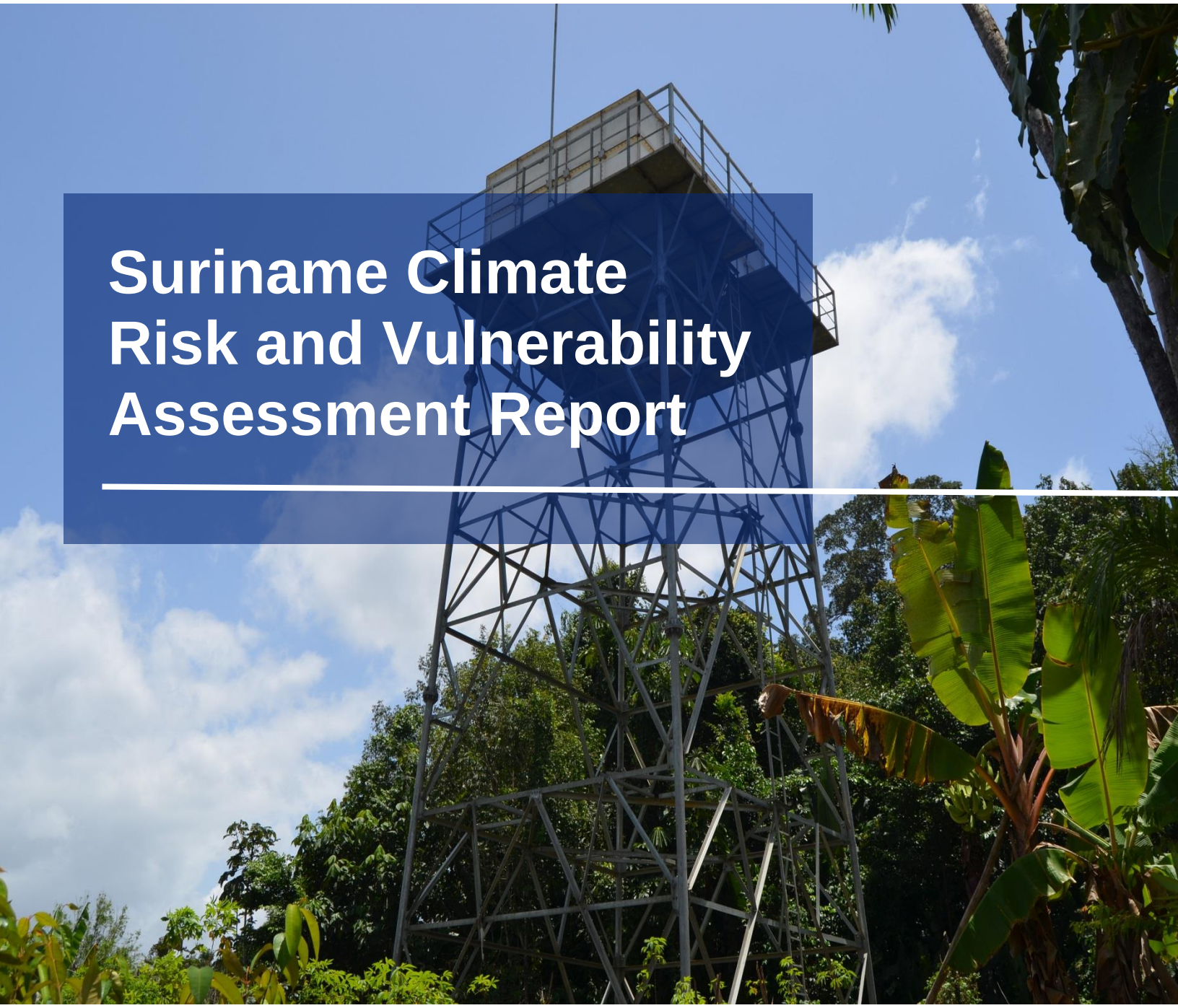
REPUBLIEK SURINAME



Suriname Climate Risk and Vulnerability Assessment Report

NIMOS

Japan-Caribbean Climate Change Partnership

From the People of Japan

UNDP

Empowered lives. Resilient nations.

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List of Acronyms

ABS	General Bureau for Statistics (Stichting Algemeen Bureau voor de Statistiek)
AdeKUS	Anton de Kom University of Suriname
ADRM	Agriculture Disaster Risk Management
ATM	Ministry of Labour, Technological Development and Environment (Ministerie van Arbeid, Technologische Ontwikkeling en Milieu)
BA	Baseline Assessment Report
BIS	Bauxite Institute of Suriname (Bauxiet Instituut Suriname)
CCD	Climate Compatible Development
CCDU	Climate Compatible Development Unit
CELOS	Centre for Agricultural Research in Suriname (Centrum voor Agrarisch Onderzoek in Suriname)
CI	Conservation International Suriname (NGO)
CZM	Coastal Zone Management
DRR	Disaster Risk Reduction
EBS	Energy Company Suriname (NV Energiebedrijven Suriname)
EWS	Early Warning System
FAO	Food and Agriculture Organisation of the United Nations
FOB	Development Fund for the Interior (Fonds Ontwikkeling Binnenland)
FNC	Initial National Communication to the UNFCCC
GHG	Greenhouse Gases
GIS	Geographical Information System
GLIS	Land Registration and Land Information System (Grondregistratie en Land Informatie Systeem)
GoS	Government of Suriname
HBO	Institute for Higher Education (Hoger Beroep Onderwijs)
HI	Ministry of Trade and Industry (Ministerie van Handel en Industrie)
ICZM	Integrated Coastal Zone Management
IDB	Inter-American Development Bank
IGSR	Institute for Graduate Studies and Research (AdeKUS)
IOL	Institute for Training Teachers (Instituut voor de Opleiding van Leraren)
IPCC	Inter-Governmental Panel on Climate Change
ITCZ	Inter-Tropical Convergence Zone
IWRM	Integrated Water Resources Management
JusPol	Ministry of Justice and Police (Ministerie van Justitie en Politie)
KKF	Chamber of Commerce and Industry (Kamer van Koophandel en Fabrieken)
LDC	Least Developed Country
LVV	Ministry of Agriculture, Animal Husbandry and Fisheries (Ministerie van Landbouw, Veeteelt en Visserij)
MAS	Maritime Authority in Suriname (Maritieme Autoriteit van Suriname)
MDS	Meteorological Service (Meteorologische Dienst van Suriname)
MinFin	Ministry of Finance (Ministerie van Financiën)
MINOV	Ministry of Education and Community Development (Ministerie van Onderwijs en Volksontwikkeling)
MZ	Medical Mission for the Interior of Suriname (Medische Zending Suriname)

NAMA	Nationally Appropriate Mitigation Action
NCAP I	Netherlands Climate Assistance Programme, Phase I
NCAP II	Netherlands Climate Assistance Programme, Phase II
NCCPSAP	National Climate Change Policy Strategy and Action Plan
NCCR	National Coordination Centre for Emergency (Nationaal Coördinatie Centrum voor Rampenbeheersing)
NCSA	National Capacity Self-Assessment
NH	Ministry of Natural Resources (Ministerie van Natuurlijkehulpbronnen)
NIMOS	National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu en Ontwikkelingin Suriname)
KAP	Climate Action Plan 2008 – 2013 (Klimaat Actie Plan 2008-2013)
NMR	National Council for the Environment (Nationale Milieu Raad)
ODRO	Under Directorate Spatial Planning (OnderDirectoraat Ruimtelijke Ordening)
OGS	Planning Commission Gold Sector (Ordening Goudsector)
OP	National Development Plan (Nationaal Ontwikkelingsplan)
OW	Ministry of Public Works (Ministerie van Openbare Werken)
PRECIS	Providing Regional Climates for Impact Studies (Regional climate modelling system)
REDD+	Reduced Emissions from Deforestation and Forest Degradation
RGD	Regional Health Service (Regionale Gezondheidsdienst)
RO	Ministry of Regional Development (Ministerie van Regionale Ontwikkeling)
ROGB	Ministry of Physical Planning, Land and Forest Management (Ministerie van Ruimtelijke Ordening, Grond- en Bosbeheer)
RVM	Council of Ministers (Raad van Ministers)
SBB	Foundation for Forest Management and Production Control (Stichting voor Bosbeheer en Bostoezicht)
SBF	Suriname Business Forum
SCF	Suriname Conservation Foundation
SER	State of the Environment Report
SLR	Sea Level Rise
SMNR	Sustainable Management of Natural Resources
SNC	Second National Communication to the UNFCCC
SoZaVo	Ministry of Social Affairs and Housing (Ministerie van Sociale Zaken en Volkshuisvesting)
SPS	National Planning Office (Stichting Planbureau Suriname)
SSB	Suriname Bureau of Standards (Suriname Standaarden Bureau)
SWM	Suriname Water Company (Surinaamsche Waterleiding Maatschappij)
TSSM	Triple Stream Sector Model
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WLA	Hydraulic Research Division (Waterloopkundige Dienst)

Executive Summary

Development and implementation of the National Adaptation Plan requires both a country level perspective and a sector level lens. The growth, sustenance and viability of Suriname's main economic sectors will be determined now and in the future by how adaptive and resilient they are to the impacts of climate change. This report therefore builds on guidance received from the National Climate Change Policy Strategy and Action Plan (NCCPSAP) and other scientific and technical studies on sector level risk and vulnerability to climate change in Suriname. More so, this report expands on and enhances those findings by conducting detailed perceptual risk and vulnerability assessments of each of the 13 main economic and livelihood sectors. Importantly, a necessary output here that is needed to build out a realistic and implementation-ready NAP, is a *prioritization* of sectors for climate change adaptation attention.

Following from Inter-Governmental Panel on Climate Change (IPCC) guidelines on conceptualization of climate change risk as a combination of impacts (direct, indirect, cumulative, slow onset, immediate); adaptive capacity (such as cross sectoral resilience); and asset vulnerability (such as ecological, human, socio-economic and physical capital), information and data were collected through national workshops and expert consultations. Along with the consultant's expert analysis and past scenario reports, a final sectoral prioritization is proposed. Additionally, based on the risk assessment findings, further adaptation options and the feasibility of such options are considered and presented. This however, will be elaborated more fully in the NAP to come.

The model recommended for sector prioritization for climate change adaptation attention in Suriname is described as the Triple Stream Sector Model (TSSM) where the 13 main sectors are analyzed within three clusters: (1) National productive sectors: These are the main economic drivers at the core of national development; (2) Cross cutting integrative sectors. These are sectors that can also be leveraged to affect multiple productive sectors at the same time, cumulatively, in parallel or additively and (3) Cross foundational support sectors. These sectors are the foundation of long term building of national economic wealth, sustainability, resilience and sustained development. This model complements and enriches findings of previous studies that informed the Second National Communication and the NCCPSAP.

In the TSSM based on calculated scores, the final priority ranking of the Productive Sectors is: 1. Water, 2. Forestry, 3. Agriculture, 4. Energy, 5. Infrastructure & Housing, 6. Tourism, and 7. Mining. A preliminary outline of an implementation plan for sector level climate change adaptation is therefore conceptualized as follows:

Phase 1: Near Term (Year 1-3): Provide adaptive planning focus on cross-collaborative sectors: Environment, Disaster Risk Reduction, and Spatial Planning. Provide adaptive planning focus on

priority sectors 1. Water, 2. Forestry, and 3. Agriculture. Provide adaptive planning focus to a significant level on foundation sectors – Education and Health

Phase 2: Medium Term (Year 3-6): Provide adaptive planning focus on cross-collaborative sectors: Environment, Disaster Risk Reduction, and Spatial Planning as required. Provide adaptive planning focus on priority sectors 4. Energy, and 5. Infrastructure and Housing. Initial focus on 1. Water, 2. Forestry, 3, Agriculture can be gradually reduced due to resilience built in Phase 1. Provide adaptive planning focus to a moderate level on foundation sectors – Education and Health, since resilience has been ramped up from Phase 1.

Phase 3: Long Term (Year 7-9): Provide adaptive planning focus on cross-collaborative sectors: Environment, Disaster Risk Reduction, Spatial Planning as required. Provide adaptive planning focus on priority sectors 6. Tourism and 7. Mining. The medium term focus on 4. Energy and 5. Infrastructure and Housing can now be reduced as resilience was built in the Medium term. Provide adaptive planning focus to a lower level on foundation sectors – Education and Health, since resilience had been built to a strong extent in Phase 2.

1. Introduction

The objectives of this report are to:

(1) Consider and update as needed, the findings and recommendations of the NCCPSAP report and the guidance provided therein on sector level climate risk and vulnerability;
(2) Identify how risk and vulnerability trends at national and sector levels can support the planning processes nationally;
(3) Improve upon the interpretations of existing climate models, climate data and climate studies reported on in the NCCPSAP and other national documents acquiring and integrating perceptual risk and vulnerability measures from key stakeholders
(4) Assess vulnerability to climate change at the sectoral and national levels and rank identified climate risks and vulnerabilities and align them with appropriate adaptation options

The NCCPSAP provides:
1. A National Climate Change Policy consistent with Suriname's National Development Plan.
2. A National Climate Change Strategy with an implementation roadmap.
3. A National Climate Change Action Plan describing programmes and actions to be undertaken under each national development planning theme.

Background

Climate change is one of the greatest challenges of our time. Suriname's people, society, economy and environment are already affected by extreme weather and climate events, and are under increasing risk from the impacts associated with climate change. The May 2006 floods, for example, affected over 13,000 households in Suriname, particularly in the Brokopondo and Sipaliwini districts, and caused damage and loss valued at approximately SRD111 million across the housing, health, education, energy, transport, communications, agriculture, tourism, commerce and trade sectors. Regional models predict that in the future, temperature will increase, sea level will rise and the proportion of total heavy rainfall will increase, while average rainfall will decrease. Where there is high vulnerability and exposure to these types of climatic changes, the risk of similar or more severe impacts in the future is high. Action is already being taken to address climate impacts, but more needs to be done.

Suriname's 2012-2016 National Development Plan, the 2013 Second National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) and the 2012-2016 Environmental Policy Plan all recognize the significance of Climate Change impacts on Suriname

and the opportunities for low carbon emission development[1]. This NCCPSAP is the logical next step in enabling Suriname to build resilience to the impacts of a changing climate, providing a clear roadmap to respond to the challenges of a changing climate, seizing opportunities for climate compatible development and attracting climate finance.

1.1 Applying concepts of risk, vulnerability and adaptation

The degree of climate change risk experienced at a national level is derived from the sensitivity of ecosystems and economic sectors to immediate and slow onset impacts, coupled with the amount of exposure that these systems encounter. The degree of climate change risk is moderated by the capacity for adaptation accrued through national and sectoral efforts especially where vulnerabilities to impacts have been identified. See figure 1 below.

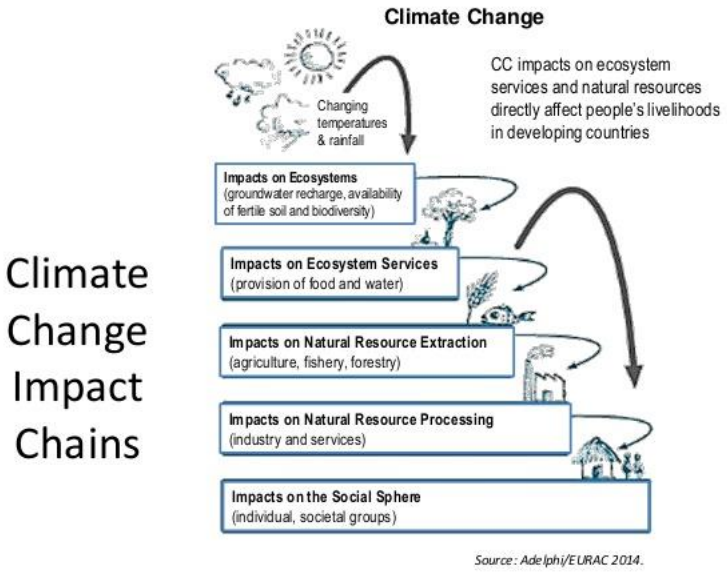


Figure 1: Cascading Effect of Climate Change Impacts on the national ecosystem

Climate Change Impacts

[1] Also stated in the Suriname 2017-2021 National Development Plan

Sectoral environmental impacts are: 1. Direct impacts, 2. Indirect impacts and 3. Cumulative impacts. Direct impacts occur through direct interaction of climate change with an environmental, social, or economic component of the sector. Indirect impacts on the environment are these which are not a direct result of climate change but are often produced away from or as a result of a complex impact pathway. A cumulative impact consists of an impact that is created as a result of the combination of climate change with other existing conditions causing related impacts.

Vulnerability and Adaptation

Vulnerability is “the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes". See figure 2 below.

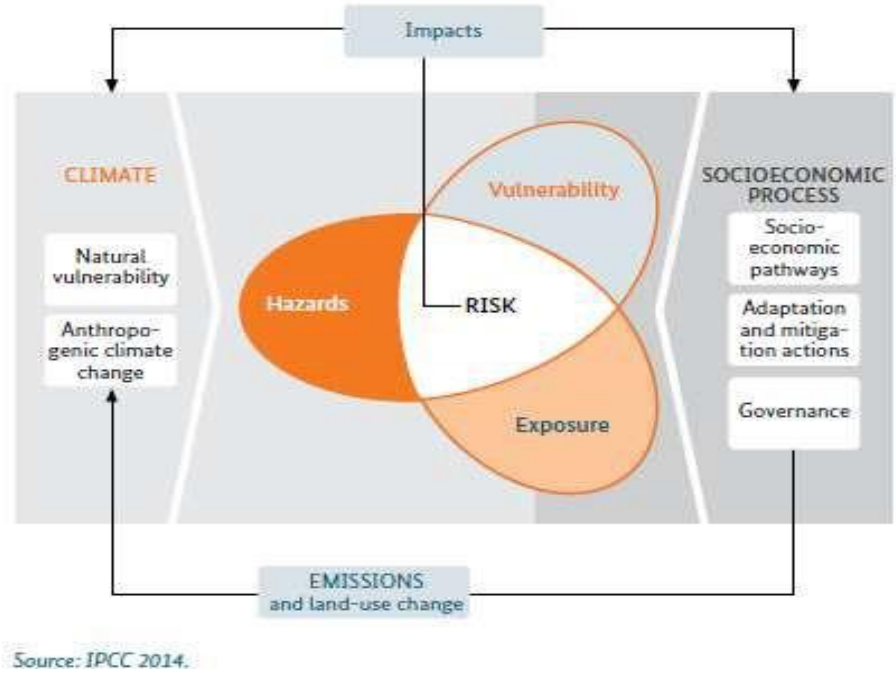


Figure 2. Concept of Risk at the intersect of Hazards, Exposure and Vulnerability

Adjustment in natural or human systems is in response to actual or expected climatic stimuli or their effects. This moderates harm or exploits beneficial opportunities. The adaptation of human systems is a process that requires the engagement of a wide range of stakeholders at multiple levels and in multiple sectors. It requires analysis of current exposure to climate shocks and stresses, and model-based analysis of future climate impacts. It demands an understanding of the existing vulnerability of individuals, households, and communities. With this information, adaptation strategies can be designed and implemented. Monitoring and evaluating the

effectiveness of activities, as well as sharing knowledge and lessons learnt, are critical components of the process. See figure 3 below.

