Caribbean Community
Climate Change Centre

A NATIONAL CLIMATE CHANGE POLICY, STRATEGY AND ACTION PLAN TO ADDRESS CLIMATE CHANGE IN BELIZE

Prepared for the
Caribbean Community Climate Change Centre (CCCCC)
Belmopan, Belize

and

Ministry of Forestry, Fisheries and Sustainable Development (MFFSD)

Belmopan, Belize

GCCA Intra-ACP Programme

An initiative of the ACP Group of States funded by the European Union

A National Climate Change Policy, Strategy and Action Plan to Address Climate Change in Belize

Caribbean Community Climate Change Centre
Lawrence Nicholas Building
Ring Road
Belmopan, Belize
T: 501-822-1094
F: 501-822-1365

This report was prepared for the Caribbean Community Climate Change Centre (CCCCC) and the Government of Belize with funding under the European Union Global Climate Change Alliance (EU-GCCA) Caribbean Support Project and the United Nations Development Programme/Global Environmental Facility Third National Communication Project.

Empowered lives.
Resilient nations.

A NATIONAL CLIMATE CHANGE POLICY, STRATEGY AND ACTION PLAN TO ADDRESS CLIMATE CHANGE IN BELIZE

Acknowledgements and disclaimer

This document is an output from the EU-GCCA Caribbean Support Project, which is funded by the European Union (EU) under a Grant Contract FED/2011/267-392for the implementation of an action entitled: Support to the Global Climate Change Alliance (GCCA) under the 10th EDF Intra-African Caribbean and Pacific financial framework in the Caribbean (EU-GCCA Project).

The report was prepared by David Simmons and Associates, Ltd., Lead Consultant – Mr. David A. Simmons, Dr. John Charlery (Climate Change Specialist); Dr. Winston McCalla (Legal Specialist); and. Ms Nikita Pardesi, Research Assistant.

CCCCC Technical supervision: Mr. Joseph McGann, Programme Manager, EU-GCCA Project

Special thanks to the Staff of the NCCO: Mrs Ann Gordon (National Climate Change Co-ordinator), Mr. Colin Mattis, Ms Safira Vasquez, and Mrs Ide McCoy, who have been extremely helpful with their time and supportive of this exercise.

For more information visit:

- The Global Climate Change Alliance website: http://www.gcca.eu/
- The African, Caribbean and Pacific Secretariat website: http://www.acp.int/
- The Caribbean Community Climate Change Centre website: http://www.caribbeanclimate.bz

FOREWORD

Statement from the Hon. Lisel Alamilla, Minister, Ministry of Forestry, Fisheries and Sustainable Development

The adverse effects of Climate Variability and Climate Change, particularly on crop production and food security, natural ecosystems, marine and coastal areas, water resources and human health, as well as on housing and infrastructure are particularly obvious around us. These impacts pose major impediments to efforts being implemented by the Government of Belize to promote sustainable economic and social development and poverty reduction, which are the first and overriding priorities of the national government. Ocean acidification due to rising carbon dioxide levels will create serious risks to marine ecosystems and species, including our coral reef systems.

Although Belize is a minute contributor to global greenhouse gas emissions, it will be among those countries which will be severely impacted by Climate Change. In light of these realities, the Government of Belize recognized that to effectively address the adverse effects of Climate Variability and Climate Change on the economic and social development of the country and to minimize the risks associated with predicted impacts, there was great need to develop a National Climate Change Policy, Strategy and Action Plan.

The National Climate Change Policy, Strategy and Action Plan is the result of extensive consultations with a wide range of stakeholders, including government departments, local communities and civil society. The development of this document took into consideration the need to cover adaptation and mitigation, and will allow the country to strategically transition to low-carbon development while strengthening its resilience to the effects of Climate Change.

Recognizing the challenges and cross-sectoral nature of Climate Change, the Government also assessed the governance architecture required for the management of Climate Change in Belize. In so doing, we are working assiduously to implement the institutional arrangements necessary for coordinating and implementing Climate Change mitigation and adaptation measures. It is our belief that coordination and collaboration along with tracking our development goals will be the key for successfully implementing the National Climate Change Policy, Strategy and Action Plan.

This document provides a roadmap outlining fundable, implementable, robust and comprehensive strategies and actions that will ensure the strengthening of Belize's capacity to adapt to the current and future impacts of Climate Change.

The National Climate Change Policy has been prepared as a living document; a document that will require periodic review driven by new scientific findings, development priorities and the outcomes of international negotiations.

Toward this end, the Government of Belize expresses its gratitude to the Caribbean Community Climate Change Centre, the European Union through the African Caribbean and Pacific Global Climate Change Alliance Programme and the United Nations Development Programme for their support in the preparation of our National Climate Change Policy, Strategy and Action Plan.

Honourable Lisel Alamilla

Minister of Forestry, Fisheries and Sustainable Development

TABLE OF CONTENTS

Foreword ii
Abbreviations and Acronyms i
Glossary of key terms used in the Report iii
EXECUTIVE SUMMARY 1
1. INTRODUCTION 13
1.1 Geography 14
1.2 Situation Analysis 14
2.0 CLIMATE CHANGE MODELS AND PREDICTIONS 16
2.1 Historical Data 18
2.2 Model Data 23
2.3 Climate Change Projections 24
2.3.1 Air Temperature 24
2.3.2 Rainfall 26
2.3.3 Sea level Rise 27
2.4 Regional Downscaling of ECHAM5 Using PRECIS 27
2.4.1 Rainfall (PRECIS/ECHAM5 Model) 28
2.4.2 Temperatures (PRECIS/ECHAM5 Model) 33
2.4.2.1 Mean Temperature 33
2.4.2.2 Mean Maximum Temperature 38
2.4.2.3 Mean Minimum Temperature 43
2.4.3 Relative Humidity (PRECIS/ECHAM5 Model) 48
2.4.4 Wind Speed (PRECIS/ECHAM5 Model) 53
2.5 Sea Level Rise (HadGEM2-ES Model) 58
2.6 Summary 60
3.0 SECTOR VULNERABILITY AND ASSESSMENTS 62
4.0 POLICY, INSTITUTIONAL AND LEGISLATIVE FRAMEWORK 66
4.1 Policy Instruments to address Climate Change 66
4.2 Institutional Framework 70
4.3 Legislative and Regulatory Framework 72
4.4 Comparative Legislative Instruments 75
4.5 International Obligation 76
4.6. Regional Obligations 77
5.0 DRAFT NATIONAL CLIMATE CHANGE POLICY 83
5.1 Preamble 83
5.2 Vision 85
5.3 Goal 85
5.4 Objectives 85
6.0 GUIDING PRINCIPLES 87

7.0 STRATEGY AND ACTION PLAN 92
7.1 Strategy 92
7.2 Climate Change Action Plan 93
7.2.1 Agriculture 94
7.2.2 Forestry 96
7.2.3 Fisheries and Aquaculture 100
7.2.4 Coastal and Marine Resources 103
7.2.5 Water Resources 105
7.2.6 Land Use and Human Settlements 107
7.2.7 Tourism 110
7.2.8 Human Health 112
7.2.9 Energy Sector 114
7.2.10 Transportation 116
7.2.11 Solid Waste Management 118
7.3 Action Plan Application 120
8.0 INSTITUTIONAL ARRANGEMENTS AND MANAGEMENT MECHANISMS 121
8.1 Climate Change Department 122
8.2 The New Belize National Climate Change Committee 123
8.3 Legislative and Regulatory Mechanism 124
8.4 Resource Mobilisation 126
8.5 Monitoring and Reporting 128
9.0 Conclusion and Recommendations 127
References i

TABLES:

Table 2.1: Summary Description of the Four Scenarios Families 6
Table 2.2: Elements and Observation Stations 18
Table 2.3: Sea Level Rise Projection Along the Coast of Belize (Longitude 88) for RCP2.6, RCP4.5 and RCP8.5 from GCM model HadGEM2-ES (Unit = cm) 59
Table 3.1: Impacts of Climate Change on Priority Sector 63
Table 4.1: Ministries, Agencies and Climate Change Management Functions 71
Table 4.2: Summary of Environmental Institutions & Legislative Framework 74
Table 7.1: Agriculture (Crops & Livestock): Climate Change Strategy and Action Plan 95
Table 7.2: Forestry Sector Adaptation and Mitigation Strategy and Action Plan 98
Table 7.3: Fisheries Sector Adaptation Strategy and Action Plan 101
Table 7.4: Coastal Zone Management: Climate Change Adaptation Strategy and Action Plan 104
Table 7.5: Water Resources Climate Change Adaptation & Mitigation Strategy and Action Plan 106
Table 7.6: Land Use and Human Settlements: Climate Change Adaptation & Mitigation Strategy & Action Plan 109
Table 7.7: Tourism Sector Climate Change Adaptation Strategy and Action Plan 111

Table 7.8: Human Health: Climate Change Adaptation Strategy and Action Plan 113
Table 7.9: Energy: Climate Change Mitigation/Adaptation Strategy and Action Plan 115
Table 7.10: Transportation: Climate Change Mitigation/Adaptation Strategy and Action Plan 117
Table 7.11: Waste Management Adaptation & Mitigation Strategy and Action Plan 119
Table 8.1: Recommendations for Mainstreaming Climate Change in the Legislative Framework 114

FIGURES:

Figure 2.1: Mean Monthly Rainfall for Belize 19
Figure 2.2: Mean Monthly Temperatures for Belize 19
Figure 2.3: Mean observed monthly Rainfall distribution (unit = mm/day) 20
Figure 2.4: Mean observed monthly temperature distribution (Unit = degrees Celsius) 21
Figure 2.5: Mean observed monthly maximum temperature distribution (Unit = degrees Celsius) 22
Figure 2.6 Mean observed monthly minimum temperature distribution (Unit = degrees Celsius) 23
Figure 2.7 - Observed (1960-2006) and projected (to 2100) annual air temperature anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 25
Figure 2.8 - Observed (1960-2006) and projected (to 2100) annual percentage of hot days anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 25
Figure 2.9 - Observed (1960-2006) and projected (to 2100) annual percentage of hot nights anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 26
Figure 2.10 - Observed (1960-2006) and projected (to 2100) annual percentage of cold days anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 26
Figure 2.11 - Observed (1960-2006) and projected (to 2100) annual percentage of cold nights anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 26
Figure 2.12 - Observed (1960-2006) and projected (to 2100) annual precipitation anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)). 27
Figure 2.13: Projected difference in monthly precipitation rate for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 29
Figure 2.14: Projected difference in monthly precipitation rate for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 30
Figure 2.15: Projected difference in monthly precipitation rate for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 31
Figure 2.16 Projected difference in monthly precipitation rate for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 32
Figure 2.17: Projected difference in monthly precipitation rate for Belize in the decade of the 2090s over the 1961-1990 period, using the PRECIS/ECHAM5 model with A1B scenario. 33
Figure 2.18: Projected difference in mean monthly temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 35
Figure 2.19: Projected difference in mean monthly temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 35
Figure 2.20: Projected difference in mean monthly temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 36
Figure 2.21: Projected difference in mean monthly temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 37

Figure 2.22: Projected difference in mean monthly temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 38

Figure 2.23: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 39

Figure 2.24: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 40

Figure 2.25: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 41

Figure 2.26 Projected difference in mean monthly maximum temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 42

Figure 2.27: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 43

Figure 2.28: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 44

Figure 2.29: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 45

Figure 2.30: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 46

Figure 2.31: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 47

Figure 2.32: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario. 48

Figure 2.33: Projected difference in mean monthly relative humidity for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 49

Figure 2.34: Projected difference in mean monthly relative humidity for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 50

Figure 2.35: Projected difference in mean monthly relative humidity for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 51

Figure 2.36: Projected difference in mean monthly relative humidity for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 52

Figure 2.37: Projected difference in mean monthly relative humidity for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 53

Figure 2.38: Projected difference in mean monthly relative humidity for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 54

Figure 2.39: Projected difference in mean monthly relative humidity for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 55

Figure 2.40: Projected difference in mean monthly relative humidity for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 56

Figure 2.41 Projected difference in mean monthly relative humidity for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 57

Figure 2.42 Projected difference in mean monthly relative humidity for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario..... 58

Figure 8.1: New Governance Architecture for Climate Change Management in Belize 124

