



Saint Lucia's Climate Change Research Strategy 2020-2030



United States In-Country National Adaptation Plan (NAP) Support Program

Gift of the United States Government



Implemented by:



Initial funding for the Network also provided by:





Saint Lucia's Climate Change Research Strategy 2020-2030

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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 Adaptation Strategies & Action Plans for priority sectors/thematic areas. Priority sectors/thematic areas for adaptation action include: Water; Agriculture; Fisheries; Infrastructure and Spatial Planning; Natural Resource Management/Resilient Ecosystems (terrestrial, coastal, and marine); Education; Health and Tourism. Other key sectors/thematic areas 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 (DSD), currently housed within the Ministry of Education, Innovation, Gender Relations, and Sustainable Development. The NAP process has benefited from the inputs of multiple stakeholders, comprising public, statutory, academic, and private sector bodies. Indeed, this process has involved both 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 Resilient Ecosystems Adaptation Strategy and Action Plan (REASAP) 2020–2028*
- *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*
- *Saint Lucia's Portfolio of Project Concept Notes for Resilient Ecosystems 2020–2028*
- *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*
- *Saint Lucia's Climate Change Research Policy 2020–2030*
- *Saint Lucia's Climate Change Research Strategy 2020–2030*
- *Saint Lucia's Private Sector Engagement Strategy under its national adaptation planning process (2019)*
- *Saint Lucia's Climate Financing Strategy under its national adaptation planning process (2019)*

This process also supported a climate change website, animated videos, 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's) 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, 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 adaptation strategies and action plans for key sectors/thematic areas and implementing the measures, programmes, projects, and activities outlined in its NAP, adaptation strategies, and action plans and other support documents.

Saint Lucia also seeks to strengthen and foster collaboration with individual researchers, academic and research institutions, science foundations, international organisations, and other stakeholders interested in conducting research in its territory that addresses climate change-relevant questions of national importance and provides high-quality data and information to support decision-making and outreach processes. Indeed, this is among the first of its kind, not only for Saint Lucia, but in the Caribbean region and beyond.

Saint Lucia is prepared to welcome support—i.e., 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 unsurmountable phenomenon of climate change.

Table of Contents

Foreword.....	3
Table of Contents.....	1
Acronyms	1
1. Context	2
2. Strategic Goal, Objectives, and Outcomes	5
3. Implementation and Funding of the National Climate Change Research Strategy.....	5
4. Monitoring and Evaluation	6
5. Climate Change-Relevant Research Questions of Critical Importance for Policy and Decision Making in Saint Lucia	7
5.1 Cross-Cutting Research and Information for Improved Decision Making.....	8
5.2 Biodiversity, Ecosystems, and Ecosystem Services.....	11
5.3 Coastal, Marine, and Ocean Environments	13
5.4 Food Production (Agriculture and Fisheries, Including Aquaculture).....	14
5.5 Water	17
5.6 Energy and Transport	18
5.7 Human Health.....	20
5.8 Human Settlements, the Urban Environment, and Critical Infrastructure.....	22
5.9 Tourism	23
5.10 Human Mobility (Displacement, National Relocation, and International Migration as Last-Resort Options due to Climate Change)	25
5.11 Climate Risk Transfer Mechanisms	26
6 Conclusions.....	27
Annex 1. List of Participants in the Consultations Conducted for the Development of Saint Lucia’s Climate Change Research Policy and Saint Lucia’s Climate Change Research Strategy.....	28

Acronyms

CCAP	Saint Lucia Climate Change Adaptation Policy
CHM	Clearing House Mechanism
EWS	early warning systems
FADs	fish aggregating devices
GCF	Green Climate Fund
GDP	gross domestic product
GHGs	greenhouse gases
GMOs	genetically modified organisms
GoSL	Government of Saint Lucia
HFC	hydrofluorocarbon
IAS	invasive alien species
IISD	International Institute for Sustainable Development
M&E	monitoring and evaluation
NAP	National Adaptation Plan
NBSAP	National Biodiversity Strategy and Action Plan
NCCC	National Climate Change Committee
NDC	Nationally Determined Contribution
NOP-SAP	National Ocean Policy and Strategic Action Plan
REDD	Reducing Emissions from Deforestation and Forest Degradation
RSO	research and systematic observation
SASAPs	Sectoral Adaptation Strategies and Action Plans
SOER	State of the Environment Report
SPCR	Strategic Programme for Climate Resilience
TEEB	The Economics of Ecosystems and Biodiversity
TNC	Third National Communication
UNFCCC	United Nations Framework Convention on Climate Change
U.S.	United States
USD	United States dollar

1. Context

Saint Lucia is highly vulnerable to climate change due to three main conditions: (a) its small geographical area, which accounts for the fact that disasters have country-wide ramifications; (b) its location in an area of cyclone, volcanic, and seismic activity; and (c) its dependence on economic sectors that are directly affected by climate variability and change. While the country's contribution to global greenhouse gas (GHG) emissions and thus to human-induced climate change are miniscule, this phenomenon could cost lives, livelihoods, and well over 24.5% of its GDP by 2050 and 49.1% by 2100¹ if no effective adaptation and mitigation measures are implemented on time.

The Government of Saint Lucia (GoSL) recognises the challenges that climate change poses to its population, the country's natural resources, and economy, and has taken considerable measures to identify and address, to the extent possible, current and future climate risks both at the policy and operational levels. 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 its Third National Communication in 2017. Saint Lucia also submitted its first Nationally Determined Contribution (NDC) under the UNFCCC in 2015² and developed an NDC Partnership Plan in 2019, ratified the Paris Agreement in 2016, and has made significant progress in the integration of climate change into national policies. Currently, the Saint Lucia Climate Change Adaptation Policy of 2015 (CCAP) is the most important policy and guidance document on the matter, and the country launched a comprehensive 10-year National Adaptation Plan (NAP) in 2018. Complementing the NAP are a series of adaptation strategies and action plans for priority sectors and thematic areas, project concept note portfolios, a communications strategy, monitoring and evaluation plan, climate financing strategy, private sector engagement strategy, and other supplements. Saint Lucia has developed its multisectoral Country Programme and Project Pipeline under the Green Climate Fund (GCF) and expects to access finance further to its first GCF readiness project. Saint Lucia received approval from the Adaptation Fund in 2019 for a USD 10 million project focused on the agricultural sector that aggregates a number of the initiatives proposed in its adaptation strategies and action plans. At the international climate change policy level, Saint Lucia is actively seeking the rapid reduction of global GHG emissions along with fair agreements, collaboration, and support for adaptation to build resilience and ensure socioeconomic development under a changing climate.

Climate change impacts result from complex interactions between climatic and non-climatic factors, which are also expected to change with time. Resilience building, therefore, implies that under considerable uncertainty, short- to medium-term decisions and investments need to be made by governments, businesses, and individuals to manage existing and emerging risks and to adequately adjust ongoing activities, operations, plans, and policies to the changing conditions. These decisions

¹ Bueno, R., Herzfeld, C., Stanton, E.A., & Ackerman, F. (2008). *The Caribbean and climate change: The costs of inaction*. Stockholm Environment Institute – US Center & Global Development and Environment Institute, Tufts University.

https://www.researchgate.net/publication/237321245_The_Caribbean_and_climate_change_The_costs_of_inaction

² The NDC has set as targets the reduction of 16% and 25% of national greenhouse gas emissions by 2025 and 2030 respectively (relative to those in 2010).

should be based on the best information available. Through research, science can generate and transfer information to enhance current understanding of climate processes and offer the support, methods, and tools needed to make more effective decisions that duly consider and incorporate climate mitigation, adaptation, as well as loss and damage.³

Saint Lucia, as with other Caribbean Small Island Developing States, has generally been labelled as data-poor⁴ and lagging with regard to peer-reviewed climate change-relevant research. While the country is making headway to improve its data storage and sharing capacity (e.g., through its National Environmental Information System [NEIS]), there is much more to be done. Existing information on the nation's climate, environmental, and socioeconomic conditions has emerged from fragmented studies in response to pressing needs or to research opportunities that sporadically arose. As a result, baseline data generation and monitoring has not followed a continuous strategic approach. In consequence, the information resources available are often outdated, qualitative as opposed to quantitative, anecdotal, insufficiently comprehensive or detailed, and major information and knowledge gaps remain.

