the LEG Guidelines, the following key questions were used for guiding the stocktaking process:

- What information on climate change is available for Saint Lucia
- What data is available to assess current and future climate risks, vulnerability and adaptation?
- How can the storage and management of the existing data be coordinated?
- What gaps can / have been identified regarding the capacity, adequacy of data and information and required resources to engage in the NAP process?
- Where does Saint Lucia stand regarding the implementation of effective short and long-term adaptation activities?
- What does the enabling environment (policy and institutions) to support climate change adaptation action in Saint Lucia look like? How will it contribute to the NAP process?
- What barriers exist to effectively design and implement adaptation in Saint Lucia?

## 5. GEOGRAPHIC AND SOCIOECONOMIC CONTEXT

### 5.1. GEOGRAPHY<sup>3,16</sup>

Saint Lucia is a Small Island Developing State (SIDS) located at 13°59'N, 61°W within the Lesser Antillean Arc of the Caribbean Archipelago. With a land area of approximately 616km<sup>2</sup>, Saint Lucia sits on an ancient volcanic ridge connecting Martinique to the north and Saint Vincent and the Grenadines to the south. The island is 42km long and, at its widest point, it is 22km wide; its coastline has a length of



Fig. 2. Geographic location of Saint Lucia

approximately 158km. Saint Lucia’s coastal shelf has an area of 522km<sup>2</sup>, is relatively narrow and drops off sharply along the west coast.

The island of Saint Lucia is of volcanic origin, with a very rugged landscape, characterized by mountains along a centrally located north-south oriented mountain range, deep valleys and rivers; which show reduced flows due to poor land use practices. Its highest point is Mount Gimie (950 meters above sea level) and the most spectacular landmarks in the country are the Pitons, two volcanic spires rising side by side from the sea to elevations of 770m and 743m, respectively. The Pitons are also the key features of *the Pitons Management Area*, a UNESCO World Heritage site.

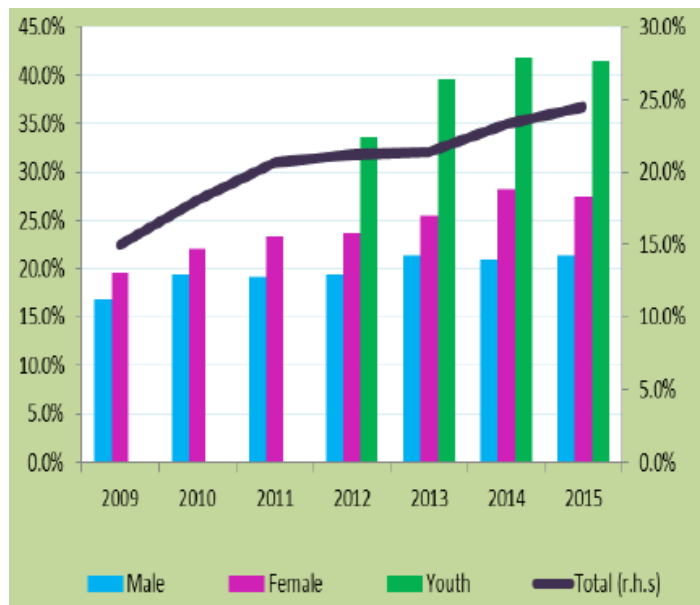
## 5.2. POPULATION

According to figures from the Statistics Department, in 2015, the estimated population of Saint Lucia stood at 172,623 and was relatively young, with 46.9% of the population under 30 years of age and 12.6% sixty years old or older. Women make 50.6% of the population. Life expectancy has increased since 2007, standing in 2012, at 75.3 years for men and 82.1 for women.<sup>3</sup>

A large portion of the island’s population is located along the coastal belt, where lowland agriculture, coastal resources, reefs, fisheries and tourism are the main livelihood sources. Approximately 60% of the population resides along the north-west corridor. Currently, approximately 41% of the total population lives in the city of Castries and 55% in the Castries-Gros Islet corridor. The rapid urbanization processes that have taken place have resulted in denser populations living in unplanned or informal settlements.<sup>4</sup>

Poverty in Saint Lucia has traditionally been a rural phenomenon. The 2010 Census report shows that over 35% of the population in the rural districts of the south and south west of the island are poor and pockets of poverty are also found in the north-east region. Over 50% of the poor are under the age of twenty and the incidence of poverty is slightly higher among men than among women (29% and 25% respectively). The census also showed that about one third of the population is economically active and that from the economically active population, 22% are employed in agriculture, 25% in manufacturing and 53% in the services sector (tourism and other services). According to the 2010 census, over 40% of households in Saint Lucia are headed by women.<sup>4</sup>

In general, the rate of unemployment is high (24% in 2015).<sup>5</sup> Fluctuations in the main economic sectors in recent years, have exacerbated the effects of both unemployment and poverty. Unemployment among women and youth is much higher, than for men (see Figure 3), especially those with a primary school education and with few marketable skills.<sup>4</sup>

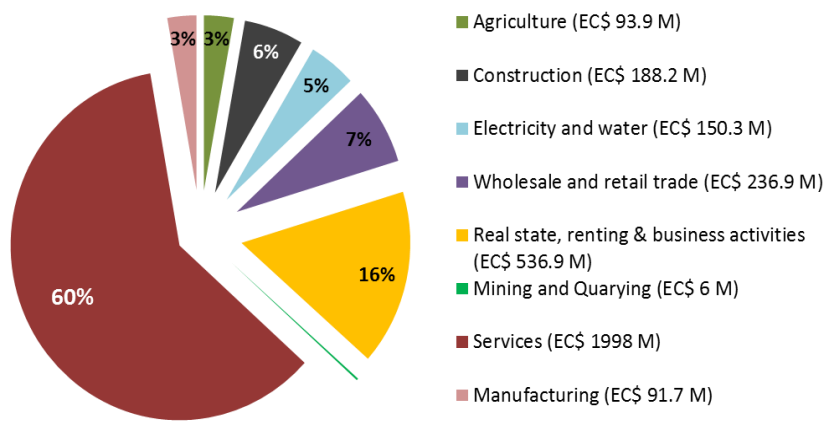


**Fig.3.** Unemployment rates in Saint Lucia  
Source: GOSL Review of the Economy 2015<sup>5</sup>

### 5.3. ECONOMY AND NATURAL RESOURCES

Over the past two decades, with the active promotion of tourism, the traditionally agrarian-based economy of Saint Lucia shifted towards a service-based economy and tourism replaced the production of bananas for export as the island's number one foreign income earner. Manufacturing and industrial production in the country concentrate on the food and beverages, paper and paper board products, metal products and chemicals subsectors. Despite rising operating costs, the island's manufacturing and industry have remained as important productive sectors. The construction sector has also made major contributions to GDP and employment.<sup>4</sup> Figure 4 shows the contribution of the different economic sectors to the country's GDP in 2015.

With a fairly liberal trade regime, Saint Lucia is a net importer of manufactured goods and also a net importer of food, with a growing trade deficit in its food bill.<sup>3</sup> In addition, the country relies almost exclusively on imported fossil fuels to meet its energy needs.<sup>6</sup>



**Fig. 4.** Sectoral contribution to Saint Lucia's GDP in 2015  
Source: GOSL Review of the Economy 2015 .<sup>5</sup>



## 6. CLIMATE RISK AND VULNERABILITY

### 6.1. CURRENT CLIMATE

Saint Lucia lies within the north-east Trade Winds belt and is normally under an easterly flow of moist, warm air. Its climate is tropical maritime, and due to its location in the Atlantic Ocean/Caribbean Sea, the sea surface temperatures vary little from 26.7°C at any time.<sup>3</sup>

Annually, the island's climate is influenced by the migration of the north Atlantic subtropical high, the eastward spread of the tropical Atlantic warm pool, the fairly steady easterly trade winds, and the passage of tropical waves, depressions, storms and hurricanes. El Niño Southern Oscillation (ENSO) is a major driver of inter-annual variability in climate conditions, with its warming phase (El Niño) bringing warmer and drier than average conditions during the late wet-season and its cooling phase (La Niña) causing colder and wetter conditions during the same period.<sup>7</sup>

**Temperature:** Due to the size and position of the country, the air temperature is strongly influenced by the winds originating from the surrounding seas and varies little along the year (~28 °C on average).<sup>3</sup> However, diurnal temperatures can vary by as much as 10 °C. The coldest period is December to March, and the warmest between June and September. The mean maximum temperature is about 30.2°C and mean minimum is about 24.6 °C. The island's mountainous topography, particularly in the more rugged interior, can also cause temperature variation between high and low-lying regions of between 2 °C and 5 °C.<sup>7</sup>

**Rainfall:** A unimodal rainfall regime characterises Saint Lucia. There is one dry season from January to May and one main rainy season from July to November; which receives approximately 60% of the total yearly rainfall. Precipitation records from the two major airports indicate that the island receives an annual average of 1,450 mm of rain in the south to 1,900mm of rain in the north.<sup>7</sup> Also across the country, annual rainfall shifts from 1,265mm in the relatively flat coastal regions to about 3,420 mm in the elevated interior region.<sup>3</sup>

**Winds:** Saint Lucia lies within the northeast Trade Wind belt. Wind speeds are highest, on average, during the months of January to July, corresponding roughly with the dry season, when the average is 24kmh-1. Between August and December, the speeds average 16kmh-1. Higher gusts are occasionally experienced with the passage of tropical disturbances.<sup>3</sup>

**Humidity:** On average, the relative humidity is around 77% (measured at the Hewanorra airport station). Daily variation in relative humidity is at a maximum during the warmer months.<sup>3</sup>

**Sunshine:** Saint Lucia receives the maximum daily sunshine from February to May and the minimum, around September. Due to cloud cover, radiation values vary widely over the island. Elevated regions with greater cloud cover, receive less direct radiation than the low-lying coastal regions.<sup>3</sup>

## 6.2. RECENT REGIONAL CLIMATE TRENDS

Recent climate change observations in the Caribbean region have been described in terms of rising temperature, along with trends towards more warm extremes, less cold extremes, as well as strong indications for enhanced heavy rainfall events.

Between 1961 and 2010, a significant warming of the region's surface air temperature was recorded, with the night-time temperature increasing more than the daytime temperature. Warm days, warm nights and extreme high temperatures became more frequent, while the frequency of cool days, cool nights and extreme low temperatures reduced. Precipitation trends are less consistent. While no significant change in annual total precipitation was detected between 1961 and 2010, a trend of increasing intensity in daily rainfall and heavier rainfall events was detected.<sup>8</sup>

It has been estimated that global sea level rise has occurred at a rate of  $1.7 \pm 0.2$  mm per year between 1901 and 2010, but has accelerated since the 1900s; with the 1993-2010 period presenting a rate of  $3.2 \pm 0.4$  mm/year (very likely).<sup>9</sup> Between 1950 and 2000, sea level rise in the Caribbean region was estimated to near the global mean.<sup>7</sup>

## 6.3. RECENT NATIONAL CLIMATE TRENDS

### **Temperature:**

Consistent with the regional trends, Saint Lucia's climate is warming. Between 1960 and 2006, the mean annual temperature increased by  $\sim 0.7^\circ\text{C}$ , at an average rate of  $0.16^\circ\text{C}$  per decade. The largest warming has been experienced in the June to August and September to November periods (with decadal increases of  $0.19^\circ\text{C}$  and  $0.18^\circ\text{C}$  respectively)<sup>10</sup>.

Between 1973 and 2014, there has been an increase in the annual frequency of warm days and nights, accompanied by a decrease in cool days and nights. In the same period, the annual maximum and minimum temperatures increased by  $0.025^\circ\text{C}$  and  $0.026^\circ\text{C}$  respectively.<sup>7</sup>

### **Precipitation:**

Also consistent with the regional observations, no statistically significant change in mean annual rainfall in Saint Lucia was found between 1960 and 2006 (period analysed by two major studies of climate change in the country).<sup>10,11</sup> However, there are some indications that since the 1970s, the rainy season has begun earlier in the year and that the total precipitation during very wet days has increased; suggesting an escalation in both the intensity and duration of rainfall events.<sup>7</sup> However, there is insufficient data to establish historical trends for rainfall extremes in the country.<sup>10</sup>

### **Windspeed:**

Windspeed has increased around Saint Lucia in all seasons over the period 1960-2006, at a rate of  $0.3$  m per second per decade. Windspeed between December and February became faster, increasing at the rate of  $0.51$  m/s per decade.<sup>10</sup>

## 6.4. FUTURE CLIMATE

Several studies have developed climate change projections for Saint Lucia in recent years. In the National Adaptation Strategy and Action Plan for the Tourism Sector (2015)<sup>29</sup>, the Caribbean Community Climate Change Centre (5Cs) and the GoSL present the results of statistical and dynamic downscaling approaches using SRES scenarios (and where possible or available, the IPCC's RCP4.5) for projecting Saint Lucia's temperature and rainfall in the 2031-2040 and 2051-2100 periods relative to the 1961-1990 baseline.

The Vulnerability and Adaptation (V&A) Assessment component of the Third National Communication to the UNFCCC (2016)<sup>30</sup>, presents projections of temperature, precipitation and water excess and deficits (P-E) for the 2040-2069 and 2081-2100 periods relative to the 1981-2015 baseline. The projections were obtained using PRECIS-downscaled scenarios of two climate models (HadCM3 and ECHAM5) and one SRES scenario.

In 2012, the CARIBSAVE Partnership, published *Climate Change Risk Profile for Saint Lucia*, the most comprehensive climate change projections for Saint Lucia to date.<sup>10</sup> This study generated climate model projections of future scenarios using both a General Circulation Model (GCM) ensemble of 15 models and the Regional Climate Model (RCM), PRECIS. The RCM was used to provide projections at a finer spatial scale (and thus give a better physical representation of the local climate) than GCMs.

While using different models, emission scenarios, baseline periods and projection periods, all projections indicate general trends of increasing mean annual temperatures and decreasing precipitation amounts with climate change in Saint Lucia.<sup>1</sup> For the sake of simplicity, the results of the CARIBSAVE projections are summarized in this report.

The climate projections generated by CARIBSAVE indicate that under a high emissions scenario (SRES A2) and relative to the 1979-2009 period, it could be expected that in Saint Lucia:

**Mean annual temperature increases** in the order of:

0.3 to 0.8 °C by 2020; 0.9 to 1.7 °C by 2050 and 1.8 to 3.1 °C by 2080 (GCM).

2.4 to 3.3 °C by 2080 (RCM).

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<sup>1</sup> An exception to this trend is found in the PRECIS-downscaled ECHAM5 model projections of seasonal precipitation anomalies for the wet season of the 2081-2100 period. These projections are presented in the Vulnerability and Adaptation (V&A) Assessment component of the Third National Communication to the UNFCCC (2016)<sup>30</sup> and indicate a generalized increase in precipitation between June and December towards the end of the century for most of the island.