ABBREVIATIONS AND ACRONYMS

BNCCC	Belize National Climate Change Committee
BPOA	Barbados Programme of Action
BSWaMA	Belize Solid Waste Management Authority
BTB	Belize Tourism Board
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CBOs	Community Based Organisations
CCCCC	Caribbean Community Climate Change Centre
CCD	Climate Change Department
CCTF	Climate Change Trust Fund
CDM	Clean Development Mechanism
CEO	Chief Executive Officer
CFU	Capture Fisheries Unit
CHPA	Central Housing and Planning Authority
CITES	Convention on International Trade in Endangered Species
CLA	Crown Lands Act
CZMAI	Coastal Zone Management Authority & Institute
DOE	Department of the Environment
ECHAM	Global Climate Model developed by the Max Planck Institute for Meteorology
EIA	Environmental Impact Assessment
ERI	Environmental Research Institute
EU	European Union
FCPF	Forest Carbon Partnership Facility
FD	Forest Department
GEF	Global Environmental Facility
GCM	Global Climate Model
GCCA	Global Climate Change Alliance
GHG	Green House Gas
GIS	Geographic Information System
GOB	Government of Belize
ICZMP	Integrated Coastal Zone Management Plan
INDC	Intended National Determined Contribution
IPCC	Inter-Governmental Panel on Climate Change
IPM	Integrated Pest Management
KBA	Key Biodiversity Areas
LDC	Least Developed Countries

LIC	Land Information Centre
LUA	Land Subdivision and Utilization Authority
LULUCF	Land Use, Land Use Change and Forestry
MCCA	Marine Conservation and Climate Adaptation
MDGs	Millennium Development Goals
MESTPU	Ministry of Energy, Science and Technology and Public Utilities
MED	Ministry of Economic Development
MFFSD	Ministry of Forestry, Fisheries and Sustainable Development
MNRA	Ministry of Natural Resources and Agriculture
MPAs	Marine Protected Areas
NAMA	National Appropriate Mitigation Action
NCCO	National Climate Change Office
NCCPSAP	National Climate Change Policy, Strategy and Action Plan
NEMO	National Emergency Management Organization
NEPPOS	National Emergency Preparedness Plan for Oil Spills
NGOs	Non-Governmental Organisations
NLA	National Lands Act
NPAS	National Protected Areas Secretariat
PA	Protected Areas
PACT	Protected Areas Conservation Trust
PCB	Pesticides Control Board
PRECIS	Providing Regional Climates for Impacts Studies
RCP	Representative Concentration Pathways
SIDS	Small Island Developing States
SICA	Sistema de la Integración Centroamericana
SPAW	Specially Protected Areas and Wildlife
STD	Sustainable Tourism Development
SWMA	Solid Waste Management Authority
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organization
WWF	World Wildlife Fund

GLOSSARY OF KEY TERMS USED IN THE REPORT

ADAPTATION: This refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation.

Anticipatory adaptation takes places before impacts of Climate Change are observed. This is also referred to as proactive adaptation.

Autonomous adaption does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. This is also referred to as a spontaneous approach.

Planned adaptation is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

ADAPTIVE CAPACITY: The ability to adjust to Climate Change in order to minimize potential damages; to take advantage of opportunities, or cope with consequences

AFFORESTATION: The planting of new forests on lands that historically have not contained forests

ATMOSPHERE: This refers to the gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium, radiatively active greenhouse gases such as carbon dioxide (0.035% volume mixing ratio), and ozone. In addition the atmosphere contains water vapor, whose amount is highly variable but typically 1% volume mixing ratio. The atmosphere also contains clouds and aerosols

ALTERNATIVE ENERGY: Energy derived from non-traditional sources (e.g., compressed natural gas, solar, hydroelectric, wind)

BIODIVERSITY: The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable

BIOFUELS: Gas or liquid fuel made from plant material (biomass). Includes wood, wood waste, wood liquors, peat, railroad ties, wood sludge, spent sulfite liquors, agricultural waste, straw, tires, fish oils, tall oil, sludge waste, waste alcohol, municipal solid waste, landfill gases, other waste, and ethanol blended into motor gasoline

CLIMATE: The average weather conditions in a particular region over a specific time period (usually 30 years).

CLIMATE CHANGE: The gradual change in either the mean state of the climate or in its variability, persisting over an extended period (typically decades or longer).

CLIMATE MODEL: A numerical representation of the climate system

CLIMATE RESILIENCE: The ability to recover from shock or, in this context, the ability to deal with change. Resilience is a concept complementary to the concepts of vulnerability and adaptation. It addresses the capacity for self-organization, learning and adapting to change, so that basic structures and ways of functioning are quickly recovered

CLIMATE SCENARIO: A reasonable, and often simplified, representation of the future climate

CLIMATE CHANGE SCENARIO: The difference between a climate scenario and the current climate

CLIMATE VARIABILITY refers to variations around the mean state, including the occurrence of extreme weather events.

DEFORESTATION: This refers to practices or processes that result in the conversion of forested lands for non-forest uses. Deforestation contributes to increasing carbon dioxide concentrations for two reasons: 1) the burning or decomposition of the wood releases carbon dioxide; and 2) trees that once removed carbon dioxide from the atmosphere in the process of photosynthesis are no longer present

DESALINATION: This refers to the removal of salts and minerals, as in soil desalination. Salt water is desalinated to produce fresh water suitable for human consumption or irrigation

DOWNSCALING: A method that derives local- or regional-scale (10-to-100 km) information from larger-scale models or data analyses

ECOSYSTEM: This pertains to any natural unit or entity including living and non-living parts that interact to produce a stable system through cyclic exchange of materials

EMISSIONS: The release of a substance (usually a gas when referring to the subject of Climate Change) into the atmosphere

EMISSIONS SCENARIO: A reasonable representation of the future levels of greenhouse gas emissions in the atmosphere

ENERGY EFFICIENCY: Using less energy to provide the same service

EROSION: The process where soil or rock is moved or weathered by the action of streams, glaciers, waves, winds, or underground water

EVAPOTRANSPIRATION: The process by which water is transferred from the land to the atmosphere by evaporation from the soil and other surfaces and by transpiration from plants

FOSSIL FUEL: A general term for organic materials formed from decayed plants and animals that have been converted to crude oil, coal, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years

FUNCTIONALISM: Is a doctrine that looks at organizations in terms of their function, also, it focuses on the way individuals and groups work together. Common interests and needs are seen to forge connections and foster co-operation

GLOBAL AVERAGE TEMPERATURE: An estimate of Earths mean surface air temperature averaged over the entire planet

GLOBAL WARMING: The recent and on-going global average increase in temperature near the Earth's surface

GREENHOUSE GAS (GHG): Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, carbon dioxide, methane, nitrousoxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride

HYDROLOGIC CYCLE: The process of evaporation, vertical and horizontal transport of vapor, condensation, precipitation, and the flow of water from continents to oceans. It is a major factor in determining climate through its influence on surface vegetation, the clouds, snow and ice, and soil moisture.

HYDROMETEOROLOGICAL HAZARD: Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage

INFRASTRUCTURE: The roads, bridges, buildings, dykes, utilities, or other installations and services essential for the development, operation, and growth of a community, province/territory, or country

THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE: The IPCC is the leading international body for the assessment of Climate Change. It was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) in 1988 to provide the world with a clear scientific view on the current state of knowledge in Climate Change and its potential environmental and socio-economic impacts.

INUNDATION: The submergence of land by water, particularly in a coastal setting

MITIGATION: A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks

NATURAL DISASTER: A natural event such as a flood, earthquake, or hurricane that causes great damage or loss of life

NATURAL VARIABILITY: Variations in the mean state and other statistics (such as standard deviations or statistics of extremes) of the climate on all time and space scales beyond that of individual weather events. Natural variations in climate over time are caused by internal processes of the climate system, such as El Niño, as well as changes in external influences, such as volcanic activity and variations in the output of the sun

RENEWABLE ENERGY: Energy resources that are naturally replenishing such as biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action

SALTWATER INTRUSION: The process by which saltwater enters a coastal aquifer, leading to contamination of groundwater

SEA LEVEL RISE: An increase in the mean level of the ocean. Relative sea level rise considers the mean level of the ocean relative to the land

SENSITIVITY: The degree to which a system is affected, either positively or negatively, by Climate Change

STORM SURGE: A rising of the sea as a result of wind and atmospheric pressure changes associated with a storm.

UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC): The Convention on Climate Change sets an overall framework for intergovernmental efforts to tackle the challenge posed by Climate Change. It recognizes that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention enjoys near universal membership, with 189 countries having ratified.

Under the Convention, governments

- gather and share information on greenhouse gas emissions, national policies and best practices
- launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries
- cooperate in preparing for adaptation to the impacts of Climate Change

VULNERABILITY: The degree to which a system is susceptible to, and unable to cope with, the adverse effects of Climate Change. Vulnerability is a function of a system's exposure to Climate Change, sensitivity, and adaptive capacity

WEATHER: Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season. Climate in a narrow sense is usually defined as the "average weather", or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30

years, as defined by the World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system. A simple way of remembering the difference is that climate is what you expect (e.g. cold winters) and 'weather' is what you get (e.g. a blizzard)

EXECUTIVE SUMMARY

It is generally acknowledged that human activities are the primary sources of greenhouse gas (GHG) emissions (GHG) and that those emissions are the main factors contributing to the warming of the Earth's atmosphere which has led to Climate Change and sea level rise. Those threats of global warming and climate variability have manifested themselves in sea level rise, more frequent and extreme weather events, ocean acidification, coral bleaching, coastal erosion, and changing precipitation patterns and have the potential to impact negatively on ecological, social and economic life of countries, particularly small, developing countries with long coastlines and whose populations live in the narrow coastal belt.

Belize, like most other developing countries, is a minute contributor to global GHG emissions, but it will be among those that will be severely impacted. In that regard, Belize, ratified the United Nations Framework Convention on Climate Change (UNFCCC) on October 31, 1994, the Kyoto Protocol in 2003, and submitted its Initial National Communication (INC) to the UNFCCC in 2002, and it's Second National Communication in the second quarter of 2012. By ratifying the UNFCCC, Belize committed itself to developing, adopting and implementing policies and measures to mitigate the adverse effects of Climate Change and adapt to these changes.

The Government of Belize (GOB) has taken initiatives to mainstream Climate Change into its national development processes and mechanisms. These initiatives include the establishment of a National Climate Change Office under the Ministry of Forestry, Fisheries and Sustainable Development (MFFSD), the adoption of climate sensitive response mechanisms for some economic development sectors, and the preparation of a comprehensive National Climate Change Policy, Strategy and Action Plan which will provide policy guidance for the development of an appropriate administrative and legislative framework, in harmony with other sectoral policies, for the pursuance of a low-carbon development path for Belize.

ES1. Climate Change in Belize

The climate in Belize can be defined by two sets of overlapping seasons characterized by temperature and precipitation. The cooler season (December - February), and the warmer season which basically includes the remaining months of the year. The second set of seasons is the dry period (December - April) and the wet period (May - November). According to the UNDP Country Profiles studies, an increase in air temperature ranging from 2^{o}C - 4^{o}C is projected by 2100 for Belize. Similarly a general decrease in annual rainfall of about 10 % is projected by 2100. Modelling scenario undertaken as part of this study revealed similar patterns.

Rainfall: With the PRECIS/ECHAM5 modelling, a slight increase in rainfall in the 2020s is suggested in the early (May) and late (Oct-Nov) parts of the wet season with peak increases of about 2-4 mm/day in the Stann Creek District. The dry season and the mid-wet season dip (June), on the other hand, are characterized by further decreases with largest reductions of about 4 mm/day in the Stann Creek and Cayo Districts. By the 2030s, reduced precipitation characterizes the entire country with exceptions only in the early (May) and late (November) sections of the wet season. In the 2050s, an enhancement of the 2030s pattern of reduced rainfall is projected to continue (-1 to -4 mm/day) in the dry season (December – April).

Temperature: Through each decade, a broad nation-wide increase of approximately 1^{o}C is indicated in the decade of the 2020s. Increases of 1-1.8^{o}C in the 2030s, 1.8 – 2.9^{o}C in the 2050s, 2.5 - 4.3^{o}C in the 2070s and 3.2 – 4.9^{o}C in the 2090s are projected over the 1961-1990 values. The rate of warming is projected to be consistently lowest along the coastal section of the Belize District.

Mean monthly maximum temperatures are projected to increase between 0 – 1.4^{o}C during the decade of the 2020s over the 1961-1990 values. In the 2030s, largest increases of 1.2 – 2.2^{o}C are projected for the cooler season. In the remainder of the year (March – October), cooler mean maximum temperatures are projected for the western Toledo, Cayo, Orange Walk, with the largest reduction of -0.5 to -1.5^{o}C in the western section of the Cayo District, while increased values of 0.5 – 1.5^{o}C cover the eastern half of the country. In the decades of 2050s, 2070s and 2090s, the projected pattern changes to a steady increase in mean maximum temperatures of 1.5 – 3.5^{o}C in the 2050s to 2.6 – 3.9^{o}C in the 2070s and then to 3.4 – 6.6^{o}C in the 2090s over the values of the 1961 – 1990 period.