GoSL recognises the urgency of bridging knowledge gaps in specific areas. It also acknowledges the fundamental role scientific research plays in the generation of the data, information, methods, and tools the country needs for making sound choices under the changing climatic conditions. GoSL calls for a coordinated approach to climate change-relevant research on the island to ensure that research efforts respond to well-identified decision and policy-making information needs, build national research capacities, avoid duplication, and that research results are meaningful to—and used—by national decision-makers. Filling the knowledge gaps through fit-for-purpose research will enable Saint Lucia to execute, monitor, and steer the implementation of its climate change agenda.

In this context, the National Climate Change Research Policy has been formulated as a framework for collaboration on climate change-relevant research between GoSL and research partners. The Policy sets principles and rules of engagement for the collaborations and prioritises research initiatives that are fit-for-purpose and build national capacities. **The National Climate Change Research Strategy, presented in this document, facilitates the implementation of the National Climate Change Research Policy by offering guidance to research partners on the existing critical knowledge gaps that limit climate change-relevant policy and decision making in the country and therefore are the topics of interest for research collaboration with the GoSL.**

³ While this work is being undertaken as part of Saint Lucia's National Adaptation Planning (NAP) process, the GoSL premises its efforts on its appreciation of the process continuum of mitigation, adaptation, and loss and damage along with the recognition of the co-benefits derived from pursuing cross-cutting climate action, inclusive of research. **Loss and damage** generally refers to the impacts of climate change that are experienced despite best efforts at mitigation and adaptation. While limits to adaptation are points when adaptation ceases to be effective, loss and damage refers to actual impacts that are experienced after limits have been reached, coupled with the inadequacy of mitigation efforts: GoSL. (2018). *Saint Lucia's National Adaptation Plan (NAP): 2018–2028*. Department of Sustainable Development, Ministry of Education, Innovation, Gender Relations and Sustainable Development.

⁴ GoSL. (2015). *Research and systematic observation* (Climate change policy brief no. 3). Sustainable Development and Environment Division, Ministry of Sustainable Development, Energy, Science and Technology.

For the formulation of the National Climate Change Research Strategy, a comprehensive document review was conducted to identify the critical data, information, and knowledge-related products that scientific research could generate, contextualise, or update to inform climate and development policy and management decisions, within and across sectors in Saint Lucia. The review included peer-reviewed articles, assessment reports, project and programme evaluation reports, policies, and other documents, sectoral and cross-sectoral in scope, which dealt with, among other topics, climate change, development, technical capacities, research and systematic observations, but also with emerging topics for Saint Lucia, such as climate migration, ocean acidification, and non-economic losses. Among the sources of information reviewed were documents formulated through extensive in-country consultations, which called for research support often on the same critical issues limiting policy and management decisions. These included: the NAP and Sectoral Adaptation Strategies and Action Plans (SASAPs) in Water, Agriculture, Fisheries and more recently, Resilient Ecosystems; Saint Lucia's NAP Stocktaking Report; Saint Lucia's First, Second, and Third National Communications to the UNFCCC; the Vulnerability and Adaptation Assessment for Saint Lucia's Third National Communication (TNC) to the UNFCCC; the Impact Assessment and 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); the Revised National Land Policy; the draft National Ocean Policy and Strategic Action Plan (NOP-SAP); the draft revised National Biodiversity Strategy and Action Plan (NBSAP); draft Country Programme for the GCF. The critical issues relevant to this strategy were compiled during the document review and translated into simple research questions and related potential research outputs. The research questions and potential outputs in this strategy, as well as the core elements of the National Climate Change Research Policy, were reviewed and validated through consultative processes and interactive exchanges involving multiple stakeholders in 2019, under the guidance of the DSD. While this policy and strategy benefited from inputs from a number of consultations held under the national adaptation planning process held between 2018 and 2019, the list of participants in the policy and strategy-specific consultations is presented in **Annex 1**.

This strategy consists of 130 research questions, 94 of which are of critical importance for 11 priority development sectors and thematic areas. The remaining questions identified cross-cutting areas of national significance. The research questions and the associated proposed research outputs and activities offer a comprehensive overview of the country's urgent research needs and a framework for developing disciplinary, interdisciplinary, and transdisciplinary research projects or programmes of relevance for Saint Lucia's development under an increasingly changing climate.

The National Climate Change Research Policy and the National Climate Change Research Strategy have been elaborated in parallel, in the framework of the Decade of Research and Innovation,⁵ which was launched in 2019. As part of Saint Lucia's National Adaptation Planning process, the work is supported

⁵ The overarching aim of the Decade of Research and Innovation is to stimulate and develop a culture of innovative scientific thinking and analysis with nationally driven research studies designed to offer sustainable solutions to socioeconomic issues within Saint Lucia's local context, and foster apolitical, sustainable and evidence-based decision making. This Decade aims to reduce the prolonged reliance on metropolitan countries to offer solutions to issues that impact Saint Lucia, as well as maximise opportunities for infusing innovations across the national economy that foster sustainable national development and visionary problem-solving.

by the U.S. In-Country NAP Support Programme, implemented by the International Institute for Sustainable Development (IISD).

2. Strategic Goal, Objectives, and Outcomes

The goal of the National Climate Change Research Strategy is to enhance the availability and use of climate change-relevant information in national decision making. This will be achieved by informing the design and execution of climate change-related scientific research initiatives in Saint Lucia about the critical data and knowledge gaps the country needs to address in order to execute its climate change agenda.

To accelerate progress toward the achievement of this goal, the National Climate Change Research Strategy has defined the following outcome and strategic objectives.

Outcome: Increased generation and use of climate change-relevant information in national (sectoral and cross-sectoral) decision making

Strategic objective 1: Generate climate, environmental, and socioeconomic data and science-based information, critical to climate action across sectors, including adaptation, mitigation, and addressing loss and damage.

Strategic objective 2: Enhance research and systematic observation (RSO) capacity in themes that are critical to climate action across sectors, including adaptation, mitigation, and loss and damage.

To streamline reporting and enhance coherence among national policy instruments related to climate change, the outcome and strategic objectives of the National Climate Change Research Strategy are aligned with the National Adaptation Plan's outcome 2 (*Increased generation and use of climate information in national and sectoral decision making*); its associated strategic objective 2 (*Generate climate, environmental and socioeconomic data and science-based information critical to adaptation across sectors*); and its associated strategic objective 3 (*Enhance Research and Systematic Observation in themes that are critical to climate change adaptation*).

3. Implementation and Funding of the National Climate Change Research Strategy

The National Climate Change Research Strategy will be implemented through the establishment of research collaboration agreements between the GoSL and research partners, in accordance with the provisions and protocols set for this purpose in the National Climate Change Research Policy. **To promote ownership and enhance the use of science-based information in sectoral policy and decision making, the execution of research projects responding to critical research questions pertinent to specific development sectors will be the responsibility of the line ministries and agencies with the mandate for managing those sectors.** However, as GoSL seeks to follow an integrated approach to climate change policy and action, information on planned research projects,

their objectives, execution, and results will also be communicated with other agencies and ministries. This will be achieved through the active participation of line ministries and agencies in the National Climate Change Committee (NCCC) and other relevant interagency coordinating mechanisms. Cross-sectoral and multisectoral research initiatives will be coordinated by one leading agency in collaboration with the other relevant agencies and follow the same mechanism of communication as sectoral research initiatives.

Funding for the execution of research initiatives that seek to answer the critical questions presented in the National Climate Change Research Strategy is expected to be derived mainly from grants or other funding sources that research partners receive from international and/or national sources, for the research projects submitted to GoSL for consideration. The execution of the National Climate Change Research Strategy will, nonetheless, require the proactive engagement and time of GoSL staff and potentially, the allocation of new public resources to sustain the results of the research conducted by research partners (e.g., to sustain the monitoring of critical climate change-related variables).

In addition, GoSL will, to the maximum extent possible, integrate the critical research questions included in this strategy (along with their associated research outputs) into existing and proposed bilateral and multilateral cooperation programmes, including those pertaining to climate finance.

4. Monitoring and Evaluation

The transparent reporting, monitoring, and review of advancement in climate change-relevant research within and across development sectors are fundamental to measure and steer the progress of Saint Lucia's climate change agenda. It is, therefore, necessary to design and put in place a monitoring plan for the implementation of the National Climate Change Research Strategy to ensure that the activities conducted are completed and contribute to the achievement of the established outcome and objectives.