**The frequency of hot days increases** between 38 and 54% by 2050 and between 55 and 97% by 2080 (GCM).

**The frequency of hot nights increases** between 38 and 67% by 2050 and between 55 and 97% by 2080 (GCM).

**Cold days and cold nights do not occur at all** by 2050 and 2080 according to the GCM models.

**Annual precipitation decreases** in the order of:

-15 to 4mm by 2020; -19 to 4mm by 2050 and -37 to 6mm by 2080 (GCM)

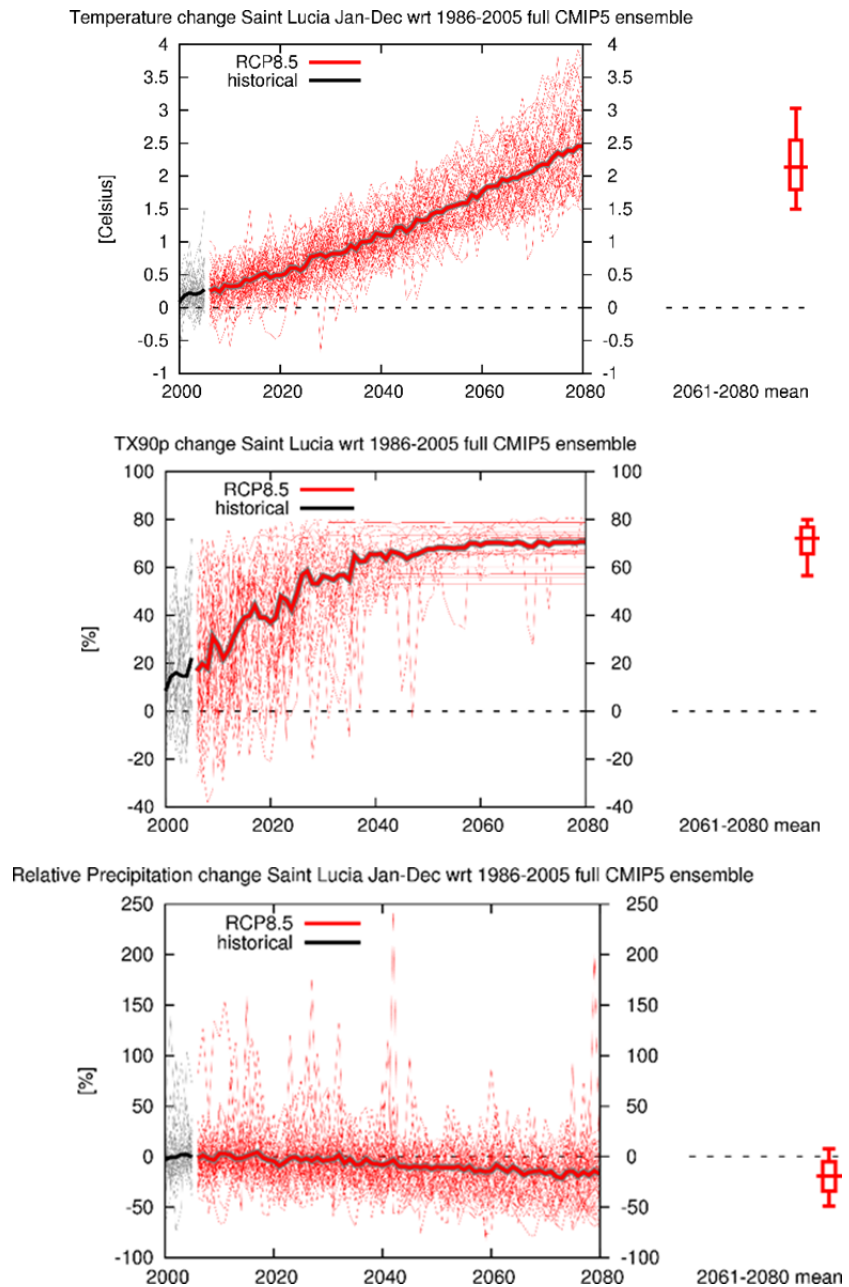
-11% to -32% by 2080 (RCM)

**Sea Surface Temperatures increases** by 0.8 to 3°C by 2080s (GCM).

**Windspeed increases** by 2080 by up to 0.5 m/s (GCM); by up to 0.7 m/s (RCM).

**The number of sunshine hours per day increases** by roughly one hour by 2080 (RCM) due to a reduction in average cloud fraction.

**Tropical storms and hurricanes become more intense, but not necessarily more frequent.** North Atlantic hurricanes and tropical storms appear to have increased in intensity over the last 30 years. Observed and projected increases in sea surface temperatures indicate potential for continuing increases in hurricane activity and model projections indicate that this may occur through increases in intensity of events, but not necessarily through increases in frequency of storms.



**Fig. 5.** Projected change in mean temperature, heatwaves and precipitation in Saint Lucia, relative to the 1956-2005 period. Note that for heatwaves changes in TX90p were plotted. This corresponds to the number of days when the maximum temperature is above the 90<sup>th</sup> percentile (TX90p).

**The proportion of total rainfall that falls in heavy events decreases**, changing by -25% to +2% by the 2080s (GCM).

The rate of **sea level rise** is difficult to calculate as new evidence suggests that the contribution of ice sheet melting to global sea level rise will be greater than considered in IPCC projections. This highly increases the range of potential mean sea level rise in the Caribbean from 0.18 -0.56m (IPCC for an SRES A2 scenario) **to up to 1.45m by 2100** (Rahmstorf, 2007), relative to the 1989-1999 baseline.

The high level of uncertainty in sea level rise and hurricane intensity creates difficulties in estimating future changes in storm surge height or frequency.

The literature reviewed for this stocktaking report contained no projections based on the Representative Concentration Pathways (RCP) proposed by the IPCC 5th Assessment Report (AR5). Therefore, to update information on the projected climate future for Saint Lucia, the consultant generated projections for 2030, 2050 and 2080 for a small range of climate variables, using the CIMP5 model ensemble and the RCP8.5 scenario (representing continued rise of emissions or “business-as-usual” greenhouse gases concentration pathway). The results of these projections confirm the trends offered in the previous and more comprehensive climate change studies (e.g. the CARIBSAVE Risk Profile), presented in the climate and vulnerability study part of this consultancy.

## 7. CLIMATE CHANGE IMPLICATIONS FOR NATIONAL SECTORS

### 7.1. TOURISM

Major tourism developments, most of the critical infrastructure and environmental attractions they depend upon, as well as the majority of Saint Lucia’s population are concentrated along the coast, exposed to rising sea levels, coastal erosion, winds, high energy waves and storm surges.<sup>12</sup> In November 1999, surge damage in Saint Lucia associated with Hurricane Lenny was in excess of USD 6 million, even though the storm was centered many kilometers offshore.<sup>10</sup>

Storm surges, together with a rising sea level, amplify coastal erosion. It has been estimated that a 1m rise in sea level would place 7% of the Saint Lucia’s major tourism properties at risk, along with one of the country’s two airports and 100% of the sea ports. Coastal erosion is expected to negatively affect the sector earlier than flooding / submersion with sea level rise (SLR). With projected 100 m erosion, 30% all the resorts in Saint Lucia would be at risk, affecting property values, insurance costs, destination competitiveness, marketing, and the wider local employment. It has been estimated, that the cost of rebuilding for tourist resorts damaged by SLR could exceed USD 134 million in 2050 and reach up to USD 315 million in 2080.<sup>10</sup>

Coastal erosion together with SLR also threaten sea turtle nesting sites, a tourist natural attraction, with 30% affected by a 50 m erosion scenario and 50% at risk with 100 m beach erosion.<sup>10</sup> The loss of near-shore tourism resources and reduced appealing of the environment-based tourism attractions (e.g. deteriorated corals or ocean views obstructed by infrastructure to stop coastal erosion), reduces the

attractiveness of Saint Lucia as a destination to potential tourists.<sup>10</sup> The total estimated cost of climate change to tourism in Saint Lucia, including reduced visits, land losses to sea level rise and damages to coral reefs has been calculated at between USD 7.9 billion and USD 12.1 billion by 2050. This is equivalent to a cost of 3.6 to 12 times the island's 2009 GDP.<sup>13</sup>

The dependence on Tourism, which is a sector that places great demands on energy, water and environmental resources, coupled with the heavy concentration of tourism infrastructure near or on the shore, makes the sector, and by extension, the national economy, vulnerable to climate change.<sup>3</sup>

## CLIMATE CHANGE ADAPTATION MEASURES

The National Adaptation Strategy and Action Plan to Address Climate Change in the Tourism Sector of Saint Lucia (NASAP)<sup>29</sup> was launched in 2015. The document includes prioritized adaptation actions to be implemented between 2016 and 2021 (e.g. to develop incentives to encourage water conservation, renewable energy and energy efficiency in hotels and related tourism entities), as well as responsible institutions and potential funding sources for each action. The NASAP can be considered the first sectoral adaptation strategy and investment plan in Saint Lucia's NAP process. As the NASAP is ready for implementation, tourism is no longer discussed in the context of this report.

## 7.2. AGRICULTURE AND FOOD SECURITY

Agriculture is highly exposed to the impact of climate-related hazards, with extended drought, flooding and other weather extremes (including tropical storms) causing substantial damage and exacerbating soil degradation (erosion) processes. For example, the drought of 2010 and 2011 accounted for a reduction of 15% in banana exports during the first semester of 2010 alone. Hurricane Tomas, also in 2010, caused damages of around EC \$151.8 million in the agricultural sector. The flooding, and to a lesser extent, the winds of the hurricane, destroyed entire banana fields and reduced production in the following years. Although various projects, grants and subsidies were initiated by the government to support the affected farmers, the agricultural sector was still recovering from the effects of the hurricane in 2016.<sup>14</sup>

Climate change is expected to affect Saint Lucia's agricultural production, mainly through the direct effects on crop production of increasing temperatures, changes in precipitation patterns (including more frequent and intense drought episodes), increasing storm intensity (and flooding) and high winds. With higher temperatures, climate change could also increase water demand (and reduce supply with more frequent drought) and increase the incidence of pests, weeds and disease. With changes in temperature and precipitation, shifts in the crop suitability of agricultural land are also to be expected. In addition, climate change may as well aggravate land degradation processes (erosion). Sea level rise is not expected to significantly affect Saint Lucia's production of bananas and other four major Caribbean crops (cassava, yams, sweet potatoes and tomatoes).<sup>15</sup>

An analysis of the economic and social impacts of climate change in the Caribbean (Hutchinson et al, 2013)<sup>15</sup> indicates that the region could see a loss of up to USD 87 million in agricultural income from decreased production of five major crops by the 2020s and of up to USD 272 million by the 2050s. The study also shows that the yields of bananas and plantains in the region could decline between 12% and 20% by the 2020s and between 20% and 32% by the 2050s.



As Saint Lucia is a major food importer, local, regional and global changes in food production and availability could increase food prices and reduce the access to food of poor and vulnerable segments of the population.

#### CLIMATE CHANGE ADAPTATION MEASURES

To reduce the impacts of climate change in the agriculture sector, Saint Lucia's Third National Communication to the UNFCCC (2017) recommends, among others, the following short-term adaptation measures:

*Technological development to provide valuable data, innovative tools and methods, and resources:*

- Development of crop varieties better suited to cope with expected climate change impacts
- Utilization of renewable energy production and technology for pumping and distributing water and cooling systems;
- Development of more water catchment areas;
- Governmental agricultural support programs and agricultural subsidies;
- Promotion of private insurances;
- Incentive programs to encourage best practices;
- Change ad hoc compensation and assistance programs to balance farmer risk;
- Establishment of resource management policies and programs to encourage best water management.

*Transition in farm operational practices for secure and improved farm production:*

- Land use changes – e.g. alternative fallow and tillage practices;
- Diversification of crop varieties to increase the flexibility of farm production;
- Changing the intensity of chemical fertilizer and pesticides use;
- Incorporating supportive farm financial management practices;
- Introduction or modification of crop insurance programs;
- Investment in crop shares and futures;
- Participation in income stabilization programs;
- Diversification of household income sources;
- Providing simple shade structures for livestock herds; e.g. trees or transportable shades for rotational grazing;
- Providing livestock access to clean, cool, and fresh water in times of drought;
- Utilizing cooling fans in chicken farms/pens to counter heat stress.

### 7.3. INFRASTRUCTURE

The total road network of Saint Lucia comprises just over 1,210km of roads, of which approximately 20% are primary roads, 17% secondary and 63% tertiary.<sup>16</sup> The 58,891 households of the island are concentrated mainly along the coast or inland along ridge lines, spurs and plateaus. Of these, 43.8% are constructed of wood, 51% of concrete construction and 20.6% a mix of both.<sup>7</sup> Critical infrastructure is located within, or close to, population centers; these include schools, libraries, medical facilities, banks and administrative services. Telecommunications infrastructure and major power supply networks are generally further inland, but the distribution centers are in population centers. Primarily, the economic infrastructures, including tourism developments, the sea ports, fuel storage and the island's two air ports are located close to the shore.<sup>3</sup>

The susceptibility of the island's infrastructure to the impacts of climate change is a consequence of both location and the island's topography. Near-shore structures are expected to be impacted by rising sea level and coastal erosion, leading to possible loss of low-lying, coastal development and communities, interruptions in local, regional and international communication, and damage or destruction of critical infrastructure; such as coastal roads and bridges.<sup>3</sup>

Yet, storm events may pose the greatest risk.<sup>3</sup> Recent hurricanes have been particularly disastrous, causing significant long-term impacts on the island's infrastructure, resulting in tremendous economic setbacks and constituting major recovery cost. High wind and rainfall events are likely to result in increased floods and landslides. Flooding from extreme weather can result both in inverse drought, as water sources are clogged and or damaged and therefore barred from use and can lead to water shortages. In addition, continuing poor waste management practices, as well as the lack of capacity of drainage infrastructure to handle these large volumes of water, causes water source contamination from sewage, with negative health effects, such as water and vector borne diseases, especially in poor and marginalised communities.<sup>10,17</sup>

Coping with freshwater shortages under warmer temperatures and prolonged dry periods, may require investment in upgrades to existing infrastructure or new and needed technologies (e.g. rainwater harvesting, drip irrigation systems, low water flow technologies). Finally, more intense tropical storms are expected to exacerbate the risk of landslides. As much of the road infrastructure of Saint Lucia traverses areas that are already susceptible to landslides, communities with limited road access are particularly and increasingly vulnerable to isolation.<sup>10,17</sup>

## CLIMATE CHANGE ADAPTATION MEASURES

To reduce the impacts of climate change on the island's infrastructure, Saint Lucia's Third National Communication to the UNFCCC (2017) recommends, among others, the following adaptation measures:

- Risk-based land use policies, including those on housing, and critical infrastructure;
- Climate proofing: appropriate and enforced codes and regulations relating to construction design and practices;
- Setting climate resilient standards for public property and new property developments;
- Collaborating with the financial sector to develop appropriate risk management measures and regimes;
- Setting-up flood and coastal defenses (e.g. groynes, bulkheads and seawalls); investing in scientific and technological innovation.

## 7.4. HEALTH

Having many endemic and environmentally-sensitive disease vectors, as well as human populations burdened from high rates of cardio-respiratory diseases, makes the health sector in Caribbean SIDS particularly vulnerable to climate change impacts.<sup>12</sup>

Amongst a wide range of direct, indirect and cumulative impacts of climate change on public health, it has been anticipated that higher temperatures and changes in rainfall patterns in Saint Lucia may lead to increased heat waves, floods, storms, fires and droughts. These, in turn, could increase the incidence of injuries, vector, water and food-borne diseases, such as *schistosomiasis* and cholera, dengue, *Leptospirosis* and yellow fever. Malnutrition, respiratory diseases and cardio-respiratory diseases could also see higher incidence rates.<sup>3,7,18</sup> Climate change could also directly affect exposed health system infrastructure.

In 2011, ECLAC estimated the economic impact of climate change on the health sector in Saint Lucia. The ECLAC study paid special focus to the costs of gastroenteritis, schistosomiasis, ciguatera poisoning, meningococcal meningitis, cardiovascular diseases, respiratory diseases and malnutrition under climate change scenarios in the country. The results of the study indicate that without adaptation measures in place for supporting health care, the cost of increased morbidity and mortality due to climate change in the island nation could reach USD 182.4 million per year by 2050.<sup>12</sup>

### CLIMATE CHANGE ADAPTATION MEASURES

To reduce the impacts of climate change on the country's health sector, Saint Lucia's Third National Communication to the UNFCCC (2017) recommends strengthening the island's public health systems and health emergency management systems. Specific measures recommended include:

- Provision of food and clothing and even medicines and medical equipment to be delivered in climate-related emergency situations to ensure the comfort and health of the affected peoples;
- Provision of temporary shelters (schools, churches, community centers) during heat waves for members of vulnerable groups (e.g. asthmatics ) that may be at risk to heat stroke and cardiovascular and cerebral attacks;
- Restoration of proper hygienic conditions (e.g. overflows from pit latrines) and supply of purified water quality for domestic uses.