A steady increase in the values of the mean monthly minimum temperatures over the 1961 – 1990 era are projected through to 2100. The decadal increases are 0.5 - 1.5^{o}C in the 2020s, 0.5 – 1.2^{o}C in the 2030s, 0.5 – 2.5^{o}C during the decade of the 2050s, 2.5 – 3.6^{o}C in the 2070s and 3.3 – 5.3^{o}C in the 2090s. A general progressively drier atmosphere is projected through to 2100.

Winds: The decadal change in wind speed is minimal with the variations frequently less than 1 ms^{-1} for most of the time slices. Not until the summer months of the 2090s does the wind speed exceed 1 ms^{-1} over the values of the 1961 – 1990 period. Even then, the difference was frequently less than 1.5 ms^{-1}.

Sea Level Rise: Sea level is projected to rise steadily along the coast of Belize. In the low, medium and high emission scenarios, sea level rise is projected to exceed 10 cm by the 2030s. Heights of 22, 23 and 38 cm respectively are projected for the low, medium and high emission scenarios by 2050 and 34, 56 and 120 cm respectively by the end of the Century.

ES2. Climate Change Impacts

Recent studies (IPCC, 2014) have indicated that the major impacts on biophysical resources "will be from sea level rise, increased sea surface temperatures, changes in weather patterns and increased storm activity. Corals will be lost due to their susceptibility to increased sea surface temperature and frequent storm events as well as to coral bleaching, disease and physical damage." Several other studies (BNMS, 2008; and GOB, 2002) have also noted that Belize, on the whole, is very susceptible to Climate Change and sea level rise and extreme storm surges. They noted further, that the coastal zone of Belize, where a significant percentage of the population is located and where the bulk of economic activity takes place (tourism and agricultural production), is for the most part below the high tide level. As a result, this places the coastal zone in a very precarious position with regards to climate-driven sea level rise, especially when augmented by storm surges (CZMAI, 2013).

ES Table 1. Impacts of Climate Change on Priority Sector

Sector	Impacts
Agriculture	▪ Higher temperatures will favour some crops like rice. However, economically important crops in Belize such as sugarcane and citrus will be adversely affected. ▪ Warmer weather from high temperature will cause soil aridity, lead to proliferation of pests and diseases, and put pressure on water resources for water irrigation purposes. ▪ Rain-fed agricultural production will be affected, demanding improved management techniques and consequently increasing the cost of production. ▪ Sea level rise will cause flooding and saline intrusion and soil salinization. ▪ The combined impact is low agricultural yields, decrease in food production and higher food prices.
Forestry	▪ Increase in the intensity of storms and hurricanes will negatively impact forestry resources, including flora and fauna ▪ Changes in climatic, hydrologic and soil conditions could lead to changes in the composition of natural vegetation. ▪ Extreme weather events (hurricanes and storms) cause uprooting of trees, and loss of commercial value and revenue ▪ Increased overall aridity could exacerbate drought potential over the long term, thus causing habitat loss and contributing to decline and death in some tree species. ▪ Increases in pests and diseases (bark beetle) and forest fires.
Fisheries & Aquaculture	▪ Rising sea level will adversely impact on fish habitat including wetlands, coral reefs and sea grasses where fish spawn, breed, feed and or grow to maturity. ▪ Rising near-surface water temperature and increasing acidification may cause massive bleaching and dieback of corals. ▪ Decrease in fish production ▪ Damage to and losses in aquaculture
Coastal & Marine	▪ Sea level rise will lead to, increased erosion, loss of beaches ▪ Damage to valuable infrastructure, increased inundation, loss of agricultural lands and crops, coastal wetlands, mangroves sea grass beds and ecosystems, and displaced coastal communities. ▪ Flooding and marine inundation ▪ Saline intrusion into freshwater lenses

Sector	Impacts
	▪ High temperature will result in loss of coral reefs and reduction in fish stock.
Tourism	▪ Climate Change, along with sea level rise, would result in loss of beaches, properties and public infrastructure, and result in a decrease in aesthetics and a loss of attractiveness of the destination. ▪ Coastal areas in Belize will experience high levels of saltwater intrusion and rising water tables, thereby reducing water quality, driving up the cost of water ▪ Higher temperatures could discourage older visitors, because of their susceptibility to heat stress. ▪ Tropical storms and hurricanes, compounded by sea level rise, are also likely to increase in intensity, size and duration, causing flooding and damage to transport and other infrastructure. ▪ Decrease in tourism arrivals could ultimately result in loss of employment for large numbers of persons who are currently employed in the tourism sector.
Human Health	▪ Climate Change will lead to higher levels of some air pollutants, will lead to an increasing number of extreme weather events and increased outbreaks and transmission of diseases through unclean water ▪ Higher temperature will increase the spread of vector diseases. ▪ Higher temperatures will also cause heat stress and will also lead to psychological stresses. ▪ Decrease in rainfall will affect potable water supply.
Human Settlements	▪ Increase in frequency and intensity of storm surge will cause more flooding and disrupt or destroy coastal settlements. ▪ Increase in frequency and intensity of storm surge and extreme rainfall will cause damages to infrastructure from flooding and erosion. ▪ Damage to transport facilities (roads, ports, airports) ▪ Damage to public facilities (water supply, energy generation) ▪ Damage to health and safety infrastructure ▪ Damage to cultural assets
Water Resources	▪ Less rainfall combined with increase in temperature will result in increased evapotranspiration and loss of available surface water. ▪ Changes in the hydrological cycle will decrease water levels and adversely impact on the generation of hydropower. ▪ Decrease in precipitation will reduce groundwater and aquifer recharge, salt water intrusion and contamination of freshwater resources. ▪ As an effect, available water resources will be reduced
Energy	▪ Increasing use of fossil fuels increase the amount of GHG emissions into the atmosphere. ▪ The demand for electricity is likely to increase as a response to rising temperatures and a demand for air-conditioning, among increasing populations ▪ Oil price fluctuations and consequent fluctuations in costs of production of electricity; and ▪ Changes in the hydrological cycle will decrease water levels and adversely impact the generation of hydropower.

ES3. Policy Intervention to Address Climate Change

GOB has to date, issued no formal, overarching, national policy in respect of Climate Change mitigation and adaptation. In 2008, a draft Adaptation Policy was developed but was never finalized or adopted. However, since the publication of its First National Communication to the

UNFCCC the GOB has sought, through several line ministries, to initiate policy-based activities, at the sector level, to address (adapt and mitigate) the impending impacts of Climate Change.

Some of the key policy initiatives undertaken to date are as follows:

- Integrated Coastal Zone Management Plan (2013)
- Ministry of Energy, Science, Public Utilities, Transport, Communications and National Emergency Management
- Strategic Plan 2012-2017 and Sustainable Energy Action Plan for Belize
- Integrated Water Resource Management Policy
- Growth and Sustainable Development Strategy 2014 - 2017
- The National Climate Resilience Investment Plan (2013)

The country has also embarked on a number of initiatives to review sector policies, legislation and other initiatives which will address issues of adaptation and mitigation in sectors which are most vulnerable to the impacts of Climate Change. These initiatives include the recently approved:

- Marine Conservation and Climate Adaptation (MCCA) project for Belize
- Management and Protection of Key Biodiversity Areas

In addition, other initiatives are being pursued towards the development of policies and project initiatives to address adaptation and mitigation in other sectors. These are as follows:

- National Agriculture Sector Adaptation Strategy and Action Plan to Address Climate Change in Belize
- The National Adaptation Strategy to Address Climate Change in the Water Sector in Belize
- Readiness Preparation Proposal (R-PP) to the Forest Carbon Partnership Facility (FCPF)
- Opportunities for Climate-compatible Tourism Development in Belize

ES4. Institutional Framework

Several Ministries also have responsibilities for management of resources which are likely to feel the effects of Climate Change. Some of the key ministries are the Ministry of Forestry, Fisheries and Sustainable Development (MFFSD), the Ministry of Natural Resources and Agriculture (MNRA), the Ministry of Energy, Science and Technology and Public Utilities (MESTPU), and the Ministry of Finance and Economic Development (MFED) (Why not use the acronyms). The MFFSD serves as the National Focal Point for Climate Change and the Ministry with responsibility for the coordination and implementation of Climate Change policies and measures with respect to the fulfilment of the country's obligations under the UNFCCC.

ES Table 2: Ministries, Agencies and Climate Change Management Functions

Ministry	Key Agencies	Key Functions
Ministry of Fisheries, Forestry and Sustainable Development	▪ Department of the Environment ▪ Forestry Department ▪ Fisheries Department ▪ National Climate Change Office ▪ Sustainable Development Unit ▪ Coastal Zone Management Authority and Institute ▪ Protected Areas Conservation Trust	✓ Preservation, protection and improvement of the environment and the control of pollution ✓ Climate Change management, UNFCCC Focal Point ✓ Fisheries, forestry, and coastal zone management ✓ Sustainable development ✓ Sustainable development of Belize's natural and cultural resources.
Ministry of Finance and Economic Development	✓ Economic Development	✓ Economic Development
Ministry of Natural Resources and Agriculture	▪ Agriculture Department ▪ Land and Survey ▪ Physical Planning ▪ National Integrated Water Resource Authority ▪ Solid Waste Management ▪ Pesticide Control Board	✓ Agriculture, Agroindustry & Aquaculture ✓ Physical Planning, land use planning and management of national lands ✓ Water Industry (except water supply and services) ✓ Solid waste management ✓ Pesticide control
Ministry of Works and Transport	▪ Works ▪ Road infrastructure	✓ Public Works ✓ Road Construction and Maintenance ✓ Bridge Construction and Maintenance
Ministry of Health	▪ Ministry of Health	✓ Public Health, sanitation and diseases prevention and control.
Ministry of Energy, Science, Public Utilities, Transport, and Communications	▪ Geology and Petroleum Department ▪ Public Utilities Commission ▪ Energy Department	✓ Climate Change mitigation ✓ Energy efficiency and conservation ✓ Sustainable Energy Development and Management
Ministry of Labour, Local Government Rural Development and National Emergency Management	▪ Meteorological Office ▪ National Emergency Management Organisation (NEMO) ▪ Department of Local Government and Rural Development	✓ IPCC Focal Point ✓ National Meteorological Service. ✓ Municipalities, Village Councils ✓ National Emergency Management Organisation (NEMO), ✓ National Fire Service
Ministry of Tourism, Culture and Civil Aviation	▪ Belize Tourism Board	✓ Tourism Development ✓ Sustainable tourism
Ministry of Housing and Urban Development	▪ Housing and Planning Department ▪ Central Building Authority	✓ Housing and Planning Department, Central Building Authority ✓ Regulation of land use, housing and infrastructural development ✓ Approve building plans ✓ Issue building permits

The responsibilities assigned to the various Ministries/Agencies stems, in some cases, from their statutory mandate e.g., Department of the Environment (DOE), which was established by the Environmental Protection Act Cap 328. However, in some cases laws may not exist to cover certain topics. In such cases e.g., Energy, the responsibility is assigned to a particular Minister by virtue of his appointment by the Governor General (on the advice of the Prime Minister) and portfolio subjects are assigned to the Ministry at the time of his appointment.

ES5. Legislative and Regulatory Mechanisms

Apart from the Environmental Protection (Clean Development Mechanism) Regulations, 2011, drafted under the Environmental Protection Act, there is no specific Climate Change legislation in Belize. There are however a wide range of environmental, planning and natural resource legislation that are germane to the effective mainstreaming of Climate Change in Belize. The articulation of a new governance structure and ultimately, the mainstreaming of Climate Change into the national development planning agenda and framework is predicated not just on individual policy initiatives but on a coherent legislative and regulatory framework which emphasizes the national importance of Climate Change and reinforces a sense of responsibility towards a development paradigm that is environmentally friendly and climate resilient.

ES6. National Climate Change Policy, Strategy and Action Plan

Recognizing that Climate Change is already having a negative effect on the social, economic and productive sectors such as the coastal zone and human settlement, fisheries and aquaculture, agriculture, forestry, tourism, water, energy and health; the physical environment including land, and infrastructure, such as roads and coastal structures; as well as the sustainability of natural resources such as marine and coastal areas, natural ecosystems, and biodiversity;

Also recognizing that because of their vulnerabilities Climate Change impacts will increase their development challenges;

The GOB:

Is Committed to taking all necessary and feasible actions at the national, regional and international levels to meet the stipulations of the UNFCCC and the Kyoto Protocol, which includes implementing and effectively executing adaptation and mitigation measures;

Declare the need for a policy to guide the national action plan and strategy to address the effects of Climate Change; such a policy entails a well-coordinated and holistic approach across various economic sectors in adaptation and mitigation measures.