To ease reporting and help to determine corrective actions in ongoing climate-related initiatives based on emerging research results, the National Climate Change Research Strategy will use the monitoring and evaluation (M&E) mechanism established for the National Adaptation Plan. Adjustments will be made as necessary to include progress on climate change mitigation research. While this National Climate Change Research Strategy has been developed as part of Saint Lucia's NAP process, GoSL premises its efforts on its appreciation of the process continuum of mitigation, adaptation, and loss and damage and the recognition of the co-benefits derived from pursuing cross-cutting climate action, inclusive of research.

It is expected that the lead agencies will report to the NCCC annually on the progress and revisions made to the implementation of the National Climate Change Research Strategy to include the relevant information in the NAP M&E system.

In the context of climate-relevant research, the DSD, through the NCCC, will note any proposed adjustments to the National Climate Change Research Policy and Strategy over time that might enhance efficiency and effectiveness.

5. Climate Change-Relevant Research Questions of Critical Importance for Policy and Decision Making in Saint Lucia

This section presents the climate change-relevant research questions and research outputs that were identified and validated by national stakeholders as critical for decision and policy-making in Saint Lucia. It is suggested that while designing research projects, interested research partners, in collaboration with the Government-designated liaison officer for the responsible Government Ministry or Department, should review past, ongoing or approved research or development initiatives related to the subject of the research to ensure they build on previous knowledge and to facilitate synergy building.

The list of critical research questions is presented according to thematic areas. However, it is recognised that some research questions could be categorised differently. The thematic areas included are:

1. Cross-cutting research and information for science-based decision making
2. Biodiversity, ecosystems, and ecosystem services
3. Coastal, marine, and ocean environments
4. Food production (agriculture and fisheries, including aquaculture)
5. Water
6. Energy and transport
7. Human health
8. Human settlements, the urban environment, and critical infrastructure
9. Tourism
10. Human mobility (displacement, national relocation, and international migration as last-resort options due to climate change)
11. Climate risk transfer mechanisms

5.1 CROSS-CUTTING RESEARCH AND INFORMATION FOR IMPROVED DECISION MAKING

Themes	Broad topics/research questions	Some indicative research activities/outputs
Improving knowledge on observed and future climate conditions, and their current and expected impacts in Saint Lucia	<ol style="list-style-type: none"> 1. How is Saint Lucia’s climate changing? 2. How will it change in the future? 3. How can the change be measured? How are non-economic losses (e.g., life, health, territory, cultural heritage, indigenous knowledge, biodiversity, ecosystem services) be factored into observed and expected impacts? 4. What monitoring procedures can be established to measure the effects of climate change? 5. What direct and indirect impacts of climate change can be expected in the short, medium, and long terms in Saint Lucia? 6. Which impacts can be already observed? 	<ul style="list-style-type: none"> • Latest-generation climate models and downscaled projections (high-resolution local climate models). • Development of local weather extreme indices, together with predictability of extreme events. • Development of seasonal, inter-annual, and decadal predictability systems. • Formulation of climate change monitoring strategies, using key climate indicators. • Establishment/improvement of in-situ and remote observation systems (for meteorological, hydrological, and ecological observations). • Establishment of baseline data for various climate parameters.
Understanding the drivers and distribution of vulnerability to climate change	<ol style="list-style-type: none"> 7. How vulnerable are the country’s population, natural resources, and economy to climate change? 8. How is vulnerability distributed across Saint Lucia’s geographic areas, development sectors, gender, age, and population groups? 9. What are the root causes of vulnerability across geographic areas, gender, age, population groups, and development sectors? How are these factors expected to change with time? What are the varying timeframes for the factors that need to be addressed? 10. How can vulnerability be best measured and monitored? At what scale? Using which indicators? 	<ul style="list-style-type: none"> • Identification of the most appropriate indicators to assess and monitor vulnerability; generation of baselines. • Improved vulnerability assessments (conducted even in the absence of downscaled climate projections, taking into consideration the best scale for assessment, and including social, economic, and environmental parameters). • Vulnerability maps and scenarios produced for the entire country.

Themes	Broad topics/research questions	Some indicative research activities/outputs
Evaluating climate change-induced risk	<ol style="list-style-type: none"> 11. How will social, environmental, and economic risks change as climate change progresses? 12. What are the appropriate parameters needed to characterise and monitor risk to multiple hazards, including climate change-related hazards? 13. How will the risk of disasters induced by climate change and its interactions with other factors change with time? What will be the associated cost? Which could be the most recurrent disaster types? 14. Are emergency and contingency plans enough for eventual extreme events in the coming decades? 15. How can climate services and early warning systems be improved in view of changing climate conditions? 	<ul style="list-style-type: none"> • Multi-hazard risk assessments (including key existing and emerging climate hazards, as well as recent demographic data to better target users) conducted periodically across the island. • Establishment/improvement of in-situ and remote observation systems and the use of modelling approaches to cover data gaps. • Evaluation and development of emergency planning and early warning systems from a climate change perspective. • Evaluation of potential climate change impacts (including impacts of slow-onset and extreme climate events) on productivity across and within sectors.
Limiting and addressing climate change	<p>Adaptation</p> <ol style="list-style-type: none"> 16. Which climate change impacts can be avoided, and with what probability? 17. Is there a critical timescale for preventive action? 18. Are the ongoing and planned adaptation measures enough to tackle the climate challenge and ensure sustained socioeconomic progress? 19. Are communities adopting climate adaptation practices on their own? How can we monitor and support it? 20. How can we evaluate if the implementation of climate solutions is/has been effective in reducing vulnerability to climate impacts? Is there risk of maladaptation? 21. What are the economic, social/cultural and environmental costs/benefits of adaptation measures? 22. What barriers to the implementation of adaptation actions exist, and how can they be overcome? 23. What role can technology and innovation play in Saint Lucia's adaptation to climate change? 	<ul style="list-style-type: none"> • Identification of appropriate community-level adaptation practices in Saint Lucia. • Development of a set of guidelines for the implementation of appropriate simple adaptation practices for rural, urban, coastal, and inland environments in the country that can be shared with and implemented by community stakeholders, including vulnerable groups. • Identification of barriers to the implementation and adoption of adaptation approaches; testing solutions and communicating best options.

Themes	Broad topics/research questions	Some indicative research activities/outputs
	<p>24. What policy or regulatory options stimulate adaptation or maladaptation?</p> <p>25. How can local and national businesses be supported to reduce climate risk within their own supply chains?</p> <p>26. How can local businesses best utilise market opportunities related to adaptation products and services?</p> <p>27. What strategies and actions can be adopted to protect the most vulnerable population groups from climate impacts (e.g., children, single mothers, high-risk informal settlement dwellers, the elderly, etc.)?</p>	
	<p>Mitigation</p> <p>28. What are the costs/benefits/risks of mitigation options in Saint Lucia? What would be the costs and/or implications of inaction?</p> <p>29. How can the effectiveness of GHG mitigation actions be best measured? Which measures give the greatest impact, consistent with declared national targets?</p> <p>30. What barriers to the implementation of mitigation actions exist, and how can they be overcome?</p> <p>31. How can the adoption of low-carbon technologies be accelerated?</p> <p>32. How can local businesses best seize low-carbon market opportunities?</p>	<ul style="list-style-type: none"> ● Generation of baselines and development of GHG monitoring systems. ● Improved understanding of the factors that influence consumption patterns and decision making. ● Identification of barriers to the implementation and adoption of mitigation approaches, testing solutions, and communicating best options. ● Identification of incentives to encourage the use of low-carbon technologies.
<p>Communicating crucial climate change information across audiences and improving</p>	<p>33. What are the best approaches to raise awareness of climate change implications among different stakeholder groups and increase their engagement in climate action?</p> <p>34. What factors influence the ability of vulnerable groups to act?</p> <p>35. How can climate change be mainstreamed into school curricula?</p>	<ul style="list-style-type: none"> ● Identification and testing of effective communication approaches to inform, create interest, and spark sustained climate action in different stakeholder groups. ● Identification of the most effective approaches to integrate resilience across all sectors. ● Analyses of the efficacy of past and current climate change education and public awareness initiatives.