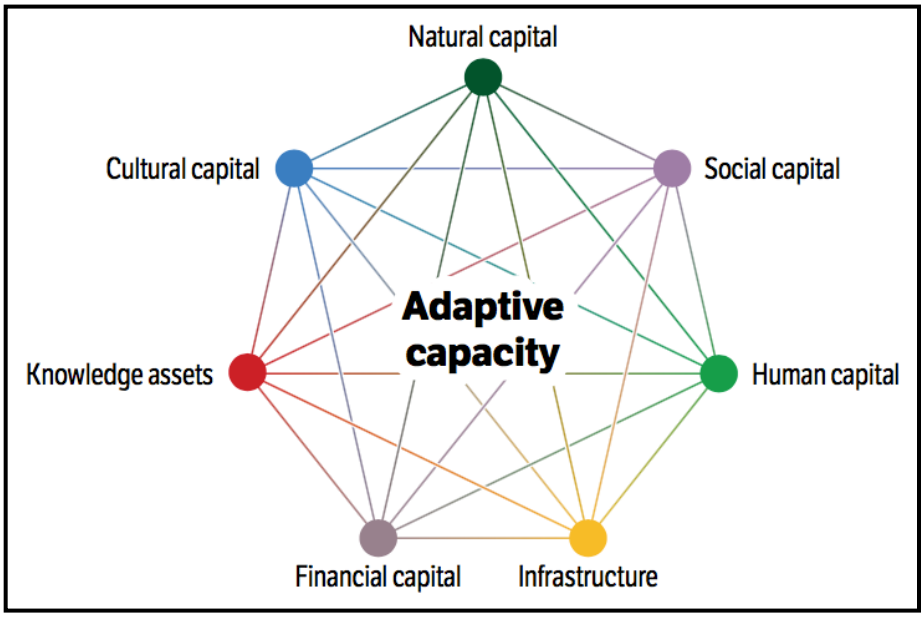


Figure 3: Adaptive Capacity conceptualized as valuable capital

Adaptive capacity at national and sectoral levels can be framed based on the valued capital concept or the anthropocentric perspective (i.e. the purpose of adaptation being primarily for human development). Human Capital: Knowledge of climate risks, technical skills, good health; Social: Community networks, farmer-based organizations; Physical: Infrastructure, facilities, machinery, equipment, tools; Natural: Water, soil quality, solar energy, forests; Financial: Insurance, diversified income sources.

In many countries, for a long time, combatting climate change has taken the effective form of ‘coping’ with impacts and side-stepping vulnerabilities or ‘patching’ instead of fixing and building resilience. It is important to understand that national adaptation planning goes beyond what decision-makers may inadvertently have been enacting in the past to ‘cope’. Refer to Table 1.

Table 1: Climate change 'coping' versus true adaptation

Coping	Adaptation
▸ Short-term and immediate ▸ Oriented towards survival ▸ Not continuous ▸ Motivated by crisis... reactive ▸ Often degrades resource base ▸ Prompted by lack of alternatives	▸ Oriented towards longer term security ▸ A continuous process ▸ Results are sustained ▸ Uses resources efficiently and sustainably ▸ Involves planning ▸ Combines old & new strategies/knowledge ▸ Focused on finding alternatives

In summary therefore, in order to frame national and sectoral climate change adaptation in terms of risk, vulnerability and building long term resilience, there are four dimensions that must be understood and tackled. National adaptation planning must address the drivers of vulnerability, build response capacity, manage the identified climate risks and take action or confront the threats. There are two equally relevant ways to contemplate the risks we must confront. First, the technical risk derived through analysis and interpretation of ecological and physico-chemical data and data trends and extrapolations (as discussed in the NCCPSAP and Baseline Assessment); and second, the perception of risks by those who will be impacted and those charged with the stewardship of national economic resources and development activities (this second contemplation of risk is reported here). See figure 4 below.

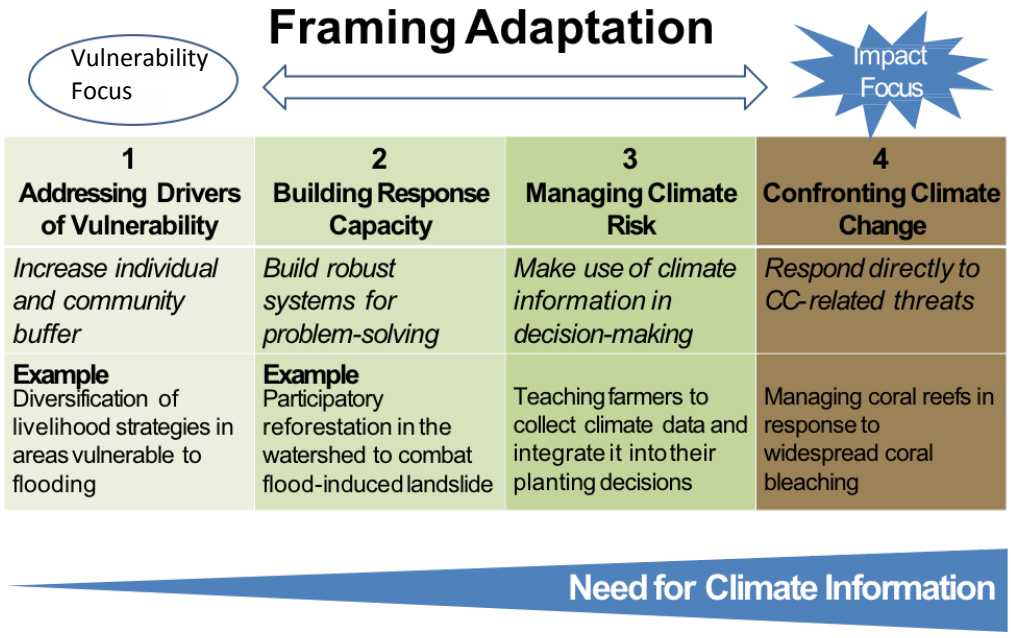


Figure 4: Framing Adaptation

In combination, we obtain a fuller picture of vulnerability and risk assessment, allowing us to consider the appropriate and realistic adaptation options we can employ to build resilience. Here resilience is the ability of a system to resist, absorb, and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity. See figure 5 below.

Figure 5: An operational process view of building a national resilience framework

Gender perspectives mainstreamed into risk and vulnerability assessments

Evidence continues to point to women in country conditions such as Suriname, and more so in rural areas, that vulnerability to climate change is more intense since they may be highly dependent on local natural resources and/ or agriculture for their livelihood. Women charged with securing water, food and fuel for cooking and heating face the greatest challenges. Women experience unequal access to resources and decision-making processes, with limited mobility in rural areas. It is thus important to this risk and vulnerability assessment to identify gender-sensitive strategies that respond to these crises for women (UNDP, 2013).

Factors that can be considered here, regarding gender differences, include differences in time use, access to assets and credit and treatment by markets and formal institutions. As a result, there is a global gender gap in earnings and productivity—women make between 30 and 80 percent of what men earn annually. In Suriname, women make up at least half of the agricultural labor force. The cumulative effects of poverty and social, economic and political barriers is that

women will often be disadvantaged in coping with the adverse impacts of the changing climate. Another observation is the extent to which socio-cultural norms could limit women from acquiring the information and skills necessary to escape or avoid hazards. An example is their responsibility for small children who cannot swim or outrun disasters and related negative effects of climate change.

Also noted here, as we developed this risk and vulnerability assessment in Suriname, is the fact that women play a pivotal role in natural resources management and in other productive and reproductive activities at the household and community levels. This puts them in a position to contribute to livelihood strategies adapted to changing environmental realities. Their extensive knowledge and expertise—that can also be used in climate change mitigation, disaster reduction and adaptation strategies—make them effective actors and agents of change (UNDP, 2013).

1.2 Methods and approaches

A workshop was held in November 2017 with the focus on the National Adaptation Plan following the gap assesment that was conducted recently based upon previous work, mainly the NCCPSAP document. The objective of this workshop was to establish priorities for the Adaptation plan, focusing on the gaps and weaknesses, and to drill down in the sector level vulnerability and risk assesment The goal is to look at the adaptation options that are present and how they are prioritized to access their feasibility for the country and its future and how they could contribute in building resilience. There were several institutions present which shared their information and perspectives and contributed to the success of the workshop.

Collecting data, information and expert insights from the national workshop

Risk perception is the subjective judgement that people make about the characteristics and severity of a risk. The phrase is most commonly used in reference to natural hazards and threats to the environment or health, such as nuclear power.

Public risk perceptions are critical components of the socio-political context within which policy makers operate. Public risk perceptions can fundamentally compel or constrain political, economic and social action to address particular risks. For example, public support or opposition to climate policies (e.g., treaties, regulations, taxes, subsidies, etc.) will be greatly influenced by public perceptions of the risks and dangers of global climate change.

Four methods were used to gather information and data about sector to sector climate change risk and vulnerability. These were:
1. Review of the information, analysis and findings of the NCCPSAP and other relevant national technical documents

2. Stakeholder consultations and focus groups held at the 2nd National Workshop
3. Consultations, documents and presentations provided by Sector Experts
4. Expert judgement of the Consultant based on literature review and latest developments, guidelines and guiding reports of the UNFCCC and the NAP Global Network

Main documents for review

The Final Draft National Climate Change Policy, Strategy and Action Plan (NCCPSAP) for Suriname, January 2015 forms one of the main basis for this report. The NCCPSAP however, is now more than a year old and this review will also consider if, how and where there may have been contextual or conditional changes that would impact on the final NAP to be developed. The Directorate for Environment of the Ministry of Labour, Technological Development and Environment notes that "This document reflects on key elements of our efforts to adapt to and mitigate the adverse effects of climate change" hence this is the main document reviewed here and it is determined to be the primary guiding document for the development of the final NAP.

Other secondary documents reviewed here, that may provide grounding for the final NAP include:

- The Suriname Intended Nationally Determined Contributions (INDC), 2015: This document puts forward Suriname's agreements to reduce greenhouse gas emissions in the context of the national circumstances, capabilities and priorities.
- The 2017-2021 National Development Plan: Developed by the Planning Bureau and a wide range of national stakeholders, this plan lays out physical development objectives as well as strategies and resource allocations to achieve goals. It notes growing relevance of climate change adaptation needs in physical, land, infrastructure and sectoral planning.
- The 2013 Second National Communication to the United Nations Framework Convention on Climate Change: Suriname has provided information on emissions; policies and measures; vulnerability; financial resources and transfer of technology; education, training, and public awareness; and other details pertaining to efforts around implementing the Convention.

National Workshop Methodology for Stakeholder Consultations

Overview:

Step	Approach	Format
1	- Provide an overview of risk and vulnerability assessment concepts	- All participants in general plenary - Step 1 led by Consultant

	- Overview of sectoral vulnerability based on existing reports and documentation - Provide an overview of the approach to the risk and vulnerability exercise to be undertaken by participants at the workshop	- Time allotted: 1 hr. 15 mins.
2	- Exercise to weight impact importance criteria - Exercise to weight risk assessment criteria - Exercise to weight adaption options criteria	- All participants in general plenary - Step 2 led by Consultant - Time allotted: 1 hr. 15 mins.
3	Sector Cluster 1: Infrastructure, Housing, Disaster Risk Management - Sectoral impact identification exercises - Sectoral impact and risk ranking exercises - Sectoral adaptation options exercises - Sectoral adaptation options ranking exercises	- Participants self-identify into either cluster 1 or cluster 2 - Each cluster is led by a facilitator under direction of the consultant - Each sector is started by a 15-20 minute introduction by a sector Expert - Consultant collects and collates results of each sector and both clusters - Total time allotted: 1 hour per sector = 3 hours
4	Sector Cluster 2: Drinking Water, Health, Tourism - Sectoral impact identification exercises - Sectoral impact and risk ranking exercises - Sectoral adaptation options exercises - Sectoral adaptation options ranking exercises	- Participants self-identify into either cluster 1 or cluster 2 - Each cluster is led by a facilitator under direction of the consultant - Each sector is started by a 15-20 minute introduction by a sector Expert

		- Consultant collects and collates results of each sector and both clusters - Total time allotted: 1 hour per sector = 3 hours
5	Sector Cluster 3: Energy, Mining, Environment - Sectoral impact identification exercises - Sectoral impact and risk ranking exercises - Sectoral adaptation options exercises - Sectoral adaptation options ranking exercises	- Participants self-identify into either cluster 3 or cluster 4 - Each cluster is led by a facilitator under direction of the consultant - Each sector is started by a 15-20 minute introduction by a sector Expert - Consultant collects and collates results of each sector and both clusters - Total time allotted: 1 hour per sector = 3 hours
6	Sector Cluster 4: Sustainable Forest Management, Spatial Planning, Agriculture & Fisheries - Sectoral impact identification exercises - Sectoral impact and risk ranking exercises - Sectoral adaptation options exercises - Sectoral adaptation options ranking exercises	- Participants self-identify into either cluster 3 or cluster 4 - Each cluster is led by a facilitator under direction of the consultant - Each sector is started by a 15-20 minute introduction by a sector Expert - Consultant collects and collates results of each sector and both clusters - Total time allotted: 1 hour per sector = 3 hours
7	Plenary Results and Discussion - Preliminary tabulated sector results and rankings presented to all participants - Comments recorded	- Led by a Facilitator - Consultant records all participant comments - Time allotted: 1 hr. 30 mins.

Detailed approach:

- Exercise to weight impact severity criteria

All participants will share 10 points among the four criteria to develop the weighting.

Sectoral environmental impacts are: 1. Direct impacts, 2. Indirect impacts and 3. Cumulative impacts.

Direct Impacts: Direct impacts occur through direct interaction of climate change with an environmental, social, or economic component of the sector.

Indirect Impacts: Indirect impacts on the environment are these which are not a direct result of climate change but are often produced away from or as a result of a complex impact pathway.

Cumulative Impacts: Cumulative impact consists of an impact that is created as a result of the combination of climate change with other existing conditions causing related impacts.

- Exercise to weight risk probability criteria

There are five criteria to consider:

All participants will share 10 points among the five criteria to develop the weighting.

Natural capital is any stock or flow of energy and material that produces goods and services. It includes: Resources - renewable and non-renewable materials, Sinks - that absorb, neutralize or recycle wastes, Processes - such as climate regulation.

Financial capital - is any economic resource measured in terms of money used by entrepreneurs and businesses to buy what they need to make their products or to provide their services to the sector of the economy upon which their operation is based, i.e. retail, corporate, investment banking, etc.

Human capital consists of people's health, knowledge, skills and motivation.

Social capital concerns the institutions that help maintain and develop human capital in partnership with others; e.g. families, communities, businesses, trade unions, schools, and voluntary organizations.

Manufactured capital comprises material goods or fixed assets which contribute to the production process rather than being the output itself – e.g. tools, machines and buildings.

- Exercise to weight adaption options criteria

All participants will share 10 points among the four criteria to develop the weighting.

There are four criteria to consider: (1) Environmental effects of the adaptation option; (2) Political and social acceptability of the adaptation option (social equity, flexibility, transparency and accountability); (3) Feasibility of implementation (administrative, technical readiness, sustainability); (4) Financial viability (direct, indirect and capital costs).

Once the criteria weightings are assigned as above, the 12 sectors are assessed. First, an expert sector representative will provide to the participants, an overview of the sector. This overview will include information on the major activities of importance to the economy as well as broad concerns regarding climate change.

Next, led by the facilitator, the participants will develop a long list of impacts on the respective sector. From this long list, the facilitator will take the participants through a process of elimination and consolidation to conclude a short list of impacts.
Once the short list is agreed upon, the participants, as a group will complete the following table.

NUMBER	IMPACT CHARACTERISTICS			RISK CHARACTERISTICS				
	Direct	Indirect	Cum.	Natural	Human	Social	Finance	Manufac.
1								
2								
3…								

Each participant will then individually complete the ranking of the numbered impacts:

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2					

RISK PROBABILITY	(Improbable or very low)					
	3-4 (Remote or low)		e.g. Impact #1			
	5-6 (Occasional or moderate)					
	7-8 (Probable or high))				e.g. Impact# 4	
	9-10 (Frequent or Very high)					

Once the impacts and risks have been ranked, participants move to identifying adaptation options. There are two steps here. First, the facilitator leads all the participants through completing the following table. Participants identify and agree to adaptation options and identify which impact(s) the option mitigates.

ADAPTATION OPTIONS	IMPACTS IDENTIFIED				
	1	2	3	4	5…
A					
B					
C					
D…					

Then, for each of the adaptation options identified above, the following table is completed INDIVIDUALLY:

ADAPTATION OPTIONS	SUCCESS CRITERIA			
	Environ. Responsibility (1 to 5)	Political and social Accept (1 to 5)	Feasibility of implementation (1 to 5)	Financial Feasibility (1 to 5)
A				

B				
C…				

As facilitators complete each sector, the Consultant collects the group results and the individual results (from individual participants worksheets that they submit to the facilitator). The Consultant then tabulates the results for each sector based on the criteria weightings and the rankings[2].

Sector Level Prioritization

Based on the sector by sector detailed vulnerability and risk assessment, the Consultant will use a decision matrix to identify the national sector level priorities. An illustration of this approach is provided below:

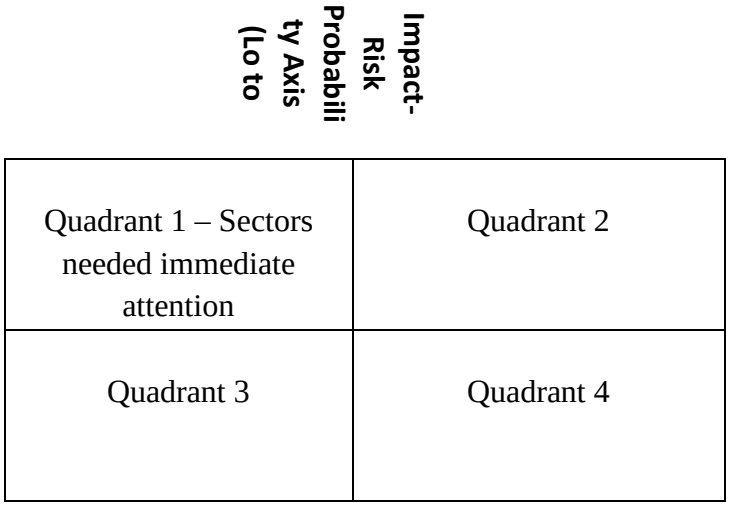


Figure 6: Priority decision matrix

[2] See Annex for samples of Workshop participant worksheets.

2.0 Conceptualization of a National Sector Level Risk and Vulnerability Approach

The objective of undertaking a perceptual risk and vulnerability assessment at the national sector level is to gauge where in the national landscape at the sector level, the most risk and vulnerabilities lie in relation to their importance to national sustainable development and relative to how realistic it would be to implement adaptation actions for the sector to strengthen resilience.

The Triple Stream Sector Model (TSSM)

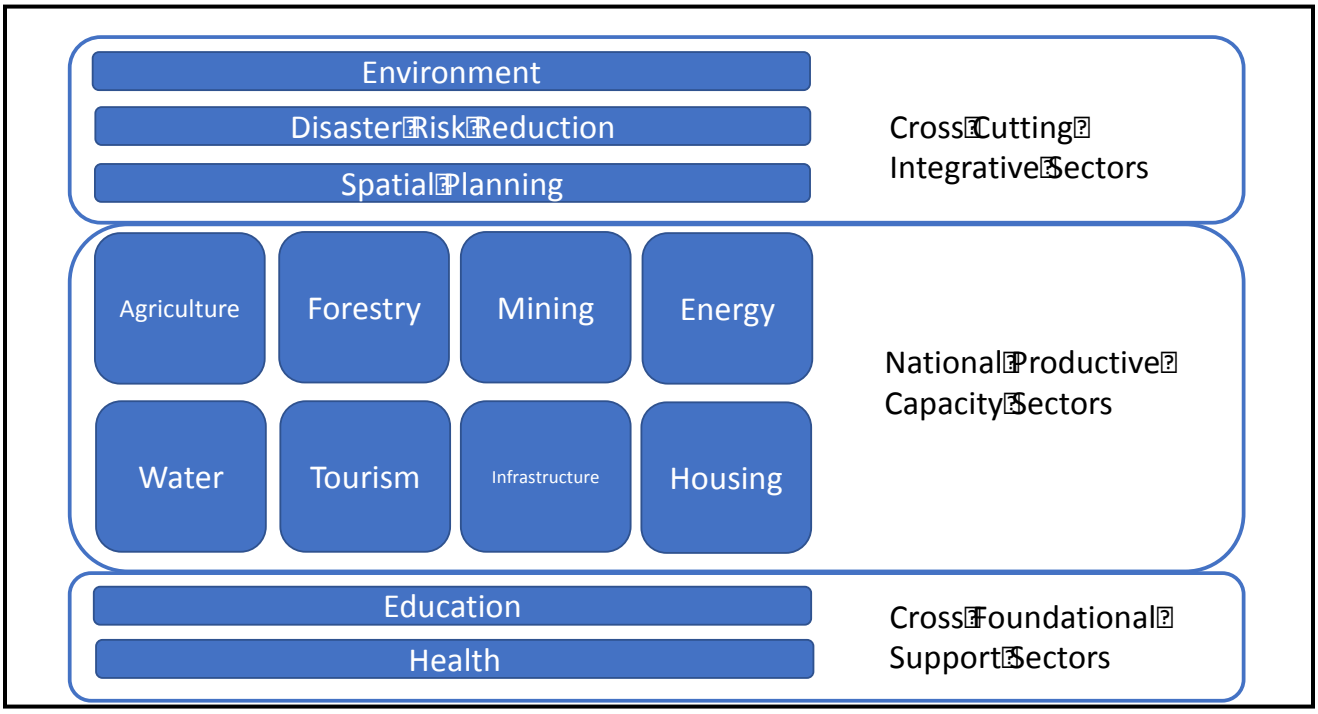


Figure 7: Triple Stream Sector Model (TSSM) for considering national sector level climate change adaptation priorities

The TSSM is an approach that considers all thirteen national sectors as identified and segmented in the NCCPSAP. These thirteen sectors are: Environment, Disaster Risk Reduction, Spatial Planning, Agriculture, Forestry, Mining, Energy, Water, Tourism, Infrastructure, Housing, Education and Health. These sectors can be further clustered into three 'streams' as follows:

(1) National productive sectors: These are the main economic drivers at the core of national development. They are the main foreign exchange earners and sources of employment in Suriname. As such, they are the focus of climate change adaptation efforts. These sectors are largely natural resource based and in some cases, for example the water and energy

sectors, they also serve a public-centric focus such as potable water supply and/or electricity generation, along with the broader economic contributions. The sectors clustered here are: agriculture, forestry, mining, energy, water, tourism, infrastructure and housing.