Have Agreed to the articulation of a **National Climate Change Policy, Strategy and Action Plan** which will serve as a Road Map for all governmental entities as they seek to develop and implement adaptation and mitigation policies and programme in their respective portfolios).

Vision

Demonstrating leadership and commitment to ensure that the challenges of Climate Change and sea level rise are fully addressed, and harnessing the necessary resources in support of the development of special programmes that are effective, resilient and sustainable.

Goal

The goal of the National Climate Change Policy is to guide the short, medium and long-term processes of adaptation and mitigation of Climate Change in accordance with national objectives for sustainable development in addition to regional and international commitments. This policy shall ensure an integrated and well-coordinated approach to Climate Change adaptation and mitigation by fostering the development of appropriate administrative and legislative mechanisms in alignment with national sectoral policies and plans. The policy will further provide guidance towards the adoption of a low carbon development pathway by focusing on the reduction of anthropogenic greenhouse gas emissions.

Objectives

The objectives of the National Climate Change Policy are to:

1. Integrate Climate Change adaptation and mitigation into key national developmental plans, strategies and budgets.
2. Build Climate Change resilience to prevent, reduce or adapt to the negative impacts of Climate Change on key sectors, economic activity, society and the environment through policies and strategic processes.
3. Promote capacity building and networking across all implementing/involved agencies
4. Source and secure adequate financing over the short, medium and long term periods for effective and timely adaptation and mitigation responses.
5. Capitalize on opportunities currently available through Climate Change negotiation processes that can enhance the economic and social development prospects of the nation.

ES7. Policies, Strategies & Action Plan

Taking into consideration the guiding principles, vision, goals, and objectives which inform the National Climate Change Policy articulated in the preceding section, the GOB will endeavour to implement the Policy through the adoption of a strategy which is consistent with the overall

goals (and objectives) of the GSDS 2014-2017. The GSDS 2014-2017 projects an integrated, systematic approach which encompasses medium-term economic development, poverty reduction, and longer-term sustainable development. In that regard the objective of the National Climate Change Policy, Strategy and Action Plan (NCCPSAP) is to ensure the mainstreaming and integration of Climate Change adaptation and mitigation at all levels of the development planning and operational processes of governance.

The implementation of this policy and its action plan shall be coordinated by the NCCO in the MFFSD. In coordinating the implementation of the NCCPSAP, the NCCO shall have regard to the need to:

a) facilitate the provision of adequate support on mitigation and adaptation measures to stakeholders in the public and private sectors, and at the community level;
b) monitor the impact of the strategy against the goals and objectives that have been set; and,
c) make appropriate adjustments to the policy and strategy in light of intended or unintended changes in the general environment.

This policy shall guide the work of all Government, Statutory, Non-governmental and Civic entities which are involved in, or seek to become involved in, addressing Climate Change in Belize.

ES8. Climate Change Action Plan

The Climate Change Action Plan is a five year programme (2015-2020) which is intended to provide the foundation for the country's capacity and resilience to meet the challenges of Climate Change. The Action Plan is divided into two thematic areas namely adaptation and mitigation. The sectors for which adaptation and mitigation strategy and action plans will be addressed are:

- Agriculture
- Forestry
- Fisheries and Aquaculture
- Coastal and Marine Resources
- Water Resources
- Land use and Human Settlements
- Human Health
- Energy
- Tourism
- Transportation
- Solid Waste

ES9. Institutional Arrangements and Management Mechanisms

The implementation of the NCCPSAP will require the establishment of a coherent, overarching governance structure, consisting of clear policy directives and supported by an enhanced institutional framework which can provide direction and coordinate the efforts of other entities and line ministries, all of which have equally important roles to play in Climate Change adaptation and mitigation. This policy and institutional arrangements should be buttressed by appropriate legislative and regulatory instruments to adopt and implement policies and measures to mitigate the adverse effects of Climate Change and adapt to these changes as it seeks to build resilience in the development of a low carbon economy.

The establishment of such a structure requires, to some extent, transformational change in thinking and leadership as old systems of sectoral pursuits have to give way to new systems favouring interagency cooperation and collaboration. A review of the operations of the existing institutions has revealed some shortcomings and raised concerns that the existing arrangements may not be capable to meet the demands of the new policy and action agenda. In that regard it is being recommended that GOB look to establish a Climate Change Department (CCD) in the MFFSD and revise the mandate of the BNCCC.

ES10. Climate Change Department

An important aspect of mainstreaming is the need for a governmental entity to be strategically placed so that it can effectively coordinate the implementation of Climate Change adaptation and mitigation action in development planning, decision-making and resource mobilization and allocation. The CCD, by virtue of its dedicated mandate, will play a crucial role in coordinating the implementation of the Climate Change programme approved by Cabinet. It will also seek to create partnerships among various stakeholders to ensure integrated and systematic implementation of the national Climate Change response agenda.

ES11. The New Belize National Climate Change Committee

The re-configuration and streamlining of the BNCCC is more in-keeping with its perceived role in providing policy guidance and facilitating the mainstreaming of Climate Change adaptation and mitigation. The large number of sector agencies with an interest in Climate Change adaptation and mitigation requires that they also have a hand in shaping the policy. This requires the establishment of a governance structure which will provide overarching leadership and guidance. Under the new arrangement it is proposed that the size of the BNCCC shall be reduced to a total of eleven (11) members with three sub-committees (Vulnerability Assessment and Adaptation, Mitigation, and Public Education and Outreach).

ES12. Resource Mobilisation

A pressing concern of small states already experiencing development challenges and now faced with the imminent threat of Climate Change is the issue of financial assistance to build resilience and sustainable development. Several funding possibilities have been identified, including locally generated resources, for obtaining the required resources to undertake the structural changes envisaged to address Climate Change adaptation and mitigation. In order to adequately prepare Belize to access those funds it is recommended that GOB establish a Climate Change Trust Fund (CCTF). That Fund, it is suggested, could be established as a separate entity, but managed initially by the Protected Areas Conservation Trust (PACT).

Based on the above it is the recommendation of this study that GOB not only establish, by an Act of Parliament, a CCTF, but also confer on PACT, responsibility for the management of that Fund. It is also recommended that Cabinet establish a Climate Change Finance Committee (CCFC) as a standing committee of the PACT whose main function will be resource mobilization in support of Climate Change. The CCFC will work exclusively for PACT and the CCD in attracting investments to assist with the implementation of the Climate Change adaptation and mitigation programmes identified in the NCCPSAP.

ES13. Financing the Start-up of the CCD:

The proposed reconfiguration of the governance structure for Climate Change management in Belize has financial implications for GOB, notwithstanding the recommendation for the establishment of the CCFT. It the organizational study undertaken by ZEPYR Services it was acknowledged the CCD must have access to adequate and predictable sources of finance for operational effectiveness. In that regard, it was estimated that the average operational cost of maintaining a full complement of staff (13) and other related programmes would cost an average of $700,000 per annum over the first five years.

While the report acknowledges that cost of recurrent expenses should come from the consolidated Fund, it also noted the possibility of innovative sources of funding-namely the establishment of two revenue streams. The two potential revenue streams identified, which can be implemented immediately are: (a) a carbon levy and (b) a vehicle efficiency levy. These revenue streams, it was noted, are in alignment with MESTPU's strategic goal to halve importation of refined fossil fuels from 1,000,000 barrels to 500,000 barrels.[1]

[1] MESTPU Strategic Plan 2012-2017, pg 3

ES14: Recommendations:

The implementation of the NCCSAP will require that the Cabinet give approval to the following:

1) Adopt the National Climate Change Policy and Strategy as the official government policy and strategy to enable the country achieve the adaptation and mitigation goals.

2) Amend key sectoral laws to make them consistent with the UNFCCC and to ensure that all actions under the Ministry responsible for Climate Change have the legislative basis to be implemented and translated from concept to practice. This can be done either through single Statute (Miscellaneous) Amendments Bill or through a raft of separate amendments of the relevant sectoral laws.

3) Establish a CCD, in the Ministry responsible for Climate Change with the role of primary coordination, policy direction, oversight and guidance across all levels of government. The CCD should ensure mainstreaming of Climate Change by national government agencies and departments. The CCD is expected to coordinate Climate Change issues through an inter-ministerial and inter-agency committee as required by the UNFCCC.

4) The CCD will be the primary national government technical agency for Climate Change response and should be located within the sectoral ministry responsible for climate affairs.

5) Approve the revised mandate of the BNCCC to provide policy guidance and oversee the operations of the CCD. Among the duties of the BNCCC will be the regular revision of the NCCPSAP, oversee the implementation of the Climate Change Strategy and Action plan, ensure there is adequate compliance with, and enforcement of policies and regulatory provisions, and monitor and report on progress achieved in implementing these policies and action plan.

6) Establish, by an Act of Parliament, a CCTF, and confer on PACT, responsibility for the management of that Fund, and establish a CCFC as a standing committee of the PACT whose main function will be resource mobilization in support of Climate Change.

In order to fulfil its mandate, the CCD will be provided with annual GOB budget allocation and adequate staffing capacity that support the performance of these key functions.

1. INTRODUCTION

The Government of Belize (GOB), acting through the Ministry of Forestry, Fisheries, and Sustainable Development (MFFSD) has obtained funding support from the European Union (EU) through the regional and national Global Climate Change Alliance (GCCA) projects to prepare a National Climate Change Policy, Strategy and Action Plan (NCCPSAP) to address the adverse effects of climate variability and Climate Change on the economic and social development of the country. This initiative is a direct response to perceived threats which Climate Change poses to Small Island Developing States (SIDS) and which, for Belize, represents real fears given the large percentage of people who live in low-lying coastal communities.

The overall goal of the project is the preparation of a comprehensive National Climate Change Policy, Strategy and Action Plan which will provide policy guidance for the development of an appropriate administrative and legislative framework, in harmony with other sectoral policies, for the pursuance of a low-carbon development path for Belize. This will be achieved through suitable and relevant strategies and actions to address Climate Change, including sectoral and cross - sectoral adaptation and mitigation measures.

The preparation of the NCCPSAP involved extensive literature based research and data mining, not only involving information on the effects of Climate Change on SIDS in general and Belize, in particular, but consultations with experts in the field, government technocrats, and practitioners, with a direct and understandable interest in the outcome of measures being designed to mitigate and adapt to Climate Changes.[2] These consultations served to highlight the concerns widely held, that not only is Climate Change and climate variability a real threat, but that it was already happening.

The serious adverse effects of climate variability and Climate Change, particularly those on crop production and food security, natural ecosystems, marine and coastal areas, water resources and human health, as well as on housing and infrastructure are particularly obvious, and were highlighted throughout the consultations. These impacts pose major impediments to efforts being implemented to promote sustainable economic and social development and poverty reduction, which are the first and overriding priorities of the national government. Ocean acidification due to rising carbon dioxide levels, it was also noted, will create serious risks to marine ecosystems and species, including coral reef ecosystems.

[2]A number of stakeholder consultations were held from June 2-6, 2014. That was followed by three Regional Workshops (Orange Walk Town, Dangriga, and Belize City) from July 21- 25, 2014.

Given those concerns, the GOB, has identified the following sectors: coastal zone and human settlement, fisheries and aquaculture, agriculture, forestry, tourism, water, energy and health as national priorities for Climate Change mitigation and adaptation efforts. In this regard, the development of the NCCPSAP has focused exclusively on the impacts of Climate Change on those sectors, and, has recognized the cross-sectoral nature of potential impacts and the need for an integrated and inclusive approach to Climate Change to ensure the implementation of robust and comprehensive strategies and actions. Such an approach must be cross-sectoral and multidisciplinary in nature, covering adaptation and mitigation, and allowing the country to transition strategically to low-carbon economic development while bolstering its resilience to the effects of Climate Change.

1.1 Geography

Belize is a Central American country bounded between latitudes 15.45 – 18.30^{o}N and longitude 87.5 – 89.25^{o}W. Total national territory covers 46,620 km^{2}, which includes 22,960 km^{2} (8,867 miles^{2}) of land and 1,060 cayes. Many of these cayes are located along the barrier reef shelf, several of which are uninhabitable. Along Belize's eastern boundary is the widely acclaimed barrier reef, while on the north, west and south sides are bounded by the Central American countries of Mexico, and Guatemala respectively. The country is well known as the home of the longest barrier reef in the Western Hemisphere. This 220 km reef stretches the entire coastline and is recognized by the United Nations as a World Heritage Site. The Government of Belize has also recognized the reef's uniqueness, protecting substantial portions in marine reserves. Many cayes and large sections of Belize's coastline stand at less than one meter above sea level, making these areas very vulnerable to storm surge from rising sea levels.[3]

1.2 Situation Analysis

Despite acknowledgement by the IPCC 2007 that Caribbean States in total, contribute less than 0.1% of the global GHGs, they are likely to be most adversely affected and the least likely to develop adequate protective mechanisms. Those dire warnings of Climate Change and climate variability have manifested themselves in sea level rise, more frequent and extreme weather events, ocean acidification, coral bleaching, coastal erosion, and changing precipitation patterns.