Themes	Broad topics/research questions	Some indicative research activities/outputs
stakeholder engagement in climate action	36. Which private sector, non-governmental groups and organisations can play an essential role in leading local climate action (e.g., business management organisations, churches, youth groups), and how can they be engaged in taking such role?	<ul style="list-style-type: none"> Analyses of youth civic engagement's role in climate action and recommendations to enhance youth leadership.

5.2 BIODIVERSITY, ECOSYSTEMS, AND ECOSYSTEM SERVICES

Broad topics/research questions	Suggested research outputs/activities
<p>37. How will biodiversity, ecosystems, and ecosystem services respond to climate change and to the interactions of climate change and other stresses in the short, medium, and long terms?</p> <p>38. How can we monitor the changes in biodiversity, ecosystems, and ecosystem services due to climate change?</p> <p>39. Which factors (and combination of factors) could have the largest negative effect on biodiversity, ecosystems, and ecosystem services across the country? Which of these factors should be prioritised for policy, regulatory, and management interventions if financial and human resources are limited?</p>	<ul style="list-style-type: none"> Identification/development of key indicators to monitor habitat and ecosystem health/integrity, ecosystem services, and biodiversity. Design and establishment of an RSO system within the Biodiversity Clearing House Mechanism (CHM) to generate/complete baselines, enable monitoring and develop forecasts of biodiversity and ecosystem change, and associated risks, under various climate change scenarios to inform both policy and management. (This includes finalising the recording of the entire island's biodiversity resources by completing the country's coastal mapping and the forest inventory; generating biodiversity maps, indicating the location of conservation priority species and habitats). Evaluation of the effects of extreme weather events on key ecosystems to understand their capacity to absorb and offer protection shocks and recover. Identification and testing of the best management practices to support the recovery of ecosystems after extreme events. Guidelines for island-wide restoration of ecosystems and habitats exposed to extreme events.
40. What species, ecosystems, and ecosystem services are most at risk of climate change-related impacts (i.e., direct	<ul style="list-style-type: none"> Improved and regularly conducted vulnerability/risk assessments for priority species and ecosystems (e.g., deciduous forest) based on the identified indicators. Forest fire hazard maps.

Broad topics/research questions	Suggested research outputs/activities
climate change effects and the interactions of these effects and other stresses)?	<ul style="list-style-type: none"> • Management guidance for controlling known and emerging forest pest populations. • Assess potential threats resulting from the accidental or intentional introduction of invasive alien species (IAS) and genetically modified organisms (GMOs).
41. What costs could the country face due to climate change-related declines in biodiversity, ecosystems, and ecosystem services? Which would be the most affected development sectors and population groups?	<ul style="list-style-type: none"> • Identification of tools and development of studies to demonstrate the current economic value of ecosystems and biodiversity (e.g., TEEB studies); mapping and valuing current ecosystem services. • Modelling ecosystem services change under various climate change scenarios.
42. Which are the best (ecologically sound and cost-effective) management strategies to address the decline of natural terrestrial ecosystems and biodiversity in Saint Lucia? 43. Which management interventions related to ecosystems and biodiversity have the potential to improve the greatest number of socioeconomic indicators?	<ul style="list-style-type: none"> • Identification and recommendation of priority conservation actions for specific ecosystems and for plant and animal species. • Research on best habitat restoration approaches. • Monitoring of and acting to control non-climatic stresses on biodiversity, ecosystems, and ecosystem services which could interact with the effects of climate change and climate variability. • Identification of feasible and cost-efficient IAS control mechanisms.
44. How can the protection of ecosystems and species from climate change impacts be financed?	<ul style="list-style-type: none"> • Economic analysis of conservation and sustainable ecosystem management approaches, including REDD+.
45. What management actions can tap the potential of ecosystems to act as buffers against climate change impacts?	<ul style="list-style-type: none"> • Tests of ecosystem-based adaptation options.

5.3 COASTAL, MARINE, AND OCEAN ENVIRONMENTS

Broad topics/research questions	Suggested research outputs/activities
<p>46. How will sea level rise, coastal erosion, ocean acidification and flooding affect Saint Lucia, and which development sectors and locations will be most exposed?</p> <p>47. What impacts of climate change on the ocean, coastal, and marine environment are expected to affect Saint Lucia? Which of these impacts are already evident?</p> <p>48. What will be the impacts of sea level rise on the country's coral reefs, seagrass beds, mangroves, agricultural land, and water supplies?</p> <p>49. Which communities and areas will be most affected by sea level rise and coastal erosion?</p> <p>50. How will ocean acidification affect Saint Lucia? What will its impacts be on the country's coral reefs and commercially important fisheries species such as lobster and conch? What can be done to anticipate and remediate the potential losses?</p> <p>51. What will be the economic repercussions of these impacts in the future decades?</p> <p>52. What are the most appropriate approaches to monitoring changes in ocean, coastal, and marine environments in the country?</p> <p>53. How should the information resulting from the monitoring of ocean, coastal, and marine changes be used, in practice, to reduce the vulnerability of communities, ecosystems, livelihoods, and development sectors that depend on these environments?</p> <p>54. Which locations, communities, and ecosystems are most vulnerable to the impacts of climate change on coastal, marine, and ocean conditions? Does vulnerability to these</p>	<ul style="list-style-type: none"> • Establishment/improvement of baselines as well as in-situ and remote observation systems for the monitoring of sea level rise, coastal erosion, flooding, wave action, and non-tropical processes that generate strong ocean swells. • Protocols for monitoring sea level rise, ocean acidification, and coastal erosion in Saint Lucia. • Improved sea level rise modelling. • Improved coastal flood and erosion mapping. • Comparative analyses of the effectiveness of beach stabilisation methods. • Modelling and mapping wave patterns and wave surge changes under various climate change scenarios, providing recommendations to establish/improve contingency plans. • Setup of national Research and Observation Systems for the Ocean, Coastal, and Marine Environment. • Identification of appropriate indicators for monitoring change in biophysical conditions in the coastal, marine, and ocean environment and generation of baselines (including temperature, ocean acidification, water quality, sedimentation, bacteria, turbidity levels, salinity; and ecosystem cover and integrity indicators). • Analyses of the dynamics of ocean acidification and its spread across Saint Lucian waters. • Identification of species and food webs vulnerable to ocean acidification. • Estimates of the ripple effects of ocean acidification on food webs and ecosystem services (including fisheries). • Analysis of the vulnerability of Saint Lucian coral reefs and estuarine ecosystems to ocean acidification and temperature changes. • Potential solutions for reducing the vulnerability of coastal, ocean, and marine life to ocean acidification. • Vulnerability assessment for all coastal communities, infrastructure and natural assets conducted, including vulnerability to extreme weather events, sea level rise, and other changes in coastal, marine, and ocean conditions with climate change. • Production/improvement of existing digitised maps for: <ul style="list-style-type: none"> - All social and economic assets located along Saint Lucia's coasts.

Broad topics/research questions	Suggested research outputs/activities
<p>factors change geographically along Saint Lucia's coasts and sea?</p> <p>55. To what extent will climate change interact with other stresses and amplify their negative effects on ocean, coastal, and marine ecosystems and environments?</p> <p>56. Are the adaptation interventions planned and ongoing enough to address the challenge of climate change on coastal, marine, and ocean environments?</p> <p>57. Are there practical and feasible approaches that can be applied in Saint Lucia to protect coastal and marine-related livelihoods from the long-term effects of climate change in the ocean environment other than livelihood diversification?</p> <p>58. Are there opportunities for sustainable business creation from the changes observed in coastal, marine and ocean conditions? (e.g., transformation of sargassum)</p>	<ul style="list-style-type: none"> - Coastal, marine, and ocean ecosystems and ocean uses (including fished areas). - Bathymetric and land contour maps indicating all features of land use, to facilitate more accurate modelling of storm waves and surges. <ul style="list-style-type: none"> • Estimation of the elevation at which projection lines and benchmarks for the country's coastline should be shifted to reflect the potential impact of sea level rise combined with storm surges for different storm categories. • Investigation on cost efficiency and effectiveness of various wave attenuation devices and coastal engineering structures to protect Saint Lucian coastal areas from climate change impacts. • Investigation into the extent to which marine protected areas contribute to the resilience of coastal and marine ecosystems, coastal communities, the broader economy, and the use of ecosystem-based adaptation. • Investigation into the major non-climate stresses affecting the sustainability of coastal and marine environments and analysis of mechanisms for the prioritisation of solutions at the policy, regulatory, and management levels to reduce climate change risks.