## 7.5. WATER

Owing to the volcanic geology of Saint Lucia with its rugged topography and impermeable rocks, the majority of rainfall flows to the sea, with very little opportunity for ground water storage. Freshwater in the country comes mainly from rivers, wetlands, streams and springs. There are 37 watersheds, of which Roseau is the most important. Water is abstracted from the Roseau River to the capital Castries and environs. This dam and the Millet Reservoir development serve the northern half of the country and together, have a total capacity of 3,182 million liters. Water production is ~18.9 M cubic meters per year; however, this figure is actually closer to 16.55 million cubic meters per year due to water losses in the distribution. During the dry season, estimated water production can be as much as 25% less than

during the wet season. Other wetlands in Saint Lucia include natural and constructed wetlands used for irrigation and aquaculture ponds, as well as sewage treatment ponds. Although many of the island's wetlands are not used for freshwater extraction, they filter sediment and pollutants and contribute to maintaining water quality. Groundwater resources are very limited and used primarily for irrigation.

It is expected that global climate change will magnify the current human stressors on freshwater ecosystems, making it even more challenging to restore and protect freshwater resources. Changes in rainfall patterns and increased temperatures will have the most obvious impacts on the island's watersheds. Protracted periods of drought will likely impact all primary river systems, which are already experiencing reduced base flows as a result of land use change. Farmers are currently allowed to use river water for irrigation and farming activities, as long as they have an abstraction license. However, under drier and warmer future conditions, water shortages may affect all activities in the island and result in curbs imposed on the farmers' use of water.

During hurricanes, the water intakes, dams and reservoirs may be damaged, and this can result in decreased water supply and quality. During these events, heavy precipitation can result in siltation of river courses and it may take up to 4 days before turbidity levels fall to a level that water treatment plants can handle. For example, Hurricane Tomas made the Roseau Dam inaccessible following landslides, leading many residents to resort to obtaining unsafe water from springs and other water sources.

Flooding may also damage dams and reservoirs or block them with debris, reducing water supply and quality and leading to the suspension of raw water treatment, especially in villages and rural communities, to avoid overloading the system. In addition, flooding erodes the topsoil and carries animal waste, pesticides, fertilizers, sewage and garbage, which may then contaminate groundwater sources as well as marine areas.

#### CLIMATE CHANGE ADAPTATION MEASURES

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To reduce the impacts of climate change on water resources and water resource-dependent sectors, the Third National Communication to the UNFCCC (2017) recommends, among others, the following adaptation measures:

a) Improving water management systems and protecting watersheds

- Scaling up efforts for the protection and restoration of ecosystems;
- Adopting forest management plans to prevent and control soil erosion;
- Encouraging water harvesting;
- Protecting water sources, preventing and controlling water pollution;
- Raising awareness to promote the effective and efficient use of water.

b) Improving water use efficiency in agriculture by:

- Developing drip and sprinkle irrigation practices;
- Improving agricultural management practices;
- Selecting and cultivating water stress-resistant varieties.

c) Reducing soil water excess due to increased precipitation by:

- Improving drainage infrastructure and harvesting practices;
- Testing and using new cultivars with higher resistance to soil anaerobiosis;

- Enhancing national capacities to test new cultivars and to conduct genetic improvement;
- Changing management practices such as planting dates to compensate for crop cycle modifications;
- The use of technologies to enhance management practices for yield increases;
- Conducting research on pest and disease resistant crop varieties.

d) Water conservation, including reduction in line losses by:

- Introducing and promoting the use of low flow water technologies for domestic uses (e.g. toilets and faucets).
- Institutional strengthening for water conservation including line loss.
- Installing new pipelines.
- Establishing and retrofitting Water treatment facilities.
- Setting up and utilizing Geographic Information Systems (GIS).

## 7.6. MARINE AND COASTAL RESOURCES, BIODIVERSITY AND THE NATURAL ENVIRONMENT

Saint Lucia possesses an impressive diversity of terrestrial and aquatic biological species and an equally remarkable diversity of ecosystems. The island's two key economic sectors, tourism and agriculture, heavily rely on natural ecosystems and the services they provide. Terrestrial and freshwater ecosystems are vital for filtering pollutants and sediment, especially to the agricultural sector, which relies primarily on rain-fed rivers and healthy watersheds. The retention of soils and the provision of a regular and clean water supply are critical services provided by forest ecosystems. Saint Lucia's coral reefs, mangroves, and seagrass meadows along the coastline form a highly interdependent and valuable coastal and marine ecosystem network that protect the shores, while providing marine life habitat and tourism attractions.<sup>7</sup>

**Beaches:** the numerous beaches around Saint Lucia's coastline are one of most important tourism destinations on the island. The beaches are also a critical habitat for some species, especially marine turtles. A single major hurricane can have a significant impact on beaches and dramatically change the shoreline. Shoreline retreat and reduction increases the vulnerability of coastal infrastructure to erosive wave action. Climate change impacts on beaches also threaten the survival of marine turtles, iguanas and shore birds. Sea turtles for example, could suffer from damage and loss of nesting sites on the island due to sea level rise (A 1 to 2 m SLR could damage 6-10% of the nesting sites), and changes in beach profiles brought by intense tropical storms. Higher temperatures may also affect these species by changing sex ratios in developing eggs and thus, reducing their reproductive capacity.<sup>10,19</sup>

Although **mangroves** build up sediments that can counter the impact of sea level rise, many mangrove shorelines are retreating inland. In addition, mangroves mitigate the impact of hurricanes on coastal lives, livelihoods and assets, but they are not unaffected by the high winds and surges. As the storms are expected to intensify in the future, these ecosystems will become increasingly vulnerable to direct damage.<sup>7</sup> Moreover, higher sea temperatures, also resulting from climate change, will be damaging to coral reefs that mangroves depend on for shelter from wave action and for nutrient exchange.<sup>10</sup>

**Coral reefs.** About 44% of the Saint Lucia's shoreline is protected by fringing, extremely delicate and sensitive coral reef ecosystems. Corals are sensitive to sea surface temperatures increase; 1°C above

average seasonal temperature can bleach them.<sup>7,10</sup> In general, coral cover is on the decline and macro-algal cover is on the rise. In 1998, 45 species of coral were recorded on the west coast; however, recent studies identified only 23 species.<sup>3</sup> In addition, climate change is expected to increase the intensity of tropical storm events, increasing the intensity of rainfall and subsequently, the increased sedimentation of near-shore coral reef, hindering the recovery of corals from damage experienced from previous events.<sup>10,19</sup> Physical damage to coral systems from these intensified storms will have negative impacts on fish nursery habitats,<sup>7</sup> and can seriously affect the abundance and diversity of reef fish that depend directly on the coral for food, protection, and a breeding ground.<sup>7,19</sup> The cost of climate change-induced damage to coral reefs in Saint Lucia could reach between USD 1.7 and 3.4 billion by 2050.<sup>20</sup>

**Fisheries:** Declining reef fish densities as a result of loss of coral, mangrove and seagrass habitats have been reported. Climate change related degradation of coral reef and mangrove ecosystems, which are vital nursery areas for many commercial species, has been detrimental to the status of fish stocks. Predicted increase in sea temperature may drive pelagic species away from the tropics in search of cooler temperatures and could potentially alter breeding and migration patterns. Of further concern, is the increase in the frequency of algal blooms that can contaminate some seafood species, and thus impact human health.<sup>10</sup>

**Forests:** Approximately 35% of the island's landmass is under forest cover,<sup>3</sup> with 19,000 acres of rainforest acting as a habitat for rare birds and plants.<sup>12</sup> Forests, in particular, are essential for water and soil conservation<sup>7</sup> as these ecosystems absorb and buffer the flow of watercourses after heavy rains, providing protection to underlying areas from flood. Extreme weather events and heavy rainfall often result in massive landslides down the mountainous slopes of Saint Lucia, as was recently experienced during Hurricane Tomas in 2010. Damages to the forestry sector, excluding damage to forest roads, river banks and soil structure was estimated at EC \$56,046,530. The already increasing intensity of hurricanes is causing more severe damage, with potentially longer-term consequences for the integrity of the forest structure and canopy. Predicted changes in precipitation patterns and increased average daily temperatures could result in a loss of rainforest zones and an associated increase in the tropical dry forest zones. Higher temperatures and reduced moisture could result in forests becoming much drier, possibly destroying epiphytes, which provide important habitat for birds, insects and reptiles. Potentially, habitats of endangered and endemic species could be lost altogether.<sup>10</sup>

## CLIMATE CHANGE ADAPTATION MEASURES

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Saint Lucia's State of Environment Report SOER (2015)<sup>19</sup> proposes a series of key policy, legal, administrative and programmatic interventions to help reverse negative environmental trends, some of which are compatible with climate change adaptation goals. These include, among others:

- Promoting the restoration and/or rehabilitation of degraded terrestrial and marine habitats.
- Adoption of ecosystem-based adaptation approaches to protect water resources (for example through integrated watershed management, promoting the use of sustainable land management practices, reducing deforestation and undertaking reforestation or afforestation where needed).
- Acquisition and maintenance of intact natural forests, and the selection of appropriate mixes of species for afforestation.
- Expanding reforestation programmes.
- Expanding forest-based sustainable livelihood opportunities.
- Implement the provisions of the Systems Plan for Protected Areas.

- Developing hazard and risk maps to inform land use planning.
- Expanding and promoting urban forestry.
- Protecting wetland ecosystems, most of which are coastal and have been targeted as landfill sites or earmarked for development.
- Implementing waste-to energy projects.
- Enhancing existing monitoring/alert networks on sea level rise through effective training and outreach mechanisms.
- Developing and implementing a national policy on data gathering and sharing.

## 7.7. BUILT ENVIRONMENT

All of Saint Lucia's population lives within 10km from the coast and approximately half of the population is concentrated in the low-lying capital city of Castries.<sup>10</sup> The island's urban centers are located mostly within harbors and bays or associated with a watercourse. Its rural settlements are found inwards along ridges, spurs and plateaus and recently, an emerging pattern of suburban development is establishing at more inland locations within the outskirts of the urban centers.<sup>21</sup>

Critical and vital infrastructure including road and bridge networks, airports and sea ports, telecommunications, power supply and medical facilities, tourism, are situated in low-lying terrain and directly adjacent to or very near to coastal areas.<sup>7,22</sup> Currently, Saint Lucia is experiencing rapid urbanization due to fairly high rates of rural-urban migration. Lack of housing options has led to prevalence of squatter settlements, of poor quality and substandard housing, particularly in the urban centers and throughout the island.<sup>21</sup> It is estimated that approximately 60% of housing settlements are unplanned, a great percentage of which occurs in sloped areas. This unplanned settlement continues to escalate in spite of Government's interventions to regulate.<sup>3</sup>

Many settlements are already at risk of landslides and flooding during extreme weather events. Hurricane Tomas in 2010, caused extensive landslides, severe flooding and damage to housing and critical infrastructure to an estimated cost of > USD 350 million (43.4% of GDP). Ninety-two percent (92%) of this cost was due to housing damages.<sup>1,21</sup>

Under climate change, more intense tropical storms will significantly affect housing and infrastructure in the island. With sea level rise, stronger storm surges from more intense hurricanes and beach and shoreline instability (as beaches erode and shorelines retreat), there is an increasing risk of temporary and permanent flooding of coastal homes, infrastructure and lands identified for potential development.<sup>7,21</sup> Rural settlements are generally less concentrated and located at higher elevations and would be less susceptible to the direct effects of sea level rise and storm surges, yet climate change impacts on coastal urban centers; infrastructure and tourist industry will threaten their livelihoods.<sup>21</sup> In areas of high or extreme landslide hazard, communities with limited road access are particularly vulnerable to being cut off and isolated; as Soufriere was by Hurricane Tomas in 2010.<sup>17</sup>

Climate change impacts on the built environment may in the long-term lead to: reduced national economic activity; loss of livelihood opportunities; increased pressure on inland forest reserves to provide land for agriculture when coastal land is lost to erosion and inundation; and economic cost of coastal protection, relocation of infrastructure, housing and populations and shifts in land use. This will



increase stress on hillside areas to accommodate coastal residents and other activities. Other impacts include service disruption and overcrowding.<sup>21,22</sup>

## CLIMATE CHANGE ADAPTATION MEASURES

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To reduce the impacts of climate change on the built environment, the Third National Communication to the UNFCCC (2017) recommends, among others, the following adaptation measures:

- The formulation and implementation of land-use planning policies to address vulnerable communities at risk;
- Fortification of sea and river defenses in vulnerable areas;
- Utilization of an early warning system in the event of storm surges (NEMO);
- Increasing the number of shelters on higher ground either near the coast or inland;
- Improving contingency planning by government, business and communities.

Comprehensive policy changes and adaptation measures to address sea level rise and storm surges would include:

- Adopting more proactive mitigation measures, such the use of building set-backs legislation to limit commercial zoning and large construct development on the coast and making land available in the interior as an alternative.
- Undertaking detailed surveys to identify most vulnerable areas along the coast and determining appropriate adaptation strategies.

The SPCR blueprint for climate change adaptation in Saint Lucia presents a series of concrete and critical interventions and actions for climate change adaptation in the sectors presented in this report. These interventions can be prioritized and included in the NAP process depending on applicability some five years later. For some of the targeted activities, the SPCR offers complete project concept notes. Both, the interventions and concept notes are listed in Annex 1.

## 7.8. PRIORITY SECTORS TO BE ADDRESSED IN SAINT LUCIA'S NAP

During a broad-based NAP consultation workshop held in Castries on May 30<sup>th</sup> and 31<sup>st</sup>, 2017, the stakeholders discussed the sectors to be included in the country's NAP and prioritized the order of formulation of Sectoral Adaptation Strategies and Action Plans (SASAPs).

The prioritization exercise permitted the ranking of each sector according to the following criteria:

- National significance,
- Opportunities for adaptation considerations to be mainstreamed into the sector's policies within the next two years (entry points opening),
- Extent to which adaptation in the sector facilitates adaptation in other sectors (cross-sectoral nature of the sector),
- level of coverage in climate change projects (neglected / non-covered sectors were given priority),

- Repercussions of non-action.

While all the sectors presented in this document were discussed and prioritized, the stakeholders argued that a better approach would be to merge several of the sectors. According to these considerations and the results of the ranking exercise, the following sectors will be included in the NAP, and the order of formulation and development of SASAPs will follow the order in which they are listed below:

1. Water
2. Agriculture
3. Fisheries
4. Infrastructure and spatial planning
5. Natural resource management (terrestrial, coastal and marine)
6. Health
7. Education

It was also accepted that informal education, along with training and awareness raising would be a cross-sectoral adaptation thematic area in the NAP.

## 8. NATIONAL POLICY AND STRATEGIC PLANNING FRAMEWORK FOR CLIMATE CHANGE ADAPTATION

Saint Lucia's development agenda is guided by national policy imperatives and instruments, including the country's Medium Term Development Strategy (MTDS), annual Budget Speeches, Annual Estimates of Expenditure (Budget) and Corporate Plans of individual Ministries.<sup>23</sup>

The following were identified as the key policy and planning instruments for the NAP process, either because they include climate change adaptation considerations and can be considered as entry points for the NAP process or because of their cross-sectoral planning nature, which offers an opportunity for reflecting NAP priorities in the future, when the instruments come under revision after their respective periods of implementation expire.

**The National Vision Plan**, approved by the Government of Saint Lucia in 2008 represents the long-term roadmap for the development of the island. In broad terms, it sets the development priorities for each of the four quadrants into which the country is divided for this purpose. The National Vision Plan is a broad-based land use plan developed to support the expansion of tourism infrastructure, to guide the expansion of the housing and industrial sectors and to support some measures related to environmental protection. This long-term plan makes no specific reference to climate change. ***Although it is not clear whether there will be a successor anytime soon, this is a major and general development and land planning instrument, which could integrate long-term national climate change adaptation priorities, shall an opportunity appear for it to be revised.***

The **Medium-Term Development Strategy (2012-2016) Sectoral Action Plan** laid out sixteen (medium-term) development goals centred around, and supportive of five development themes, *namely*:

- a) Stabilization of the Economy;
- b) Poverty Reduction;

- c) Gender Equality;
- d) Environmental Sustainability; and
- e) Education, Training and Human Resource Development.