The GOB in its first (1994) National Inventory of Sources and Sinks of Greenhouse Gases confirmed that its contribution to GHG is negligible, and that in fact, it is a net sink for greenhouse gases, i.e., it absorbs more than it emits.[4] A second National Inventory, using base

[3]Second National Communication to the UNFCCC, 2012

[4]Belize First National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change 2002.

years for 1997 and 2000 and carried out in 2009 reveal similar findings.[5] Despite these findings, Belize, like other Caribbean and small, developing, countries is most vulnerable to the adverse impacts of Climate Change due to:

- its long, low-lying coastline;
- its over 1,060 small islands;
- its second-longest barrier reef in the world and 17,276 km^2 of forest cover, each of which support fragile ecosystems; and
- the fact that it is very prone to natural disasters, especially hurricanes.

Given the above, some of the major concerns to Belize as a result of Climate Change are induced natural hazards and sea level rise. According to recent IPCC reports, there is evidence to support the assertion that hurricanes and tropical storms are likely to become, on the whole, more intense under a warmer climate as a result of higher sea-surface temperatures. What there is some uncertainty about are the changes in frequency, and changes to storm tracks and their interactions with other features of climate variability (such as the El Niño Southern Oscillation) which introduces uncertainty at the regional scale (Christensen *et al*., 2007).

Notwithstanding these uncertainties, what is known is that Belize's long low-lying coastal areas are especially vulnerable to more intense and frequent tropical storms, hurricanes, flood damage, and rising sea levels. In recent years the country has experienced frequent natural disasters of catastrophic proportions, and most recently suffered the impact of a Category 1 Hurricane Richard, in October 2010, and widespread flooding in 2008. Tropical Storm Arthur (May 2008) caused extensive damage to infrastructure and the agriculture sector.

Given that about one half of Belize's population are concentrated in coastal population centers, and that the country's economy is highly dependent on commodity exports and tourism, the nation's economic and social exposure becomes significantly increased when one considers the compounding effects of Climate Change. Tropical storms have historically inflicted the greatest damage and recurrent flooding (a major threat) is due to storm surge, heavy and/or persistent rainfall and the altering of natural drainage and sink systems. Recent hydro-meteorological events have resulted in significant losses to the country's productive sectors. The vulnerability of concentrated populations in exposed areas such as in Belize City, home of approximately one third of the country's population, is exacerbated by inadequacies in housing and support infrastructure, and environmental fragility, in part a result of its location, climate, and topography.

[5] Belize Greenhouse Gases Inventory of Emissions and Sinks 1997 and 2000.Enabling activities for the preparation of the 2nd National Communication to the UNFCCC. GEF/UNDP

2.0 CLIMATE CHANGE MODELS AND PREDICTIONS

Climate Change identifies an alteration or statistical redistribution of mean long-term weather patterns over an area. This alteration may therefore be manifested as changes in the average weather conditions, or in the time variation of weather around longer-term average conditions (e.g., more or fewer extreme weather events). Changes in climate may be caused by numerous factors such as biotic processes, variations in solar radiation received by Earth, changes in atmospheric greenhouse gases such as water vapour and carbon dioxide, plate tectonics, volcanic eruptions and certain human and population activities. Climate models are therefore mathematical constructions of those contributing elements (and their feedbacks), to compute how they drive the long-term mean weather behaviour over an area. They are computationally intensive numerical models, which are based on the physical sciences through integration of a variety of fluid dynamics, chemical, and biological equations. From the quasi-closed atmospheric system of the global climate models to the smaller, nested 'opened borders' system of the regional climate models, the primary objective of the climate model is to determine to what degree the local climate of the given area could change as a result of the changing contributions from the climate drivers.

Since 2000, the IPCC produced The Special Report on Emissions Scenarios (SRES), which described four families of emissions' scenarios. The scenarios are based on an extensive assessment of driving forces and emissions in the scenario literature, alternative modelling approaches, and an "open process" that solicited wide participation and feedback. Four qualitative storylines yield four sets of scenarios called "families": A1, A2, B1, and B2. Altogether 40 SRES scenarios have been developed. All scenarios are equally valid with no assigned probabilities of occurrence. The set of scenarios consists of six scenario groups drawn from the four families: one group each in A2, B1, B2, and three groups within the A1 family, characterizing alternative developments of energy technologies: A1FI (fossil fuel intensive), A1B (balanced), and A1T (predominantly non-fossil fuel). The SRES scenarios are "baseline" (or "reference") scenarios, which means, that they do not take into account any current or future measures to limit greenhouse gas (GHG) emissions. Projections of future climate and hence quantifying the Climate Change could then be assessed under the auspices of the storylines defined by the individual scenarios. A summary description of the four scenarios families is provided in Table 2.1

The climate modelling process for Belize, utilized mostly in this report, the results from the A1B, A2 and B1 scenarios. The range of likely future emission scenarios is effectively captured by these storylines and they have therefore been the beneficiaries for most of the studies within the climate modelling community. As a result, most of the discussions in the IPCC AR4 and AR5 reports are based on these three scenarios, for which global climate model data are available.

Within the past decade, global climate models have demonstrated admirable skills in reproducing the large-scale characteristics of the global climate dynamics. Regional climate models on the other hand, have been able to incorporate regional and local effects into the GCM results, by using the projected GCM data as boundary conditions and simulating the climate at a finer spatial scale over a relatively small area, such as a country, through the process of downscaling the GCM projections. The downscaled results have been shown to provide a better physical representation of the local climate of that area. It is through this process of downscaling that changes in the dynamic climate processes at the national scale of Belize and at a local or municipal scale could be projected. A combination of GCMs and RCMs projections was utilized in investigating the climatic changes for the country of Belize, up to the end of the 21st Century.

Table 2.1: Summary Description of the Four Scenarios Families[6]

Scenario Family	Description
A1	This storyline and scenario family describes a future world of very rapid economic growth, global population that peaks in mid-century and declines thereafter, and the rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family develops into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil intensive (A1FI), non-fossil energy sources (A1T), or a balance across all sources (A1B).
A2	This storyline and scenario family describes a very heterogeneous world. The underlying theme is self-reliance and preservation of local identities. Fertility patterns across regions converge very slowly, which results in continuously increasing global population. Economic development is primarily regionally oriented and per capita economic growth and technological changes are more fragmented and slower than in other storylines.
B1	This storyline and scenario family describes a convergent world with the same global population that peaks in mid-century and declines thereafter, as in the A1 storyline, but with rapid changes in economic structures toward a service and information economy, with reductions in material intensity, and the introduction of clean and resource-efficient technologies. The emphasis is on global solutions to economic, social, and environmental sustainability, including improved equity, but without additional climate initiatives.
B2	This storyline and scenario family describes a world in which the emphasis is on local solutions to economic, social, and environmental sustainability. It is a world with continuously increasing global population at a rate lower than A2, intermediate levels of economic development, and less rapid and more diverse technological change than in the B1 and A1 storylines. While the scenario is also oriented toward environmental protection and social equity, it focuses on local and regional levels.

[6] **IPCC Special Report on Emissions Scenarios, 2000**

2.1 Historical Data

The historical data used to define the climate in Belize was provided by the National Meteorological Service of Belize and came from a set of sixty-six (66) stations scattered across the country. The period of observations varied widely for the different meteorological elements at the various stations. For example, some of the stations which recorded rainfall had data series beginning as early as 1912 while rainfall data collection for a few of the other stations began only in the late 1970s. Further, although all the stations recorded rainfall, only a handful recorded the other atmospheric elements. *Table 2.2* below provides the number of stations, which recorded the main meteorological elements.

Table 2.1: Elements and Observation Stations

Meteorological Element	Number of Stations With Observation
Rainfall	66
Temperature	32
Wind	4
Evaporation	18
Relative Humidity	7
Soil Temperature	14

The climate in Belize can be defined by two sets of overlapping seasons characterized by temperature and precipitation. The cooler season (which coincides with the Northern Hemisphere's winter period (December - February), and the warmer season which basically includes the remaining months of the year. The second set of seasons is the dry period (December - April) and the wet period (May - November). A double peak of rainfall quantities further characterizes the wet period, which typically occur in June and September, with a characteristic dip during the months of July and August. *Figures 2.1* and *2.2* provide the long-term mean monthly rainfall and temperatures for the entire country for the period 1960 – 2013.

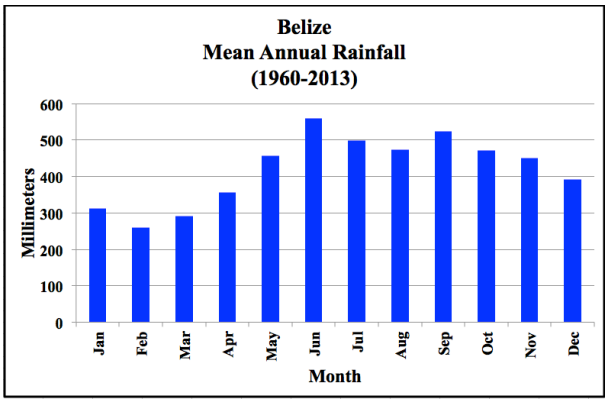


Figure 2.1 Mean Monthly Rainfall for Belize

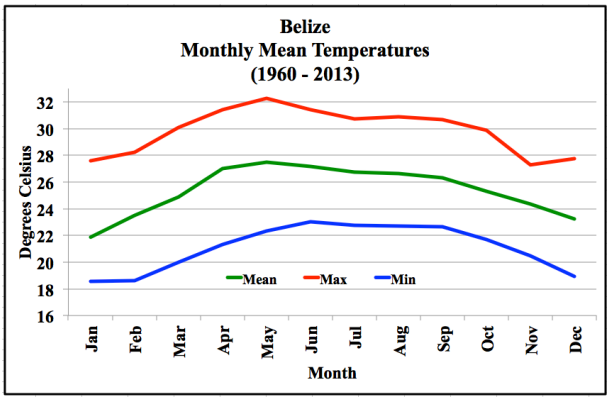


Figure 2.2 Mean Monthly Temperatures for Belize

Although the country receives an annual average of over 4000 mm of rainfall, the distribution is quite diverse, with the largest amounts concentrated in the southern region of Toledo as depicted in the monthly distributions in *Figure 2.3*. The onset of the wet season begins in early May in Toledo and progresses steadily northward to the Stann Creek, Belize, Cayo and Orange Walk Districts by late May, and then extends into the Corozal District by early June. The annual rainfall average ranges from about 1500 mm in the north to about 4050 mm in the south. Despite the wide variability in the rainfall quantity in the northern districts from year to year, in the south, the rainfall quantities have been fairly stable and regular.

Temperature distributions during the cooler and warmer seasons are also quite distinctive. Although there is a general gradient in the annual average temperature of about 27°C along the coast to about 21°C in the inland mountainous regions, the spatial contrast is more conspicuous in the defined thermal seasons on a month-by-month basis. During the cooler months (Nov-Feb), there is a sharp differential in the mean temperatures between the northern and southern halves of the country, with the mean temperature in the northern half typically being 3-5^{o}C warmer than that of the southern districts. In the warmer part of the year (March – October) that difference is not apparent (See *Figure 2.4.*).