5.4 FOOD PRODUCTION (AGRICULTURE AND FISHERIES, INCLUDING AQUACULTURE)

Broad topics/research questions	Suggested research outputs/activities
<p>59. How will climate change affect Saint Lucia's agriculture and fisheries (including aquaculture) sectors directly (through changes in hydro-meteorological conditions, extreme events, sea level rise, changes in fishery resources and other changes) and indirectly (through the amplification of existing and the emergence of new threats such as land degradation, disease, and pests)?</p> <p>60. What would be the most affected fishery and farming systems and regions in the island?</p>	<ul style="list-style-type: none"> • Update assessment of climate change impacts on Saint Lucia's agriculture and fisheries, based on the latest and downscaled climate projections, including all major farming and fisheries systems in the island. • Set up/update research and observation systems for agriculture and fisheries to establish baselines and monitor changes over time in yields, practices, crop and livestock production, fish landings, fish stocks, disease, and pests. • Vulnerability assessment of fisheries, farming systems and crop production and fishing areas to various climate change-related hazards, including (for agriculture sea level rise,

Broad topics/research questions	Suggested research outputs/activities
<p>61. What could be the costs associated with these impacts? (including economic and non-economic costs and losses)</p> <p>62. Could climate change amplify the negative effect of other non-climatic factors on food production and security in the short to medium term (e.g., affordability of food imports; changes in the price of agricultural inputs, etc.)?</p>	<p>soil salinisation, loss of agricultural lands due to year-round and seasonally high-water tables and to salt-water flooding).</p> <ul style="list-style-type: none"> • Studies on the impacts of ocean acidification and temperature change on Saint Lucian fisheries (including bioeconomic, biological, and physiological studies, e.g., on ocean acidification and temperature effects at different life stages, and across food webs for fishery important species). • Assessment of existing crop pests and livestock and fish disease as well as the potential effect of increased temperatures and other environmental changes on their incidence. • Identification of environmentally friendly and integrated pest/disease management systems for aquaculture, crops and livestock that could be appropriate under climate change projections in Saint Lucia. • Research to produce and market natural pesticides (e.g., Indigenous entomopathogenic fungi) as alternative to imported chemicals.
<p>63. Are the adaptation measures proposed for and ongoing in the agriculture and fisheries sectors enough to tackle the climate change challenge in the short, medium to long term? Are there non-identified sources of climate risk that should be addressed now?</p>	
<p>64. What are the most promising agricultural/fisheries (including aquaculture) diversification/adaptation approaches to respond to the expected climate change impacts across Saint Lucia? What should be learned from traditional knowledge?</p> <p>65. What are the opportunities that climate change can present to the agriculture sector/food production that can be explored (among others, new crops, more flowering, etc.)?</p> <p>66. How can the transition to climate-smart agriculture be financed?</p>	<ul style="list-style-type: none"> • Testing and researching traditional fishing and agriculture methods that could be applied under different climate change scenarios. • Testing different (and identifying the best) fisheries, aquaculture, agricultural farming systems, crop varieties, and livestock breeds that could be used in the country to increase the sectors' sustainability, or to open new business opportunities, under projected climate change scenarios. For agriculture, tests could be performed for, among others, different cropping sequences for short-term crops; various agro-ecological practices, including mulching, zero-till, agroforestry, mixed species planting, and intercropping; tests of new crops, pastures, and varieties, tolerant/resistant to drought, salinity, higher temperatures; tests of promising heirloom species and plants that attract beneficial insects. • Soil management studies.

Broad topics/research questions	Suggested research outputs/activities
	<ul style="list-style-type: none"> • Collection and management of crop germplasm on crop breeding. • Identification and testing of soil and water conservation measures (e.g., mulching, appropriate terracing, drip irrigation, solar pumps). • Tests of semi-intensive production systems (e.g., rotational grazing) to encourage pasture growth and organic matter production. • Identification and assessment of high-water efficient irrigation systems and water conservation technologies that could be adopted in Saint Lucia. • Identification of most suitable irrigation systems supported by rainwater harvesting for Saint Lucia. • Analysis of opportunities in international trade, bilateral or multilateral cooperation agreements to fund the transition to climate-smart agriculture.
<p>67. How could carbon sequestration be increased/GHG emissions avoided through changes in agricultural and fisheries practices while maintaining or enhancing food production potential in the island? Which would be the practices recommended for different locations and crops? How could this be measured and financed?</p>	<ul style="list-style-type: none"> • Studies of best management practices to reduce GHG emissions in agriculture, without major adverse consequences in Saint Lucia. • Assessment of the potential to trade avoided agricultural GHG emissions in carbon markets. • Assessment of opportunities for integrating renewable energy systems into Saint Lucia's agriculture and fisheries.
<p>68. What climate services, tailored to Saint Lucian farmers and fishers, could be developed to improve their yields and reduce injuries, losses, and personal risks under increasingly variable climate conditions?</p>	<ul style="list-style-type: none"> • Study to identify mechanisms for improving climate-related and fisheries-relevant information services to help fishers minimise climate risks in their daily activities, including their time at sea. The assessment should cover, among others, existing climatological data collection and information services, EWS, changes in fish stocks, seaweed, and invasive species, and an analysis of how improving the services could enable fishers to make informed decisions on where to fish, hazardous areas to avoid, and location of smart fish aggregating devices (FADs), among others.

5.5 WATER

Broad topics/research questions	Suggested research outputs/activities
<p>69. How is climate change expected to affect the quantity and quality of Saint Lucia's water resources?</p> <p>70. How will climate change amplify the negative effects of other factors on the island's water supply and quality?</p> <p>71. What are the most important non-climatic factors that need to be addressed to reduce climate change-related risks on the supply and quality of water resources?</p>	<ul style="list-style-type: none"> • Latest climate change projections. • Develop/improve long-term observational systems for measuring and predicting hydrological changes and planning management responses in the water sector. • Development of: a) baselines for the 37 watersheds and all water resources in Saint Lucia and b) a comprehensive water resources database, hydrological models, and a reporting system. • Identification, monitoring the status of and mapping threats to freshwater systems from agriculture, industry, tourism, infrastructure, sedimentation, pollution, and natural hazards. • Identification of cost-efficient and effective policy, regulatory, and management measures to respond to the threats.
<p>72. What geographic areas, development sectors and user groups will become more vulnerable to changes in freshwater supply and quality in the short and medium-terms?</p> <p>73. What alternative freshwater sources can be explored to guarantee water supply with climate change?</p> <p>74. What management approaches can be established/improved to minimise the risk of conflicts between water uses under expected drier conditions in the future?</p> <p>75. What are the most effective and efficient investments to improve the resilience of freshwater infrastructure to climate change impacts?</p> <p>76. How can water supply planning be improved in the face of climate variability and change?</p> <p>77. What interventions need to be implemented in the short to medium term to ensure sustainable water provision during expected drought periods?</p>	<ul style="list-style-type: none"> • Detailed water supply and demand assessments based on the country's development plans and contrasted against climate change scenarios and vulnerability maps to inform policy and management actions. • Identification of the geographic areas and user groups that will be in largest need for bulk water storage and other water supply solutions to address climate change impacts. • Identification and mapping of the water and sewer infrastructure that is most exposed to expected direct climate change impacts and propose cost-effective solutions (water/sewerage infrastructure contrasted with projected hazard maps). • Investigation into the most feasible and robust, low-cost investment interventions to reduce the risk posed by extreme weather events to water supply and sewage infrastructure. • Investigation into the infrastructural requirements for tertiary-level municipal sewage treatment facilities to cover the island's needs and prevent pollution of freshwater sources resulting from climate change impacts. • Identification of priority areas for engineering solutions to flooding along riverbanks and channels. • Identification and assessment of the risks of exploitation of alternative freshwater sources (e.g., groundwater, runoff water, wastewater, desalination).