This Plan recognized the high physical vulnerability of the country to environmental, man-made and climate-change induced risks and disasters. It included, as major imperatives, the expansion, retrofitting and caring for infrastructure (hard and soft) that can withstand hazard impacts and protect the population. This included, “retrofitting of existing infrastructure to meet the more demanding requirements created by global climate change and from the estimated risks that attend resilience in a vulnerable and ecologically brittle island state... all new structures will need to abide by standards-CUBiC in particular” and,

“The inculcation of a sense of responsibility among the citizenry at large for protection of the physical environment, especially where biological controls and soft interventions are required as part of the protective infrastructure: e.g. terracing in hillside agriculture and the retention of tree cover or the avoidance of felling of trees, squatting and slash and burn agriculture, as protective measures against flooding. These measures require the appreciation of the public of the importance of such measures and of their active support for their own protection.”

***This strategy has been identified as the key instrument to integrate NAP priorities in the country’s mid-term development agenda. As the strategy’s implementation term just came to an end, there could be an opportunity for the NAP to be reflected in its successor.***

**Climate Change Adaptation Policy.** In 2015, the Government of Saint Lucia launched its Climate Change Adaptation Policy (CCAP), built on the previous National Climate Change Policy and Adaptation Plan - 2002 (NCCPAP). The CCAP outlines the general strategy for understanding and addressing the risks posed by climate change. It seeks to “ensure that Saint Lucia and its people, their livelihoods, social systems, and environment are resilient to the risks and impacts of climate change.” The Policy endorses the principles of a cross sectoral approach to climate adaptation and concretely addresses: 1) adaptation facilitation- (appropriate policy, legislative and institutional environment); 2) adaptation financing (measures to ensure adequate and predictable financial flows) and, 3) adaptation implementation (concrete actions to prepare for, or respond to, the impacts of climate change).

Implementation of the CCAP will encompass activities geared towards building the resilience of households, communities, vulnerable groups, enterprises, sectors and ultimately, the nation, with efforts directed towards achieving the following objectives by 2022: a) Priority adaptation measures to the adverse effects of climate change developed and implemented at all levels; b) Identification of vulnerable priority areas and sectors and appropriate adaptation measures using available and appropriate information, recognizing that such information may be incomplete; c) Adaptation measures in vulnerable priority areas supported by existing data sets and traditional knowledge, or new data developed as necessary; and d) Appropriate adaptation measures integrated into national and sectorial development strategies and linked as far as national circumstances will allow to the national budgeting process.

In terms of facilitation, the CCAP proposes actions related to strengthen inter-agency and inter-sectoral collaboration, for example, identifying a suitable mechanism for strengthening the nexus between

climate change adaptation and disaster risk reduction and formalizing the relationship between the National Climate Change Committee (NCCC) and other coordinating bodies, as appropriate.

Among the actions the CCAP outlines for implementation, is the development of National Adaptation Plans (NAPs). Importantly, the CCAP puts specific focus on:

- Establishing integrated coastal management and adaptation measures to increase the resilience of coastal systems, communities, critical infrastructure, and economic activities;
- Protecting freshwater resources, promoting watershed management and implementing rainwater harvesting and storage;
- Diversifying economic opportunities in agriculture and fishing, biodiversity conservation and management;
- Protecting human health from climate change- related diseases;
- Formulating appropriate building and zoning codes and promoting integrated early warning and response systems; and
- Promoting strategic partnerships between the public sector, private sector and civil society in the implementation of adaptation measures.

Importantly, while addressing climate change adaptation in particular, the CCAP recognizes that some mitigation activities provide meaningful adaptation co-benefits and increase resilience.

***The CCAP is a clear demonstration of the Government's commitment to address adaptation challenges and opportunities. Consequently, the NAP process should guide the priority adaptation measures proposed in the CCAP's successor.***

**The Strategic Programme for Climate Resilience (SPCR)** formulated under the Pilot Programme for Climate Resilience (PPCR) entailed multiple consultations with stakeholders from all sectors in the country and provides a framework for planning and implementing sectoral climate change adaptation in Saint Lucia. It offers a broad, but consistent range of project/program areas for action in all sectors, which correspond to the three priorities of the CCAP (i.e. facilitation, financing and implementation of adaptation actions) and can be considered as the key programmatic and operational foundation for the implementation of the CCAP and as a blueprint for Saint Lucia's NAP. In addition to the SPCR, the PPCR supported the incorporation of climate change into an Environmental Management Bill and Physical Planning Act and Regulations and the formulation of the Climate Change Public Education and Awareness Strategy. It also provided recommendations for data procedures/protocols and for enhanced data management; offered a basket of incentives to be implemented within and beyond PPCR to address climate change; funded the Climate Change Knowledge, Attitude and Practice (KAP) study and facilitated the establishment of an open access platform for access, management and publication of geospatial data for informed decision making, namely, a GeoNode.

**The National Adaptation Strategy and Action Plan for the Tourism Sector (2015)** is based on an impact assessment of the risks faced by the national tourism sector under a changing climate. The Action Plan provides overall strategic objectives, information on implementation and evaluation, and a budget estimate for tourism adaptation activities. The document also includes a review of the institutional framework for implementation and recommendations for increasing capacity for climate adaptation in the tourism sector. ***While this Strategy and Action Plan can be considered a sectoral NAP in its own right, it would benefit from clear linkages to the NAP process.***

**The Estimates of Revenue and Expenditure 2016-2017<sup>24</sup>** is the most recent national budget document. It prioritizes expenditure for the period within the following key areas: infrastructural development; value-added agriculture and fisheries; improving security; enhancing the quality of and access to basic education and essential healthcare services; enhancing public sector efficiency; eliminating gender bias and promoting children’s rights. ***The budgeting process allocates funds to various ministries for the following key program strategies, which can be clearly related to climate change adaptation and resilience building.***

- Development of National Wastewater Policy and Strategic Plan for the collection, treatment and disposal of wastewater by March 2017
- Development of Watershed Management Planning Guidelines and Model Watershed Management Plan by December 2017
- Development of Rainwater Harvesting Training Manual for plumbers, Code of Practice and Engineering Standards by March 2017
- Improvement of island wide hydro-meteorological network by March 2017
- Facilitate training and certification of Met Officers at Entry, Mid & Senior level Met Technicians courses by March 2017 to comply with international standards / requirements set by the World Meteorological Organization (WMO) and the International Civil Aviation Organization (ICAO).
- Implementation of recommendations and requirements of Quality Management Systems (QMS) for all Met Services operations by December 2017.
- Increase the use of Climate Smart Agriculture including use of rain-water harvesting technologies and renewable energy in agriculture production.
- Formulate an Integrated Sustainable Transport Policy to incorporate Climate Change, E-Transport / Mobility, Route Planning agendas by March 2017.
- Standardize the use of Planning and Design Standards for Ministry of Infrastructure, Port Services and Transport (MIPST) to inform adequate design, maintenance and construction practices especially in the light of Climate Change challenges by March 2017.

Saint Lucia has multiple sectoral policies, strategies and action plans addressing climate adaptation needs, although not always explicitly. These, and others that are currently under development could all be used as entry points for sectoral NAPs. The most relevant are listed below and detailed in Annex 2.

- The National Hazard Mitigation Policy (2007)
- The National Emergency Management Plan (2007)
- The National Land Policy (2007) - Revised draft (2015, awaiting adoption)
- The National Water Policy (2004) - Revised draft (2015, awaiting adoption)
- Water Resources Management Agency Strategic Plan: 2012 to 2017
- National Wastewater Policy and Strategic Plan (currently under formulation)
- Development of Watershed Management Planning Guidelines and Model Watershed Management Plan (currently under formulation)
- The Saint Lucia Forests and Lands Resources Development Department Strategy 2015-2025
- The Saint Lucia National Energy Policy (2010)
- The National Energy Transition Strategy (2016) (NETS)
- The National Environmental Policy and Strategy (2004) (NEP/NEMs) – Revised draft (2014, awaiting adoption)

- Environmental Management Bill- Revised draft (2014, final revision in progress for enactment)
- The National Food and Nutritional Security Policy and Action Plan (2013)
- The Food Production Action Plan (2014)
- Coastal Zone Management Policy (2004) - revision underway for Policy and draft Strategy and Action Plan

## 9. COORDINATING MECHANISMS

### **The National Climate Change Committee (NCCC)**

A key foundation for the NAP process is that Saint Lucia has a national inter-agency coordinating mechanism for national and regional climate change activities. This mechanism is *the National Climate Change Committee (NCCC)*, which is recognized under the CCAP as the body in charge of coordinating and facilitating the implementation of climate change adaptation measures across sectors and agencies and at all levels of society. The NCCC was established in 1998 by the Cabinet of Ministers to provide advice and support to national climate change-related programs and processes. Over the years, the NCCC has helped to facilitate and guide national efforts relating to: climate change adaptation and building resilience; national climate change action plans and mitigation strategies; and climate change education, training, and raising public awareness. The NCCC sits within the Ministry with responsibility for coordinating climate change efforts, which is currently the Ministry of Education, Innovation, Gender Relations and Sustainable Development. The Committee meets periodically and comprises representatives of public, statutory, academic and private sector bodies. In addition, the NCCC may co-opt other members on an as-needed basis. As stated in the CCAP, the responsibility of monitoring and enhancing the implementation of the CCAP rests on the NCCC.

The complete list of NCCC members is presented in Annex 3.

The following are other mechanisms established to facilitate collaboration between state institutions and to act as an interface between state and non-state actors to manage various aspects of the national development agenda. Collaborating in the definition of and communicating the NAP priorities to these mechanisms could further support the NAP implementation, both at the policy and ground levels.

**The National Biodiversity Coordinating Committee (NBCC)** meets regularly and collaborates with other relevant coordinating bodies to ensure that biodiversity considerations are included in national environmental management and sustainable development decisions.

**The National Emergency Management Advisory Committee (NEMAC)**, comprising representatives primarily from public/state agencies, with provision for inclusion of other persons and organisations at the advice of the Minister with responsibility for disaster management. It also provides for the establishment of other committees and sub-committees charged with particular responsibilities, at the directive of the Director of NEMO. Non-state actors, such as community-based organisations (CBOs) and the small number of functioning Non-Governmental Organisations (NGOs) on the island are also active participants within the national disaster preparedness and response mechanism, as well as within the environmental management framework.

Currently less active but with the potential of participating in NAP activities is the **Coastal Zone Management Advisory Committee (CZMAC)**, a cross-sectoral body responsible for proposing and formulating policies to guide the management and development of Saint Lucia’s coastal zone.

Some of the institutions and groups identified as potential key stakeholders for the NAP process are listed below. Note that many of them already participate in the NCCC.

- Ministry of Tourism, Information and Broadcasting
- Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Co-operatives
  - Agricultural Division
  - Fisheries Department
  - Forestry Department
- Ministry of Economic Development, Housing, Urban Renewal, Transport and Civil Aviation
  - Physical Planning Section
- Ministry of Finance, Economic Growth, Job Creation, External Affairs and the Public Service
- Ministry of Health and Wellness
- Ministry of Commerce, Industry, Enterprise Development and Consumer Affairs
- Water Resources Management Agency
- Ministry of Education, Innovation, Gender Relations and Sustainable Development
- Ministry of Equity, Social Justice, Empowerment, Youth Development, Sports and Local Government
- National Conservation Authority
- Ministry of Home Affairs, Justice and National Security
- Ministry of Infrastructure, Ports, Energy and Labour
- Saint Lucia Hotel and Tourism Association
- Saint Lucia National Trust
- National Emergency Management Organisation (NEMO)
- Saint Lucia Solid Waste Management Authority
- Water and Sewerage Company
- Land Conservation Board

## 10. FACTORS UNDERLYING SAINT LUCIA’S VULNERABILITY TO CLIMATE CHANGE

### *Non-climate stressors*

- **Its small geographic surface and location** in an area with some of the highest risk conditions on the planet, such as mid ocean ridges with strong volcanic and seismic activity, tropical cyclone belts and direct exposure to the forces of the oceans.
- National **economic dependence on few sources of income and employment** in sectors exposed to climate variability and extremes; in particular tourism and agriculture. As it has been seen in the last five years, single and combined catastrophic events can severely reduce income for months. In 2010, Saint Lucia had not recovered from the worst drought in forty years when it was impacted by Hurricane Tomas. As of 2016, the country was still recovering from the impact of these events.
- **Financial capacity constraints to reactivate the development process following major disasters.** The challenges posed by global externalities such as trade liberalization, commodity price fluctuations, rising cost of food and fuel, and the effects of global financial crises, further increase economic vulnerability.



- **Population growth, demographic changes** (including urban-rural migration) **and poor land use planning** have led to the use of land in an unsustainable manner, natural resource degradation (deforestation, erosion, water contamination, etc.) and conflict for available resources. Through these processes, infrastructure, livelihood activities and populations have increasingly expanded to areas highly exposed to hazards. Examples of this are squatter developments in urban areas and the expansion of agriculture into zones prone to landslides. In most cases, the poor are the most vulnerable.

*Other stressors include, among others:*

- High unemployment rates and poverty
- The absence of formally approved building codes and standards (and the inadequate capacity for their enforcement), resulting in a housing stock prone to the damage by floods, landslides and high winds.
- Small-scale agriculture on limited and highly fragmented farming land.
- Agriculture dominated by a single crop (bananas) and the low technical and financial capacity of farmers to diversify production.
- Poor agricultural practices, such as slash and burn techniques and the excessive use of agrochemicals exacerbate land degradation.
- Agriculture, livestock grazing, planting of exotic tree species, biomass harvesting, cultivation of marijuana, illicit harvesting of posts, bamboo, lianas, incense and other forest products all largely contribute to forest clearing and degradation.
- Land degradation affecting potable water availability and soil and ecosystem productivity; increasing sediment deposition and erosion damage to productive sectors and infrastructure. Together, land degradation and drought act as drivers of poverty and declining food security and health.
- The absence of a national land use plan, a weak regulatory framework for development control, inadequate enforcement capabilities and conflicting demands to meet the needs of a growing population, leading to increased vulnerability to natural disasters; reduced water supply levels and increased contamination of rivers and the maritime environment.
- Conflicting interests between environmental conservation and infrastructural, commercial, residential and other developments in areas where ecosystems are fragile but offer invaluable ecological and non-ecological services (e.g. mangrove areas, where these ecosystems act as protective storm barriers and as fishery nurseries).
- Presence of invasive species, such as lionfish, reduce the populations of commercially important fish species, affecting the country's communities reliant on fisheries.

- Absence of a national recycling program. Indiscriminate solid waste dumping in rivers, drains and on vacant properties and littering in public places, blocks waterways and increases damages during flooding episodes.
- Poor chemicals management, use and residues disposal with negative impacts on water quality, air, soil, human health and biodiversity.
- Poorly maintained wastewater treatment systems in hotels which discharge insufficiently treated sewage into the coastal waters with the potential for pollution.
- Lack of appropriate toilet facilities in unplanned housing developments representing a high risk of disease from faecal matter.

**Key Climate-related Stressors** in Saint Lucia include tropical storms; extended dry periods; heavy rains and strong winds; less predictable rains and heat waves.

## 11. DATA AND INFORMATION RELEVANT TO THE NAP

There is a significant amount of data and information on Saint Lucia's climate, environment and socioeconomic conditions. There are also a good number of studies addressing sectoral vulnerabilities and expected climate change impacts and suggesting potential adaptation measures for the country. All this information can be used as the basis for starting the NAP process, understanding that in the mid and long term, information gaps should be bridged, additional data acquisition and analyses undertaken and new and relevant information channeled into the NAP decision-making cycle.

The information resources presented in this section were developed in the absence of a strategic research and information action plan or agenda. While they respond to pressing information needs, their production and publication seem to have been guided by available opportunities (including external funding). However, effective decision-making on climate adaptation (and thus the NAP process) relies on the systematic generation and monitoring of change of environmental, climate and socioeconomic information, as well as on access to this information.