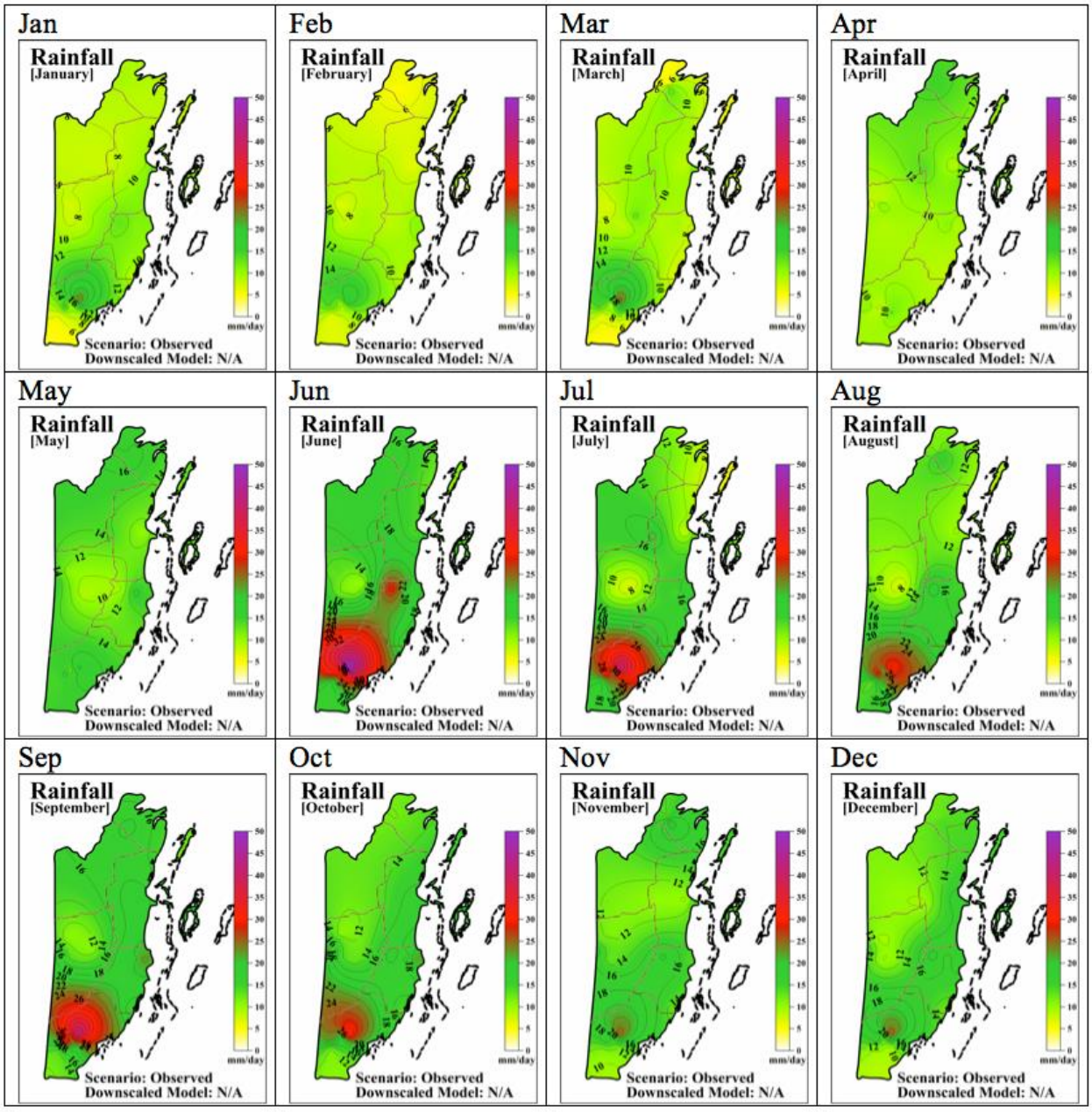


Figure 2.3: Mean observed monthly Rainfall distribution (unit = mm/day)

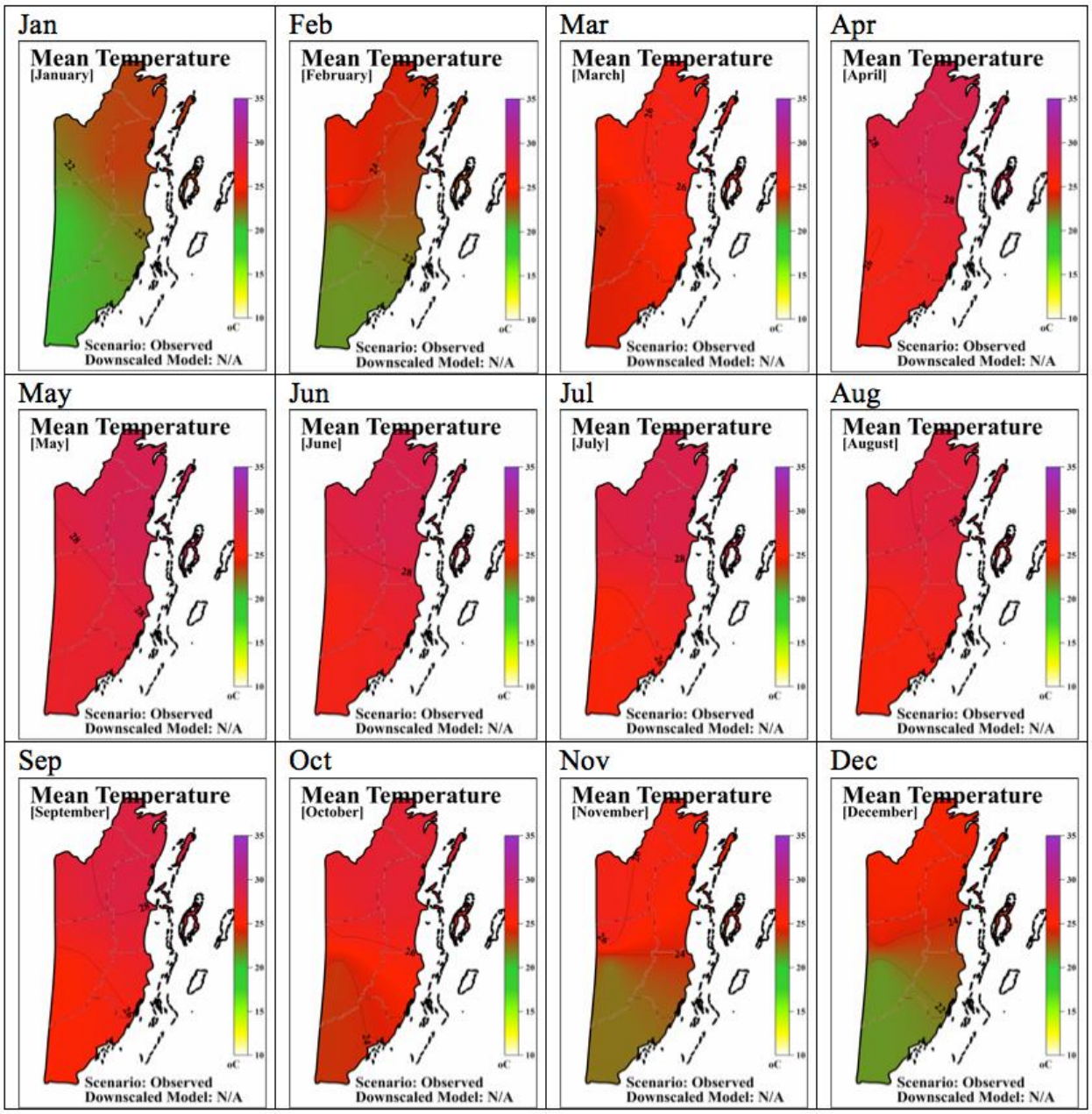


Figure 2.4: Mean observed monthly temperature distribution (Unit = degrees Celsius)

The mean maximum temperatures typically vary between 26 ^{o}C and 33^{o}C, with the highest values always in the northern regions of Corozal, Belize and Orange Walk Districts and the coolest values in the highlands of the Maya Mountains. See *Figure 2.5*.

The distribution for the mean minimum temperature mirrors that of the mean maximum temperature during the cooler season (November – February) with the higher values in the northern region and the cooler values in the highlands of the Maya Mountains. However the pattern is quite different in the warmer period (March – October) when the higher minimum

temperatures spread along the coastal region and become wrapped around the Maya Mountains before retreating again by the end of October. See *Figure 2.6*.

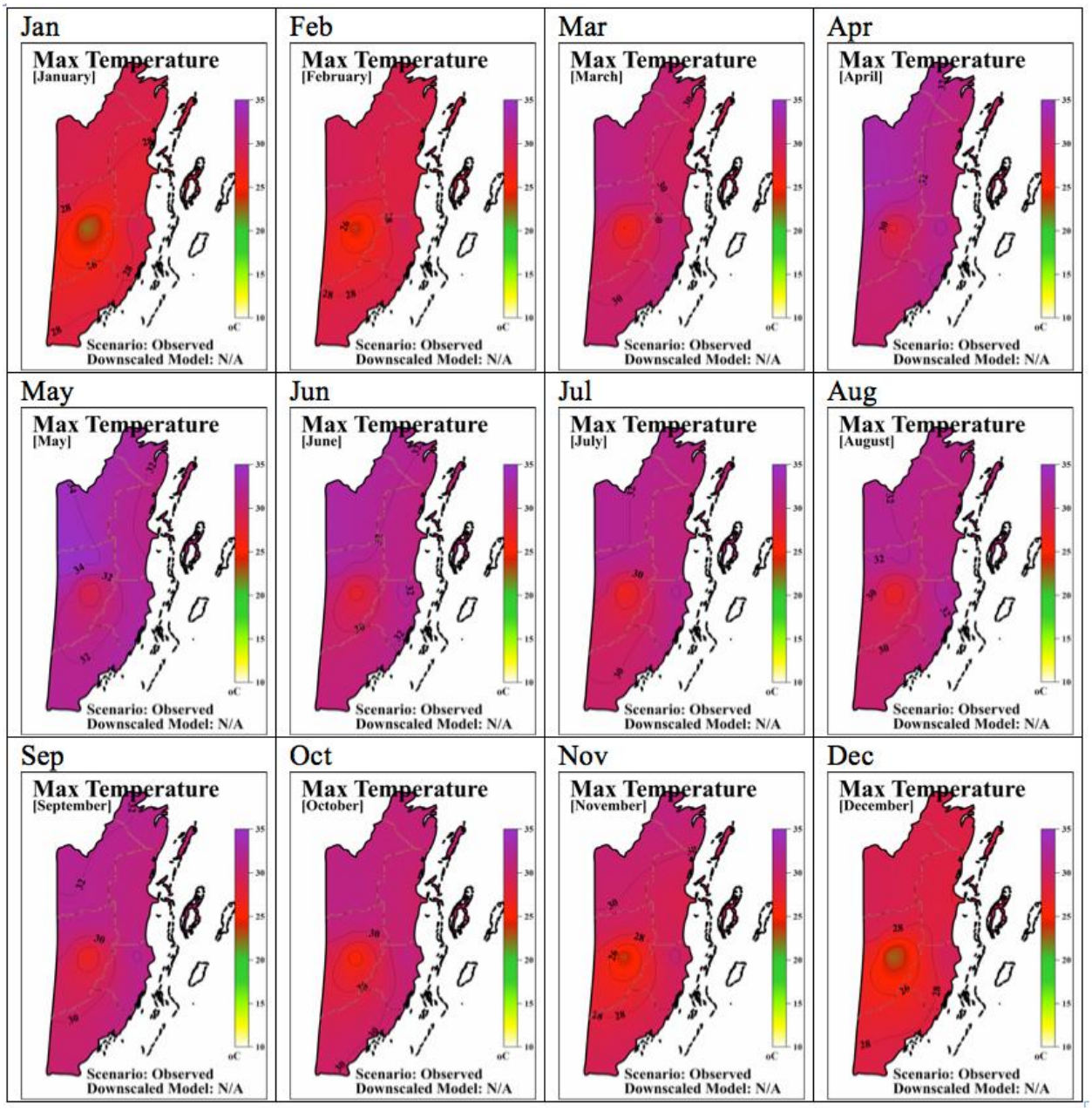


Figure 2.5: Mean observed monthly maximum temperature distribution (Unit = degrees Celsius)