(2) Cross cutting integrative sectors. These are sectors that overarch the functioning of the productive sectors and while they each have separate risk and vulnerability profiles in and of themselves, they can also be leveraged to affect multiple productive sectors at the same time, cumulatively, in parallel and even additively. The sectors clustered here are: environment, disaster risk reduction and spatial planning.

(3) Cross foundational support sectors. These sectors are the foundation of long term building of national economic wealth, sustainability, resilience and sustained development. Essentially, progression through growth, development and climate change adaptation in each of the productive and cross-cutting sectors noted above, will be handicapped without maintaining the viability and strength of these cross foundational support sectors. The sectors clustered here are: education and health. Again, while both these sectors require adaptation attention in and of themselves, their underlying foundational support for all other sectors is important.

This TSSM approach also complements findings of studies that informed the Second National Communication and enriches the general approaches outlined in the NCCPSAP. These previous studies, among other issues, point out the need to prioritize adaptation efforts by sector. They also forward the argument that such prioritization be founded on current national evidence on risk and vulnerability as well as additional considerations of societal equity, economic well-being, national cultural values and the realism of resources for practical implementation in the national interest.

There are several advantages to address risk and vulnerability at the sector level, using the TSSM approach. First, it addresses the complex interlinkages between different sectors, which could not be effectively achieved in a conventional linear prioritization model (i.e. 1st priority sector X, 2nd priority sector Y …). The linear model is often unrealistic, leading to an oversimplification of the national adaptation planning effort and loss of vital gains that could be made through accounting for inter-sectoral interlinkages. This is unsuitable in country circumstances like Suriname where resource allocations for climate change adaptation may be scarce or uncertain coupled with the urgency with which action has to be taken. Second, by prioritizing the productive sector stream but coupling that with simultaneous efforts across the cross-cutting integrative sectors and maintaining an eye on foundation sector stream, there is a greater probability of successful adaptation in each productive sector tackled in sequence; more likelihood that gains made will

not regress; and resiliency in the foundation and cross-cutting sectors means a progressive reduction in risk of failure to adapt in each productive sector tackled in prioritized sequence.

3.0 BACKGROUND ON SCENARIO MODELS FOR RISK AND VULNERABILITY ASSESSMENTS

There have been some efforts at scenario modelling of climate change vulnerability at the national level in Suriname. Through developing predictive climate change scenarios according to IPCC guidelines, there is some relevant information for understanding sector level vulnerability assessment in Suriname. The following section summarizes the key risk and vulnerability assessment findings available, largely based on work completed in preparation of the Second National Communication to the United Nations Framework Convention on Climate Change (2013).

The critical issues emphasized included water resources which are mainly used for agriculture, energy generation in the form of hydro-electricity and consumption. Emphasis was also placed on urban areas, which are susceptible to flooding as a result of the combination of abundant rainfall, poor drainage, and rising sea and river levels. Additional attention was paid to excessive rainfall in the interior, which caused severe flooding annually.

At the sector level, for the agriculture sector, emphasis was placed on food security and food safety; and in health, emphasis was placed on monitoring occurrences of dengue and malaria. Not all sectors as identified in the NCCPSAP, were treated with in the Second National Communication (SNC) scenarios. The scenarios also pay attention to coastal geomorphology and the coastline with respect to sea level rise and climate change as well as socio-economic analysis primarily on existing vulnerabilities among certain groups in society, such as farming communities and women in the interior.

Scenario models described the baseline conditions relevant to understanding vulnerability in Suriname. This includes discussion of climate characterized as tropical wet and hot and generally controlled by the biannual passage of the Inter-Tropical Convergence Zone (ITCZ). The first passage occurs during the period from December to February (known as the short wet season), and the second during the period from May to mid-August (the long wet season). The periods between these are the short dry season (February to the end of April) and the long dry season (mid-August to early December). According to the Köppen classification, Suriname has three climate types: monsoon climate, tropical rainforest climate and humid and dry climate.

Another major condition that determines the country's climate is that of its surface conditions. Characteristics such as an abundance of rivers and swamps and the presence of a well-developed vegetation cover produce large amounts of water vapour. Along with local convection and orographic lifting along the hills and mountainous regions, these contribute to the relatively high precipitation in the country. For decades, general climatic conditions have remained nearly the same throughout the year.

The variation of annual temperature is 2-3 degrees Celsius. The Suriname Meteorological Services and the University of Suriname have confirmed at least a 1 degree Celsius rise in temperature on average.

In the coastal zone of Suriname, temperature observations over the past forty-seven years have shown an average increase of approximately 0.016 degrees per year. In the hinterland, no significant trends in temperature change have been observed. The SNC noted however, that temperature observations in the coastal zone as well as in the interior may be affected by local conditions. In the coastal zone, such conditions would increase due to urbanization. In the interior, the type of land cover (savannah or forest, for example) would be a factor.

One of the principal parameters of climatology is rainfall. For Suriname, this is essential, since rainfall is the basis for the distribution of the four seasons. Due to incomplete data, rainfall trend analyses is difficult to do well in scenario modelling currently. Based on the available data, the SNC stated that the highest amount of rainfall (about 3,000 mm/yr.) is observed in the center, and the lowest amount in the north-western part of the country (less than 1,750 mm). In Paramaribo and Wanica, rainfall varies widely, from 1,400mm/yr. in the north to 2,100 mm/yr. in the south. To the south of this zone (except for the central part of the country) yearly rainfall varies on average from 2,000 to 2,350 mm/yr. An example of an exceptionally wet year was 2006, when large amounts of rainfall caused significant areas along rivers upstream to be inundated. However, it has been noted that this type of event seems to reoccur every 25-75 years.

Winds are generally light, with annual averages of about 1.3-1.6 on the scale of Beaufort (or 1-5 m/s). The daily wind-speed variation is higher, up to 3-4 Beaufort (3-8 m/s). High winds in Suriname correspond with the occurrence of local gales, called sibibusi in Surinamese, reaching speeds of up to 20-30 m/s near the end of the rainy seasons.

Extreme weather conditions often occur related to El Niño and La Niña events. There may be a connection between extremely dry conditions and strong El Niño events, as well as between extremely wet conditions in the country with strong La Niña events. Extreme weather conditions are also observed during sibibusi events, when wind speeds of up to 58 knots occur. Such winds can cause significant damage in urban areas.

The SNC states that based on data in hand and scenarios put forth to date, it is unclear how global climatic circulations affect extreme weather patterns in Suriname. Moreover, according to predictions, the Walker current is weakening and may drop by 1% in force by the year 2100. This will impact the hydrological cycle and hence rainfall and other climatologic conditions. A clear description of the current climate is unavailable due to a lack of data and poor observation networks. Events such as sibibusis and strong variations in rainfall have not been consistently observed, and therefore no analyses have been produced. Still, the Second National Communication recommends the following best possible assumptions for use in vulnerability assessment for Suriname: - sea-level rise of 1m; - rainfall decrease of 10%; - temperature increase (unknown value); and - possible changes in wind speeds.

3.1 Applying IPCC Scenarios to Suriname Conditions[3]

The projected sea-level rise in Suriname has been calculated according to the A2 and B2 IPCC scenarios[4]. Elements from both of these scenarios have been used, since one specific scenario is difficult to apply to the national circumstances of Suriname. The adapted IPCC scenario includes country-specific data for expected rise of the average temperature and sea-level and possible changes in total rainfall. Other data, such as occurrences of extreme events and variations in the amounts of seasonal rain, including periods between dry and wet seasons, are also considered in the adapted scenarios.

[3] As reported in the Suriname SNC (2013) and subsequently utilized and made reference to in the NCCPSAP (2016).

[4] The A2 marker scenario (A2-ASF) was developed using an integrated set of modeling tools that was also used to generate the first and the second sets of IPCC emission scenarios (SA90 and IS92). Overall, the A2-ASF quantification is based on the following assumptions:

- Relatively slow demographic transition and relatively slow convergence in regional fertility patterns.
- Relatively slow convergence in inter-regional GDP per capita differences.
- Relatively slow end-use and supply-side energy efficiency improvements (compared to other storylines).
- Delayed development of renewable energy.
- No barriers to the use of nuclear energy.

The B2 world is one of increased concern for environmental and social sustainability compared to the A2 storyline. Increasingly, government policies and business strategies at the national and local levels are influenced by environmentally aware citizens, with a trend toward local self-reliance and stronger communities. International institutions decline in importance, with a shift toward local and regional decision-making structures and institutions. Human welfare, equality, and environmental protection all have high priority, and they are addressed through community-based social solutions in addition to technical solutions, although implementation rates vary across regions.

According to these scenarios, economic growth will vary from low to intermediate. Suriname has a number of natural resources that could be utilized to contribute to intermediate economic growth. However, if these natural resources were to be depleted, a drop in economic growth would be expected. Scenarios A2 and B2 show technological change as fragmented and relatively slow-paced, undoubtedly depending on the level of education in the country. Suriname is currently investing in the improvement of education at various levels, so that more Surinamese people can receive a quality education, have better access to higher education and thereby become more involved in the various sectors of the country's economy.

Taking into consideration the intermediate economic growth within these scenarios, the Surinamese population is expected to undergo some growth as well. Current demographic diversity will be largely maintained, and this will remain reflected in the social, cultural, and political structure of Suriname. Simultaneous cultural integration will continue to take place. Suriname's membership to both the Caribbean Common Market (CARICOM) and the Union of South American Nations (UNASUR) demonstrates the country's continuing efforts to maintain and be open to the process of regional integration. These efforts are in line with the adapted scenarios, according to which the ambient temperature is expected to rise approximately 2-3 degrees Celsius by 2100. Changes in severity and frequency of extreme weather events could therefore have great impacts on many sectors in Suriname.

Projections resulting from these scenarios also reveal that the sea level is expected to rise by 20–51 cm by 2100. The main factors contributing to this rise are expansion of sea water and melting/sliding of land-based ice sheets and glaciers. Yet there are many uncertainties regarding carbon cycle feedbacks, ice-flow processes, the amount of heat uptake by the oceans and recently observed ice-discharge rates. Since such factors are insufficiently understood, their contributions to sea-level rise are oftentimes neglected.

These range from the IPCC projection of 59 cm to 190 cm. An average of sea-level projections from these five studies exceeds 100 cm. Further analyses of these studies reveal that the lowest value of the maximum projected sea level rise is +80 cm. These high projection values are based on complex, on-going processes and the vulnerability of the Greenland and West Antarctic ice sheets. Depletion there could result in a continuation of sea-level rise, regardless of predicted changes in global temperatures. According to the same studies, sea-level rise in the Caribbean could be more pronounced than in some other regions.

A 1m sea level rise projection has been adopted for Suriname. This is based on: - analysis of five major projections of sea-level rise; - exclusion of the IPCC projection (AR4) sea level rise projection is because new evidence is available that results in higher predictions than those found there; - a lack of reliable data on sea-level rise in Suriname. In addition, local factors such as

storm surge and subsidence should also be considered as important contributors to sea-level rise in Suriname.

4.0 PRIORITIZATION OF SECTORS BASED ON RISK, VULNERABILITY AND ADAPTATION CAPACITY

4.1 Infrastructure and Housing

For the Infrastructure sector, the national climate change aim is to ensure that all that is designed, built and operated should be done in a climate resilient manner and produce minimal greenhouse gas (GHG) emissions (NCCPSAP, 2016). Infrastructure development increases the adaptive capacity of Suriname's population through increased access to markets and social services.

Impacts and Vulnerability

Suriname is vulnerable to external shocks. With the current population which is slightly above 0,5 million the country could end up with 2.5 to 3 million by the end of the century, of which the largest part is located in Paramaribo and Wanica (approximately 74,4% of the households). Due to temperature and rainfall increases, and sea level rises, Climate Change impact would effect 40% of Suriname's GDP. The low lying coastal lands with the highest concentration of population and economic activities are vulnerable to hazards related to Climate Change.

The National Climate Change Action Plan highlights several points. The transport sector was presented as the main source of GHG emissions (10% of total GHG). The current situation is one of urban areas concentrated in the coastal zone, while other dwelling areas are established near rivers, which are already susceptible to flooding due to poor drainage, mangrove deforestation and abundant rainfall. Appropriate spatial planning is needed to address the issues around infrastructure, both for the coastal areas and hinterland. Maintenance and upgrade of the existing drainage system was among the activities listed to mitigate flooding in urban areas. An example of this is the infrastructure work taking place at the Zwartenhovenbrugstraat.

Construction of coastal protection works (dikes) started in Coronie in 2008, at the market in Domburg, Wanica in 2014, and construction of river bank defenses on the right bank of Suriname river and left bank of the Commewijne river in 2008. As part of the Sustainable Land Management initiative sediment trapping units were constructed at Weg naar Zee and Nickerie. Although the impact is not clear, other activities were also implemented such as in the area of energy use in buildings; the EBS had launched an energy efficiency programme which started in

2014. It was noted that no projects had been initiated in the transport sector while in the area of Building and Construction, still no increase in enforcement and adjusted/improved construction methods and building plans had taken place.

Regarding housing, those settlements in coastal areas are exposed to flooding due to sea level rise, while in the interior, flooding occurs due to heavy rains. Heavy rains combined with strong winds, Sibibusi, resulted mostly in damaged construction (roofs). Spatial planning was mentioned to be an adaptation option although it was also agreed that more emphasis should be put on permit control and enforcement.

Currently an adaptation plan is developed for Paramaribo and included elements such as urban investments for the resilience of Paramaribo, aiming at building adaptive capacity of communities. When implemented it can have substantive impact on the resilience of Paramaribo. Apart from that plan, the Ministry of Public Works has taken actions within its mandate (such as waterway maintenance), but such actions remain minimal.

Table 2. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)		INDIRECT			
	5-6 (Occasional or moderate)			DIRECT		
	7-8 (Probable or high))			CUMULATIVE		
	9-10 (Frequent or Very high)					

Table 3. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2					

RISK PROBABILITY	(Improbable or very low)					
	3-4 (Remote or low)	NATURAL CAPITAL				
	5-6 (Occasional or moderate)		SOCIO-ECONOMIC; HUMAN CAPITAL			
	7-8 (Probable or high))				PHYSICAL CAPITAL	
	9-10 (Frequent or Very high)					

Table 4. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
RISK PROBABILITY		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)		LONG TERM/ SLOW ONSET	MEDIUM TERM IMPACTS		
	7-8 (Probable or high))				SHORT TERM/ IMMEDIATE	
	9-10 (Frequent or Very high)					

Adaptation Options

1. Enhance comprehensive infrastructure and housing information and data for decisive decision-making

Comprehensive national research programme on social, environmental and economic baselines, climate science, vulnerability, impacts and risk management. Expand climate data monitoring network (number of stations and climate variables collected). Undertake analysis of and collect data on past climate impacts (including but not limited to salinization, erosion, water levels, river dynamics, natural ecosystems) on infrastructure (operational performance, maintenance, financial impacts). Undertake research to assess the role of mangrove forests and coastal dikes/drainage systems to provide protection against storm surge and flooding.

2. Design and Implement infrastructure and housing regulations, standards and guidelines

Develop specific infrastructure guidance on the appraisal, design and operation of assets under conditions of a changing climate. Conduct an awareness raising programme to inform the general public about climate resilient building and its importance.

Develop and implement law, policy and regulation to integrate climate change resilience into infrastructure planning and development. Develop and implement design criteria to protect new key assets in flood risk areas (for example, the protection of mangrove forests and the prohibition of coastal sand and shell ridge removal). Design and implement measures to protect existing assets located in flood risk areas. Establish building codes that incorporate new, appropriate and affordable technologies to improve the resilience of physical infrastructure to climate change. Provide incentives to encourage the implementation of building codes. Establish a monitoring programme to ensure compliance with building codes and to enforce regulations.

3. Build infrastructure and housing sector skills, training and expertise; manage and keep human resource capital

Increase access to finance for climate-resilient infrastructure development. Identify sources of funding for climate resilient infrastructure and train stakeholders in how to access such funding. Promote infrastructure development to improve drainage, storm surge and flood management and prevent saltwater intrusion in “at risk areas. Identify “at risk areas” and develop flood management options, for example dikes and adequate drainage systems (e.g. roadside drainage system to deter water pooling and stagnation), and strengthen riverbanks (especially in areas where a road runs parallel to the river or where communities have built near the bank). Conduct regular maintenance and frequent inspection of infrastructure and identify areas which require investment for improvements. Incorporate climate change considerations into road development and maintenance.

4. Co-ordinate infrastructure and housing efforts in transportation and capital projects

Assess and adjust the coordination of the main transport infrastructure, currently located in the vulnerable coastal zone. Develop roads that are climate-proof (ie. resilient to heavy rainfall) and hydrologically sensitive (that do not disrupt the hydrological processes essential to preserve ecosystems). Determine categories of road infrastructure for climate proofing based on strategic functions for the Surinamese economy, through the Multi Annual Policy Plans of the Roads Authority. Evaluate current surcharge on motor fuels and determine the economic feasibility to incorporate a system of investing the revenue in building climate resilient roads.

Table 5. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
	(as listed above)	Financial	Political	Social	Administrative
Adaptation Actions	1	M	M	M	H
	2	L	L	L	L
	3	M	L	M	M
	4	L	M	M	M

H: High; M: Midlevel; L: Low

4.2 Mining

The mining sector views 'making Mercury history for the well-being of the environment and future generations' as its main challenge. Combatting climate change is a relatively newer focus and the sector has declared that it will work to introduce environmental friendly technologies for mining; rehabilitate mining areas and stimulate sustainable land use. The overall objective is to make mining infrastructure and operations climate resilient and produce minimal GHG emissions.

Impacts and Vulnerability

The sector is currently undertaking a Mercury Initial Assessment to enable the GoS to determine the national requirements and establish a sound foundation to undertake future work towards the implementation of the Convention. The PPG aimed at improving environmental management in

the mining sector of Suriname, with emphasis on Gold mining and to improve the management of gold mining and promote uptake of environmentally-responsible mining technologies.

Mining in Suriname is guided by the Mining Act (Decree E58) of 8th of May 1986. There are different types of mining such as Surface and Underground mining. In Suriname mining activities are concentrated around bauxite, goldmining (Large, MSGM & ASGM), oil, construction material (sand, gravel, crsuhed stone, dimension stone, shells) and potentially diamond.