A general recommendation made in the studies reviewed, is the creation of a centralized system / platform for climate and environmental information sharing. A proposal to create a Common Data Storage Facility (CDSF) linked to an Environmental Information System has been recently prepared to facilitate Multilateral Environmental Agreement (MEA) reporting. The implementation of this knowledge management system could substantially improve access and use of existing critical information for the NAP. A parallel initiative, led by the 5Cs and which could link to and benefit from the CDSF is a project for digitizing paper-based climate-related information existing in ten Caribbean countries (including Saint Lucia). The data would be handled and uploaded at national nodes connected to a regional hub housed and maintained at the 5Cs. This initiative is expected to allow the countries to access each other's public data and information, improving its availability and use. Further, the project proposes that the national nodes become safe repositories of climate change and environmental information.

However, to ensure that in the future Saint Lucia generates the information needed and builds in-country capacity for collecting the necessary data, analyzing and disseminating it in ways that allow

decision-making at all levels, an overarching, clearly articulated national research policy and strategy for climate research is required. The 2005 National Environmental Management Strategy (NEMS) had taken steps towards this goal, by committing to issue an Environmental Research Policy. This Policy was formulated in 2008 but remains a draft. The 2005 NEMS also committed to: a) develop and implement, by 2010, monitoring and evaluation procedures and protocols in all relevant and priority areas, including pollution and water quality, land use, climate change and its impacts on local resources and processes, and the status of critical and locally important habitats and species and; b) to promote and support research and information gathering at the national, regional and international levels on aspects of climate and its impacts as they pertain to Saint Lucia. This has been partially achieved through the fragmented studies presented below and other research efforts. However, this is an area that the NAP can both support and benefit from.

The following list presents some selected key sources of information available and useful for the initial stages of the NAP process.

### 11.1 SOCIOECONOMIC INFORMATION RESOURCES

**The 2010 Population and Housing Census**<sup>25</sup> (national census) was conducted by the Central Statistics Office. The Census Report offers the majority of the socioeconomic and demographic data that is reported in most of the more recent national plans, policies, and project documents.

**The Country Poverty Assessment (CPA)** conducted in 2005, is the most recent comprehensive assessment of socioeconomic conditions in Saint Lucia, specifically focused on poverty and vulnerability and commissioned by the Caribbean Development Bank. This assessment being over 10 years old, current efforts are underway to produce an updated assessment (expected to be concluded by 2018/2019).

**The UNDP's Human Development Index** for Saint Lucia (HDI) measures long-term progress in three basic dimensions of human development: a long and healthy life, access to knowledge, and a decent standard of living. It is based primarily on international data from the United Nations Population Division (life expectancy), the United Nations Scientific and Cultural Organization Institute for Statistics (mean years of schooling and expected years of schooling data) and the World Bank (Gross National Income per capita data). Saint Lucia's Human Development Index (HDI) value for 2014 was 0.729, which placed the country in the high human development category, a large improvement from 2000, when its HDI was 0.683.

### 11.2. METEOROLOGICAL DATA

Meteorological data and services in Saint Lucia are the responsibility of the Saint Lucia Meteorological Service, which manages two meteorological stations, one at the north end and one at the south end. The service provides 24-hour forecasting and observations, as well as some climatological support. The most complete meteorological records are those from the Hewanorra International Airport station, collected since 1973. Rainfall records collected at 31 secondary meteorological stations across the island are also available.

### 11.3. CLIMATE CHANGE MODELLING

Non-governmental organizations (NGOs) and research groups have developed climatological model projections using general circulation and regional climate models (GCMs and RCMs), following the projected change scenarios defined by the Intergovernmental Panel on Climate Change. The most comprehensive projections of future climate conditions for the country was developed by CARIBSAVE and included in the CARIBSAVE Climate Change Risk Atlas - Climate Change Risk Profile for Saint Lucia in 2010.

Some additional modelling work was undertaken by the 5Cs and also by the Climate Studies Group from Mona, under Saint Lucia's Second National Communication to the UNFCCC (2011), further to the preparation of vulnerability and adaptation assessments for various sectors. The Group has also undertaken some modelling work to support the elaboration of the Third National Communication to the UNFCCC (in preparation) and the NASAP (2015)<sup>29</sup>.

### 11.4. LAND USE, LAND COVER AND NATURAL HAZARD MAPPING AND ASSESSMENT RESOURCES

Saint Lucia and multiple international groups have collected comprehensive land use and land cover data as part of risk assessments and national land use plans, with specific assessments for landslide risk and the agriculture sector. Of particular relevance are:

- The mapping and assessment of land use conducted during the preparation of the 2015 National Land Policy
- The land cover mapping conducted by the United States Geological Service (USGS) in the country and the Caribbean using Landsat Thematic Mapper and SPOT imagery in 2000. A note of caution is that no ground-truthing was conducted for the maps generated.
- Landslide and flood risk information and resources provided by the Caribbean Handbook on Risk Information Management (CHARIM), a regional initiative initiated by the World Bank to build capacity of government clients in the Caribbean in disaster risk reduction planning.
- The Landslide Risk Assessment for Saint Lucia's Primary Road Network (2013) conducted as part of the Hurricane Tomas Rehabilitation and Reconstruction Project.
- Flood hazard maps produced for the island in 2006, 2012, and 2015.
- Wind hazard maps and storm surge maps were developed for Saint Lucia by Kinetic Analysis Corporation (2006 and 2008).

- A study on wind speeds undertaken for Saint Lucia by the International Code Council in 2008 as part of the GEF- World Bank Special Programme on Adaptation to Climate Change (SPACC) Project.
- The Watershed-river analysis of Saint Lucia, West Indies (2012) is the most detailed source for water availability in the country. It includes detailed information on each watershed in Saint Lucia, including the flow rate of rivers and streams, existing water intakes, and a rank in terms of water availability during the wet and dry seasons. The study provides a basis for developing a greater understanding of the potential impacts of hydrological flow on key sectors, such as agriculture and infrastructure. However, this study was based on modelled data only.
- Data for improving the management of marine areas in the Caribbean is collected, analyzed and shared by the Monitoring Network of ECMANN (Eastern Caribbean Marine Managed Areas Network)
- Natural resource maps and documents available at CaribNode, a clearinghouse of information resources for the creation of resource management tools.
- GeoNode (<http://www.charim-geonode.net/>) is a GIS based platform created under the Caribbean Handbook on Risk Information Management (CHARIM) project, financed by the EU-funded ACP-EU Natural Disaster Risk Reduction program and managed by the Global Facility for Disaster Reduction and Recovery (GFDRR). This Platform offers GIS resources to construct maps using existing hazard and land cover layers for Saint Lucia; it also allows users to share new layers. The platform is easy to use. However, comments posted by the authors of some of the most recent map layers (e.g. Susceptibility to landslides, 2016) highlight problems associated with the accuracy of existing data.

## 11.5. INFORMATION ON NATURAL RESOURCES AND NATURAL RESOURCE MANAGEMENT

Numerous natural resource inventories and assessments have been undertaken for Saint Lucia over the past several years. Key information resources are:

- **The Fourth National Report for the Convention on Biological Diversity (CBD)**<sup>26</sup>, which provides a comprehensive overview of the biodiversity trends, threats, and progress related to biodiversity conservation in Saint Lucia.
- **The Government of Saint Lucia's Biodiversity Resources website** (<http://biodiversity.govt.lc/Documents-Centre>)
- **The 2010 National Environmental Summary** (prepared with support from UNEP)
- **The 2006 and the 2015 State of the Environment Reports**. The first of which includes an assessment of key ecosystems, and the second summarizes environmental pressures and impacts, including impacts of climate change on natural resources and the loss of ecosystem goods and services.
- **The Eastern Caribbean Coral Reef Report Cards** project report, financed by The Nature Conservancy and supported by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety mapped Saint Lucia's coral reefs, seagrass beds, and

mangroves (2015). In 2017, the Commonwealth Marine Economies Programme, funded by the United Kingdom, issued the Caribbean Marine Climate Change Report Card 2017 and a series of 12 scientific review reports\* that support it. These reports include important information for Saint Lucia.

## 11.6. SECTOR-RELEVANT INFORMATION

The **Assessment of the Economic Impact of Climate Change on the Agriculture Sector**<sup>13</sup> (2011) supported by ECLAC provides a detailed review of the agriculture sector, with statistics on crop production and consumption, as well as forecasts for each agricultural commodity under projected climate futures.

**The Census of the Agriculture Sector (2007)** provides detailed baseline statistics on production by commodity, as well as other useful data. However, the ECLAC's Economic Impact of Climate Change Assessment (2013) includes more recent data and analyses.

**The National Food and Nutritional Security Policy and Action Plan** has detailed socioeconomic and sectoral statistics related to the agricultural sector and food security, (e.g., birth and fertility rates, causes of death, etc.), as well as detailed agricultural productivity statistics.

The **Impact Assessment of Climate Risks to the Tourism Sector**, conducted in preparation of the National Adaptation Strategy and Action Plan for the tourism sector, includes an overview of vulnerability issues and threats to different sectors that impact tourism, and a detailed economic analysis of existing and potential future trends in the tourism sector.

The **CARIBSAVE Climate Risk Profile** (2012)<sup>10</sup> also includes a sectoral vulnerability assessment that incorporates climate change projections and sectoral adaptive capacity profiles.

The **Saint Lucia: Country Document for Disaster Risk Reduction** (2014)<sup>4</sup> summarizes hazard impacts and vulnerabilities across the island.

The **Second and Third (draft) National Communications to the UNFCCC**, and the reports of the studies mandated for their preparation (V&A analyses) provide a whole wealth of information on sectoral vulnerability and adaptation options. These resources also highlight data gaps for both, adaptation and mitigation efforts and, in some cases provide specific recommendations on critical climate change adaptation measures.

**Saint Lucia's Baseline Assessment Report (2016)**<sup>31</sup> produced under the JCCCP to offer a review of the status and path toward completion and implementation of the National Adaptation Plan (NAP) and

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\* Available online at: <https://www.gov.uk/government/publications/commonwealth-marine-economies-cme-programme-caribbean-marine-climate-change-report-card-scientific-reviews>

National Appropriate Mitigation Actions (NAMAs) provides an analysis of key sectors that are vulnerable to climate change and suggest potential interventions to reduce vulnerabilities.

## 12. STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS

A Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis is an effective tool to review internal and external factors which can affect the development of an initiative and the achievement of its objectives. Through SWOT analyses, medium and long-term plans can be built to make the best use of existing strengths and opportunities and minimize the impacts of external threats. The following SWOT was constructed to provide a situational analysis of Saint Lucia's NAP process.

### STRENGTHS (INTERNAL FACTORS)

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#### Institutional setup

- The NAP coordinating mechanism (National Climate Change Committee) is in place and has a relatively long work history;
- Other inter-agency coordinating mechanisms for key NAP sectors exist, e.g. National Biodiversity Coordinating Committee; National Emergency Management Advisory Committee, among others.

Supportive policy initiatives and instruments, among others, include:

- 2015 National Climate Change Adaptation Policy;
- The Medium Term Development Strategy (2012-2016);
- Various sectoral policies and policy instruments recognize adaptation needs (e.g. The National Food and Nutritional Security Policy and Action Plan (2013);
- The National Adaptation Strategy and Action Plan for the Tourism Sector (2015), which could be considered the first of the sectoral NAPs; and,
- Saint Lucia's national budget addresses which reflect climate change adaptation measures.

National climate change adaptation priorities have been identified and a wide reaching plan to address them defined: The SPCR provides a Blueprint for Saint Lucia's NAP process. It was developed in consultation with the various sectors of society and government and responds to national needs.

A more comprehensive outline of strengths is provided in Annex 4.

### WEAKNESSES (INTERNAL FACTORS)

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Potential weaknesses for NAP implementation include:



- Limited human resources and technical capacity for coordination and implementation of climate change adaptation measures at the national level;
- Limited in-country capacity to undertake research to fill data and information gaps and to conduct regular climate, socio-economic and environmental monitoring;
- Long period for policy approval;
- Inadequate national funding for NAP implementation and monitoring;
- Weak cooperation between the NCCC and sectoral coordination mechanisms.
- Limited awareness of climate change and adaptation options at the local level

#### OPPORTUNITIES (EXTERNAL FACTORS)

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The external opportunities identified for the development and operation of the NAP refer mainly to the availability of financial and technical resources as follows:

- Saint Lucia is a SIDS, highly vulnerable to climate change and thus eligible for financial and technical support for climate change adaptation under the UNFCCC, Article 4; Paris Agreement, Article 9).
- Saint Lucia is a beneficiary of multilateral and bilateral support and, in addition, the country has signed several Multilateral Environmental Agreements (MEAs) through which technical and financial support for climate change adaptation may be sourced.
- As a member of CARICOM and the Organisation of Eastern Caribbean States (OECS), Saint Lucia benefits from important regional climate change research, information and policy efforts.
- The Climate Change Adaptation Policy (2015) outlines the potential for Saint Lucia to develop financial mechanisms to fund adaptation and mitigation actions.
- Strong global support for climate change adaptation activities.
- Availability of financial support by climate change multilateral funds (the Green Climate Fund, Global Environment Facility and the Adaptation Fund).

#### THREATS (EXTERNAL FACTORS)

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- Climate change adaptation competes weakly with other national priorities, with NAP implementation and funding receiving little national support. This is also influenced by international commitments for support to developing countries, as articulated, for example, under Article 4 of the UNFCCC.

- Low level of involvement of the private sector and other civil society groupings in participation and engagement in NAP planning.
- The global economic crisis affects climate change funding and in particular, substantive funding for climate change is mostly channelled to mitigation activities, which are deemed by donors to provide bigger impacts.
- The failure of major GHG emitters to sign and ratify MEAs.

The strengths and opportunities in this analysis indicate that Saint Lucia is in a very good position to undertake its NAP process. The analysis also shows the process is exposed to some external risks and indicates specific areas to be considered for improvement during the formulation of the NAP (for example, strengthening collaboration between interagency coordinating mechanisms).

### 13. NAP PROCESS GAPS AND BARRIERS ANALYSIS

The following gaps and barriers analysis was conducted as part of this NAP stocktaking exercise to identify issues that may delay, divert or hinder progress in formulating and implementing the adaptation plan. The information presented below will be complemented and refined after initial stakeholder consultations take place. The barriers presented refer mainly to institutional, financial and policy obstacles that should be addressed in both the short and medium term. The gap analysis followed the framework offered by the World Resources Institute for the analysis of national and subnational capacities for climate adaptation planning and implementation (Dixit et al, 2012).<sup>27</sup> This framework recommends the identification of critical gaps in the following areas:

- Assessments of available information on vulnerability, impacts, practices and sensitivity of development activities;
- Tools for the prioritization of vulnerable groups, sectors and geographic areas
- Institutional coordination for the implementation of adaptation activities
- Information management systems to facilitate collecting, processing, storing and sharing of information on adaptive capacities of the various sectors
- Climate risk management

#### 13.1. CLIMATE DATA AND INFORMATION AVAILABILITY AND ACCESS

##### *Gaps*

The most comprehensive climate change analysis conducted for Saint Lucia is that included in the Climate Change Risk Atlas, *CCRA* (CARIBSAVE, 2012),<sup>10</sup> although some other more recent climate projections were produced by Mona University. Based on the extent of the review conducted for the elaboration of this document, it is considered that the information available is reliable. However, all projections reviewed are based on SRES scenarios and seem to have relied on data more than 7 years old. While not crucial at this point, planning a broad-based modelling effort, such as that presented in the CCRA, but based on RCP scenarios and using dynamic downscaling, would be a good contribution to update Saint Lucia's basic climate change information. Other important and more pressing needs for climate data and information, which would complement the broad modelling effort suggested before

and would provide comprehensive data on climate change impacts for the NAP priority sectors, were highlighted in 2015 by the Ministry of Sustainable Development, Energy, Science and Technology.<sup>28</sup> These include:

- *Development of local climate extreme indices, together with predictability of extreme events;*
- *Development of seasonal, inter-annual and decadal predictability systems.*
- *Prediction of crop yields under various climatic conditions, using Crop Growth Simulation Models;*
- *Modelling/Mapping/Predicting Human Health Disease outbreaks*
- *Sea level rise Modelling and Coastal Flood and Erosion Mapping*
- *Assessment of Food Security and Water Security under Climate Change scenarios;*
- *Analysis of past hydro-meteorological data;*
- *Application of watershed models to simulate the flows of major rivers and to assess the impact of climate change on their flows;*

There is also a pressing need for wind hazard information based on up-to-date meteorological records and methodologies.