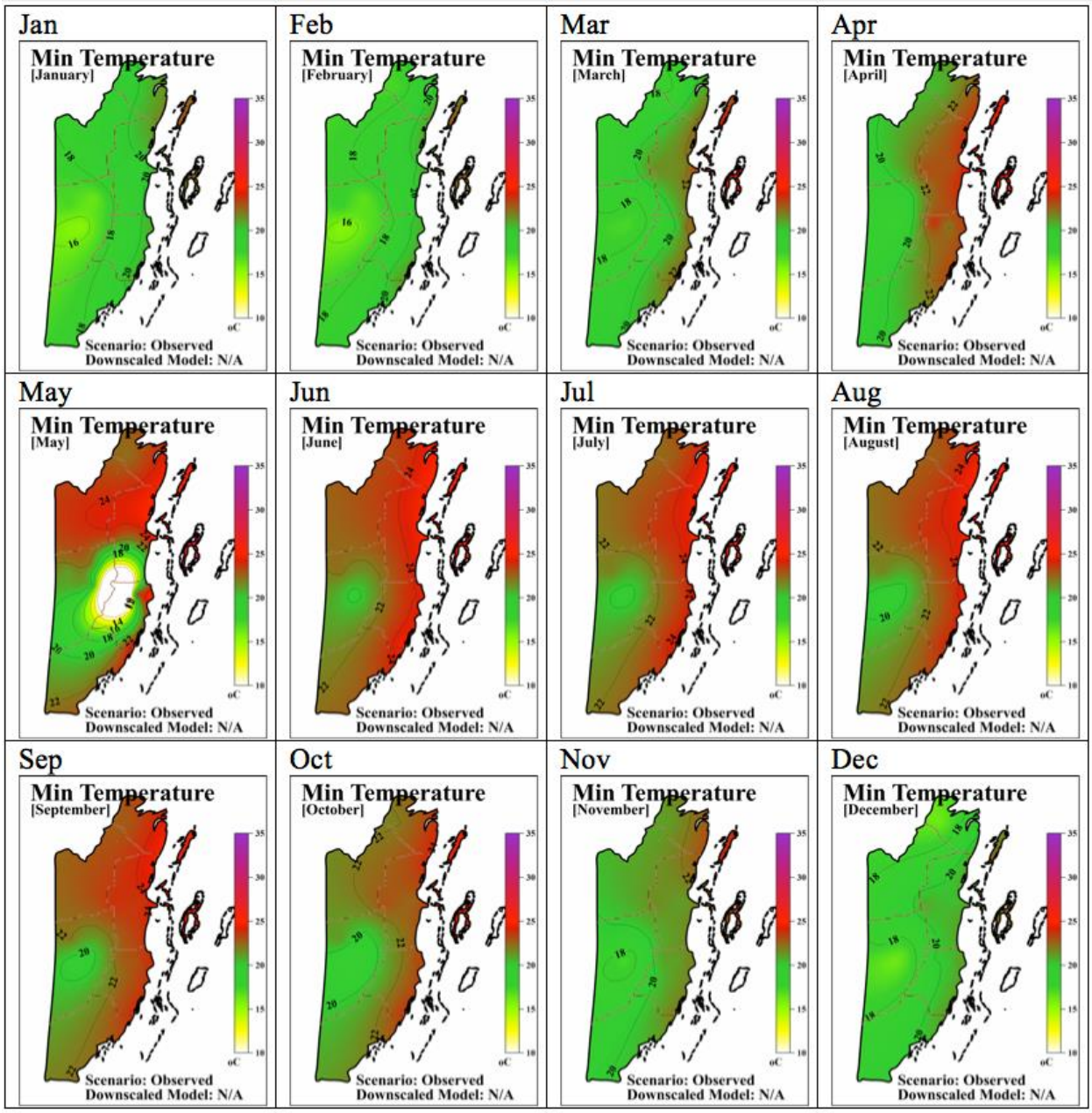


Figure 2.6 Mean observed monthly minimum temperature distribution (Unit = degrees Celsius)

2.2 Model Data

The data, which constitute this section, are mostly the result of the regional downscaling performed by the PRECIS model at 25 km resolution, with boundary conditions from the ECHAM5 global climate model (GCM) to generate the higher-scaled resolution and forced by the SRES A1B scenario. Further very high-resolution model downscaling was also performed using the Direct Area Downscaling (DAD) model (Charlery and Nurse, 2010). The DAD model allows the development of very high-resolution downscaling in small domains such as

watersheds, islands and where observed data is not regular or standardized. Additional data were extracted from the United Nations Development Programme (UNDP) Climate Change Country Profiles project (McSweeney *et al.* 2008; 2009). This latter dataset provides country-scale data files and multi-model scenario-based projections for several developing countries, including Belize. The dataset makes available observed and modeled climate data for climate impact assessment and exploration by providing observed data and future climate projections modeled using the SRES scenarios in the IPCC Fourth Assessment Report for each country, including Belize, in a standard format (Meehl *et al.,* 2007; McSweeney *et al*, 2008, 2010).

2.3 Climate Change Projections

2.3.1 Air Temperature

Using an ensemble A-OGCM projections model, McSweeney et al. (2008, 2010) have shown the following overall projected mean temperature changes for Belize:

1. Increases in the 2030s:
    - 0.4°C to 1.3°C according to the B1 scenario;
    - 0.4°C to 1.7°C according to the A1B scenario;
    - 0.7°C to 1.5°C according to the A2 scenario.
2. Increases in the 2060s:
    - 0.8°C to 2.0°C according to the B1 scenario;
    - 1.2°C to 2.9°C according to the A1B scenario;
    - 1.7°C to 2.9°C according to the A2 scenario.
3. Increases in the 2090s:
    - 1.3°C to 2.7°C according to the B1 scenario;
    - 2.0°C to 3.8°C according to the A1B scenario;
    - 2.8°C to 4.6°C according to the A2 scenario.

The study further showed that the projected rate of warming is similar in all the seasons, but more rapid in the southern region during August to October and in the western interior regions of the country during May to July, than in the northern, coastal regions (McSweeney *et al*, 2008; 2010). McSweeney also reported that the mean annual temperature has increased by 0.45^{o}C since 1960, at an average rate of 0.10^{o}C per decade. The average rate of increase is most rapid in the wet seasons (May - Oct) at 0.14^{o}C - 0.15^{o}C per decade and slower in the dry seasons (Nov - Apr) at 0.08 - 0.09^{o}C per decade. *Figure 2.7* depicts the mean annual temperature anomaly across the models ensemble referenced to 1970 - 1999.

Between 1960 and 2003, the frequency of hot days and hot nights has increased strongly, with the average number of hot days having increased by 6.7 days during summer (Jun – Aug) and the average number of 'hot' nights per year having increased by 37 nights. Contrastingly, the frequency of cold days and nights, annually, has decreased significantly. The average number of

'cold 'days per year has decreased by 21 days and the average number of 'cold' nights per year has decreased by 23 days between 1960 and 2003. *Figures* 2.8 though to *2.11* depict the mean annual percentage of hot days, annual percentage of hot nights, annual percentage of cold days and annual percentage of cold nights anomalies respectively, across the models ensemble referenced to 1970 - 1999.

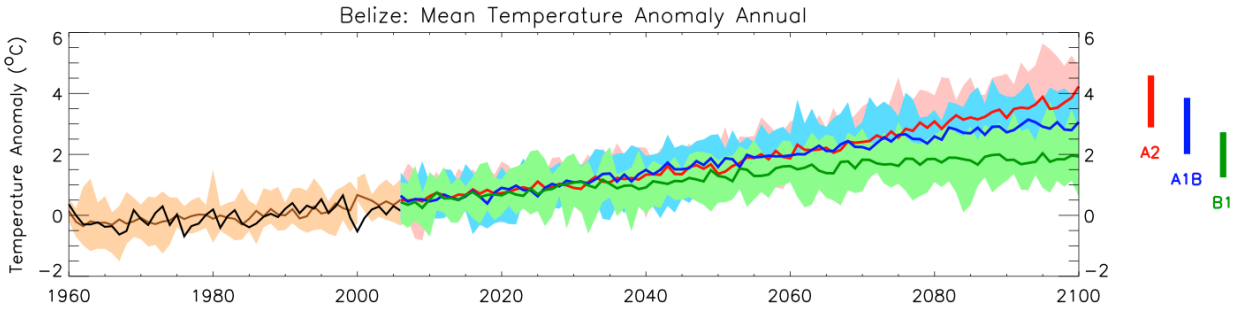


Figure 2.7 - Observed (1960-2006) and projected (to 2100) annual air temperature anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

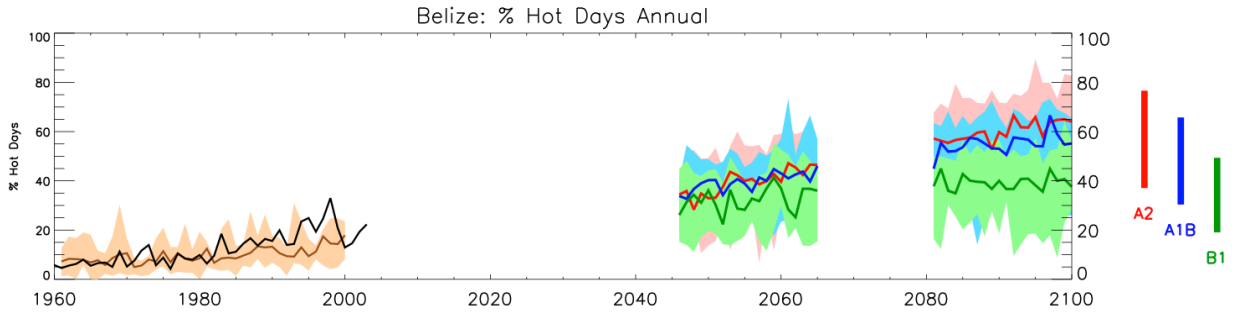


Figure 2.8 - Observed (1960-2006) and projected (to 2100) annual percentage of hot days anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

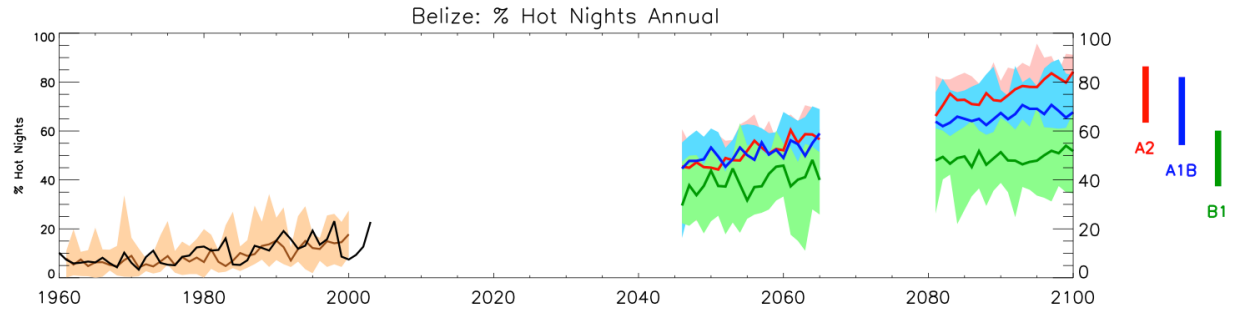


Figure 2.9 - Observed (1960-2006) and projected (to 2100) annual percentage of hot nights anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

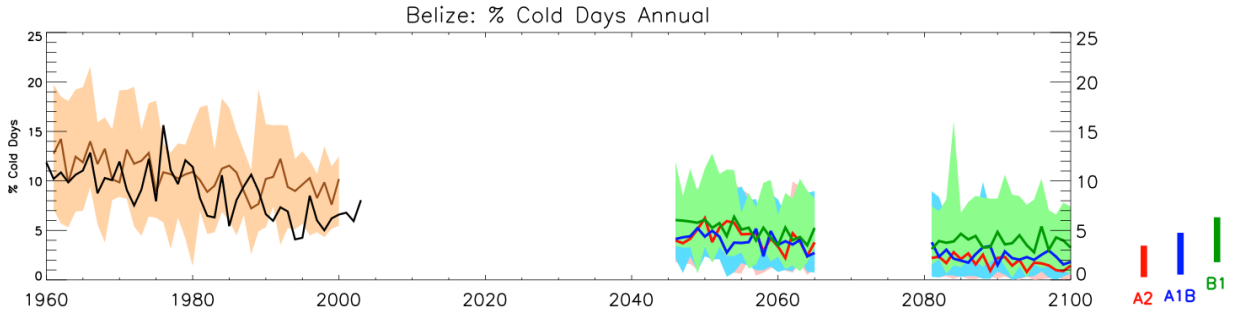


Figure 2.10 - Observed (1960-2006) and projected (to 2100) annual percentage of cold days anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

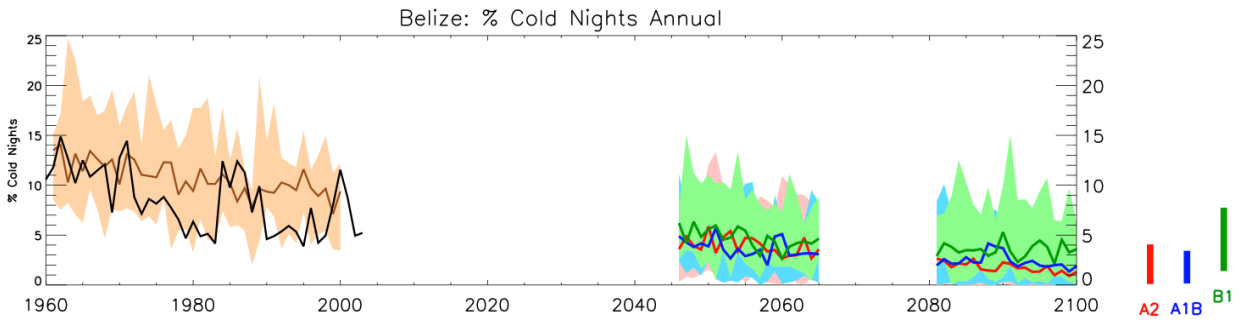


Figure 2.11 - Observed (1960-2006) and projected (to 2100) annual percentage of cold nights anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

2.3.2 Rainfall

Projections of mean annual rainfall indicate a progressive decrease from the 2030s to the 2090s across all seasons and all emissions scenarios. Mean seasonal rainfall vary at a reduction of 26% for the A2 scenario during February to April to an increase of 55% under the B1 scenario during August - October by the 2090s, but with median values showing overall reductions of between 1% under the B1 scenario during November to January and a reduction of 26% under the A2 scenario during February to April. Despite the variability, ensemble minimum and median values of rainfall changes by the 2030s, 2060s and 2090s, are generally and consistently negative for all seasons and emissions scenarios (McSweeney *et al*., 2008, 2010). *Figure 2.12* depicts the mean monthly precipitation anomaly across the models ensemble referenced to 1970 - 1999.