Within the mining sector not many are aware of the effects that climate change has. Exploitation of shells are a threat to the vulnerable Surinamese coast. The exploitation by State Oil Company and other commercial activities such as agriculture can lead to flooding as a result of swamp elevation. Mining operations in the interior includes large scale goldmining which leads to increased planned deforestation, and small scale goldmining, which can lead to increased unplanned deforestation and flooding. Mining has a high energy demand, and as such may be regarded as major admitter of green house gasses. Also as the process progresses the ore deposits are increasingly deeper situated while the ore grades are declining, which resulted in increased demand of water. Noteworthy to highlight is that Rosebel Goldmines installed a solar plant in 2014.

Recommendations for combatting climate change impacts in the mining sector include: fostering partnerships with other projects/programmes to implement the comprehensive national research programme; creation of a national platform with participation of all relevant stakeholders; the use of innovative communication tools to inform stakeholders in the hinterland (create an application with relevant up to date information as well as the use of more traditional communication tools (radio, etc.); advising that climate resilience for mining operations should be part of any decent mine plan as well as corporate social responsibility (CSR) towards the local communities; and the provision of institutional strenghtening and capacity building for the mining institutions.

There will not be a pertinent change in the bauxite sector. However with oil there will be pertinent change via offshore drilling. The State Oil Company is busy with the process of looking at replacement of fossil fuels. In the years ahead it does not seem likely that fossil fuel will be replaced, especially if there is no legislative regulation. As for small scale gold mining, the gold reserves are almost exhausted and therefore increases the challenge.

Lastly, rehabilitation is very important if Suriname wants to keep the commitment of 93% forestation.

Table 6. Risk Perception by Impact Type

	IMPACT SEVERITY					
RISK		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)

PROBABILITY						
	1-2 (Improbable or very low)					
	3-4 (Remote or low)		Direct	Cumulative		
	5-6 (Occasional or moderate)			Indirect		
	7-8 (Probable or high))					
	9-10 (Frequent or Very high)					

Table 7. Risk Perception by Resource Capital

	IMPACT SEVERITY					
RISK PROBABILITY		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)			Natural Capital		
	5-6 (Occasional or moderate)		Socio-Economic	Human; Physical Capital		
	7-8 (Probable or high))					
	9-10 (Frequent or Very high)					

Table 8. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2					

RISK PROBABILITY	(Improbable or very low)					
	3-4 (Remote or low)		Short Term/ Immediate	Medium Term		
	5-6 (Occasional or moderate)				Long Term/ Slow Onset	
	7-8 (Probable or high))					
	9-10 (Frequent or Very high)					

Adaptation Options

1. Rehabilitate forests that have been impacted by mining operations. Implement a forest rehabilitation programme to sequester carbon dioxide. Include the design and implementation of offset/ compensation programmes for exhausted and/ or abandoned areas.

2. Develop and implement law, policy and regulation to integrate climate resilience into mining operations. Include updating the Mining Decree and standards considering climate change through State Orders. Develop standards for energy efficiency and reforestation of mined out areas in all mineral agreements with national mining companies and small-scale mining operations.

3. Enhance awareness and capacity building programmes for climate resilient and low emission mining such as the use of alternative mercury-free mining techniques and the closure of pits after mining.

4. Promote a comprehensive national research programme on social, environmental and economic baselines, climate change in the mining sector. This will include: sustainable mining practices (e.g. research on climate impacts, alternative sources of freshwater, alternative mercury-free mining techniques and appropriate reforestation systems; analysis on past climate impacts on the sector (small and large scale) and modelling of future risks (e.g. impacts on infrastructure, operations, labour, etc.).

Table 9. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions	(as listed above)	Financial	Political	Social	Administrative

	1	L	L	M	L
	2	L	L	L	L
	3	M	L	M	L
	4	L	L	L	M

H: High; M: Midlevel; L: Low

4.3 Energy

The Energy Policy in Suriname is based on three (3) pillars, namely energy access for all; to promote energy efficiency; and to promote the use of renewable energy (RE). Sustainable energy is of imminent importance for the social and economic development of Suriname. The use of solar energy for electricity generation seemed to be more favorable through techological advances and declining prices of equipment. High investment costs for purchase and installation are still a constraint to enable the wide spread use of solar energy. National policy will support this development because of its environmentally sound characteristics.

Impacts and Vulnerability

The expansion of RE projects depends more or less on available financial resources. A SWOT Analysis (see figure 8 below) conducted for the energy sector resulted in the following strengths and weaknesses:

Strenghts	Weakness
Approval of Electricity Law and the role and function of the Energy Authority	Limited attention to environmental issues e.g. CO2 emission and Renewable Energy
Central role of electricity supply	Energy inefficient street lighting
Opportunities	**Threats**
Research in sustainable alternative energy sources	Climate Change and New Climate Change protocols
Enforcement of Electricty Law	Demand for change in technical corporate management and production technologies
Public – Private Partnership and Corporate Social Responsibility	

Figure 8: SWOT Analysis

Current and future plans in energy include: 1. Energy supply through RE and EE of urban and rural areas (e.g. the project "Development of RE, EE and electrification of Suriname"); 2. Energy NAMA project; and 3. Solar energy supply of water stations in the Hinterland. Other activities include the improvement of public street lighting through energy efficiency and the development of an Energy Sector Plan.

Table 10. Risk Perception by Impact Type

	IMPACT SEVERITY					
RISK PROBABILITY		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Indirect	Cumulative	
	7-8 (Probable or high))				Direct	
	9-10 (Frequent or Very high)					

Table 11. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)		Socio-Economic	Human Capital		
	7-8 (Probable or high))			Physical Capital	Natural Capital	
	9-10 (Frequent or Very high)					

Table 12. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)				Long term/ slow onset	
	7-8 (Probable or high))			Medium Term	Short Term/ Immediate	
	9-10 (Frequent or Very high)					

Adaptation Options

1. Comprehensive national research programme including analysis and collect data on past climate impacts (including but not limited to salinization, erosion, water levels, river dynamics, natural ecosystems) on energy sector (operational, performance, maintenance, financial impacts). Feasibility of new energy sources, such as wind, solar, biomass and hydropower, as well as electricity generation methods.

2. Awareness and capacity building programme to encourage training of new professionals in energy research and development; facilitate technical and university education that focuses on the use of new technologies and research into alternative technologies. Establish access to international training facilities (including the international private sector). Develop and implement an awareness raising programme to promote energy conservation and efficiency for domestic and commercial users.

3. Market based incentives to influence energy use and decrease emissions including taxes, emission trading and other economic instruments to steer energy use and emissions, conveying clear, long-term market signals (for example develop a Feed-in-Tariff policy for renewable energy to encourage private investment). Remove fossil fuel subsidies for the energy sector. Promote procurement of energy efficient goods and services by public and private sector; explore provision of incentives for using energy goods and services.

4. Conduct assessment and baseline for the development of the national energy strategy. Develop national energy policy, strategy and regulatory framework that minimizes energy use, increases efficiency and enables renewable energy development. Amend the Act on Import Duty 1996 to include other sources of renewable energy than solar systems to qualify for an exemption from import duty. Consider a fund for rural electrification which could be used to reduce the costs of startup renewable energy operations and provide capacity-building support to implement small scale power projects. Design a building code for housing and infrastructure with regards to energy use (focusing on green energy), electricity efficiency and locally-sourced building and construction material. Amend the Driving State Order to provide the opportunity to regulate carbon dioxide levels in exhaust gases by ministerial order. Develop a ministerial order to regulate carbon dioxide and monoxide.

5. Infrastructural improvements of existing hydropower facilities. Assess feasibility of artificially increasing water level in van Blommenstein Lake using water from neighbouring rivers and creeks.

Table 13. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative

	1	L	M	M	L
	2	L	M	M	M
	3	L	L	L	L
	4	M	M	M	M
	5	M	M	M	M

H: High; M: Midlevel; L: Low

4.4 Water

The Suriname water sector policy is based on the availability of healthy and affordable potable water to ensure a healthy Surinamese population. The view is that healthy potable water is a crucial link in the social economic development of a country.

Impacts and Vulnerability

The SWOT Analysis for the water sector presented the following strengths and weaknesses:

Strenghts	Weakness
Sufficient resources of ground and surface water	Insufficient legal, regulatory and institutional framework to protect and regulate the sector
Central role of water supply	Legislation and regulations relating to water supply
Opportunities	**Threats**
Partnerships for financing of projects	Climate change induced drought due to prolonged dry periods

Invest in internal expertise	
Continuation with the implementation of the initiated projects in 2018	
New water sources for the expanding of the water supply network in order to improve the drinking water supply.	Salinization of water resources

Figure 9: SWOT Analysis

The current and future plans in the water sector includes the improvement of the integrated approach to water policy. First steps were taken for the development of an integral water resource management system, in which all parts related to water are better attuned to each other. The necessary preparations will also be made for the establishment of a Water Authority Suriname, which will mainly focus on the implementation of an Integral Water Management System and management plan.

The implementation of a project to put in place a water purification system for the village of Nieuw Lombé is currently in process. The proposed Project entitled 'Climate resilient access to drinking water for the Maroon community of Nieuw Lombé ', has as overall objective to strengthen the resilience capacity of sustainable water management. The objectives of the project are to (1) achieve 100% access to clean water; (2) enhance water storage capacity to overcome water shortage in dry and rainy seasons; (3) institutionalize monitoring framework in place to meet its quality standards; and (4) contribute to increase women's social and productive activities by reducing their time in collecting water from a remote area.

An UNDP/ NH project "Strengthening of policy formulation, drafting of legislation and data management for the water sector in Suriname" is in the process of preparation. The overall goal of the project is to strengthen the policy formulation, drafting of legislation, data management and institutional capacity building to work towards integrated water resources management (IWRM).

Table 14. Vulnerability factors from previous studies (including the SNC, 2013 and NCCPSAP, 2015)

- Water resources in Suriname may experience stress as a result of climate change through the combined effects of reduced annual rainfall, increased evapo-transpiration, and prolonged dry periods.
- Reduced rainfall and the resulting reduced discharge will lead to saltwater intrusion in the rivers, creeks and streams that flow directly into the Atlantic Ocean. A linear projection of this relationship with respect to a one-meter sea-level rise causes a displacement of the saltwater wedge by approximately twenty kilometres upstream

- The tidal effect of the Atlantic Ocean on the water system and the freshwater discharge from upstream. It is certain that under such conditions, water resources of all rivers and significant parts of the wetlands in the coastal zone will decline rapidly.
- Without proper adaptation measures, saltwater intrusion will have a significant impact and even jeopardize the agricultural sector, while other sectors will be strongly affected as well.

Table 15. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Indirect		
	7-8 (Probable or high))					Direct
	9-10 (Frequent or Very high)					Cumulative

Table 16. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Physical Capital		Human; Socio-Economic Capital

	7-8 (Probable or high))				Natural Capital	
	9-10 (Frequent or Very high)					

Table 17. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)					
RISK PROBABILITY	7-8 (Probable or high))				Medium Term	Short Term/ Immediate
	9-10 (Frequent or Very high)					Long Term/ Slow onset

Adaptation Options

1. Undertake in-depth studies (including water balance and aquifer replenishment studies) and establish an observation network and monitoring system, in order to enhance water management and sustainable use of water resources. Assess vulnerabilities and risk from climate change to drinking water infrastructure. Develop pilot projects to assess artificial recharge of aquifers and conduct feasibility studies to explore the possibility of additional groundwater projects, as well as alternative freshwater resources, to buffer the effects of saltwater intrusion.

2. Explore the development of mechanisms to facilitate Integrated Water Resources Management (IWRM), including appropriate institutional and legislative frameworks at all stages of water planning and management. Undertake an assessment of water needs and sources, identify and appraise options for new sources.

3. Review and amend draft legislation to ensure that climate change is taken into account. Include provisions for 1) the protection of water resources 2) the promotion of their sustainable use and 3) for water quality standards and wastewater discharge. Assess options for the establishment of an institutional organization for the enhancement of water management, for example water boards and a water authority. Develop robust land management and waste management policies to reduce the discharge of pollutants including sediments, sewage, agrochemicals and mining pollutants into water systems, and to protect aquifers from surface contamination. Develop policy and guidance for the construction of drinking water storage mechanisms for use in times of drought; possibilities include artificial controlled ground reservoirs, water towers, or bottled water reserves in strategic locations throughout the country. Develop policy to increase efficiency of drinking water supply mechanisms.

4. Develop and implement land and waste management solutions to reduce discharge of pollutants into water resources. Develop, implement and monitor drinking water storage mechanisms for use in times of drought and flooding. Identify and implement waste water recycling schemes, including mining and forestry sectors. Waste water from domestic and tourism use can be re-used, for example for agricultural irrigation.

5. Construct an emergency network of agricultural irrigation pipes and pumps connected to reliable water sources, such as nearby larger fresh water rivers or controlled reservoirs. Develop and upgrade infrastructure for water supply, irrigation, drainage and flood protection, in order to increase the efficiency of water use, including storage and distribution, without compromising sanitation systems. Develop and implement a leakage management programme, including mains rehabilitation, to reduce water leakage from distribution and supply networks.

6. Awareness raising programme on the impacts of climate change on water resources and management of these impacts. Awareness raising programme on avoiding contaminated water post-disaster.

Table 18. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions	(as listed above)	Financial	Political	Social	Administrative
	1	L	M	M	M
	2	M	M	M	M
	3	M	H	H	M

	4	L	L	L	L
	5	L	M	M	M
	6	M	M	H	M

H: High; M: Midlevel; L: Low

4.5 Forest Management

Impacts and Vulnerability

The current status of Surinamese forests reflects the following destribution: 4-5 million ha is dedicated to sustainable timber harvesting; 2,1 million ha representing 13% of Suriname's land area is formally designated as protected areas such as Nature Reservation, Muma's, and Nature Park; and the remaining will be kept as forest. The distribution is 2,1 million ha of protected forest; 4,5 million ha of production forest and 8,2 million ha of forest to maintain.

The strategic function of the forest to combat climate change has been highlighted as an asset to sustainable development. The forest is the largest visible renewable natural resource in Suriname and could be vulnerable if not used and managed responsibly. Sustainable use includes responsible logging, collection of forest byproducts, sustainable fisheries managment and eco-tourism. The forest stores CO2, which functions as a mitigation mechanism against climate change. The forest also functions as a natural buffer, such as along waterways, slopes that are vulnerable to erosion, and mangrove forests for coastal protection, among others. For forest-dependent communities, the forest ensures food security and functions as their supermarket. Lastly, it also regulates water management for agriculture purposes and energy provision.

Climate change may have the following impacts on the forest: loss of biodiversity and forest degradation; flooding of both the interior and coastal areas; rising sea level (Suriname is among the ten most vulnerable countries when it comes to rising sea level); waterways will no longer be navigable; change in composition of biodiversity; outbreak of diseases; and increased chance of wild fires (forest fires).

There is a misconception in Suriname, where most people think that logging causes deforestation; but that statement is false, because sustainable logging specifically does not cause deforestation. Clear guidelines for sustainable forest management/timber exploitation should be adhered to, whereby the principle of selective logging is used to prevent clear-cutting and to create opportunity for natural regeneration. Also, proper supervision should be in place to ensure that activities are in compliance with the Forest Management Act.

The high increase of wood harvesting and export of logs may pose a risk to the sustainability of forest production. Unlimited export of unprocessed round logs is likely to increase the demand for logs, which can lead to forest degradation. Log production and export from Community Forest Areas needs to be monitored more closely.

The measures and actions to be taken to ensure sustainable forest management (sustainable development) and thus sustainable use of the forest include: sustainable logging, collection of forest by-products, selective logging, protection of vulnerable areas during operation, setting up buffer zones and unutilized areas, minimal deforestation when towing roads, protection of forests through establishment and maintenance of nature reserves; setting up a National Forest Monitoring System, and capturing a forest reference emission level.

The Foundation for Forest Management and Production Control (SBB) currently implements the following projects:

1. REDD+ Readiness Phase 1: a 3.8 million dollar project, coordinated by NIMOS and funded by the Forest Carbon Partnership Facility (FCPF / WB) for the period of 2013 to 2018. This project aims to develop a national REDD + Strategy (NS) for sustainable use and protection of Suriname's forests, to retain 93% forest cover nationally, and to develop a National Forest Policy in alignment with the Development Plan 2017-2021.

2. National Mangrove Strategic Policy Document 2017-2018: Developing a National Mangrove Strategic Policy Plan under the Global Climate Change Alliance (GCCA +) project. This project aims at formulating an effective strategy for sustainable management of the mangrove ecosystem that includes various actions for the sustainable use of services and goods, conservation and rehabilitation. The project is meant to support Suriname's strategic planning for integrated coastal management, by providing the necessary insights on how the country can use new coastal conservation techniques and can adapt new and existing legislation and regulations to protect the entire mangrove ecosystem in Suriname. In addition, it will focus on strengthening capacity and activities for adequate management and monitoring of the mangrove ecosystem in Suriname.

3. Project "Setting up a Mangrove Biodiversity Monitoring System", is a GCCA + Suriname Adaptation project, which started in January 2018 for a duration of 1 year with a budget

of USD 205,000. This project is being undertaken by SBB and UNDP Suriname and is a combination of mitigation and adaptation strategies aimed at setting up a National Forest Monitoring System (NFMS). Through this project, up-to-date and reliable information will be collected in a structural, scientific way pertaining to the size of the mangrove ecosystem, the change of this area, and the fragmentation of the ecosystem. This information is crucial for monitoring and protecting biodiversity as well as for using natural resources sustainably.

Table 19. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Indirect		
	7-8 (Probable or high))				Direct	Cumulative
	9-10 (Frequent or Very high)					

Table 20. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)			Human Capital		
	5-6 (Occasional or moderate)		Physical Capital			

	7-8 (Probable or high))				Socio-Economic Capital	Natural Capital
	9-10 (Frequent or Very high)					

Table 21. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)				Short Term/ Immediate	
RISK PROBABILITY	7-8 (Probable or high))			Medium Term	Long Term (slow onset)	
	9-10 (Frequent or Very high)					

Adaptation Options

1. Comprehensive national research programme on social, environmental and economic baselines, climate science, vulnerability, impacts and risk management. Conduct analysis on past climate impacts on forests and sustainable forest management.

2. Establish reference level for carbon emissions, with special attention to mangrove forests and wetlands.

3. Perform awareness activities regarding the role of forest conservation, restoration and sustainable use of forests in climate change mitigation. Improve capacity and knowledge regarding accounting of carbon stocks, emissions and carbon sequestration. Engage and involve local communities in monitoring of carbon levels.

4. Develop and implement law, policy and regulation to incorporate climate resilience and mitigation in forestry. Review and update Forest Management Act to include climate change

considerations. Assess options to access climate finance through UNFCCC mechanisms and other related funding avenues financing carbon sequestration by forest.

5. Develop a State Order for the protection of mangrove forests (article 7) and other relevant State Orders. Include mangrove afforestation in REDD+ strategy and identify REDD+ readiness actions needed for mangrove carbon sequestration through mangrove planting. Implement programme for reforestation and afforestation of mangroves along coastline.

Table 22. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	L	M	L	L
	2	L	M	M	L
	3	M	H	M	M
	4	M	M	M	M
	5	M	M	M	M

H: High; M: Midlevel; L: Low

4.6 Agriculture, Livestock and Fisheries

The national objective is to "ensure food security and food safety related to agricultural products for the Surinamese society, and promote and facilitate sustainable development of the agricultural sector" (NCCPSAP, 2016).

Impacts and Vulnerability

The agriculture sector in Suriname provides national food security and is therefore an important pillar of the economy. The vulnerability of Suriname to climate change is due to its geographical

position. The agriculture sector will be highly impacted by climate change, as it is mainly concentrated in the low lying coastal zones and is therefore vulnerable to a number of climate change impacts, such as sea level rise and more frequent and extreme weather events. Sea level rise causes breaks in the sea defense infrastructure (dykes) along the coast and salt intrusion, while the whirlwinds cause damage to crops such as rice and banana. Extreme rainfall provokes erosion and leaching, the growth of weeds, productivity decline of traditional crops and cropping systems, and a regular pattern of flooding not only in the hinterland but also in the coastal plain.