In addition, the existing climate change information for Saint Lucia comes from multiple sources and is scattered in documents from various institutions, which makes the search for updated information and data lengthy. Creating a platform to host the inventory of resources and data available and offering interfaces for different stakeholder groups would facilitate the access and increase the use of climate data. Two current and independent initiatives could be linked to bridge this gap. The first is a proposal to create a Common Data Storage Facility (CDSF) linked to an Environmental Information System recently prepared to facilitate MEA reporting. The second is an initiative by the 5Cs to create a national repository of digitized old and new climate and environmental information through a national node linked to a regional hub. The implementation of and coherence between these knowledge management systems would substantially improve access and use of existing critical information for the NAP.

Addressing climate data and information gaps is critical for prioritizing sectors and making decisions on adaptation measures at the national and sub-national levels. It is recommended that measures to cover the above listed data and information needs are included in the NAP roadmap.

#### *Barriers*

Financial and capacity limitations could preclude commissioning the required studies.

Acquiring the data and producing the required information may not be completed before the end of the first cycle of the NAP process. Nonetheless, since the NAP is a dynamic long-term process divided into middle-term planning cycles, the information obtained will be of use in the later cycles of national and sectoral adaptations.

## 13.2. IN-COUNTRY CLIMATE SCIENCE CAPACITY

### *Gaps*

Many of the major climate change modelling studies, reports and peer-reviewed documents analysed in the stocktaking exercise were conducted and produced by foreign scientific and development institutions and researchers (reviewed by the Government staff), highlighting a low capacity of national institutions to take the lead in climate observation and monitoring and to produce and disseminate the information the country needs. Whilst professionals with the capacities to undertake this work occupy some public offices, their obligations and work regulations do not facilitate the fulfilment of these roles on a rolling basis.

### *Barriers*

The review undertaken could not identify academic programs in hydrology, climatology or other relevant scientific fields, which could assist in the generation of basic climate change data and information in the country. The documentation revised also mentions a shortage of trained research and technical staff in these areas in key public institutions. Developing national capacities in these disciplines will take time and resources. The interest of national and regional universities and other academic institutions in opening programs to fill the identified gap is not known. It is not unusual for Masters and PhD students to engage in research in Saint Lucia (e.g. from the University of the West Indies and CERMES Programmes), in collaboration with government organisations. A concerted effort can be made to encourage such research and collaboration.

## 13.3. BASIC SOCIO ECONOMIC AND ENVIRONMENTAL DATA AVAILABILITY AND ACCESS

### *Gaps*

There are major and fundamental data and information gaps in the areas of socioeconomic conditions and natural resources in Saint Lucia. These gaps preclude the identification of vulnerable groups and vulnerable geographic areas, fundamental for decision-making and prioritization in the NAP process. Important needs to fill the gaps and weaknesses in terms of data and information for these areas include:

- A comprehensive water resources inventory and assessment, including groundwater resources
- Digital hydrogeographic data sets
- An updated forest inventory
- A comprehensive marine habitats survey
- Digital flood and erosion maps
- Landslide hazard maps at high resolution (the current maps are useful but of low resolution, which does not allow for careful targeting of adaptation interventions)
- Updated land use and zoning plans

The existing socioeconomic and environmental information of relevance for the NAP process is scattered. There have been calls to integrate and consolidate it in a single site, managed by a single institution and to make sure it is updated frequently. This option would certainly help researchers, technical officers and policy makers, as well as the private sector and the public at large.

### *Barriers*

Financial and technical constraints may limit the development of all the necessary studies and the establishment of the climate adaptation-information and knowledge platform. Additionally, proactive contributions of data, information and exchange from all the sectors should be secured, to ensure that the platform facilitates cross-sectoral planning and coordination. This may *per se* be a constraint.

## 13.4. COMMUNICATION OF CLIMATE CHANGE INFORMATION

### *Gaps*

In general, Saint Lucia's population perceives tackling climate change as a government responsibility and considers that the information disseminated is insufficient. Simultaneously, the population is largely unaware of the efforts made by the government to address climate change issues.<sup>32</sup> Lack of awareness of climate change impacts at the policy-making level has also resulted in key sector policies, such as the National Agricultural Policy 2009-2015, to view these impacts as "external factors beyond their scope". Decisions affecting funding may also result from choosing between meeting basic public needs and funding other responsibilities with limited budgets.

### *Barriers*

Various wide-reaching climate change awareness raising campaigns and trainings have been conducted in Saint Lucia, and though showing a satisfactory level of success, these efforts need to be scaled-up. An increased level of understanding of climate change-related risks will contribute to overcoming the current constraints in mainstreaming adaptation into development policy and in spurring local action. The Climate Change Adaptation Policy (2015) offers various options to overcome this situation, including the establishment of a climate change platform that offers the general public important and basic information presented in a simple and effective way. The slow response of the education sector to new requirements is a barrier for scaling-up climate change learning in schools.

## 13.5. NATIONAL AND SECTORAL POLICY

### *Gaps*

- Saint Lucia has made some progress in mainstreaming climate change into policy and mid-term development planning processes and budgets. However, the efforts made have not been consistently successful across all sectors.
- While there have been several training efforts in this regard, there are no specific mechanisms or guidelines for mainstreaming climate change adaptation into national policies. Although guidelines for developing sector adaptation plans under the NAP Global Network Initiative are expected to bridge this gap.
- Some key policies, formulated several years ago, still rest without formal approval. Policy instruments relevant to the current national context and the NAP process include, among others:
  - Land development regulations
  - Land use and zoning plans;
  - Housing policy or settlement strategy;

- Policies to promote the adoption of commercially available water conservation technologies for use in heavy water using sectors
- Policies to regulate coastal development (currently being updated)
- Environmental management regulations (e.g. the Draft Environmental Management Act)
- Pollution regulations (currently being finalized)
- Draft Environmental Impact Assessment (EIA) regulations
- Wildlife protection regulations

#### *Barriers*

- Policy processes tend to take a long time in Saint Lucia.
- Policy enforcement is often weak.
- The missing policy instruments listed as gaps require sound climate information, which may be weak, outdated or non-existent.

Strategies to strengthen mainstreaming into development policy can be developed as part of the NAP, taking into consideration the inputs from the stakeholder consultations and the strategic position of the members of the NCCC. Engaging critical stakeholders from the beginning of the NAP process and during key stages of sectoral NAP development will play a major role in adaptation mainstreaming at all levels, as mandated by the CCAP.

## 13.6. INSTITUTIONS, ACTORS AND ACTIONS

#### *Gaps*

- Weak collaboration between the NCCC and other sectoral coordinating mechanisms.
- The knowledge and experience of NCCC members on the Committee does not necessarily translate into mainstreaming or integration of climate adaptation considerations in their Ministries as part of their routine work.
- Outdated socioeconomic information currently hampers the identification of vulnerable groups
- Insufficient involvement of Saint Lucia's civil society and private sector in the implementation of climate adaptation policy and programs

#### *Barriers*

- Public sector bodies have narrow sectoral mandates, which limit cooperation between agencies and ministries.
- Low capacity of the NAP coordinating mechanism, the National Climate Change Committee (NCCC) and low connectivity between the work of NCCC members on the Committee and their respective daily work.
- Low capacity of public and private financial institutions to evaluate and participate in the development and implementation of climate change projects.

## 14. RECOMMENDATIONS

Based on the documentation reviewed, the following recommendations are made to move the NAP process forward. These recommendations will be updated after the first stakeholder consultations.

**Improving the knowledge base for climate change adaptation in Saint Lucia** by developing local climate extreme indices; yield projections under a wider range of climate scenarios and for a wider range of crops; modelling and mapping coastal flooding and erosion under sea level rise; modelling and mapping disease outbreaks; assessing climate change impacts on watersheds and river flows and developing wind hazard information. Beyond future climate data and information on sectoral climate change impacts, it is fundamental to generate information on the country's current socioeconomic conditions and natural resources. Updated water, forest and marine resource assessments are needed; digital high-resolution landslide and flood risk and erosion maps, updated land use maps and a new poverty assessment would allow identifying and mapping of vulnerable groups. The latter is urgent for planning targeted adaptation measures.

While some current and planned projects address some of these information needs, funding the bulk of assessments and studies required will imply a large investment. A review of sectoral budgets can help identifying public funding opportunities; private and international development funding can be sought to cover the additional costs.

### **Improving access to climate, socioeconomic and environmental data**

Creating a portal to centralize the necessary climate, environmental and socioeconomic data as well as mapping resources and reports relevant to the NAP process would facilitate access to the existing information, which is scattered and to add in a coherent and organized manner the new information generated during the NAP process and other adaptation initiatives. The portal could offer interfaces for dissemination of climate change-related information that is useful to various audiences.

**Investing in climate change communication and awareness raising efforts** is necessary to expand the coverage of previous and ongoing initiatives and to improve the basic understanding of climate change challenges and adaptation options at all levels of society. These efforts would be more effective if they receive guidance from science and social communicators and are integrated as short and long-term NAP activities. Further, a 2016 study on climate change knowledge, attitudes and practices/behaviours<sup>32</sup> indicates an important level of interest from Saint Lucia's population in having access to more climate change information (91.2% of survey respondents); the study also signals that tackling climate change is perceived as a government responsibility and that awareness of government initiatives related to climate change is low. Important recommendations from the study, which can be also adopted in the NAP are to address knowledge gaps through communications-based interventions and to increase the visibility for climate change actions undertaken by the government (increasing government campaigns and/or collaborations with community-based organizations to tackle climate challenges).

**Building in-country climate change information generation capacity.** This is a long-term objective for the NAP that involves the engagement of universities and research institutions for the development and strengthening of academic scientific programs in areas of high relevance for the NAP (e.g. hydrology,



climatology, marine biology, etc.). In the short-term, capacity could be built through the provision of scholarships for interested students to register in recognized programs in these areas in foreign universities. Internships and exchanges could also greatly benefit existing technical officers. Building in-country capacity in scientific disciplines of direct relevance to climate change adaptation will reduce dependence on foreign expertise and accelerate and improve the generation of information needed at each decision-making level and fit to the national context. It could also help in transferring the responsibility of assessing and analysing climate, natural resources and socioeconomic conditions beyond government structures, increasing national ownership of the NAP process.

**Alignment of the NAP Process with medium and long-term development planning.** Various policies that are currently under formulation or revision could be used as opportunities (entry points) for the NAP to mainstream climate change adaptation at the national level and into some sectors in the short and middle-term. The mechanism to incorporate national and sectoral NAP priorities into these policies is still to be defined. Designing general guidelines for mainstreaming adaptation into sectoral policies and planning processes, such as the guidelines for the formulation of SASAPs planned by the NAP Global Network could help in this effort.

**Ensuring an enabling policy environment.** Accelerating the pending formal approval of draft policies and regulations that are directly relevant to the NAP would be a critical step to facilitate the formulation of sectoral NAPs and the prioritization of NAP activities. This could also help to integrate adaptation considerations into the relevant sectoral budgets. Taking into account that policy approval processes take a long time in Saint Lucia, this could be considered a mid-term to long-term objective for the NAP process.

**Strengthening the NAP coordination mechanism.** The Climate Change Adaptation Policy calls for strengthening the NCCC. Assessing and addressing the technical capacity and membership needs of the NCCC to drive the NAP is a short-term priority of the process. It will help ensure all development and society sectors are engaged in the iterative decision-making; create shared ownership of the process and provide opportunities for stronger inter-agency and inter-sectoral collaboration. The participation of members of the other sectoral coordinating mechanisms in the NCCC could be taken into consideration as a strategy to strengthen collaboration and identify wider opportunities for mainstreaming climate change adaptation into sectoral development policies and initiatives. Encouraging the active participation in the NCCC of the private sector, civil society and vulnerable groups is recommended to ensure their interests and needs are reflected in the NAP.

## 15. NEXT STEPS

This stocktaking and climate report lays the knowledge basis for Saint Lucia's NAP process. It highlights existing strengths and opportunities and defines information and capacity gaps.

The immediate next step is to identify the thematic areas of the prioritised sectors addressed by the NAP; to establish the institutional roles and responsibilities for the process and timelines, and to agree on the strategic actions and sequential steps for development and implementation. These will all be reflected in a NAP roadmap (strategy document), which will also include a plan to address identified

capacity gaps. The NAP roadmap, inclusive of a capacity development plan is the next output of this consultancy. In addition, stakeholder consultations will be held for the elaboration of the sectoral climate change adaptation strategies and investment plans for the water sector and the agriculture and fisheries sectors as well as for the elaboration of the NAP communications strategy.

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## ANNEX 1. SPCR BLUEPRINT FOR CLIMATE CHANGE ADAPTATION IN SAINT LUCIA

### INTERVENTIONS AND ACTIONS PROPOSED FOR CLIMATE CHANGE ADAPTATION AND RESILIENCE BUILDING IN SAINT LUCIA'S AGRICULTURAL SECTOR.

**The following interventions and actions are proposed to ensure security and safeguarding of food provisioning.**

*Identify, assess and demonstrate production enhancement and resource management measures to extend food availability (2011-):*

- Alternative/ climate-resilient agricultural production technologies
- Drought/flood tolerant crops – pilot demonstrations
- Alternative fisheries – species and production systems

*Establishment of germplasm banks for indigenous and climate resilient crops (2012-2015)*

*Develop and facilitate implementation of formal and informal mechanisms for value-added production (2011-):*

- Agro-processing – national or community facility; cottage industry

*Improve food storage and availability:*

- Support upgrading of food storage facilities or establishment of new facilities
- Improve national emergency food stores – satellite warehousing
- Food production/ landscaping with indigenous drought-tolerant plants; into a new development initiative or area (southern or north/east quadrant)

*Establish and maintain patterns of sustainable land use and management that protect agricultural productivity and food security:*

*Promote sustainable land Management practices (2011-):*

- Soil and Water Conservation Programmes
- Implementing GAPs/ organic agriculture and Certification Programmes for sustainable land use in agriculture

*Facilitate implementation of Land Bank Initiative to promote sustainable land management through management of land assets (2011-)*

*Support for updating of regulatory protocols to manage/ Protected Areas and regulatory mechanisms for existing PA15s, including SMMA, CAMMA, PMA, PSEPA (2011-)*

#### **PROJECT CONCEPT NOTES**

The SPCR blueprint for national climate change adaptation provides complete concept notes for the following potential future projects for the agriculture sector.

**1. Program Area: Increased Climate Resilience through Improved Food Provisioning and Food Security**

*Project Objectives:* (i) Improve food security from national sources as global food sources begin to decline because of the impact of global climate change; (ii) Ensure that vulnerable groups have access to food that is affordable at all times; (iii) Ensure that food supplies belonging to both the public and private sectors are well secured and decentralised so that food is readily available to communities in the outlying districts immediately following a hazardous event.

*Project Activities:*

- Scaling up the use of water efficient irrigation systems to increase production acreages, thereby increasing food supplies even during the dry seasons;
- Scaling up the use of culturally sensitive and appropriate technologies – use of greenhouses; new cropping systems and technologies; soil and water conservation methods, etc. - to increase food production; and
- Decentralising and climate proofing NEMO's warehousing facilities and the private sector's supply chain infrastructure

Total Duration: 3 years

Implementing Agency: Ministry of Agriculture, Lands, Forestry and Fisheries (MALFF) in conjunction with Relevant Public Sector Ministries/Agencies and Private Sector

2. *Project Title:* Enhancing the capacity of The Ministry of Agriculture – Pest Control and Surveillance Services

*Project Objectives:* To automate the processes of the Plant Quarantine Department to enhance capacity in pest surveillance and identification

*Estimated Cost:* USD 100K

*Total Duration:* 3 months

*Implementing Agency:* Ministry of Agriculture, Lands, Forestry and Fisheries.