Broad topics/research questions	Suggested research outputs/activities
	<ul style="list-style-type: none"> • Studies to determine aquifer health. • Identification and assessment of potential business opportunities associated with alternative water source exploitation (e.g., sea salt businesses with desalination plants). • Identification of cost-efficient and effective approaches to reduce Non-Revenue Water losses that become especially critical in the face of water deficits in a changing climate.
<p>78. How could GHG emissions be avoided through management and infrastructure changes in the water sector? Which interventions would be recommended, and where? How could this be measured and financed?</p>	<ul style="list-style-type: none"> • Development of tools for calculating current GHG emissions in the operations of the water utility. • Identification of cost-efficient and cost-effective management, technology, and infrastructure interventions to reduce emissions. • Assessment of opportunities for integrating renewable energy systems into the water sector.

5.6 ENERGY AND TRANSPORT

Broad topics/research questions	Suggested research outputs/activities
<p>79. What are the possible impacts of climate change on energy and transportation systems in Saint Lucia?</p> <p>80. What approaches can be used to adapt Saint Lucia's energy and transport systems to expected climate change-related changes?</p>	<ul style="list-style-type: none"> • Low-emissions development studies.
<p>81. How can urban mobility planning in Saint Lucia be improved to prioritise transport options that are efficient, safe, practical, affordable for all residents, and which reduce GHG emissions?</p> <p>82. What are the costs and benefits of changes in transportation systems, and how will those changes impact GHG emissions?</p>	<ul style="list-style-type: none"> • Establishment of baselines and development of models of future public transport demand. • Analyses of the evolution of transportation needs. • Analyses of load demand for transitioning to electric vehicles in the country. • Feasibility assessments for various transportation options in Saint Lucia. • Assessment of viable mechanisms to lower GHG emissions in the power-generation and transport sectors (e.g., incentives, carbon tax, etc.)

Broad topics/research questions	Suggested research outputs/activities
<p>83. What are viable ways to lower GHG emissions in the power generation and transport sectors (e.g., through mechanisms such as incentives or a carbon tax)?</p> <p>84. What would be the impact on the electricity grid of the use of electric vehicles?</p>	<ul style="list-style-type: none"> • Investigation into the infrastructural changes required to enable the transition into greener transportation options. • Assessment of the impact on the electricity grid of the use of electric vehicles, inclusive of options for stabilisation as a result of the use of renewal energy to charge the vehicles.
<p>85. What strategies can be used to promote the use of less fuel-intensive modes of transportation?</p>	<ul style="list-style-type: none"> • Assessment of appropriate strategies to promote the use of less fuel-intensive modes of transportation in Saint Lucia.
<p>86. How can Saint Lucia adopt and promote the use of low-carbon energy sources (e.g., solar, wind, geothermal)?</p>	<ul style="list-style-type: none"> • Assessment of appropriate, environmentally sustainable, and cost-effective alternative renewable energy technologies and options for Saint Lucia (including Indigenous energy sources), with due consideration of the work undertaken to date under the National Energy Transition Strategy. • Assessment of the feasibility and environmental impact of biofuel production (e.g., transforming sargassum into biofuel, learning from the experience of Guadeloupe). • Investigation into the appropriate compensation and caps for household-level generation of solar power (connected to the grid).
<p>87. What are the barriers to the implementation of carbon-mitigation policies (e.g., energy efficiency) at the national and subnational levels? How can these barriers be overcome, in such a way that the Government, private sector, households, and other groups make short-term economic gains from their implementation?</p>	<ul style="list-style-type: none"> • Producing and updating national energy balances by sector and subsector, including annual fuel sales data from distributors and fuel imports data. • Generation of estimates of total electricity use in Government buildings using a bottom-up survey of meter data. • Development of projections of hydrofluorocarbon (HFC) emissions based on expected demand for refrigeration and air conditioning equipment, as well as the availability of alternatives to HFCs.
<p>88. What systems should Saint Lucia adopt to measure and monitor GHG emissions from the transport, energy, and other sectors?</p>	
<p>89. What changes in air quality can be expected with climate change?</p>	<ul style="list-style-type: none"> • Identify links between air quality, development sectors, and climate change and develop strategies that to improve air quality.

Broad topics/research questions	Suggested research outputs/activities
90. What major trends in consumption patterns contribute the most to GHG emissions?	<ul style="list-style-type: none"> • Assessment of major trends in consumption patterns (purchases of appliances, their types, increasing efficiency, etc.) and identification of approaches to raise awareness on alternatives.
91. What approaches would be effective and appropriate for the different sectors and the public to make informed decisions, purchase energy-efficient products, and reduce energy consumption?	<ul style="list-style-type: none"> • Cost-benefit analysis of the cost of inefficient air conditioning systems to inform an awareness-raising campaign targeting the tourism sector.

5.7 HUMAN HEALTH

Broad topics/research questions	Suggested research outputs/activities
<p>92. How will climate change affect the health of Saint Lucians and the national health system in the short to medium term?</p> <p>93. What existing health risks could be amplified by climate change, and what potentially significant health threats could emerge?</p> <p>94. What climate change impacts on other development sectors/areas could indirectly amplify existing (or bring new) health concerns?</p> <p>95. Who are the population groups most vulnerable to these threats, and how is vulnerability distributed across the island?</p>	<ul style="list-style-type: none"> • Improvement of health data collection and processing protocols and systems, including the incorporation of vector-borne, water-borne, food-borne and other potential climate change-related diseases (allergies, respiratory disease, heatstroke, etc.). • Evaluation and strengthening of health monitoring, surveillance and reporting systems, including if necessary, the establishment of surveillance systems for climate change-related disease outbreaks. • Analyses of the psychological impacts of climate change and extreme climate events. • Modelling and mapping the risk of disease using updated (downscaled) climate change projections, updated socioeconomic, environmental, and epidemiological information. • Assessment of priority health impacts of climate change in occupational settings.
<p>96. How will climate change-related health vulnerabilities change with time?</p> <p>97. What are the most effective and cost-efficient management approaches to address the amplification of</p>	<ul style="list-style-type: none"> • Assessment of the level of use and effectiveness of public health guidance. • Identify approaches to improve public knowledge, attitudes, and behaviours on climate change-related health risks.

Broad topics/research questions	Suggested research outputs/activities
<p>existing and the emergence of new diseases with climate change?</p> <p>98. What will be the economic implications of climate change impacts on the health sector? How can they be addressed? When should planning to address them commence?</p> <p>99. What plans and programmes need to be established within the national health system to strengthen its response to emergencies and new situations (e.g., new diseases and pandemics) with climate change?</p> <p>100. How can the different development sectors contribute to reducing current and future climate change-related health risks? (e.g., modifications in land use, land planning, construction, water storage, ecosystem monitoring, etc.)</p> <p>101. How can the different development sectors contribute to improving disease outbreak surveillance systems?</p> <p>102. How can it be ensured that interventions to adapt and mitigate climate change conducted in other sectors do not result in negative health outcomes?</p> <p>103. How can health risks be better communicated to the different stakeholder groups?</p> <p>104. How can investment in protecting the health system from climate change impacts be prompted?</p>	

5.8 HUMAN SETTLEMENTS, THE URBAN ENVIRONMENT, AND CRITICAL INFRASTRUCTURE

Broad topics/research questions	Suggested research outputs/activities
<p>105. How will climate change impacts directly and indirectly affect the built environment and critical infrastructure in Saint Lucia?</p> <p>106. Could climate change impacts amplify the effects of other stresses on critical infrastructure? Which stresses?</p> <p>107. How is vulnerability of the built environment and critical infrastructure to climate change and other stresses distributed across the country? How is it expected to change as climate change progresses?</p>	<ul style="list-style-type: none"> • Vulnerability assessment of critical infrastructure and the built environment to climate change hazards across the island (prioritising the assessment in coastal areas). • Evaluation of the costs and benefits of hard infrastructure vs. various natural buffers on reducing exposure of the built environment and critical infrastructure to climate impacts island-wide. • Economic analysis of the costs of climate change adaptation and disaster management for critical infrastructure.
<p>108. What are the priority investments that need to be made for protecting key infrastructure and urban environments (along with their population) from climate change impacts?</p> <p>109. What steps should Saint Lucia take to decrease GHG emissions and adapt to climate change from an urban planning and design perspective?</p> <p>110. What is the best balance between ecosystem-based and hard infrastructure to protect coastal infrastructure and communities?</p>	<ul style="list-style-type: none"> • Assessment of climate change-risk reduction options for critical infrastructure in coastal areas, including relocation. • Calculations of the appropriate modification of coastal defence infrastructure dimensions in anticipation of projected sea level rise and greater storm surge events. • Identification and reporting of the most appropriate blue/green infrastructure and ecosystem-based adaptation and mitigation options for Saint Lucia’s human settlements.
<p>111. How can communities and populations be protected against heat in urban settings without increasing air pollution and GHG emissions?</p> <p>112. What climate adaptation interventions can be initiated in urban environments and settlements, engaging local residents and generating mitigation co-benefits (e.g., green roofs).</p>	<ul style="list-style-type: none"> • Social, economic and environmental assessment of green and gray infrastructure solutions to the heat island effect (e.g., green roofs, cool pavement, urban afforestation and reforestation).