Agriculture in the coastal plains is threated by a combination of sea level rise, dilapidating coastal protection structures (dykes and sluices) as well as neglected management practices. All of the above will lead to increased salination of water and soils and need to be addressed urgently. In the hinterland interior, the Inter-American Institute for Cooperation on Agriculture (IICA) has noted shifting from the predominant slash and burn type of agriculture to more permanent production systems including emphasis on sustainable irrigation and rainwater harvesting; plant propagation and nursery set ups for resistant crop varieties to be able to adapt to changing environmental conditions (IICA, 2016 Annual Report).

Drought causes water scarcity for livestock and crops as well as loss of pasture. Rising temperatures have a severe impact on most crops. As a result, Suriname's agricultural sector is experiencing slow overall growth and development of traditional crops, reduction of grain production, heat stress in poultry and cattle, degraded water quality for fish farming, and higher occurrence of pests, diseases and weeds. There is a decrease in fishing activities due to the lush growth of the sea algae "Sargassum," which is caused by rising ocean temperatures.

The Ministry has taken some adaptive measures against climate change including: promoting good agriculture practices or climate smart agriculture for resilience, researching and promoting protective agriculture structures for horticulture, promoting integrated pest and crop management, performing research on water and soil management, researching drought resilience in crops and breeds, training and technical support and adaptive actions for fisheries and animal husbandry (Samoender, 2017).[5]

The Inter-American Development Bank (IDB) has approved loans for strengthening innovations in the agriculture sector to fund projects relating to adaptation. FAO is undertaking a technical cooperation project with the following objectives: to scale up proven good practices and technologies for disaster risk reduction, to promote climate change adaption and natural resource management, and to support policy-making for sustainable agriculture in Suriname. One of the most important outputs of the project will be the development of an Agriculture Disaster Risk Management (ADRM) Plan for Suriname and the establishment of an institutional mechanism to

[5] Based on presentation made by Iwan Samoender of the Ministry of Agriculture, Animal Husbandry and Fisheries at the 2nd National Adaptation Plan Workshop, Dec. 2017).

implement it. There is also a project with IICA with the objectives to build capacity of farmers in the use and management of protected agricultural structures, rainwater harvesting, and irrigation systems for sustainable commercial vegetable production.

Some of the adaptive actions that are being undertaken for the fisheries sector are promoting aquaculture by setting up an agricultural technology center with the cooperation of China and by establishing research stations for fresh and brackish water. The adaptive actions being undertaken for animal husbandry are: pasture and breeding management, adjusting housing facilities, increasing awareness on general and nutrition management, and promoting animal diversity.

Table 23. Vulnerability factors from previous studies (including the SNC, 2013 NCCPSAP, 2016)

- Rice subsector would be significantly threatened by seawater intrusion, strong and unpredictable variations in rainfall patterns or the combined effects of these two. Rice production may also be hampered by frequent occurrences of crop diseases and pest infestations in the coming years. Inland flooding and sea-level rise, may become more evident and seriously hamper food security.
- Bananas subsector will also experience stress, since it is located on the young coastal plain.
- Vegetable Crops can only be effective if accompanied by large-scale Investments. Using existing farming systems, farmers who produce in areas susceptible to flooding and salinisation may no longer be able to produce their crops and have to move to other, lower-risk areas or to adapt their livelihoods to the changed conditions. Under such circumstances, the number of farmers involved in vegetable production could decline, making produce more expensive.
- Livestock subsector is under pressure due to several factors: agronomical constraints (rainfall, soil fertility and texture, temperature) and scarcity of good breeding stocks. Without strong support for adaptation to new production conditions, stagnation or decline in livestock production will remain of great concern.
- Fisheries/Aquaculture subsector is in decline, a situation expected to worsen in the near future due to climate-related processes.
- Trends in mean sea surface temperature (SST) and SST anomalies for the Caribbean Large Marine Ecosystem (CLME) show a steady warming trend since 1982. Rising sea water temperatures may have a large impact on the distribution of maximum catch potential (a proxy for potential fisheries productivity) of pelagic and demersal species by 2055. Such a redistribution of catch potential is driven by projected shifts in species' distribution ranges and by the change in total primary production within the species' exploited ranges. The catch potential in the CLME decreases considerably under a high range scenario[6]

[6] Caribbean Large Marine Ecosystem Regional Transboundary Diagnostic Analysis, UNDP/GEF CLME Project (2011)

Table 24. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Indirect		
	7-8 (Probable or high))				Direct; Cumulative	
	9-10 (Frequent or Very high)					

Table 25. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)		Natural Capital	Human Capital		
	7-8 (Probable or high))		Physical Capital		Socio-Economic	
	9-10 (Frequent or Very high)					

Table 26. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY

		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Medium Term		
	7-8 (Probable or high))			Short Term/ Immediate	Long Term/ Slow Onset	
	9-10 (Frequent or Very high)					

Adaptation Options

1. Comprehensive national research programme on climate resilient crops, agricultural practices, animal husbandry and fisheries. Analyze the impact of changing climate situations / extreme weather conditions; continuously gather and compile data regarding yield, production and specified losses and link those to the weather pattern during the related growing seasons while looking for trends. Improve data compilation and data management, transparency / availability/ accessibility. Conduct analysis on past climate impacts and the impacts of climate change on Suriname's agriculture, livestock and fisheries sector (e.g. impacts on yield, agro-ecological research on pests and diseases, and impact of drought and heavy rain on water and food shortages in the interior). Develop and trial agricultural, livestock and fishing techniques that build resilience to a variable and changing climate in a participatory way (gender specific and according to Free Prior and Informed Consent (FPIC) protocol).

2. Integration of climate resilience into agricultural extension services (raising awareness of farmers, pastoralists and fisherfolk on the impacts of climate change, and building capacity on how to manage impacts based on research results). Provide guidance/ training on alternative growing systems such as appropriate greenhouses and hydroponic gardens, improved drainage systems, crop diversification, etc. (fruit and vegetables). Climate-control systems on livestock farms and modification of livestock feed, in both the coastal area and the interior.

3. Develop and implement Sustainable Agriculture Policy including relevant climate resilience mechanisms in existing and new regulations. The existing Water Boards Act is the most relevant legislation as it deals with water management in the agricultural sector. Infrastructure

development to conserve water, provide irrigation or fast drainage and protect agriculture from salt water intrusion. Integrate climate change considerations (including results from climate impact studies) into national dike construction programme in low-lying areas.

4. Financial support to farmers, pastoralist and fisherfolk to build up climate resilience. Develop and provide a financial incentives scheme for farmers, based on research results appropriate to each region and ecotype, to implement climate resilient farming techniques/actions. Develop and provide a financial incentives scheme for fishermen to engage in aquaculture. Evaluate opportunities for parametric insurance schemes to compensate farmers/pastoralists/ fisherfolk whose agricultural production suffers damage from climatic events.

5. Technological transfer programme on sustainable and environmentally friendly agricultural practices. Introduce modern technology and practices to reduce GHG emissions caused by rice production or by other potential, expected and developing large scale and mechanized cultivated crops.

Table 27. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	M	M	H	L
	2	M	M	H	M
	3	M	M	L	L
	4	L	L	L	L
	5	L	L	L	L

H: High; M: Midlevel; L: Low

4.7 Tourism

Suriname promotes itself as "the beating heart of the Amazon." Suriname has been making strong efforts to expand the management of the area of forest that is under its protection despite the increasing encroachments from mining activities. Apart from those challenges on the ground, there are also challenges of an institutional nature in the form of weak regulations and legislative framework necessary to conserve and protect rainforests through sustainable tourism activities. As the tourism authorities of Suriname plan to accelerate growth in the tourism sector and to increase visitors, the impacts of climate change on sustainable tourism practices should not escape their attention.

Impacts and Vulnerability

Current sustainable tourism policies and strategies of the Surinamese Government indicate a potential for the tourism sector to contribute to the gross domestic product. It is evident in this plan, that tourism policy is strongly attached to environmental preservation and protection of local community rights. The prospects for tourism development are positive, not only for large companies, but increasingly for small and medium enterprises and community-based initiatives. The country's tourism policy is clearly focusing on sustainable management of natural and cultural resources and promotes ongoing monitoring and mitigation of negative impacts on the resources that the industry relies on. Of particular interest are the sustainable benefits for the community and the human rights of Maroons and indigenous peoples.

The government favors tourism development through private investments, supportive to the following areas: legislative and institutional strengthening of the tourism sector; human resource development and training for necessary staffing; support for the improvement, development and promotion of tourism products; execution of awareness programmes to public and private sector to promote tourism; and integration of sectors and sub-sectors to promote economic growth.

The regional cooperation between countries of the Amazon basin to collaboratively develop a rainforest product is applauded and marks an important step to further integration in the region. The forestry sector in Suriname has also clearly advocated the importance of ecotourism development. Full support is provided for ecotourism and recreational use of the rainforest by granting licenses and promoting adequate infrastructure. Ecotourism is marginally developed at present in Suriname, but has the potential to grow, provided that requirements for competitive supply and international standards are met.

Table 28. Vulnerability factors from previous studies

• The tourism sector in Suriname is only a small contributor to GDP, yet it is one of a few sectors that have achieved continuous growth over the past decade. The tourism sector is also an important source of revenue for Maroon and Amerindian communities who host visitors in their villages and sell crafts. However, these groups also have some

characteristics that make them vulnerable to climate change, such as their high dependence on raw natural resources for survival and their high vulnerability to the effects of prolonged drought and flooding.

- Any increase in the level of eco-tourism in Suriname will mean more vulnerability to climate change. Projected changes in temperature and precipitation involve corresponding changes to vegetated areas, including displacement and/or loss of habitats and other adverse changes to plant and animal species.
- Forest and bush fires, augmented by reduced moisture levels, will have profound negative impacts on Suriname's biodiversity, rural communities and hence eco-tourism. Flooding and prolonged drought will also negatively affect the hinterland, its inhabitants, and the means of transport necessary to bring tourists in and out of the area.
- A one-meter sea-level rise by the year 2100 will change existing ecosystems, almost surely in negative fashion, primarily in the coastal zone, and result in degradation of nature reserves, wildlife habitats and the overall biodiversity. Tourism activities in the coastal area, which mainly consist of bird, dolphin and turtle watching, will be severely affected.

Table 29. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)			Indirect		
	5-6 (Occasional or moderate)			Direct		
	7-8 (Probable or high))				Cumulative	
	9-10 (Frequent or Very high)					

Table 30. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)

RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)		Human Capital; Physical Capital	Socio-Economic		
	7-8 (Probable or high))			Natural Capital		
	9-10 (Frequent or Very high)					

Table 31. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
RISK PROBABILITY		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Long Term/ Slow onset		
	7-8 (Probable or high))			Medium Term	Short Term/ Immediate	
	9-10 (Frequent or Very high)					

Adaptation Options

1. Improve knowledge on how climate change will impact the tourism sector. Create comprehensive national research programme on social, environmental and economic baselines, climate science, vulnerability, impacts and risk management.

2. Communicate with industry on how to manage climate impacts. Undertake engagement and awareness raising programme on climate impacts and climate resilient decision-making.

3. Develop and implement law, policy and regulation to integrate climate resilience into tourism operations and decrease GHG emissions.

4. Promote conservation, protection and monitoring of ecotourism. Integrate measures to protect tourism attractions, operators, and tourists from climate impacts.

Table 32. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	M	M	L	M
	2	L	M	L	L
	3	L	L	L	L
	4	L	L	L	L

H: High; M: Midlevel; L: Low

5.0 FOUNDATION SECTORS

5.1 Education

The Ministry of Education and Community Development (MINOV) is responsible for education in Suriname. The central aim has historically been to entrench an 11-year basic education system, which consists of an integration of pre-primary, primary and junior secondary school. Higher education is mainly offered by the country's national university, Anton de Kom University, and has been organized into 3-year bachelor's and 2-year master's programmes since 2004. Education in Suriname is provided by both state-run and private schools. The language of instruction is Dutch.

Anton de Kom University has four faculties and various research institutes, described in more detail below. Suriname has various higher professional education institutes and an institute offering higher professional bachelor programmes, (higher professional) master and postgraduate programmes (FHR Institute for Social Studies). The M.Sc. in Sustainable Development which started six years ago is highly regarded and a main conduit for training new personnel to be absorbed in various climate change related roles across the public sector as well as for preparation for higher level research and roles in the private sector.

The University has the following faculties:

Medical Sciences: The faculty of medical sciences offers two specializations: medicine (4-year doctor and 7-year MD degree: 4 years bachelor, 2 years clinical phase and 1 year internship) and physiotherapy (4-year Bachelor of Science). The entry requirement is a VWO diploma with biology, chemistry, mathematics and physics (total of 24 points).

Social Sciences: The faculty offers the following study programmes: law, economics, business administration, public administration, sociology and psychology. After the introduction of the bachelor-master system in 2004, the previous 5-year doctoral courses were replaced by 3-year Bachelor of Science programmes and 2-year Master of Science programmes. Since 2010, the Faculty of Social Sciences offers the following master's programmes: education for sustainable development, Surinamese law and accountancy.

Engineering: In 2013, the renewed bachelor's programme infrastructure was launched. The nominal duration is 3 years and the admission requirement is the VWO diploma. The following specialisations are offered: Agricultural Production (Agriculture, Forestry, Animal Husbandry, Fishery and Aquaculture, Soil Science and Horticulture), Mineral Production (Geology and Mining), Electrical Engineering (Energy and Computer Technology), Infrastructure (Architecture, Civil Engineering and Land/Water Management), Mechanical Engineering and Environmental Science (Environmental and Nature Management, Aquatic Resources Management).

Graduate Studies and Research (IGSR): The Institute of Graduate Studies and Research (IGSR) was founded in 2006 as a forerunner of the Faculty of Graduate Studies (FGS). The IGSR (later FGS) offers master's programmes and has the role of monitoring all the master's programmes that are offered by the university. Currently, the following master's programmes are offered: development and policy, international relations (in collaboration with the University of the West Indies), macro-economic analysis and policy and public health.

FHR Institute for Social Studies: The FHR Institute for Social Studies consists of the following schools: FHR School of Business, FHR School of Management, FHR School of Law and the School of Governance. The institute has cooperation with among others the Maastricht School of

Management, the Erasmus University Rotterdam/ International Institute of Social Studies and the University of the West Indies.

In 2014, the Nationaal Orgaan Voor Accreditatie (NOVA, the national accreditation organization in Suriname) accredited 2 of FHR master's programmes: the Master in International and Comparative Law Program and the Master of Public Administration in Governance Program.

Higher education includes all training at the post-secondary level which requires at minimum a diploma at senior high school level or its equivalent for admission. The Anton de Kom University of Suriname (ADEKUS), the Institute for training of Advanced teachers (IOL), the LOBO, the Polytechic College (PTC) and the AHKCO are institutions governed by MINOV. The Central Training for nurses and those in related professions (COVAB) and youth dental care (JTV) are governed by the Ministry of Health. The relationship with MINOV and the degree of autonomy awarded to each institution are all different. Semi-government ADEKUS has a large degree of autonomy. IOL is governed by the Directorate of Education and falls under the statutory regulations for schools. This is subsumed under the Directorate for AHKCO culture, while PTC was established as a public foundation.

In addition to the national education infrastructure, other institutions such as CELOS (the Foundation, Center for Agricultural Research) make contributions via training, knowledge transfer and certifications in areas including: research on sustainable agricultural production, forestry systems and biodiversity and other services rendered to these sectors by the laboratories (chemistry, microbiology, phytopathology, wood technology, plant tissue culture, GIS and remote sensing).

Table 33. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)		Direct			
	5-6 (Occasional or moderate)					
	7-8 (Probable or high))			Cumulative	Indirect	
	9-10					

	(Frequent or Very high)					

Table 34. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)		Natural Capital	Physical Capital		
	7-8 (Probable or high))			Socio-Economic Capital	Human Capital	
	9-10 (Frequent or Very high)					

Table 35. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)			Short term		
	7-8 (Probable or high))			Medium Term	Long Term	
	9-10 (Frequent or Very high)					

Adaptation Options:

1. Provide climate change information at all levels of formal education. Incorporate climate change into curricula for primary, secondary, tertiary and vocational educational institutions, for example discussion about what one can do personally to respond to climate change and how climate change can affect where one lives. Develop advanced research capacity by offering academic courses at the HBO and IOL curricula level on sustainability topics to train scientists and engineers.

2. Create public awareness raising and capacity building programme on climate resilience and mitigation. Provide training to ministerial staff on climate change, including an intermediate level climate change course and CCORAL training to all relevant ministries to raise awareness on how to integrate climate change resilience into programme and project cycles. Establish a country-wide strategic programme to conduct awareness raising initiatives, including in all interior communities.

3. Develop climate resilient infrastructure in the education sector. Require schools to be built on higher ground or on stilts to avoid disruption/closure from flooding.

Table 36. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	M	M	H	H
	2	H	H	H	H
	3	M	H	H	H

H: High; M: Midlevel; L: Low

5.2 Health

The health sector's strategic agenda consists of 1) health programs; 2) health systems and 3) determinants of health.

Sectors	Activity
Ministry of Finance	• Financing of the health sector
Ministry of Education	• Promoting healthy schools and providing health programs • Basic Life Skills program (incl. HIV prevention) • School health care services • University, Medical faculty and MPH program
Ministry of Sport and Youth Affairs	• Psychical activity for the total population esp. the youth
Ministry of Agriculture, Fishery and Husbandry	• Food safety and Food security
Ministry of Natural Resources	• Safe drinking water • Energy supply
Ministry of Trade and Industry	• Laws , regulation and guidelines regarding transfats, salt and sugar for healthy food and for pharmaceuticals
Ministry of Justice and Police	• Disaster preparedness policy and a specialized disaster unit, linked to health • Domestic violence prevention, suicide prevention, road safety and drugs prevention • Financing of health care for their personnel and their families
Ministry of Public Works	• Domestic waste collection • Increase of basic sanitation • Maintenance of roads, canals, environment, etc…
Ministry of Transport, Communications, and Tourism	• Significantly improved telecommunications for Interior area
Ministry of Social Affairs (SoZaVo)	• Financing health care of the poor and near poor
Ministry of Defence	• Disaster management; Military Hospital • Financing of health care for their personnel and their families
Ministry of ROGB	• Securing and planning for sport and recreation in neighborhoods
Ministry of labour, technology and environment	• Basic sanitation • Environmental health
Ministry of Home Affairs (BIZA)	• Vital statistics
Ministry of Foreign Affairs (BUZA)	• Visa for foreign health care workers

Source: Health Sector Planning Workshop, January 23-24, 2011
Source: Begroting 2011 RvM – Dr C.W. Waterberg

Figure 10: Involvement of other Sectors in Health Administration

Looking towards future needs of the population, there is a need to shift towards a diagonal approach to health programs aiming for disease-specific results through improved health systems. Focus on preventing or treating individual diseases or working with specific

populations can lead to substantial successes with specific conditions. Nevertheless, more can be achieved through comprehensive, coordinated care to address multiple health issues and risk factors, grounded in practices based on inclusion and evidence. This diagonal approach helps to continue the specialization required for some conditions, while strengthening the integration that is beneficial for others. With this approach, desired health outcomes and specific burdens of disease are the basis for identifying services and emphasizing integration into a strengthened primary health care system.

There is a need to reorient the health system to ensure maximum responsiveness and efficiency and to prepare for and mitigate future threats. At present, the health system is facing many crucial challenges, while also being presented with numerous opportunities. Crucial challenges, including rising expectations, increased demands, and inequalities in access, coverage and expenditure, can be mitigated. The mutual demand for change from all stakeholders provides the opportunity for the health sector to reaffirm its commitment to the values of equity, solidarity, and social justice. Changes to reorient the health sector require a horizontal and systematic approach to primary care: dealing with health inequalities by moving towards universal coverage; putting people at the center of service delivery; integrating health into public policies across sectors; and providing inclusive leadership for health governance. The reorientation of the sector will also focus on aligning the building blocks of health systems: the health workforce; the health information system; the systems to provide access to medical products, vaccines, and technologies; the financing system; and leadership and governance.