## INTERVENTIONS PROPOSED FOR THE ADAPTATION OF SAINT LUCIA'S INFRASTRUCTURE TO CLIMATE CHANGE

*Program:* Climate Change and Ports

Consists of the inventory and assessment of existing coastal engineering structures towards validation of various coastal engineering solutions, with the purpose of scaling up best practice in other locations around the island and at the regional level. Design guidelines and standards will also be an output that will inform the coastal engineering process in Saint Lucia, through the authority of the Development Control Authority

*Projects:*

- Bathymetric survey to all ports of entry. Total Cost: USD 250K. Implementing Agency: Saint Lucia Air and Sea Ports Authority (SLASPA)
- Dredging at seaports. Total Cost: marinas USD 1.5M (every 5-10 years) + USD 2.25M Re. Port Castries (every 3-4 years). Implementing Agency: SLASPA

- Undertake study to assess impact of Sea Level Rise on all facilities of SLASPA. Preliminary cost: USD 100K. Implementing Agency: SLASPA
- Elevation of runways to adapt to sea level rise and flooding. Total Cost: TBD. Implementing Agency: SLASPA
- Re-designing of drainage at all ports and installation of pumps to combat sea level rise. Total Cost: USD 3.5M. Implementing Agency: SLASPA
- Re-designing of port infrastructure – reinforcement for more intense hurricanes and storms. Total Cost: USD 4M. Implementing Agency: SLASPA
- For the HIA Redevelopment Project – necessity for utilization of rain water harvesting at facility; possibly at GFLC Airport and Castries Seaport. Total Cost: USD 1.6M. Implementing Agency: SLASPA
- Implementation of solar cooling at HIA, GFLC, and Castries Seaport. Total Cost: USD 3.43 M. Implementing Agency: SLASPA

## INTERVENTIONS PROPOSED FOR CLIMATE CHANGE ADAPTATION IN SAINT LUCIA’S HEALTH SECTOR

*Facilitate the design and/or upgrading and implementation of national programs for pest and disease control (2011-):*

- Public health – monitoring of vector and water borne diseases
- Animal and plant health – pest and disease monitoring – including introduction of Alien invasive species

*Facilitate the design of a national program for addressing psycho-social needs of developing coping mechanisms to respond to climate events related trauma - Build on MoH mental wellness program*

### **PROJECT CONCEPT NOTES**

**1. Project Title:** Effective Surveillance and Control of Schistosomiasis in Saint Lucia

**Project Objectives:** (i) determine the prevalence of vector snails in Saint Lucia; (ii) map areas where vector snails are present and the potential for transmission of schistosomiasis; (iii) train officers in the identification and surveillance of vector snails.

**Activities and Tasks:** Activities should include, inter alia:

- Preliminary survey/assessment by consultant to determine the prevalence of vector snails in Saint Lucia
- Training of officers in the identification and surveillance of vector snails
- Mapping of sites where vector snails are present

**Total Cost:** USD 50K

**Total Duration:** 10 weeks

**Implementing Agency:** Ministry of Health

2. *Project Title:* Enhancing the Water Quality Surveillance Program of the Department of Environmental Health

*Project Objectives:* Decrease of water related diseases, mortality rate and potential epidemics.

*Activities and Tasks:* Activities should include, inter alia:

- Training (water and waste water quality analysis and sampling).
- Procurement of new equipment to facilitate water and waste water quality analysis and sampling

*Total Cost:* US16K

*Total Duration:* TBD

*Implementing Agency:* Ministry of Health

3. *Project Title:* Short-Term Rodent Control Project

*Project Objectives:* (i) Reduce rodent population in nine (9) major towns and villages in Saint Lucia; (ii) ensure sustainability of the programme through existing town village councils; (iii) Educate the public about measures that may be taken to reduce the likelihood of contracting rodent-borne diseases, particularly in the aftermath of an extreme weather event.

*Activities and Tasks:* Activities should include, inter alia:

- Sensitization of key stakeholders
- Implementation of control strategies
- Consolidation (Stakeholders assuming responsibility of control)

*Total Cost:* USD 81,038.00

*Total Duration:* 6 months

*Implementing Agency:* Ministry of Health

## INTERVENTIONS PROPOSED FOR CLIMATE CHANGE ADAPTATION IN SAINT LUCIA'S WATER SECTOR

**Measures to rehabilitate, restore or establish water supply systems to augment national water supply include:**

*Formulation of a 10 -25 years national water resources plan (Water Master Plan) – including water quality monitoring*

*Facilitation of the Water Reform Project implementation:*

- Alternative water sources exploration
- Ground Water Prospecting

*Construction of Emergency Water Stores - decentralized tank farms or micro dams in strategic communities & Refurbishment/ replacement of water abstraction.*



*Develop and implement specific rainwater harvesting interventions for targeted vulnerable households, businesses, communities, building on and complementing existing initiatives, and integrating with the broader National Reconstruction Plan and Water Master Plan (2011-)*

*Promote water recycling and water conservation measures in development initiatives:*

Action:

Collaborate with developers in the establishment of water recycling and conservation measures in new residential, tourism and commercial projects, as demonstration sites (2011-)

*Collaborate with relevant stakeholders to further development of enabling environment for implementation of the IDP/EMF approach to national development:*

*Facilitate the preparation of climate-resilient integrated development plans using the watershed as a unit of analysis including (2011-2015):*

- National Physical Development Plan
- Regional Development Plans Watershed Management Plans
- Local Area Development plans
- Land Use Plans and Coastal Zone Management Plan

*Implement Integrated Watershed Planning:*

- Pilot Project in a key watershed in e.g. enhancing climate resilience of North East Quadrant development plan to demonstrate integrated watershed Planning/(2011-2013)
- Support implementation of IWRM Roadmap initiatives (2012)
- Facilitate implementation of Watershed Management Plans and Riverbank Assessment and Rehabilitation Strategy (2012-2016)

## INTERVENTIONS PROPOSED FOR SUPPORTING THE ADAPTATION OF SAINT LUCIA'S NATURAL RESOURCES TO CLIMATE CHANGE

### **Measures for rehabilitation, restoration and management of degraded ecosystems**

*Facilitate implementation of measures for rehabilitation and restoration under:*

- New Forest Management Plan
- National Reforestation and Watershed Rehabilitation Programme
- Coastal Zone Management Strategy

*Maintain the integrity and value of terrestrial and aquatic environments:*

- Support implementation of the National Action Plan and Strategic Action Plan (NAPSAP) to Combat Desertification and Drought in Saint Lucia: Studies to identify priority areas for rehabilitation:
- Utilize community-based management approaches, incorporating sustainable land management practices, and piggy-backing on integrated water management, to undertake physical measures to rehabilitate degraded lands, including riverbank and slope stabilization in degraded priority watersheds inter alia:
- Agro-forestry cropping systems – (traditional and modified)

- Management of Riverbank Buffer Zones and Ridge Reserves (RBBZ) and Protected Forest Areas (PFA)

*Introduce environmental best practice in the sustainable land management approach to engender the adoption of conjoined environment/land/water management approaches*

- Support community SLM initiatives in establishment of demonstrations of Best Practice in SLM – support for SLM project (2011-)

#### **PROJECT CONCEPT NOTES**

*Project Title:* Coastal Stabilization of Pigeon Island to Prevent and Mitigate Coastal Erosion Caused by Climate Change

*Project Objectives:* (i) Restore the sections of the south-western coastline of the Pigeon Island National Landmark that were eroded/lost to the effect of storm surges and wave action; (ii) Stabilize the south-western shoreline.

*Activities and Tasks:* Activities should include, inter alia:

- Reclamation of land lost to coastal erosion.
- Beach nourishment to lengthen Beaches 1 and 2.
- Rehabilitation of existing groynes.
- Placement of two partially emergent offshore breakwaters.

*Total Cost:* USD 1,718,963

*Total Duration:*

*Implementing Agency:* Saint Lucia National Trust

#### **Interventions to safeguard community and livelihood assets**

- Establish mechanisms to facilitate the relocation of housing/settlements/ building/infrastructure vulnerable to climate-induced hazard (i.e. sea level rise)
- Integrating climate resilience into building and development practices

*Climate resilient coastal zone planning and development promotion*

Review of methodology for determining coastal setbacks and facilitating the implementation of these new setbacks into the development planning process in the context of sea level rise, Assessment of existing coastal engineering structures and formulation of design guidelines/ standards in the context of storm surge, Completion of coastal habitat mapping activity (2011-2013)

*Promote best practice in climate resilient coastal zone planning and development*

- Facilitate re-design and modification of critical coastal infrastructure, such as ports, to adapt to storm surge, coastal flooding and sea level rise based on SLR modelling
- Facilitate implementation of community adaptation measures including artificial reefs, silt traps at river mouths MALFF; MCWTPU; MPDE-SDED Target B 4. Risk Reduction to Climate Related

#### **PROGRAM CONCEPT NOTE**

*Program Area: Building Climate Resilience through Sustainable Land Management*

*Project Objectives:* the PPCR Component will be to (i) Reduce community vulnerabilities to rain induced landslides;(ii) Build national capacities for landslide rehabilitation through inter alia, scaling up pilot activities that had been undertaken in river bank stabilization and integrated watershed management planning through SFA 2003; and (iii) Provide low interest rate loans to communities and the private sector for undertaking landslide rehabilitation and associated works in sustainable land management.

- Activities to demonstrate sustainable land management through integrated watershed management, reforestation, river bank management; and integrated development planning for watersheds.
- Provision of funds through the Climate Adaptation Loan facility – which will be set up with Concessional Loans - for vulnerable groups and communities, in collaboration with the private sector, to access low interest capital to undertake necessary interventions on landslide rehabilitation.

*Total Cost:* TBD

*Total Duration:* 3 Years

*Implementing Agency:* Relevant Public and Private Agencies and CSOs

## INTERVENTIONS RELATED TO SCIENTIFIC DATA AND INFORMATION

*Establish and implement effective information management systems for appropriate assessment and monitoring of issues, trends and impacts of climate change:*

- Expand data network for climate change beyond GeoNode Phase I activity
- Promote a regional GeoNode and CHM as data sharing tool, where access can be gained to data from regional agencies) is also important in the longer term
- Facilitate collaboration among relevant agencies in the establishment of comprehensive databases of climate change indicators parameters, including available information on assessment of impacts, identification of root causes and vulnerability mapping in order to set a baseline for and establish a system for CC Research and Systematic Observation (RSO)
- Establish security protocols and procedures for safeguarding of databases and information systems at all levels and ensure requisite approval procedures for granting access to such information are followed

*Ensure knowledge and information on climate change issues and adaptation measures and benefits to be derived are accessible and utilized by state and non-state parties and civil society to advance socio-economic development:*

- Facilitate regional level programs for data sharing; - vulnerability mapping exercise; support to hazard mapping; data acquisition using top-of-the-line-technology, e.g. LIDAR; PPCR regional clearinghouse mechanism (CHM) – Note: hazard and events mapping can be considered for regional application, although the immediate need in the context of Saint Lucia must be emphasized.
- Enable participation in 5Cs Clearing House Mechanism and Information Management System for climate change for dissemination of information on trends and impacts of climate change,

adaptation measures, policies and plans, among others, to promote effective CC resilience building in pursuance of sustainable development

- Produce and disseminate information materials to relevant target groups inclusive of vulnerable groups, civil society, public and private sector

*Build capacity for Research and Systematic Observation to guide climate adaptation/resilience building:*

- Facilitate the establishment of national and community-based Environmental (Meteorological and Hydrological) Monitoring Networks to encourage and facilitate contributions to information management systems; provision of training, equipment and instrumentation for development and maintenance of network;
- Develop protocols for data collection and information sharing
- Establish systems for assessment, monitoring, research, etc. on climate change
- Facilitate the operations of the National Council for Science and Technology to coordinate research activities within a broader national environmental framework 2012 - onwards Monitoring and assessment systems established within broader national environmental framework SDED-PPCR; MPDE-NEC/SDED; NCSTD; MALFF – DoF; Other Government/ national agencies
- Establish procedures and guidelines for Green Accounting – in particular economic valuation of land resources to inform decision making - Determine the opportunity cost of no-regrets options

*Create formal and informal knowledge exchange strategies and mechanisms to facilitate access to local and traditional knowledge and practices and promote benefits to be derived – documentation, awareness, etc:*

- Develop protocols for access and use of traditional knowledge and practices
- Facilitate the documentation and dissemination of local and traditional knowledge and practices associated with adaptive capacity and resilience building utilising CC database, GeoNode platform and CHM

*Design and implement systems to identify and assess negative social and environmental impacts of natural and man-made hazards including those caused by development activities (tourism, agriculture, industry) and minimize harmful effects of these sectors on national ecosystems and to increase ecosystem/land resilience to such hazards:*

- Build on existing methodologies such as the Riverbank Assessment methodology to develop and adopt appropriate methodologies for assessment of land degradation and drought monitoring
- Conduct assessment of disaster risk and hazards with respect to land degradation and drought– to enhance Disaster Management Planning
- Enhance/develop and implement national Disaster Management Plans.

*Capacity building to provide timely, relevant and quality data for resilience building of operations in relation to climate change impacts:*

- Conduct baseline studies utilizing SNC vulnerability and adaptation assessments with respect to climate change indicators at national and sector level to derive appropriate predictive models
- Develop systems/predictive models for early warning for climate-related phenomena – floods, drought, and storm surge.
- Combine various national initiatives aimed at data capture and vulnerability and hazard mapping to establish systems for data capture and analysis for vulnerability and hazard mapping of resources and hazards relating to landslides, flood risks, drought, and other climate impact.
- Provide equipment and resources to facilitate implementation of systems for data capture and analysis using available technologies such as GIS for vulnerability and mapping; Include GIS training to improve human resource.
- Utilize environmental monitoring networks to establish systems at the local/community level for early warning re: storm surge, floods, landslides drought, etc.
- Deepen relationship and use of CIMH to approach drought triggers on a regional level.

### **PROJECT CONCEPT NOTES**

*Program Area:* Data Management

*Project Title:* Events Mapping – Hurricane Tomas

*Project Objectives:* To produce an Event Map of Hurricane Tomas and comprehensive descriptive database using scientific methods. A comprehensive spatial and descriptive database of landslides and floods resulting from Hurricane Tomas; mainstreaming of events mapping in disaster planning and locally built capacity in events mapping using GIS and related technologies.

*Estimated Cost:* USD 150K

*Project Duration:* 9 months

*Implementing Agency:* Ministry of Physical Development, NEMO27 and local Disaster Committees, Ministry of Works and National Reconstruction and Development Unit.

*Project Title:* Enhancing the capacity of the Ministry of Physical Development

*Project Objectives:* Enhanced capacity of the Physical Planning and Survey and Mapping Departments in the management of digital geo data.

*Estimated Cost:* USD 200K

*Project Duration:* 1 year

*Implementing Agency:* Ministry of Physical Development – Physical Planning; Survey and Mapping.