Broad topics/research questions	Suggested research outputs/activities
<p>113. How can waste management be improved to reduce pollution, health risks, and GHG emissions?</p> <p>114. What would be the best approaches to improving the efficacy of education and outreach efforts regarding waste source reduction and household-/community-level waste management?</p> <p>115. How can the reduction in GHG emissions from waste be measured and monitored?</p> <p>116. Are there waste materials that could become the source of environmentally friendly products and businesses?</p>	<ul style="list-style-type: none"> • Identify waste management approaches and simple technologies and practices that are appropriate for Saint Lucia, reduce pollution, health and other climate-related risks and GHG emissions. • Assess the main sources of waste and provide sustainable management alternatives to reduce and better manage waste in the country. • Assess the risks posed by current waste and dangerous chemical management approaches under various climate change scenarios and formulate feasible solutions.

5.9 TOURISM

Broad topics/research questions	Suggested research outputs/activities
<p>117. How will climate change affect the tourism sector in Saint Lucia?</p>	<ul style="list-style-type: none"> • Estimation of the effect on tourism of reduced beach areas resulting from climate change. • Updated beach profiling, including an assessment of Saint Lucian beaches (with or without humanmade structures) in both dry and wet seasons. • Assessment of the cost of coastal erosion, flooding, and storm surges on beachfront hotels. • Projections of changes in travel patterns of tourism markets due to the increased temperatures, and increased intensities of storms.
<p>118. Which tourism infrastructure and attractions are most vulnerable to the effects of climate change?</p> <p>119. What is the expected impact of climate change on sports, entertainment, and cultural activities (e.g., music festivals, carnival, cricket, etc.)?</p>	<ul style="list-style-type: none"> • Estimation of the carrying capacity of heavily used tourism attractions (e.g., Soufriere, beaches). • Assessment of climate change impacts on tourism assets under various climate scenarios. • Assessment of climate change impacts on sports, entertainment, and cultural activities under various climate scenarios.

Broad topics/research questions	Suggested research outputs/activities
120. What tourism activities are most damaging to local ecosystems and biodiversity, increasing their vulnerability to climate change?	<ul style="list-style-type: none"> • Assessment of the impact of tourism activities on key marine and terrestrial ecosystems and recommendations for management.
121. How can the tourism sector contribute to limiting the impact of climate change?	<ul style="list-style-type: none"> • Assessment of energy- and water-efficient solutions for the tourism sector in Saint Lucia, including sustainable procurement, sustainable food sourcing, renewable energy, and optimised waste management solutions. • Establishing baselines on the import of food, goods, and consumables for the tourism sector in the country. • Assessment of systems to make sustainable linkages between tourism and food production to reduce GHG emissions, reduce waste, and enhance local livelihoods (e.g., use of local fruits in season to make juices available to visitors in the off-season).

5.10 HUMAN MOBILITY (DISPLACEMENT, NATIONAL RELOCATION, AND INTERNATIONAL MIGRATION AS LAST-RESORT OPTIONS DUE TO CLIMATE CHANGE)

Broad topics/research questions	Suggested research outputs/activities
<p>122. How will extreme and slow-onset events related to climate change affect human mobility within, into, and out of Saint Lucia? Which communities and locations will be most affected?</p> <p>123. Which integrated climate risk management and development policies and actions are needed to avert, minimise and address human displacement within, into, and out of Saint Lucia?</p> <p>124. What national and regional policy changes, collaboration agreements and institutional arrangements need to be made or strengthened to facilitate migration and relocation due to slow-onset hazards (e.g., sea level rise)?</p> <p>125. What programmes need to be put in place to ensure migration due to climate change (as a last-resort option) occurs with dignity? (e.g., skills-building programmes, health and education programmes for migrants, communication programmes, etc.) How can they be funded?</p> <p>126. What special arrangements need to be made to ensure the needs of vulnerable groups are met when they are faced with migration as their last-resort option? How can they be funded?</p>	<ul style="list-style-type: none"> • Studies that integrate and map human displacement considerations onto risk assessments and identify the most vulnerable groups and populations as well as potential relocation areas in Saint Lucia. • Studies that set standards for the collection and analysis of data on displacement and other forms of human mobility in the context of climate change and that include the participation of communities affected. • Assessments of existing national capacities to assist human relocation and migration due to climate change (as a last-resort option). This includes studies assessing the capacity of national facilities, social protection programmes, public services, and development programmes to cope with migrants from other countries and with the relocation of Saint Lucian citizens who are unable to return to their original locations due to the impacts of slow-onset hazards (e.g., sea level rise). • Analyses of potential skills that would enable Saint Lucian citizens to make a livelihood if confronted with international migration as their last-resort option. • Analyses of best practices and procedures for ensuring the relocation of people (including most vulnerable groups) as a last resort occurs with dignity. • Assessment of the adequacy of national and international policies, programmes, collaboration agreements, and protocols relevant to human migration to deal with climate change-induced human mobility (including free movement protocols, labour schemes or transhumance agreements; protocols for the evacuation and possible relocation of people living in high-risk areas, etc.; expediting or waiving visa agreements).

5.11 CLIMATE RISK TRANSFER MECHANISMS

Broad topics/research questions	Suggested research outputs/activities
<p>127. What climate risk transfer mechanisms/instruments could be developed/strengthened in Saint Lucia to reduce the impacts of climate change on livelihoods and assets?</p> <p>128. What are the costs and benefits of using different risk transfer mechanisms for the different development sectors? What are successful models applied in Small Island States?</p> <p>129. What data and information variables would need to be monitored for the establishment of weather index insurances?</p> <p>130. What types of insurance mechanisms would be more widely accepted and used by Saint Lucian citizens? How can the market for the most suitable insurance mechanisms be developed and funded?</p>	<ul style="list-style-type: none"> • Analyses of climate risk transfer mechanisms and instruments that could be adapted to the Saint Lucian context, and developed and implemented in a sustainable way to reduce the losses due to climate change impacts in the different development sectors. These include but are not restricted to weather index insurances. • Analyses of financial mechanisms for strengthening climate-insurance markets in Saint Lucia.

6 Conclusions

The National Climate Change Research Policy and the associated National Climate Change Research Strategy contained in this document present the efforts of GoSL to enhance and promote collaboration on climate change-relevant research in the country. Together, these documents provide the necessary guidance for research partners to plan and undertake disciplinary, interdisciplinary, and transdisciplinary fit-for-purpose studies with the potential to contribute meaningfully to sound climate action (including adaptation, mitigation, and loss and damage) and development decision making in Saint Lucia now and in the coming decades. In addition, filling the knowledge gaps through fit-for-purpose research will enable GoSL to better execute, monitor, and steer the implementation of its climate change agenda.

Every effort will be made to continue to communicate, disseminate, and make available and accessible the National Climate Change Research Policy and Strategy to potential research partners and Government entities to enhance awareness and understanding of the process.