The important interface between health, well-being, economic development, and social determinants is becoming more prominent in Suriname because existing inequalities have a significant impact on development. Reducing these inequalities increases the capacity for learning, strengthens families and communities, supports sustainable habitats and environments, and contributes to security, poverty reduction, and social inclusion. In turn, quality of life improves and workforce productivity increases, thereby facilitating broader developments. The implications of social determinants extend well beyond the realm of health. However, the health sector is a well-positioned leader and catalyst that can provide a sense of direction required for sustained commitment from other sectors to address these concerns, thus establishing meaningful multi-sectorial partnerships. These partnerships must focus on engaging all stakeholders to commit and implement practical, cross-sector initiatives to address social determinants.

Table 37. Vulnerability factors from previous studies (including the SNC, 2013 NCCPSAP, 2016)

• Human health in Suriname is vulnerable to the effects of climate change, such as increased temperature, alternating rainfalls leading to excessive stagnant water, floods, droughts, and rising seawater levels that cause flooding and intrusion of saltwater further inland.

- These effects, occurring either separately or in combinations, have impacts on:

- population concentrations located in the low coastal area;
- population concentrations located in isolated and remote areas in the hinterlands;
- low-income members of the population, many of whom lack insurance; and
- members of the population who are in poor health, infants, and the elderly.

- Rising temperatures will affect health in various ways, including:

- an increase in numbers of existing microorganisms including pathogens, disease vectors and diseases that will potentially thrive and cause a significant threat;
- development of new pathogens as a result of conditions more hospitable to mutant species, which could significantly challenge the country's disease-control ability; and
- an increase in mortalities due to high temperatures, particularly during heat waves, especially among the elderly and those with specific cardiovascular, cerebrovascular and respiratory diseases.

- Changes in precipitation may have the following impacts on Human Health:

- increases in cases of vector-borne diseases, such as malaria in the interior and dengue in the coastal area;
- increases in cases of upper (nasal area and throat) and lower (respiratory tract and lungs) respiratory illnesses; and
- increases in incidents of diarrhoea and in the likelihood of cholera outbreaks.

Table 38. Risk Perception by Impact Type

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)			Indirect		
	5-6 (Occasional or moderate)			Direct		
	7-8 (Probable or high))				Cumulative	
	9-10 (Frequent or Very high)					

Table 39. Risk Perception by Resource Capital

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)		Natural Capital			
	5-6 (Occasional or moderate)			Physical Capital		
	7-8 (Probable or high))			Socio-Economic		Human Capital
	9-10 (Frequent or Very high)					

Table 40. Risk Perception based on Impact Timeframe

	IMPACT SEVERITY					
		1-2 (Negligible)	3-4 (Concerning)	5-6 (Marginal)	7-8 (Critical)	9-10 (Catastrophic)
RISK PROBABILITY	1-2 (Improbable or very low)					
	3-4 (Remote or low)					
	5-6 (Occasional or moderate)					
	7-8 (Probable or high))			Medium Term	Short Term; Long Term	
	9-10 (Frequent or Very high)					

Although global warming may bring some localized benefits, the overall health effects are likely to be negative. Climate change affects social and environmental determinants of health – clean

air, safe drinking water, sufficient food and secure shelter. Extreme high air temperatures contribute directly to deaths from cardiovascular and respiratory disease, particularly among elderly people. Pollen and other aeroallergen levels are also higher in extreme heat. These can trigger asthma and similar conditions.

Increasingly variable rainfall patterns are likely to affect the supply of fresh water. A lack of safe water can compromise hygiene and increase the risk of diarrheal disease. Floods are also increasing in frequency and intensity. Floods contaminate freshwater supplies, heighten the risk of water-borne diseases, and create breeding grounds for disease-carrying insects such as mosquitoes. They also cause drownings and physical injuries, damage homes and disrupt the supply of medical and health services.

Climatic conditions strongly affect water-borne diseases and diseases transmitted through insects. Changes in climate are likely to lengthen the transmission seasons of important vector-borne diseases and to alter their geographic range. The *Aedes* mosquito vector of dengue is also highly sensitive to climate conditions, and studies suggest that climate change is likely to continue to increase exposure to dengue. Areas with weak health infrastructure – mostly in developing countries – will be the least able to cope without assistance to prepare and respond.

Adaptation Options:

1. Create comprehensive national research programme to track international research on newly emerging pathogens relevant to Suriname's future and keep abreast of preventative measures such as new vaccination protocols, new antibiotics, and new health related precautions. Stimulate national health research and conduct a continuous programme for monitoring diseases that have been highlighted with a climate change signal for Suriname, which include malaria, yellow fever and dengue fever.

2. Create a capacity building programme for public health sector on climate resilient health practices. Build up a supply of public health resources for the surveillance, prevention and control of vector borne diseases.

3. Launch awareness raising programme on climate-related health impacts, prevention and treatment. Conduct a public-awareness campaign on climate related health impacts, such as dangers of prolonged heat stress. Provide information to the public on climate related vector-borne diseases.

4. Develop climate resilient health infrastructure and initiatives. Identify potential risk zones and locations vulnerable to climate change health impacts. Establish medical centres near potential risk zones and hospitals in areas that are not vulnerable to climate-change impacts.

5. Integrate new technology and procedures into the health sector to enhance disease control. Introduce Early Disease Warning Systems that consider temperature signatures for vector borne diseases and other diseases. Implement WHO Integrated Vector Management.

Table 41. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	M	M	H	M
	2	L	H	H	M
	3	M	M	H	L
	4	L	H	H	M
	5	M	M	M	M

H: High; M: Midlevel; L: Low

6.0 CROSS-CUTTING/ COORDINATION SECTORS

6.1 Environment

The environment is cross-sectorial, and therefore climate change adaption is also cross-sectorial, earmarking that adaptation is linked to various sectors. The environment therefore has a more coordinating and facilitating role when it comes to adaptation actions (depicted in Fig. 11). Key sector elements of this coordinating role:

- National Focal Point to UNFCCC
- Reporting to UNFCCC (1st and 2nd National Communications)
- Responsible for overall environment policy in Suriname
- Signing of Paris Agreement (April 2016)

- Process of ratification and (re) formulation of NDC

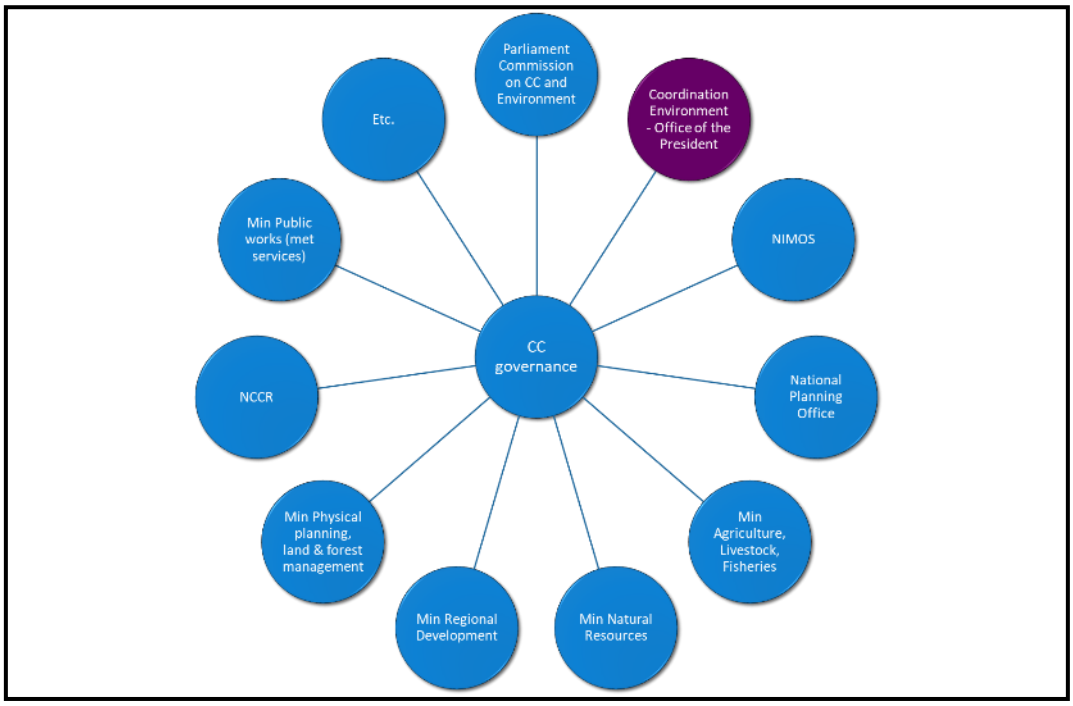


Figure 11: National Climate Change Governance Scheme

It should be noted that Suriname has no comprehensive and overarching law for environmental protection and management and the institutional framework for environmental management is not well defined. The Constitution of 1987 lists as one of its objectives, "The creation and promotion of conditions, necessary for the protection of nature and for conservation of the natural environment". Also, there are various laws and policies related to social and environmental issues and various institutions involved in carrying them out. Suriname is a party to numerous international conventions related to the environment, which drive many of its environmental policy efforts.

The National Institute for Environment and Development in Suriname (NIMOS) was created in 1998 to support the National Council for the Environment (NMR) in implementation and research and to create a national framework for environmental policy and management. NIMOS's current activities include review of environmental and social impact assessments of proposed projects, environmental monitoring and enforcement of environmental mitigation plans, and education and outreach. NIMOS is also involved in grant-funded projects related to the environment.

In 2013, the Environment Directorate was removed and a National Environmental Policy Office was created in the Cabinet of the President of the Republic. The Policy Office started operating in late 2015. The Office is responsible for formulating and coordinating environmental policy

and environmental legislation and serves as the environmental focal point, representing the country internationally. NIMOS and the National Environmental Policy Office co-ordinate on a more ad hoc basis rather than using a solidified framework.

Suriname is party to the Kyoto Protocol of the UNFCCC. The country's 2012-2016 National Development Plan, the 2013 Second National Communication to the UNFCCC and the 2012-2016 Environmental Policy Plan all recognized the significance of climate change impacts on Suriname, with special emphasis on developing opportunities for lowering carbon emissions. The most recent Suriname National Climate Change Policy, Strategy and Action Plan (NCCPSAP) extends for the period 2014-2021. In April of 2016, Suriname signed the COP 21 climate agreement negotiated in Paris, pledging to reduce its GHG emissions by 0.01 percent.

Table 42. Feasibility of Cross-sectoral Collaboration of Environment with other Sectors to Reduce Resource-based Vulnerability

	RESOURCE BASE			
SECTOR	Natural Capital	Physical Capital	Socio-Economic Capital	Human Capital
Energy	H	H	M	L
Mining	H	M	M	L
Agriculture	H	H	H	H
Forestry	H	M	H	M
Infrastructure and Housing	L	M	L	L
Water	M	M	H	L
Tourism	M	L	M	M

H= High; M=Medium; L=Low

Adaptation Options

1. Research natural ecosystems and the natural protection they provide from extreme weather events, and how these will be impacted by climate change. Assess engineering measures to increase sedimentation rates along severely encroached coastal stretches in order to support mangrove growth. Perform Technology Needs Assessment to draw out and identify priority resilience and low emission technologies required. Continue development of climate change projections, including general circulation model (GCM) statistical downscaling to 25-50 km resolution.

2. Establish database on energy and GHG emissions, making use of current available data. Establish monitoring stations across the country, including for monitoring GHG emissions.

3. Create capacity building programme on climate resilience and mitigation for knowledge and best practices sharing, for exchange of expertise and for dissemination of technological knowledge.

4. Develop and implement law, policy and regulation to protect natural environment and build climate resilience. Enact the Environmental Framework Act 2000, which stipulates that climate change be considered in development planning and proposes a fund to finance climate related research. Require environmental impact assessments when developing long-term projects. Implement conservation strategies designed to protect marine turtles in the face of climate change.

5. Adopt an ecosystem-based adaptation approach to environmental management to maintain and increase the resilience and reduce the vulnerability of ecosystems and people in the face of the adverse effects of climate change.

Table 43. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions		Financial	Political	Social	Administrative
	1	M	M	L	M
	2	M	M	M	M
	3	M	M	M	H
	4	M	M	H	M
	5	L	L	M	L

H: High; M: Midlevel; L: Low

6.2 Disaster Risk Reduction

The international context for disaster risk reduction (DRR) in Suriname is defined by global DRR strategies such as the Hyogo Framework for Action (HFA) 2005–2015: Building the Resilience of Nations and Communities to Disasters. It is also defined by a growing awareness

that the current global development path leads dangerously towards pushing the boundaries of resilience of our planet, with corresponding impacts on Suriname. Suriname is party to major environmental conventions, among them the UNFCCC and the UN Convention on Biological Diversity (CBD). Suriname is currently discussing ratification of the Minamata Convention, a global treaty to protect human health and the environment from the adverse effects of mercury (opened for signature on 10 October 2013) [7].

The Constitution of Suriname has no specific provisions for disasters, but it mandates the President to declare a state of emergency to maintain external and domestic security in case of danger or threat in any part of Suriname, subject to previous consent of the National Assembly (Art. 102 paragraph 3). The Act on Regional Bodies gives the District Commissioner (DC) a specific mandate to demand the use of buildings and vehicles, and demand the assistance of capable residents, in case of disasters and calamities in the district; this mandate is enforced by the police if needed (Art. 49 paragraphs 1 and 2). The DC is in charge of the police and the fire department in his/her district and has extensive local regulatory and administrative powers.

Since 2014, the National Coordination Centre for Emergency (NCCR) has been institutionally moved from the Ministry of Defense to the Cabinet of the President. The draft Disaster Management Legislation and the law providing NCCR a legal base have not yet been approved. Other main legislative gaps identified in the context of DRR are the absence of national environmental legislation (the existing draft of such legislation has yet to be discussed and approved) and the delay in operationalization of the Planning Enactment (Planverordening).

Cohesion between different disaster-related plans (which are often responding to different international commitments) should be improved. As climate change has a clear impact on biodiversity, the National Biodiversity Action Plan (NBAP) 2012-2016 should be better linked to the National Climate Change Action Plan (NCCAP), which has a focus on adaptation and mitigation. Furthermore, a National Road Safety Plan and a National Health Disaster Plan have been developed but it is not clear how operational they are currently.

NCCR works most closely with five selected Ministries who each have a designated Disaster Coordinator. NCCR has adapted the Incident Command System (ICS) as the strategy that best suits the current reality: based on the size of Suriname and the huge variety in population density, NCCR strives to enable the population at district and community levels to be first responders. In the envisioned structure, the District Commissioner is the Head of the Disaster Committee in the district and central in the response network.

According to NCCR, the Bureau for National Security (BNV) should focus on making broad policy and produce an overall National Strategic Safety Plan, while NCCR concentrates on

[7] There continues to be successful efforts including the 2018 signing of the Minamata Convention by the Government of Suriname.

preparedness, concept legislation, response coordination and early recovery. Producing the National Disaster Response Plan would be a part of this.

Table 44. Feasibility of Cross-sectoral Collaboration of the Disaster Risk Reduction Sector with other Sectors to Reduce Resource-based Vulnerability

	RESOURCE BASE			
SECTOR	Natural Capital	Physical Capital	Socio-Economic Capital	Human Capital
Energy	L	H	M	M
Mining	M	M	L	M
Agriculture	H	M	H	L
Forestry	H	M	H	M
Infrastructure and Housing	L	L	L	L
Water	M	M	M	M
Tourism	M	M	H	M

H: High; M: Midlevel; L: Low

Adaptation Options

1. Conduct research into past Sibibusi trends and relationship with regional climatic events (such as Caribbean hurricane season) and climate change. Conduct research into past hurricane trends and interaction with Suriname's Exclusive Economic Zone (EEZ), and potential links to climate change. Strengthen existing monitoring of hurricanes in Suriname's EEZ.

2. Develop printed materials or other awareness raising measures to clearly show disaster victims how to handle potentially contaminated water sources in order to prevent illness. Increase awareness on preventative measures, regarding operating procedures for an emergency response plan that is activated before a natural disaster strikes Suriname. Provide psychological guidance and physical relief measures to victims.

3. Develop specific legislation with regards to disaster management, incorporating climate change. Incorporate forest fire measures into the national disaster plan.

4. Expand and improve equipment of the existing NCCR infrastructure. Implement a National Early Warning System (EWS).

5. Establish a disaster relief fund. Establish specialized insurance coverage schemes for health, housing and infrastructure and other areas vulnerable to the impacts of extreme weather conditions.

Table 45. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
Adaptation Actions	(as listed above)	Financial	Political	Social	Administrative
	1	M	H	M	M
	2	M	H	H	M
	3	L	M	M	L
	4	L	M	M	L
	5	M	M	H	L

H: High; M: Midlevel; L: Low

6.3 Spatial Planning

Economic development created a proliferation of competing demands on Suriname's rich natural resources. Land use planning in Suriname is characterized by the issuance of overlapping mining and forestry concessions; double issuance of domain land; lack of structure, planning and zoning plans; and even land degradation in protected areas. The Government expresses the need for spatial planning of its territory in the Development Plan 2012-2016. The Government intends to prioritize the development of updated legislation for spatial planning.

The government acknowledges that spatial planning is needed to ensure responsible use of the land. It is a priority of the government to develop updated legislation for spatial planning, which will provide the government the authority and the obligation to direct said planning. The government will implement spatial policy through zoning plans, which will be the policy vision of the government for future spatial development for specific areas. Both the Government as well as citizens will have to obey to these plans. Planning of land and natural resources will be concretized within zoning and structural plans, while regional and zoning plans will consider physical development opportunities and social, cultural and economic circumstances of the area in question. The Land Registration and Land Information System (GLIS) project is an important foundation for sound spatial planning, especially in terms of the uniformity and the accuracy of

geographic information. The digital land information will be used as the basis for developing regional, structure and zoning plans as well as in monitoring of projects.

Current legislation related to spatial planning is scattered across various laws and regulations administered by different ministries and government agencies. Planning legislation dates back to the colonial period, while legislation relating to the use and management of land and natural resources was adopted after independence. The Planning Act and the Urban Planning Act set out a strategic framework for zoning and land use planning. The legislative regime for land management consists of mainly fragmented pieces of legislation regulating the issuance of land and use of natural resources. Some legislation has its own land use planning scheme:
– The Forest Management Act designates different types of forest, which should be in conformity with national and regional plans;
– The Mining Act provides for designating areas for small scale mining;
– The Hindrance Act provides for designating streets, neighborhoods, towns and cities where certain facilities are not allowed to be established;
– The Nature Conservation Act provides for establishing nature reserves.

Some of the challenges faced by the spatial planning sector will weaken the country's climate change response, especially since this sector will play a coordinating role. Some of the key risks and vulnerabilities of the sector include: different pieces of legislation provide different government bodies with responsibilities for planning; the Ministry of RGB's responsibility for spatial planning was given by a State Order, which is lower in hierarchy than an Act of Parliament; there is a lack of a structured coordination between relevant government agencies in the land allocation process; the permitting process for exploitation of natural resources also lacks coordination between permitting agencies (GMD, SBB, DC), resulting in overlapping concessions; planning institutions are not established, hampering the implementation of planning legislation; there is confusion about and overlap of responsibilities related to spatial planning due to the fact that different ministries and organizations have departments responsible for spatial land use allocation.

Table 46. Vulnerability factors from previous studies (including the SNC, 2013 NCCPSAP, 2016)

- The largest portion of productive land is found in the fertile young coastal zone.
- A number of factors jeopardize the country's ability to retain this classification, however. One is the lack of land-use planning. Necessary legislation on the issue has indeed been discussed, but it has never been implemented.
- This deficiency is certain to exacerbate the negative effects of climate change in terms of changing rainfall patterns and sea-level rise, especially in the coastal area.