*Project Title:* Enhancing the capacity of WASCO28 in the use of GIS technology

*Project Objectives:* Improving the Operations of WASCO's distribution and supply system through the use of GIS technology

*Estimated Cost:* USD 260K

*Project Duration:* 18 months

*Implementing Agency:* WASCO

*Project Title:* Development of Landslide Hazard Maps based on newer comprehensive Hazard Models

*Project Objectives:* To develop comprehensive and high-quality hazard maps at a useable scale to provide strategic guidance to land planning

*Estimated Cost:* USD 600K - USD 1M

*Project Duration:* 1-3 years

*Implementing Agency:* Ministry of Physical Development and Ministry of Communications, Works, Transport and Public Utilities

*Project Title:* Enhancing the capacity of the Fire Department to address climate-induced fires

*Project Objectives:* To improve the capacity of the Fire Department to respond to Climate and hence man-made fires

*Estimated Cost:* USD 100K

*Project Duration:* 1 Year

*Implementing Agency:* Fire Department

## ANNEX 2. NAP-RELEVANT SECTORAL POLICIES, STRATEGIES AND ACTION PLANS

### **The National Hazard Mitigation Policy (2007).**

The Hazard Mitigation Policy includes Climate Change as a hazard and states that the Government of Saint Lucia, in collaboration with its social partners will, inter alia, encourage non-coastal development; adopt integrated natural resources management; adopt measures to protect coastal areas and increase resilience of coastal ecosystems and resources; develop a comprehensive national land use and management plan which will incorporate natural hazard and climate change concerns and will guide the location of developments in the coastal zone; develop and implement poverty reduction programmes for coastal communities which will be built around sustainable resource use and management. The government will accelerate the implementation of the National Land Policy; seek to develop or strengthen a national adaptation strategy for the forestry sector to address climate-related impacts.

### **The National Land Policy**

The purpose of the land policy is to “provide policy guidelines for land use and management in Saint Lucia, in order to effectively strike a balance between environmental integrity versus successfully meeting the social and economic needs of the increasing population. The guidelines emphasize sustainability, while still considering the wide range of demands placed on Saint Lucia’s limited resources.

The overall land use and sustainable development goal is to create a system which focuses on conservation and sustainability, while still providing clear accessibility to the people of Saint Lucia.

The strategic objectives of the Policy are to: Enhance the contribution of land to economic development, including poverty reduction, food security, and employment and revenue generation opportunities for all citizens; Facilitate the provision of adequate public services to all, notably in health, education, public utilities, recreation and transportation; Provide opportunities for all citizens to have access to adequate shelter; Minimise the risk of loss of life, degradation of land resources and other assets from the impacts of hazards and disasters; Establish and maintain patterns of land use and development that are responsible and sustainable, and that maintain options for future uses; Encourage the development and functioning of efficient land markets; Conserve the country’s biological diversity; Support the rehabilitation, restoration and management of degraded lands; Maximize the effectiveness and efficiency of land management institutions, systems and procedures; Provide a framework for the management, resolution or avoidance of conflicts related to land and its uses; Develop and promote a positive cultural relationship between people and the land.

### **The National Water Policy (2004)**

The objectives of the National Water Policy are:

- To foster the adoption of an integrated approach to the management of water resources.
- To enable people to lead healthier and more productive lives through improved management of water resources and increased and sustained access to water supply and sanitation and water-based services.
- To increase and sustain the contribution made by water resources to the development of the agriculture and food sector.
- To increase and sustain the contribution made by water resources to the development of the industrial sector.
- To increase and sustain the contribution made by water resources to environmental sustainability and the conservation of biological diversity.
- To ensure efficient and equitable allocation of water among competing uses.

The Water Policy identified the following four challenges to the sustainability of water resources management in the country:

- Financial Sustainability
- Institutional Sustainability
- Operational Sustainability
- Technical Sustainability

### ***Water Resources Management Agency Strategic Plan 2012 to 2017***

The vision of the Water Resources Management Agency Strategic Plan is, “To manage the water resources of Saint Lucia in an efficient, sustainable and equitable manner that is consistent with the social, economic and environmental needs of current and future generations as well as with the country’s regional and international obligations.” The mission statement, “The Water Resource Management Agency is committed to the management of Saint Lucia’s water resources. Adhering strongly to the principles of integrated water resources management, the Agency, which will comprise a cadre of committed and scientifically competent personnel, will utilise the most appropriate technology and engage in participatory approaches and strategic partnerships to enhance collaboration among public and private sector, and civil society interests in promoting the sustainability of water resources.”

The overall goal of the strategic plan is to “strengthen the capacity of the WRMA to fulfil its mandate.” The four strategic objectives are:

1. Strengthening the WRMA Institutional Framework for increased coordination and implementation of its mandate;
2. Water Resources Planning and Management;
3. Communication, Outreach and Advocacy; and
4. Monitoring and Evaluation.

### **The Saint Lucia Forests and Lands Resources Development Department Strategy 2015-2025**

This is an overarching strategy, covering five individual strategies, each with an associated management policy and 10 year goals. The individual strategies are related to:

1. Maintaining healthy ecosystems and thriving species.
2. Ensuring sustainable flows of products that support both local economies and biodiversity conservation.
3. Protecting water supplies, soils and coastal zones and ensuring resilience to climate change.
4. Promoting awareness, visits to the forest reserves and cultural enrichment.
5. Strengthening the organizational structure, working practices and staff capacity of the Forestry Department to implement strategies 1 to 4.

### **The Saint Lucia National Energy Policy (2010)**

The Policy seeks to promote:

- Procurement of least cost energy supplies through sector liberalization and private sector participation;
- Energy security and reliability;
- Diversification of the energy supply base;
- Exploitation of indigenous renewable energy resources;
- Efficiency in energy production, conversion and use;
- Reduction of adverse environmental effects and pollution;
- Implementing appropriate pricing policies; and
- Establishing an appropriate regulatory framework.

### **National Environmental Policy and Strategy (NEP/NEMS) - awaiting adoption**

The vision of the revised National Environmental Policy and Management Strategy is, “Saint Lucia is a beautiful, clean, verdant and sustainably developed island state which respects and enhances the natural and built environment and conserves and shares the world’s treasures with genuine appreciation and stewardship by all.”

The mission statement is, “The Government of Saint Lucia will lead the process of achieving sustainable development by:

- Facilitating an integrated and participatory approach to governance
- Promoting environmental management and innovative technologies
- Building human and financial capacity to monitor and manage environmental risk
- Promoting sustainable consumption and production
- Building capacity for climate change adaptation
- Demonstrating the value of building a green economy.

The seven outcomes which will be pursued for the period 2014-2019 are:

1. Improved policy, legal regulatory and institutional framework for sustainable development.
2. Diversity and productivity of ecosystems and ecological processes maintained.
3. Improved management of the natural and built environment, with a focus on adapting to, and mitigating the impacts of, climate change and reducing the risk of disasters.
4. Improved systems for managing waste and controlling pollution so as to enhance environmental health for optimised quality of life for citizens, and protection of terrestrial and marine resources, and of the atmosphere.



5. Improved generation and manage scientific data for establishment of a knowledge platform to underpin environmental management initiatives.
6. Improved knowledge and awareness, attitudes and behaviours among all sectors (private, government and civil society).
7. Integrated management and development of marine and ocean resources.

The seven strategic objectives of the revised Management Strategy (NEMS) are:

- A policy-driven and pro-active approach to environmental management will be employed, within a framework of integrated development planning, and with an improved and more effective policy process;
- Full integration of environment and development objectives, concerns and actions at the macro and micro levels;
- Appropriate institutional arrangements developed, with institutional collaboration, social participation and partnerships, and with the sharing and decentralization of environmental management responsibilities whenever desirable and feasible;
- Improved capacity to manage the environment and the various processes that impact on it to be built at all levels within government, the private sector and civil society;
- Appropriate, fair, effective and efficient instruments of environmental management to be developed and used, including financing mechanisms and technologies;
- Cultural and attitudinal change to be promoted, leading to a greater sense of ownership of and responsibility towards the environment, an awareness of issues and an understanding of causes and possible solutions;
- Enhanced knowledge of environmental management to be promoted. Improved access to and use of information, allowing knowledge to serve as the basis for environmental policy making and programming.

Outcomes expected between 2014 and 2019 are:

1. Improved policy, legal regulatory and institutional framework for sustainable development.
2. Diversity and productivity of ecosystems and ecological processes are maintained.
3. Improved management of the natural and built environment, with a focus on adapting to, and mitigating the impacts of, climate change and reducing the risk of disasters.
4. Improved systems for managing waste and controlling pollution so as to enhance environmental health for optimised quality of life for citizens, and for protection of terrestrial and marine resources, and the atmosphere.
5. Improved generation and manage scientific data for establishment of a knowledge platform to underpin environmental management initiatives.
6. Improved knowledge and awareness, attitudes and behaviours among all sectors (private, government and civil society)
7. Integrated management and development of marine and ocean resources.

**The Environmental Management Bill (2014 Revised Draft – Awaiting enactment)** The purpose of the Bill is to provide a framework for environmental management in Saint Lucia. It structures and allocates public administrative responsibilities for environment management.

**The National Food and Nutritional Security Policy and Action Plan (2013)**, was designed to complement the Food Production Action Plan and focuses on poverty and food security, with primary objectives to reduce the vulnerability of poor residents and communities to food insecurity. It includes an assessment of existing demographic and socioeconomic conditions as they relate to food availability and accessibility. Policy instruments and the institutional framework for implementation are also provided, with information on existing capacity to address food security. An action plan is also included to aid implementation. **This document includes a significant climate change component**; specifically, it assesses the impact of climate change on food security and potential interventions to increase the resilience of the food sector to climate change. Climate change is considered a critical priority area in the plan.

**The Food Production Action Plan (2014) offers a series of interventions** to increase production of nutritionally rich foods some of which may also have export potential. **Although it does not specifically address climate change, the goals of the plan and some of the measures it offers for sustainable food production are compatible with the measures supported by the CCAP. The goals of the Action Plan are:** 1) A reduction in the food import bill by 10 percent in the first two years and 30 percent in the subsequent years; 2) the provision of sustainable and long-term employment in agriculture; 3) Stable food prices domestically as a result of keeping imports low; 4) Diversification of the agricultural sector. This plan is to be implemented with the collaboration of various ministries and other stakeholder groups.

## ANNEX 3. COMPOSITION OF SAINT LUCIA'S NATIONAL CLIMATE CHANGE COMMITTEE

Organisation	Department / Division / Section / Unit
Ministry of Education, Innovation, Gender Relations and Sustainable Development	Sustainable Development and Environment Division (Chair/Secretariat) Biodiversity Unit Sir Arthur Lewis Community College
Ministry of Agriculture, Fisheries, Physical Planning, Natural Resources and Cooperatives	Department of Agriculture Department of Forestry Department of Fisheries Physical Planning Section
Ministry of Health and Wellness	Environmental Health Division
Ministry of Tourism, Information and Broadcasting	
Ministry of Finance, Economic Growth, Job Creation, External Affairs and the Public Service	
Office of the Prime Minister	National Emergency Management Organisation
National Insurance Council of Saint Lucia	
Saint Lucia Bankers Association	
National Conservation Authority	
Saint Lucia Electricity Services Limited	
Saint Lucia Solid Waste Management Authority	
Saint Lucia Air and Sea Ports Authority	

## ANNEX 4. KEY BUILDING BLOCKS FOR THE NAP PROCESS IN SAINT LUCIA – LINKAGES BETWEEN THE NAP AND OTHER PROCESSES RELATED TO CLIMATE CHANGE ADAPTATION IN SAINT LUCIA

Saint Lucia has made considerable progress towards building resilience and enhancing national capacities to adapt to climate change. As it is starting the NAP process, establishing the foundation upon which the NAP will be designed and formulated is a logical first step. This requires looking into the current national landscape of adaptation-related policies and projects and back at the road followed by the country and its institutions in this field. The review undertaken for this assignment identified the following elements as key building blocks for the NAP:

**Engagement in global climate change policy.** Saint Lucia became a party of the United Nations Framework Convention on Climate Change (UNFCCC) in 1993, submitted its Initial National Communication to the UNFCCC in 2001, its Second National Communication in 2012 and is currently finalizing its Third National Communication. Saint Lucia also submitted its Intended Nationally Determined Contribution (INDC) under the UNFCCC in 2015 and signed the Paris Agreement in 2016.

**Saint Lucia's Climate Change Adaptation Policy.** In 2015, the Government of Saint Lucia launched its Climate Change Adaptation Policy (CCAP), built on the 2002 National Climate Change Policy and Adaptation Plan (NCCPAP). The CCAP endorses the principles of a cross sectoral approach to climate adaptation and concretely addresses: 1) adaptation facilitation- (appropriate policy, legislative and institutional environment); 2) adaptation financing (measures to ensure adequate and predictable financial flows) and, 3) adaptation implementation (concrete actions to prepare for or respond to the impacts of climate change).

### **Sectoral climate change adaptation planning.**

As a product of multiple consultations with stakeholders from all sectors in the country, Saint Lucia's ***Strategic Program for Climate Resilience (SPCR)*** provides a framework for planning and implementing sectoral climate change adaptation in the country. It offers a broad, but consistent range of project/program areas for action in all sectors which serves as the key programmatic foundation for Saint Lucia's NAP. SPCR reiterates the importance of addressing the three key priority areas identified in the CCAP (i.e. facilitation, financing and implementation of adaptation actions). There are also multiple studies providing specific suggested adaptation interventions at the sectoral level, which could be used to complement the blueprint offered by SPCR. Of particular relevance is the *Assessment of the Economic Impact of Climate Change on the Agriculture Sector (2013)*, which considers the priorities for adaptation in the agricultural sector of Saint Lucia and other Caribbean nations to offer potential interventions. The study provides a cost-benefit analysis for the suggested adaptation options and could become a pillar of Saint Lucia's NAP for the agricultural sector.

Highly relevant is that in 2015, Saint Lucia prepared the ***National Adaptation Strategy and Action Plan for the Tourism Sector***. This Strategy and Action Plan is based on an impact assessment of the risks faced by the national tourism sector under a changing climate. The Action Plan provides overall strategic objectives, information on implementation and evaluation, and a rough budget for tourism adaptation activities. The document also includes a review of the institutional framework for implementation and

recommendations for increasing capacity for climate adaptation in the tourism sector. While this Strategy and Action Plan can be considered a sectoral NAP in its own right, it would benefit from clear linkages to the NAP process.

### **Funding**

The CCAP recognizes that for success in its implementation, there will be need for national budgetary allowances as well as for support from regional agencies and programs, from international donors and financial institutions. Aligned with this recognition, the expenditures of climate change adaptation measures in various sectors are already included in the most recent budget; concept notes and proposals for some of the measures included as part of the NAP blueprint in the SPCR have been prepared and some funded and under current implementation. Furthermore, the CCAP will look into putting in place by 2022 appropriate economic and fiscal incentives to encourage climate change adaptation (by attracting investment into and promoting innovation in commercial adaptation solutions) and opens the possibility of establishing a Trust Fund for climate change adaptation in the future. Notably, the Saint Lucia Development Bank is currently offering low interest loans to households and businesses (to a total of USD 4.5 million) to undertake climate change adaptation measures. This financing facility, the Climate Adaptation Financing Facility (CAFF), is being implemented as part of the Pilot Program for Climate Resilience which is supported by the Climate Investment Fund.

### **Coordination**

A key foundation for the NAP process is that Saint Lucia has a national inter-agency coordinating mechanism for national and regional climate change activities. This mechanism is *the National Climate Change Committee (NCCC)*, which is recognized under the CCAP as the body in charge of coordinating and facilitating the implementation of climate change adaptation measures across sectors and agencies and at all levels of society. The NCCC was established in 1998 by the Cabinet of Ministers to provide advice and support to national climate change-related programs and processes. Over the years, the NCCC has helped to facilitate and guide national efforts relating to: climate change adaptation and building resilience; national climate change action plans and mitigation strategies; and climate change education, training, and public awareness-raising. The NCCC sits at the Ministry of Education, Innovation, Gender Relations and Sustainable Development, and meets periodically. The Committee comprises representatives of public, statutory, academic and private sector bodies. In addition, the NCCC may appoint other members on an ad hoc basis.

### **Ground level experience in the implementation of climate change adaptation measures**

The experience of Saint Lucia in applying a climate change adaptation lens to initiatives on the ground is relatively long. The country has engaged in regional climate change adaptation programs and projects, has coordinated multiple stakeholder consultations for national action on adaptation and has implemented multiple initiatives for adaptation in various sectors, and at multiple levels although often conducted as pilots or ad-hoc projects.