Annex 1. List of Participants in the Consultations Conducted for the Development of Saint Lucia’s Climate Change Research Policy and Saint Lucia’s Climate Change Research Strategy



DEPARTMENT OF SUSTAINABLE DEVELOPMENT
Saint Lucia's National Adaptation Plan (NAP) Process
Climate Change Research Policy and Strategy Consultations
Palmville Conference Room, Coco Resorts, Rodney Bay, Gros-Islet
Wednesday April 24, 2019

ATTENDANCE REGISTER

	NAME OF ORGANISATION	DESIGNATION	NAME
	MINISTRY OF FINANCE, ECONOMIC GROWTH, JOB CREATION, EXTERNAL AFFAIRS AND THE PUBLIC SERVICE		
1	Department of Finance Research and Policy	Economist	Nalisa Marieatte
2	Department of External Affairs	Foreign Service Officer	Maria Jean-Baptiste
3		Foreign Service Officer	Kinz Francis
	MINISTRY OF ECONOMIC DEVELOPMENT, HOUSING, URBAN RENEWAL, TRANSPORT AND CIVIL AVIATION		
4	Department of Housing	Physical Planning Officer	Kahlil Glasgow
	MINISTRY OF AGRICULTURE, FISHERIES, PHYSICAL PLANNING, NATURAL RESOURCES AND CO-OPERATIVES		
5	Department of Agriculture	Chief Extension Officer	Kemuel Jn. Baptiste
6		Agronomist	Thaddeus Constantine
7		Deputy Director- Agricultural Services	Barry Innocent
8	Forests and Land Resources Department	Assistant Chief Forestry Officer	Rebecca Rock
9	Water Resources Management Agency (WRMA)	Acting Director	Jason Ernest
10	Department of Physical Planning	Physical Planning Officer	Werner Houson

	NAME OF ORGANISATION	DESIGNATION	NAME
11	Architectural Section	Physical Planning Officer	Florencius Eudovique
	MINISTRY OF EDUCATION, INNOVATION, GENDER RELATIONS AND SUSTAINABLE DEVELOPMENT		
12	Department of Education	Research Officer/School Safety Officer	Lindy Eristhee
13	Department of Gender Relations	Gender Relations Officer	Rohn Peter
14	Department of Sustainable Development (DSD)- Lead Agency	Acting Permanent Secretary	Caroline Eugene
15	Sustainable Development and Environment Division (SDED)	Chief Sustainable Development and Environment Officer	Annette Rattigan-Leo
16		Deputy Chief Sustainable Development and Environment Officer	Dawn Pierre-Nathoniell
17		Sustainable Development and Environment Officer	Kasha Jn. Baptiste
18		Sustainable Development and Environment Officer	Maier Sifflet
19		Sustainable Development and Environment Officer	Jeanel Volney
20		Science and Technology Officer	Eulampius Frederick
21		Professional Cadet	Snaliah Mahal
22		DVRP/PPCR Communications Officer	Lucius Doxerie
23	Protected Areas Management (PAM)	Manager	Augustine Dominique
	MINISTRY OF HEALTH AND WELLNESS		
24	Department of Health	Social Planning Officer	Jackie Joseph
25	Department of Environmental Health	Chief Environmental Health Officer	Parker Ragnanan
26		Assistant Chief Environmental Health Officer	Cheryl St. Romain
	MINISTRY OF INFRASTRUCTURE, PORTS, ENERGY AND LABOUR		
27	Department of Infrastructure	Civil Engineer	Naomi Cherry
28	Renewable Energy Division	Energy Officer	Charlin Bodley
29	Saint Lucia National Trust (SLNT)	Programme Officer-National Heritage	Joanna Rosemond

	NAME OF ORGANISATION	DESIGNATION	NAME
30	Water and Sewerage Authority (WASCO)	Strategic Planning Manager	Peter Norville
31	Saint Lucia Solid Waste Management Authority (SLSWMA)	Acting General Manager	Laurianus Lesfloris
32	Saint Lucia Development Bank (SLDB)	Managing Director	Vincent Boland
33	Sir Arthur Lewis Community College (SALCC)	Quality Assurance Officer	Cathy James-Springer
34	Caribbean Youth Environment Network (CYEN)	Representative	Cathy Louis
35	International Institute for Sustainable Development (IISD)	Consultant	Clara Ariza



DEPARTMENT OF SUSTAINABLE DEVELOPMENT

Saint Lucia's National Adaptation Plan (NAP) Process

Climate Change Research Policy and Strategy and NAP Monitoring and Evaluation Report Consultations

Palmville Conference Room, Coco Resorts, Rodney Bay, Gros-Islet

Thursday June 6, 2019

ATTENDANCE REGISTER

	NAME OF ORGANISATION	DESIGNATION	NAME
	OFFICE OF THE PRIME MINISTER		
1	Research and Policy	Programme Manager	Josette Maxwell-Dalsou
2	National Emergency Management Organisation (NEMO)	Maintenance Officer	Malcolm Job
	MINISTRY OF FINANCE, ECONOMIC GROWTH, JOB CREATION, EXTERNAL AFFAIRS AND THE PUBLIC SERVICE		
3	Department of Finance	Communication Specialist-National Competitiveness and Productivity Council (NCPC)	Glen Simon
4	Department of External Affairs	Foreign Service Officer	Maria Jean-Baptiste
	MINISTRY OF ECONOMIC DEVELOPMENT, HOUSING, URBAN RENEWAL, TRANSPORT AND CIVIL AVIATION		
5	Department of Economic Development	Economist	Charlin Louisy
6		Research Officer/Economist	Nadine S. Isidore
	MINISTRY OF AGRICULTURE, FISHERIES, PHYSICAL PLANNING, NATURAL RESOURCES AND CO-OPERATIVES		
7	Department of Agriculture	Crop Protection Officer	Cletus Alexander
8		Youth Officer	Vernet Francis

	NAME OF ORGANISATION	DESIGNATION	NAME
9	Department of Fisheries	Chief Fisheries Officer	Sarita Williams-Peter
10		Fisheries Officer	Vaughn Serieux
11	Forests and Land Resources Department	Assistant Chief Forestry Officer	Rebecca Rock
12	Water Resources Management Agency (WRMA)	Acting Director	Jason Ernest
13		Water Resource Specialist	Miguel Montoute
14	Veterinary Services	Animal Husbandry Officer	Darryl Best
15	Department of Physical Planning	Physical Planning Officer	Jasmine Weekes
16		Physical Planning Officer	Humphrey Regis
MINISTRY OF EDUCATION, INNOVATION, GENDER RELATIONS AND SUSTAINABLE DEVELOPMENT			
17	Department of Education	Research Officer/School Safety Officer	Lindy Eristhee
18	Department of Gender Relations	Teacher Assigned	Blossom Gonzague
19	Department of Sustainable Development (DSD)-Lead Agency	Acting Permanent Secretary	Caroline Eugene
20		Acting Deputy Permanent Secretary	Silka Tobias
21		Acting Chief Technical Officer	Samanthia Justin
22	Sustainable Development and Environment Division (SDED)	Chief Sustainable Development and Environment Officer	Annette Rattigan-Leo
23		Deputy Chief Sustainable Development and Environment Officer	Dawn Pierre-Nathoniell
24		Sustainable Development and Environment Officer	Maier Sifflet
25		Science and Technology Officer	Bethia Thomas
26		Professional Cadet	Snaliah Mahal
27		Legal Officer	Kate Wilson
28		Sustainable Development and Environment Officer	Jannel Gabriel

	NAME OF ORGANISATION	DESIGNATION	NAME
29		Sustainable Development and Environment Officer	Shanna Emmanuel
30		Secretary	Sansha Mathurin
	MINISTRY OF HEALTH AND WELLNESS		
31	Department of Health	Director-Health Promotion	Natasha Lloyd- Felix
32	Department of Environmental Health	Deputy Chief Environmental Health Officer	Cheryl St. Romain
	MINISTRY OF INFRASTRUCTURE, PORTS, ENERGY AND LABOUR		
33	Department of Infrastructure-Public	Civil Engineer	Naomi Cherry
34	Utilities Division	Public Utilities Officer	Fabian Lewis
35	Sir Arthur Lewis Community College (SALCC)	Lecturer	Lindsley Philbert
36		Educational Technical Officer	Royston Emmanuel
37		Quality Assurance Specialist	Cathy James-Springer
38	Saint Lucia National Trust (SLNT)	Director	Bishnu Tulsie
39	National Conservation Authority (NCA)	HR Manager	James Perineau
40	Saint Lucia Development Bank (SLDB)	Project Officer	Diane Francois
41	Soufriere Marine Management Authority (SMMA)	Manager	Micheal Bobb
42	Greening the Caribbean	Chief Operations Officer	Wayne Neale
43	Caribbean Agriculture Research and Development Institute (CARDI)	CARDI Representative SLU	Andrea Veira
44	Saint Lucia Solid Waste Management Authority (SLSWMA)	Deputy General Manager	Laurianus Lesfloris
46	Caribbean Public Health Agency (CARPHA)	Technical Officer	Bradshaw Isaacs
47	International Institute for Sustainable Development (IISD)	Consultant	Clara Ariza