Table 47. Feasibility of Cross-sectoral Collaboration of Spatial Planning Sector with other Sectors to Reduce Resource-based Vulnerability

	RESOURCE BASE			
SECTOR	Natural Capital	Physical Capital	Socio-Economic Capital	Human Capital
Energy	H	M	L	L
Mining	H	M	L	L
Agriculture	H	H	M	M
Forestry	M	L	M	L
Infrastructure and Housing	H	H	L	M
Water	M	M	L	L
Tourism	M	M	M	M

H: High; M: Midlevel; L: Low

Adaptation Options

1. Conduct mapping of land titles of total surface area of Suriname. Perform research on vulnerability of land under various uses to climate change impacts. Conduct hazard and vulnerability mapping of land conditions. Conduct an awareness raising programme on the impacts of climate change on land use planning.

2. Review the current legal framework for spatial planning (Planning Act 1973, Urban Planning Act 1972, and the Decree on Issuance of Domain land) and incorporate potential climate change impacts into future spatial planning legislation. Implement land-use planning through the creation of a single land-use authority that considers vulnerability, land availability and location, and the suitability of land for industrial, agricultural or human settlement purposes.

3. Establish agro-ecosystem zoning based on vulnerability and risk assessment of land. Implement spatial planning and zoning by a central authority in order to promote appropriate urban growth. Assess natural waterways and streamline with land allocation policy to mitigate flooding and drainage problems. Require drainage plan for allotment and housing projects. Update master plan of Greater Paramaribo to integrate climate change considerations. Establish flexible and appropriate land tenure systems that allow for long-term decision making on the part of land owners, tenants or other users.

4. Regulate activities such as sand and shell mining and the issuance of land rights in the estuarine zone. Establish protected area and buffer zone along the coastline and along other water bodies such as rivers and lakes. Protect mangrove forests; regulate and enforce regulations on tree removal. Forbid new development initiatives in vulnerable zones and gradually reduce existing activities in vulnerable zones and in potential future buffer zones.

Fig.48. Perceptions of the Feasibility of Successful Implementation of Adaptation Actions

	Feasibility of Implementation Success				
	(as listed above)	Financial	Political	Social	Administrative
Adaptation Actions	1	M	M	M	M
	2	M	L	M	M
	3	L	M	M	L
	4	L	M	M	L

H: High; M: Midlevel; L: Low

7.0 COMPARATIVE FINDINGS

7.1 Productive Sectors and Foundation Sectors

In this section, sectors are compared to each other based on (1) direct, indirect and cumulative impacts expected in each sector; (2) vulnerability of each sector based on its intrinsic resource capital bases and; (3) vulnerability of each sector based on the dynamics of impact being long term or slow onset, medium term and short term, or of immediate urgency. As noted in the methodology, the comparative results are based on perceptual measures collected from key experts, national consultations, and consultants and are grounded in the relevant technical background and scenario models of the NCCPSAP, SNC and other documents.

Figures 12 to 21 provide comparative analyses of the productive sectors and the foundation sectors (the latter are represented in green columns). Figures 22-24 provide comparative analysis of the cross cutting sectors.

Fig. 12. Risk of Direct Impacts of Climate Change by Sector (relative % scale)

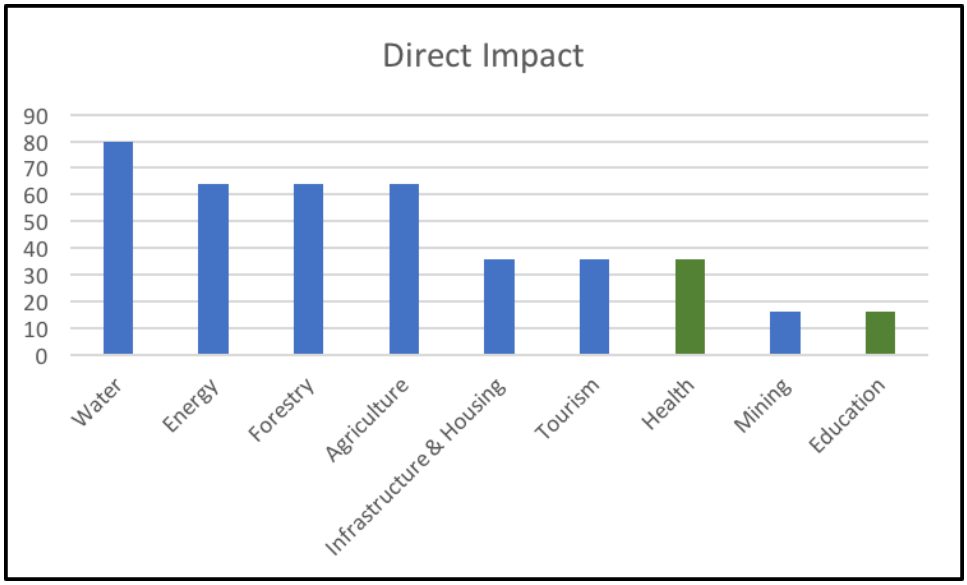


Fig. 13. Risk of Indirect Impact of Climate Change by Sector (relative % scale)

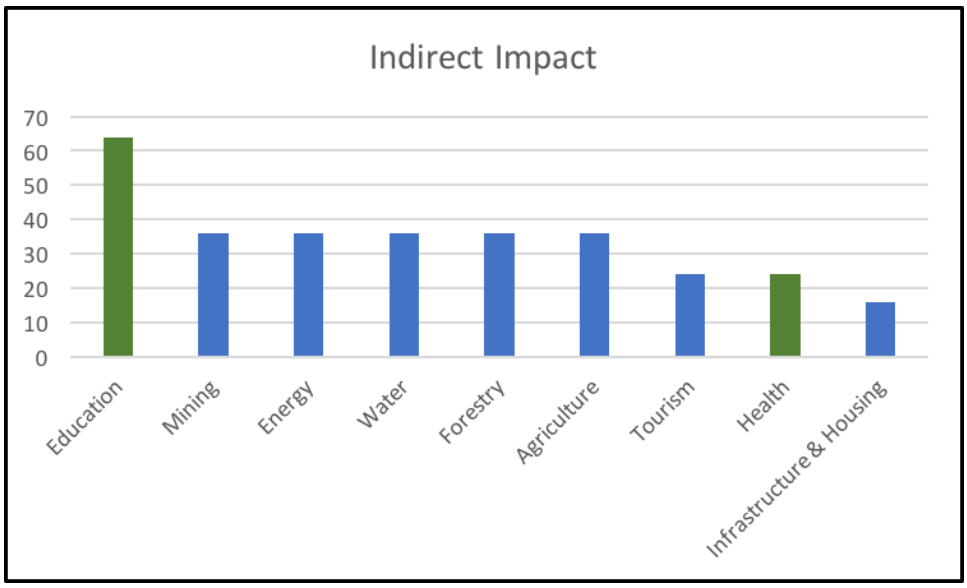
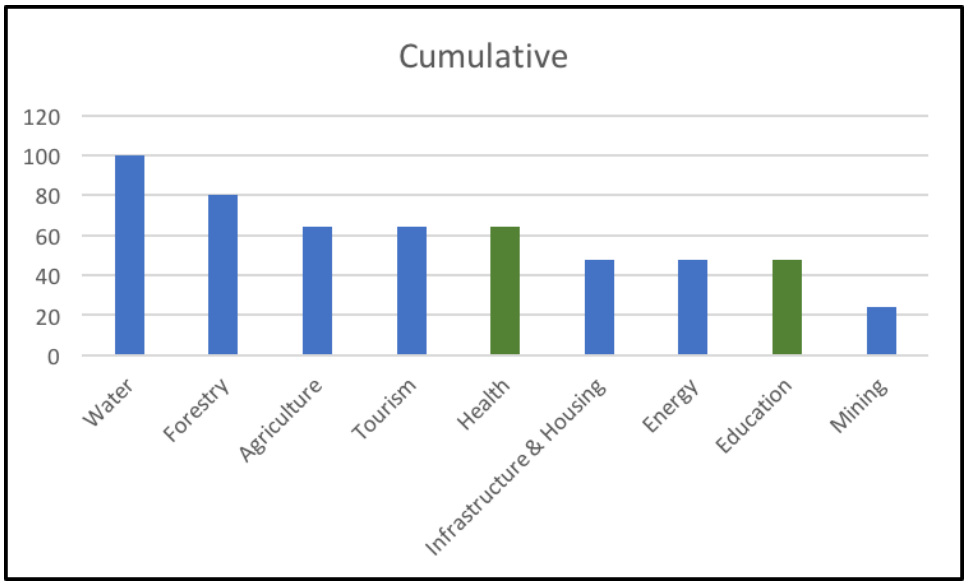


Fig. 14. Risk of Cumulative Impact of Climate Change by Sector (relative % scale)



The comparative analysis suggests that based on impact perception, the most important productive sectors are clearly water and forestry. In the second tier of importance, without inclusion of the foundation sectors, are energy and agriculture. Interestingly, of all the productive sectors, mining is perceived to have the greatest indirect impacts to climate change. Also regarding indirect impacts, the greatest risk is not perceived as being to a productive sector at all, but rather to the foundation sector of education.

Fig. 15. Vulnerability of Natural Capital to Climate Change Impacts, by Sector (relative % scale)

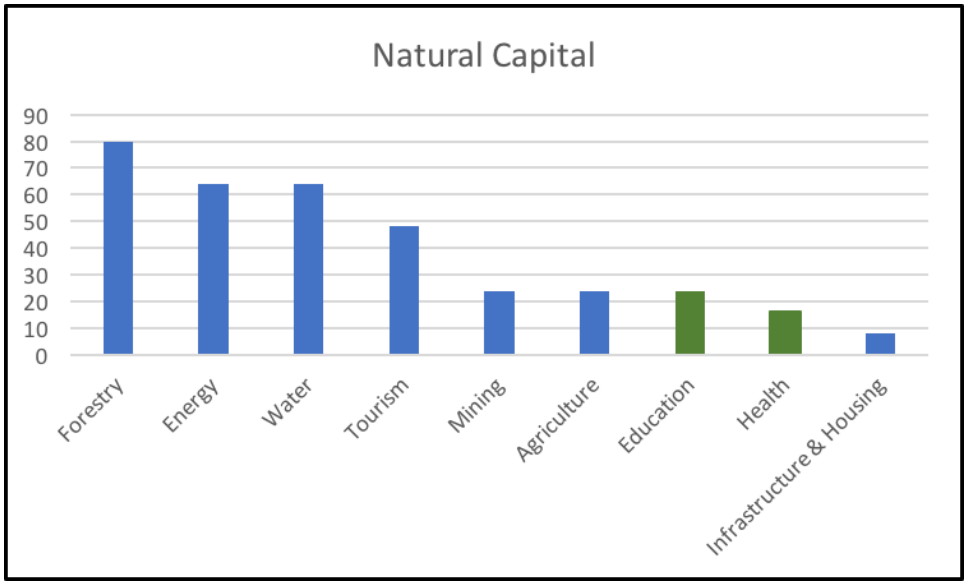


Fig. 16. Vulnerability of Socio-Economic Capital to Climate Change Impacts, by Sector (relative % scale)

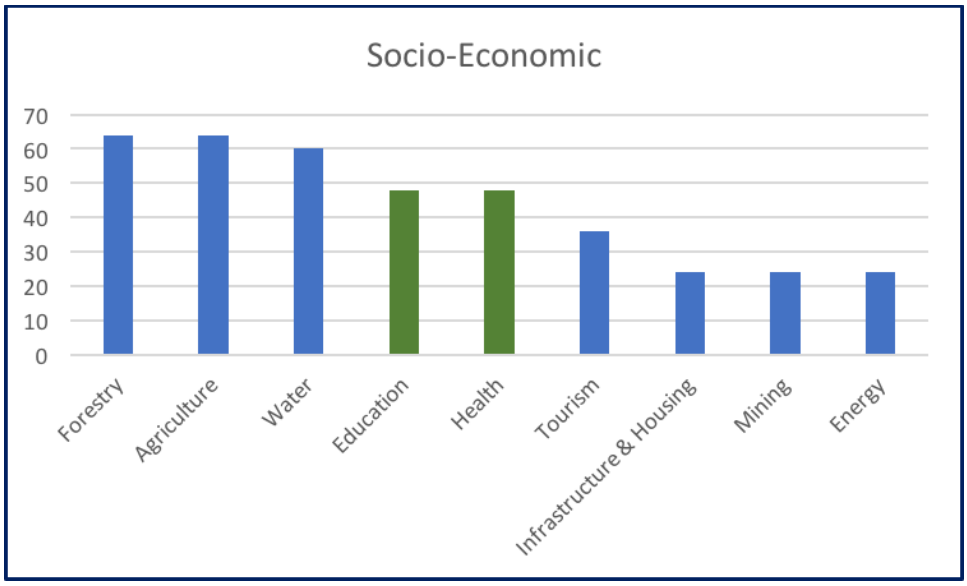


Fig. 17. Vulnerability of Human Capital to Climate Change Impacts, by Sector (relative % scale)

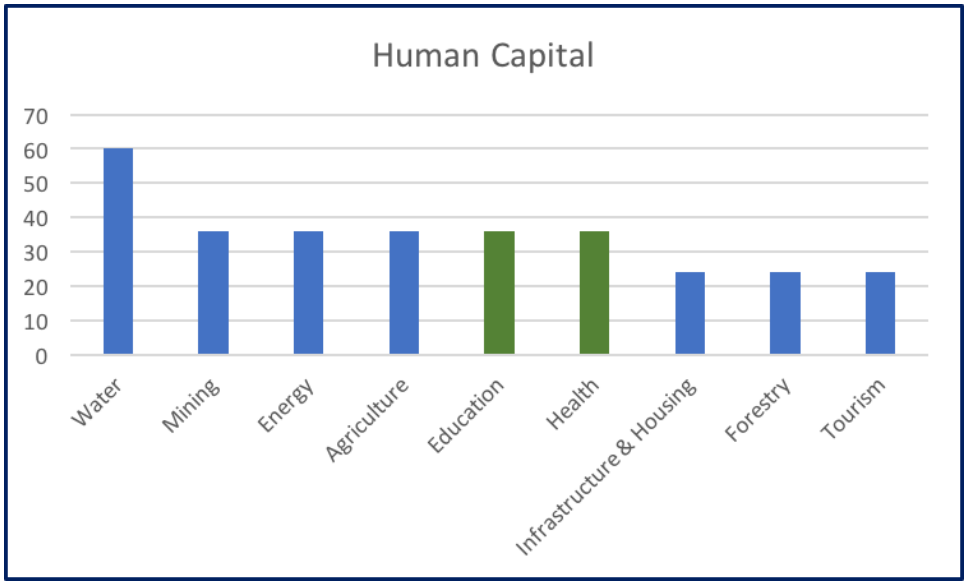
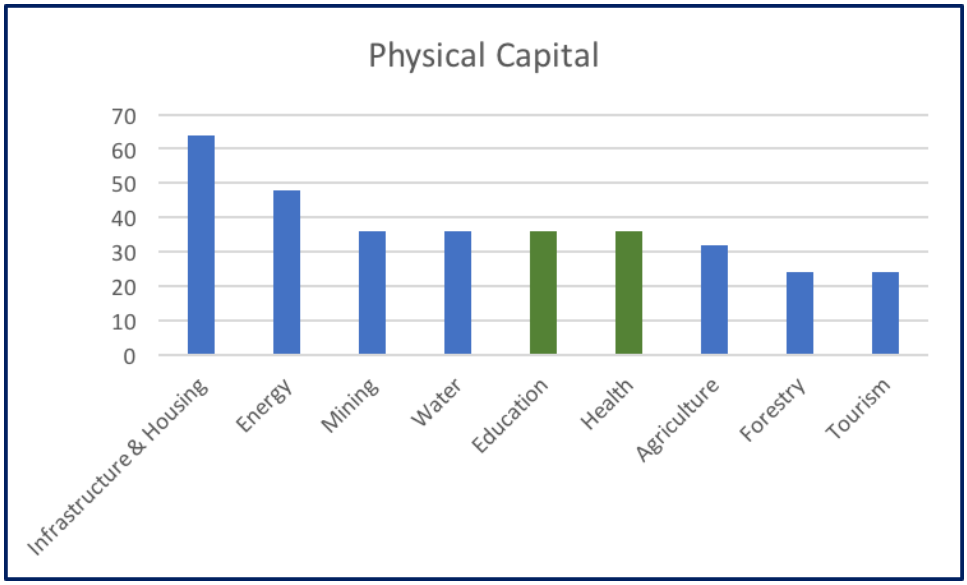


Fig. 18. Vulnerability of Physical Capital to Climate Change Impacts, by Sector (relative % scale)



The comparative analysis suggests that based on perceptions of vulnerability of each sector's resource capital bases, the water and energy sectors emerge as highest priorities, both appearing in the higher rankings across all four resource capital bases. This would be followed in importance/ priority by the forestry and agriculture sectors, each of which appear higher in rankings across at least two resource capital bases. Forestry may potentially be considered the more vulnerable of those two given that this sector was top ranked across two resource bases – natural capital and socio-economic capital; the only sector to do so. Unsurprisingly, the infrastructure and housing sector was ranked as highest priority based on physical capital.

Fig. 19. Vulnerability of Sectors to Long Term/ Slow Onset Impacts of Climate Change (relative % scale)

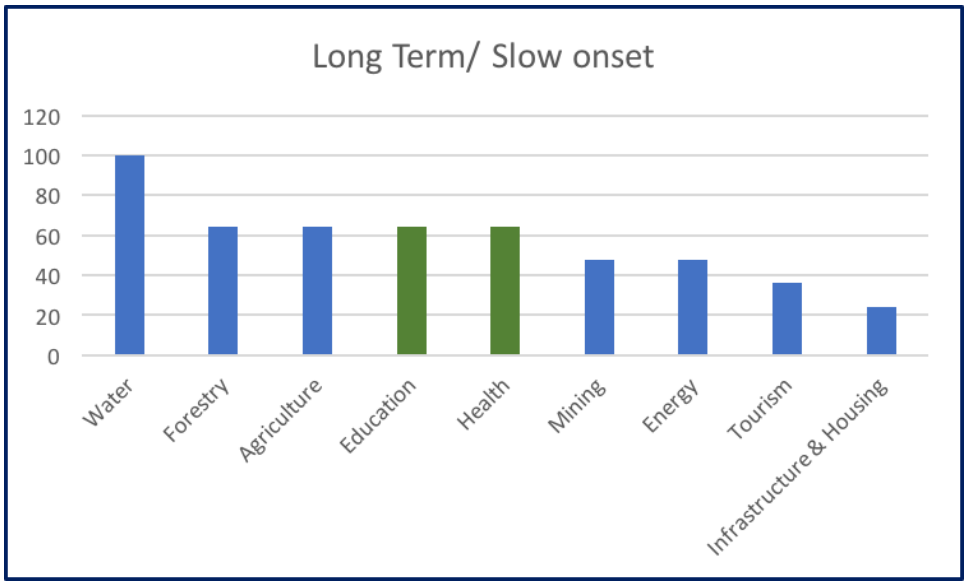


Fig. 20. Vulnerability of Sectors to Medium Term Impacts of Climate Change (relative % scale)

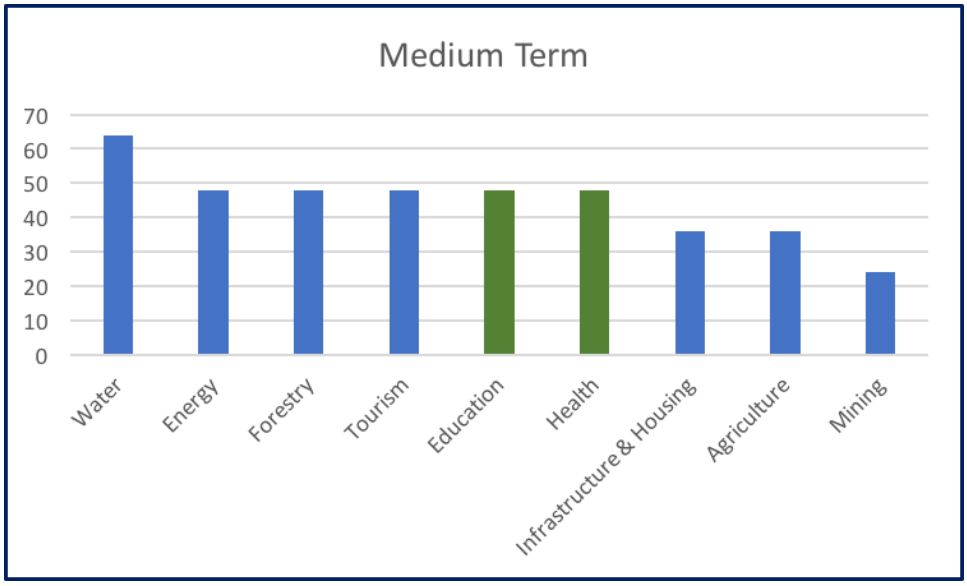


Fig. 21. Vulnerability of Sectors to Short Term Onset Impacts of Climate Change (relative % scale)

The comparative analysis suggests that based on perception of the risk posed to each sector over short, medium and long-term time spans, the water sector clearly emerges as the highest priority. Next, both the energy and forestry sectors are ranked as high priority, having each scored highly across at least two time spans (energy in short and medium term; forestry in medium and long term). Apart from those emergent priority sectors, it is notable that regarding the short time span/ immediate risk, infrastructure and housing is second to the water sector; and regarding long term/ slow onset, the agriculture sector is perceived as most at risk after the water and forestry sectors.

7.2 Cross Collaborative Sectors

Fig. 22. Feasibility of Environment Sector Cross Collaborating on Climate Change Adaptation with Productive Sectors

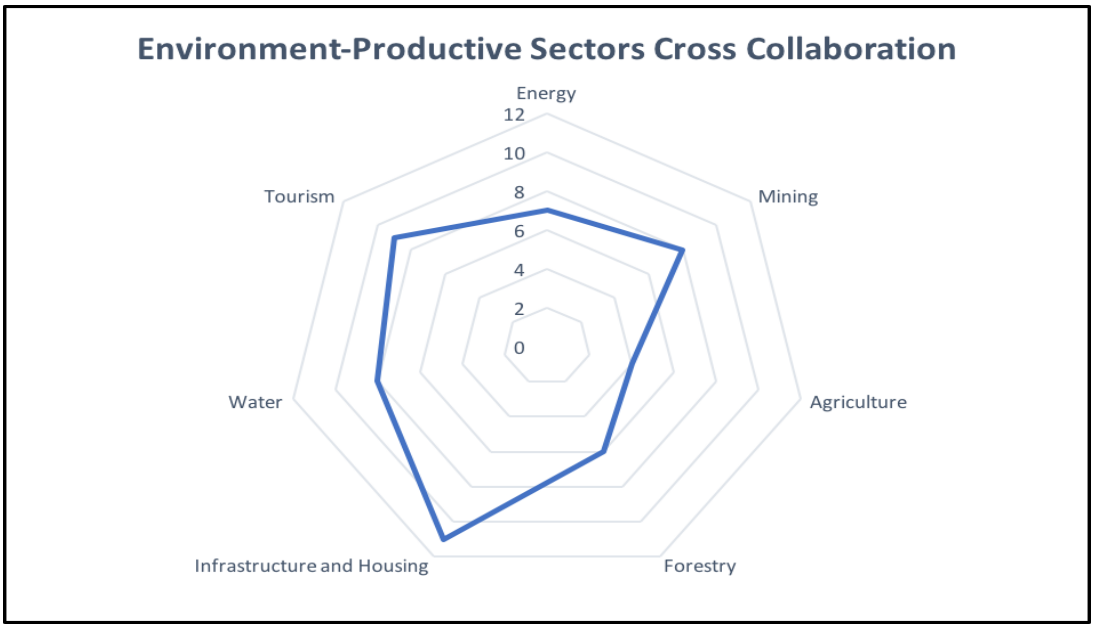


Fig. 23. Feasibility of Disaster Risk Reduction Sector Cross Collaborating on Climate Change Adaptation with Productive Sectors

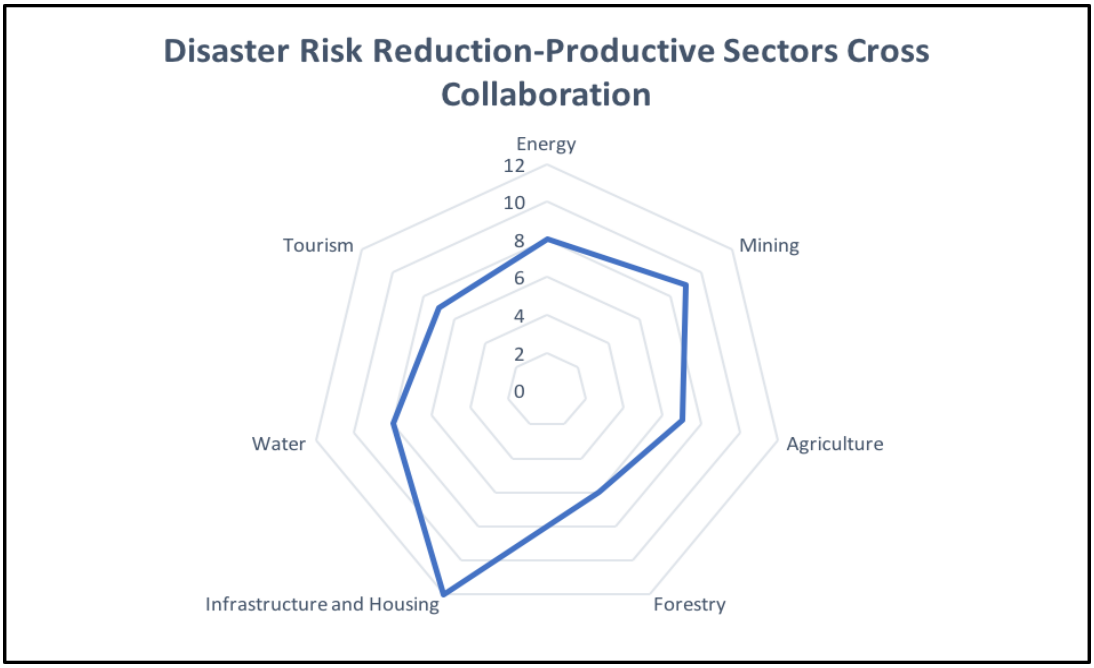
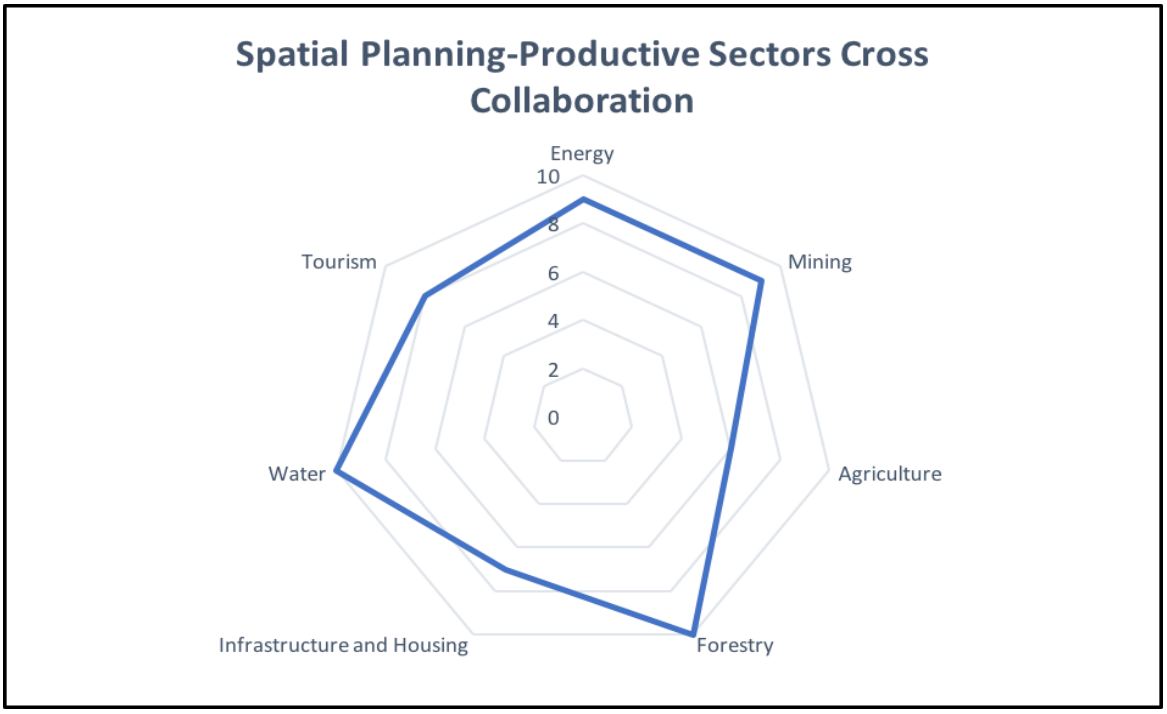


Fig. 24. Feasibility of Spatial Planning Sector Cross Collaborating on Climate Change Adaptation with Productive Sectors



Figures 22-24 illustrate the perceived feasibility of each of the cross cutting collaborative sectors to build climate change resilience in each of the productive sectors. The closer to the center of the radar the productive sector is, the more feasible the collaborative sector-productive sector relationship is.

With the environment sector, the most feasible cross sector collaboration for building climate change resilience is with the agriculture sector and the least feasible is perceived as being with the infrastructure and housing sector. With the disaster risk reduction sector, the most feasible collaboration is perceived to be with forestry and the least feasible is with infrastructure and housing. With the spatial planning sector, the most feasible collaboration is perceived to be with the agriculture sector and the least feasible is with the water and forestry sectors.

7.3 Summarizing and Prioritizing based on these Findings

By applying simple rank scored calculation with the equation:

Risk = (Exposure – Adaptive Capacity) x Sensitivity

Where exposure is proxied to the average of direct, indirect and cumulative impact; adaptive capacity is proxied to the ability of the sector to be strengthened through cross-sectoral linkages to environment, disaster risk reduction and spatial sectors; vulnerability is proxied to the average of natural capital, socio-economic, human and physical vulnerability.

Scores provided the final priority ranking of the productive sectors:

1. Water
2. Forestry
3. Agriculture
4. Energy
5. Infrastructure & housing
6. Tourism
7. Mining

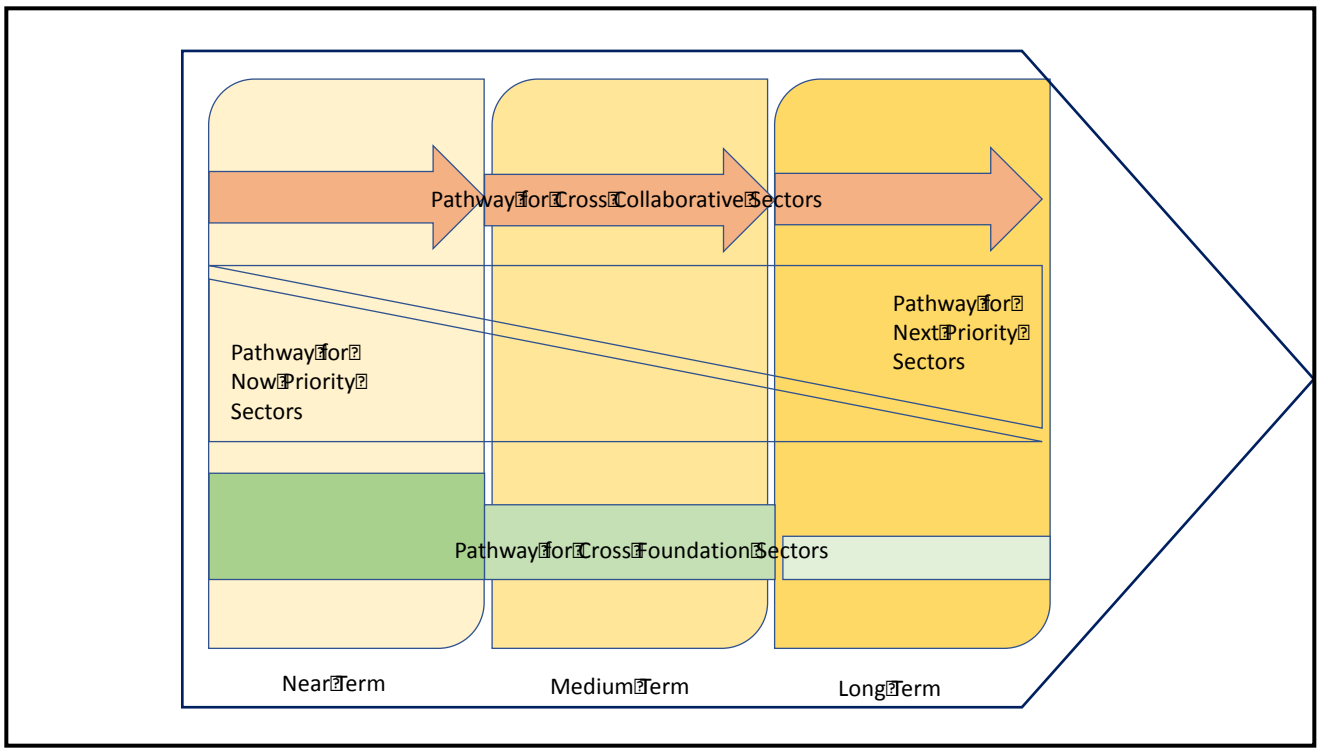
8.0 RECOMMENDATIONS

Based on the findings of the risk and vulnerability assessment conducted, it becomes clearer that for Suriname that there cannot be a linear approach to national climate change adaptation. There are risks and vulnerabilities spread across multiple sectors as well as concentrated risk and vulnerability characteristics within each sector, which is derived from the intrinsic nature of the sector itself (e.g. national annual budgetary allocations) and/or from extrinsic pressures and drivers (e.g. the sector activity depends on seasonal stabilities).

It is therefore equally important to rank and prioritize sectors as matters of national priority, as to plan with and across sectors holistically so that national adaptation comes to resemble a model of several moving parts (sectors). These sectors are activated in and of themselves, but in so doing, also build resilience cross sectorally. In this way, adaptation efforts are more likely to make multiplicative gains rather than only additive ones.

The proposed strategic model for national climate change adaptation planning based on sector level risk and vulnerability assessment will therefore have four overarching pathways to be operationalized in compliment to one another.

Fig. 25. Strategic Model Based on Sector-level Risk and Vulnerability Assessments



1. “Pathway for ‘Now’ Priority Sectors”: The emphasis for national climate change adaptation starts with strong focus on those productive sectors with the most vulnerable risk profiles. These are the: water sector, energy sector, forestry sector and agriculture sector. As sectoral resilience is strengthened over the near and medium term, there can be progressively reduced focus, in order to shift attention to the “Pathway for ‘Next’ Priority Sectors”.

2. “Pathway for ‘Next’ Priority Sectors”: As national climate change planning moves into the medium term, the focus shifts to those productive sectors with somewhat less vulnerable risk profiles. These are the: mining, tourism, infrastructure and housing sectors. This shift to build resilience in these sectors occurs as the ‘Now’ sectors exhibit stronger resiliency and therefore require less attention and resources.

Over time, as this dual strategy across the productive sectors occurs, synergies across sectors also increase climate resilience.

3. “Pathway for Cross-Foundation Sectors”: There are two foundation sectors upon which the productive sectors and the cross collaborative sectors depend. These are the education and health sectors. Long term resilience cannot be confidently built without first paying substantial attention to these two sectors. In this pathway, therefore, in the immediate near term, there should be strong emphasis on building resilience in the education and health sectors. Over time through the medium and long term, while resiliency must be maintained in these sectors, the foundation

would have been sufficiently strengthened so as to shift focus from building up resilience to maintaining it.

4. “Pathway for Cross-Collaborative Sectors”: The environment, disaster risk reduction and spatial planning sectors undertake climate change resilience building intrinsic to each respective sector but also play an undeniable and often essential role in the building of climate resilience in each of the productive sectors as well. The importance of maintaining focus on these three sectors can therefore not be minimized. Over the course of the near, medium and long term, an underlying but consistent focus on these sectors will serve to build resilience across all of the productive sectors as well.

When this comprehensive sector level strategy of (1), (2), (3) and (4) is implemented in a complimentary manner, it offers the most effective and realistic approach to addressing risk, reducing vulnerability and building national level climate resilience.

8.1 A Proposed Sector by Sector Action Roadmap

Phase 1: Near Term (Year 1-3) Provide adaptive planning focus on cross-collaborative sectors: environment, disaster risk reduction, spatial planning as required. Provide adaptive planning focus on priority sectors 1. Water, 2. Forestry, 3. Agriculture. Provide adaptive planning focus to a significant level on foundation sectors – education and health.
Phase 2: Medium Term (Year 3-6) Provide adaptive planning focus on cross-collaborative sectors: environment, disaster risk reduction, spatial planning as required. Provide adaptive planning focus on priority sectors 4. Energy, 5. Infrastructure and Housing. Initial focus on 1. Water, 2. Forestry, 3, Agriculture can be gradually reduced due to resilience built in Phase 1. Provide adaptive planning focus to a moderate level on foundation sectors – education and health, since resilience has been ramped up from Phase 1.
Phase 3: Long Term (Year 7-9)

Provide adaptive planning focus on cross-collaborative sectors: environment, disaster risk reduction, spatial planning as required.

Provide adaptive planning focus on priority sectors 7. Mining and 8. Tourism. The medium term focus on 4. Energy, 5. Infrastructure and Housing can now be reduced as resilience was built in the medium term.

Provide adaptive planning focus to a lower level on foundation sectors – education and health, since resilience had been built to a strong extent in Phase 2.

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1. Annual Development Plan (2017 – 2021)[8]
2. Regeerakkoord 2015- 2020 (Government Agreement)
3. Ontwikkelingsplan (OP) Suriname 2012- 2016 (Development Plan Suriname 2012- 2016)
4. Second National Communication, February 2013
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6. National Climate Change Policy, Strategy and Action Plan for Suriname 2014- 2021 (NCCPSAP), January 2015
7. Integrated Coastal Zone Management Plan (ICZM) Suriname- Component 1 Background Report, December 2009
8. ICZM Plan Suriname- Implementation of a Pilot Plan for the Paramaribo/ Wanica Region Final Assessment Report, December 2009
9. Suriname's National Energy Policy (Draft) 2013- 2033
10. National Biodiversity Strategy, March 2006

[8] The Plan will be presented to Parliament shortly. It was recently finished and presented to the President for approval.

11. National Biodiversity Action Plan (NBAP) 2012- 2016, February 2013
12. National Capacity Self- Assessment Report, May 2009
13. National Capacity Self- Assessment (NCSA) Cross- Cutting Analysis, December 2008
14. Country Programming Framework for Suriname 2016- 2019 (FAO partnership with the government of Suriname)

Projects and Activities

1. Project Document: Mainstreaming global environment commitments for effective national environmental management
2. Project Document: Feasibility study of the commercial production of biofuels from dedicated biomass crops on mined- out bauxite lands in Suriname
3. Project Document: Strengthening national capacities of Suriname for the elaboration of the national REDD+ Strategy and the design of its implementation framework
4. Readiness Preparation Proposal (R-PP) for Suriname, February 2013
5. Project Document: Transition Phase to Implement Suriname Readiness Preparation Proposal (R-PP)
6. Project Document: Suriname Coastal Protected Area Management

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1. Environmental Statistics, December 2014
2. 8ste volks- en woningtelling in Suriname, augustus 2012 (Census data)

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1. IICA, Annual Report 2016. IICA Delegation to Suriname. 2016.
2. Caribbean Large Marine Ecosystem Regional Transboundary Diagnostic Analysis, UNDP/GEF CLME Project (2011)
3. Gender and climate change Asia and the Pacific: Overview of linkages between gender and climate change. Policy Brief, UNDP 2013

APPENDIX:

A: Consultant K. Shah discussing some of the participant worksheets (in the background) at the National Adaptation Workshop, November 2017

B: Sector Expert presenting an overview at the National Adaptation Workshop (note several participant worksheets in background), November 2017