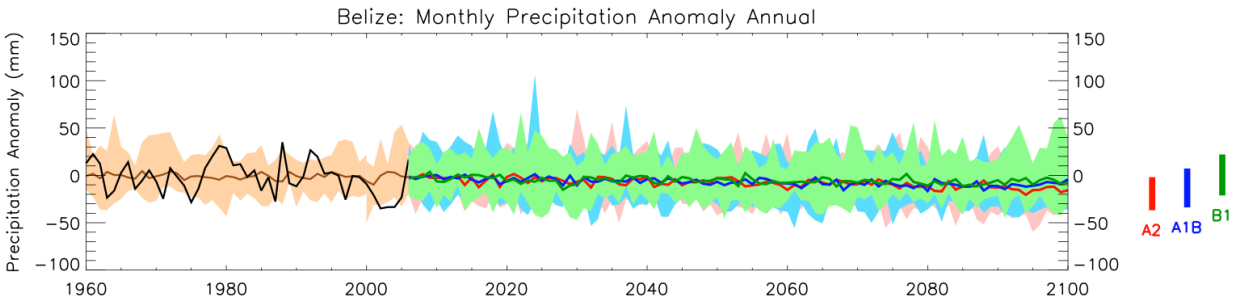


Figure 2.12 - Observed (1960-2006) and projected (to 2100) annual precipitation anomalies for Belize (referenced to 1970-1999 (McSweeney et al, 2008; 2009)).

2.3.3 Sea level Rise

Most of the eastern coastline of Belize and the outlying reef islands are composed of low-lying lands which are all susceptible to inundation due to sea level rise. According to the IPCC's Fourth Assessment Report (IPCC, 2007), sea level in the vicinity of Belize is projected by climate models to rise by the following levels by the 2090s, relative to 1980 - 1999 sea level:

- 18 to 43 cm under SRES B1;
- 21 to 53 cm under SRES A1B;
- 23 to 56 cm under SRES A2

Other authors (such as Meehl *et al.*, 2007; Gregory *et al*., 2004) have shown that these estimates may be too conservative and regional variability in sea level change relative to the global average is projected to be higher in the North Atlantic in the region near Belize by the end of this century. In fact other recent authors (such as (Rahmstorf, 2007 and 2010; Horton et al., 2008; Vermeer and Rahmstorf, 2009; Grinsted et al., 2009), using semi-empirical models, estimate that sea level may rise more than 1 meter by 2100 or at least double the IPCC (2007) estimates. For the IPCC's Fifth Assessment Report (IPCC, 2013), the new projections show an increase of 26 - 55 cm by 2100 under a low emissions scenario and 52 - 98 cm under the high emissions scenario.

2.4 Regional Downscaling of ECHAM5 Using PRECIS

The Hadley Centre's regional climate model, PRECIS, is used to downscale the ECHAM5 GCM data for Belize at 25 km resolution using the SRES A1B scenario. The following meteorological elements from the simulations will be considered:

- Rainfall
- Temperature (Mean, Maximum, Minimum)
- Wind speed
- Relative Humidity.

The changes in the monthly mean of those elements from the baseline 1961 – 1990 values will be presented for the decades of the 2020s, 2050s, 2070s and 2090s.

2.4.1 Rainfall (PRECIS/ECHAM5 Model)

Figures 2.13 to *2.17* present the changes in mean daily rainfall rate (mm/day) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean daily rainfall rate during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario.

The decade of the 2020s (*Figure 2.13*) suggests a slight increase in the early (May) and late (Oct-Nov) parts of the wet season with peak increases of about 2-4 mm/day in the Stann Creek District. The dry season and the mid-wet season dip (Jun), on the other hand, are characterized by further decreases with largest reductions of about 4 mm/day in the Stann Creek and Cayo Districts.

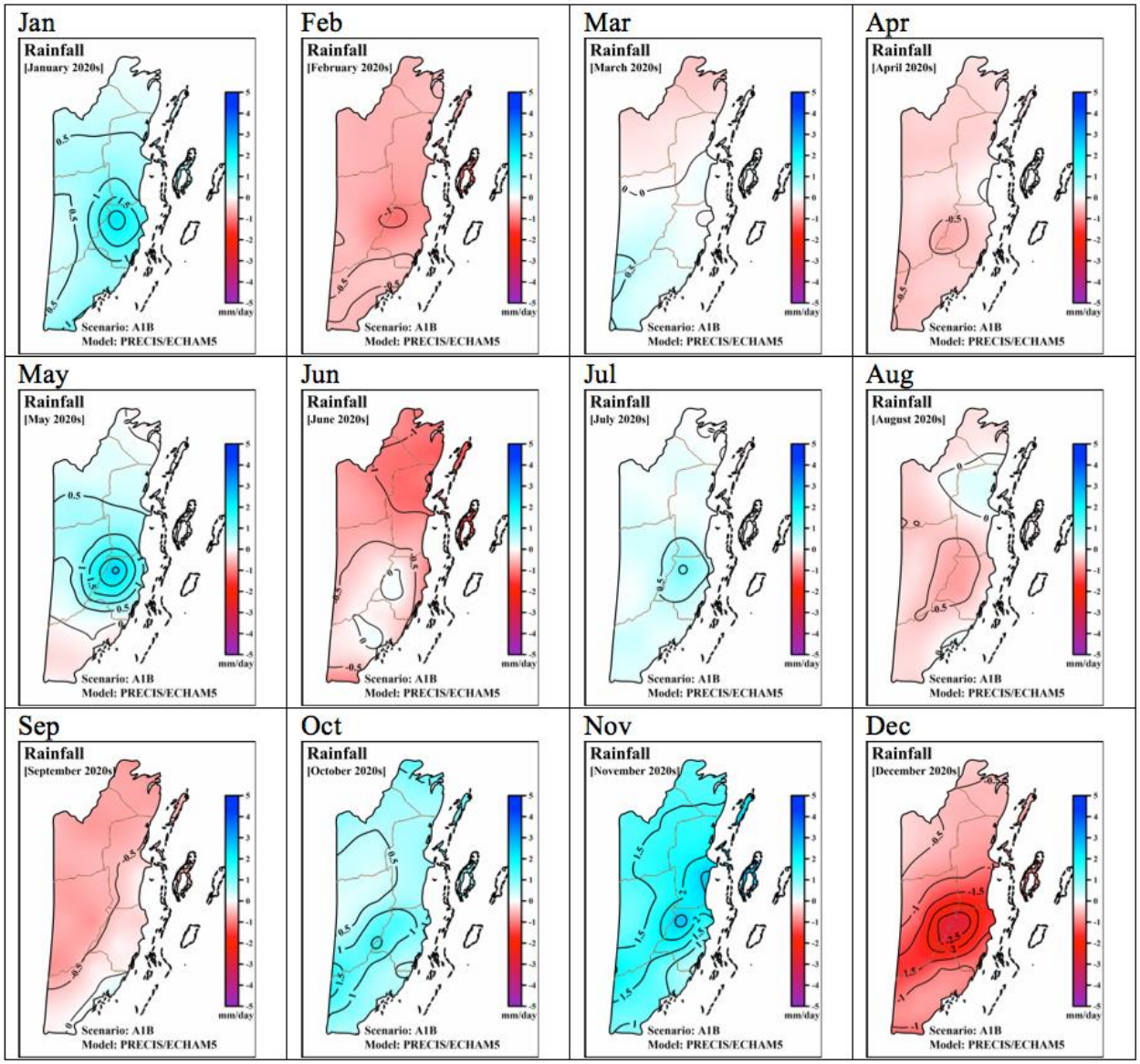


Figure 2.13: Projected difference in monthly precipitation rate for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

In the decade of the 2030s (*Figure 2.14*), reduced precipitation characterizes the entire country with exceptions only in early (May) and late (Nov) parts of the wet season. Largest decreases of 2-5 mm/day are projected in the Stann Creek District. The months of May and November are marked by an increase of 1-3 mm/day in the Stann Creek, Cayo and Orange Walk Districts.

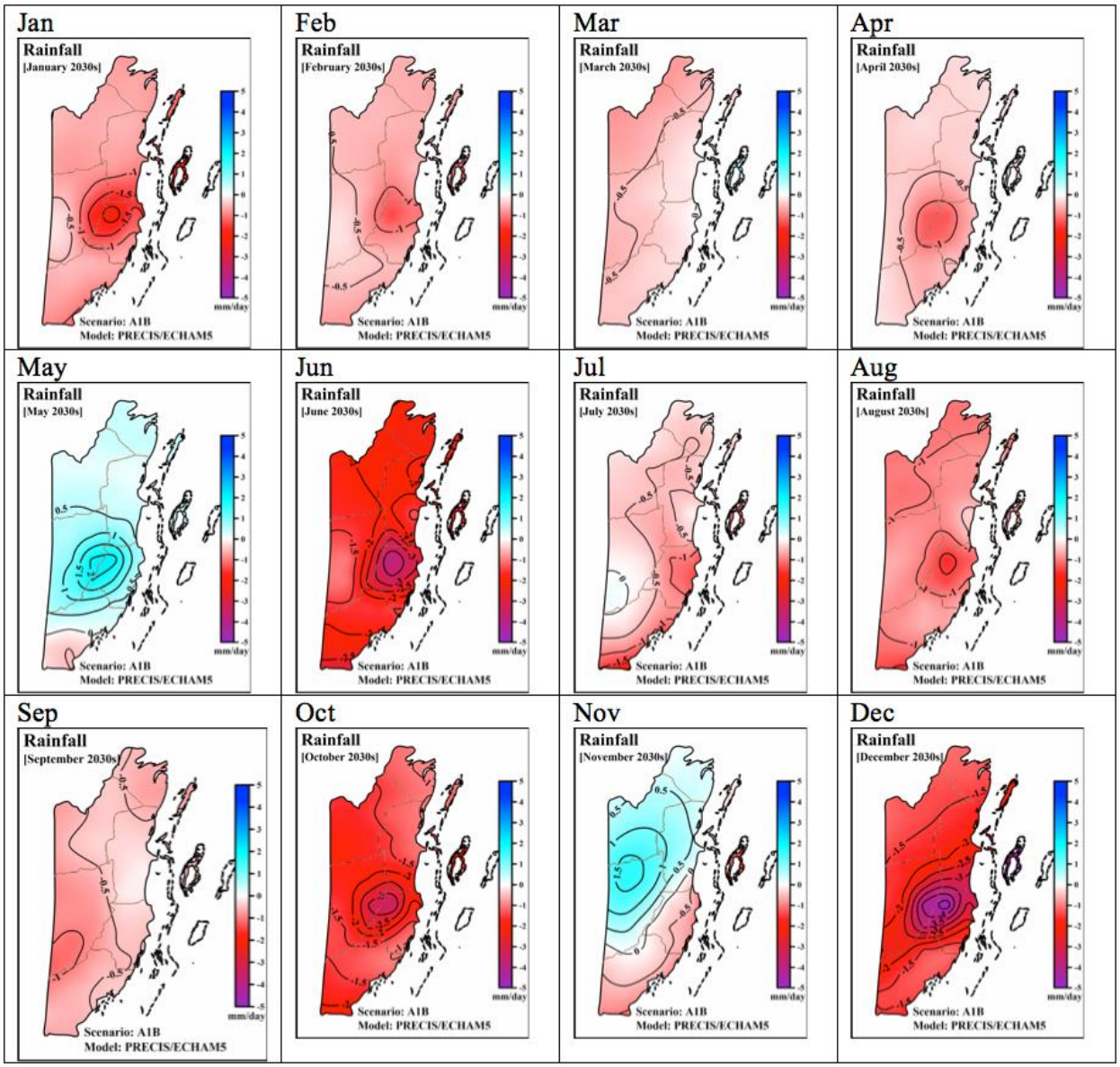


Figure 2.14: Projected difference in monthly precipitation rate for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

The decade of the 2050s (*Figure 2.15*) projects an enhancement of the 2030s pattern of reduced rainfall (-1 to -4 mm/day) in the dry season (December – April). Increased precipitation of 2-7 mm/day is projected during the early (May) and late (Oct - Nov) parts of the wet season in the Stann Creek and Cayo Districts.

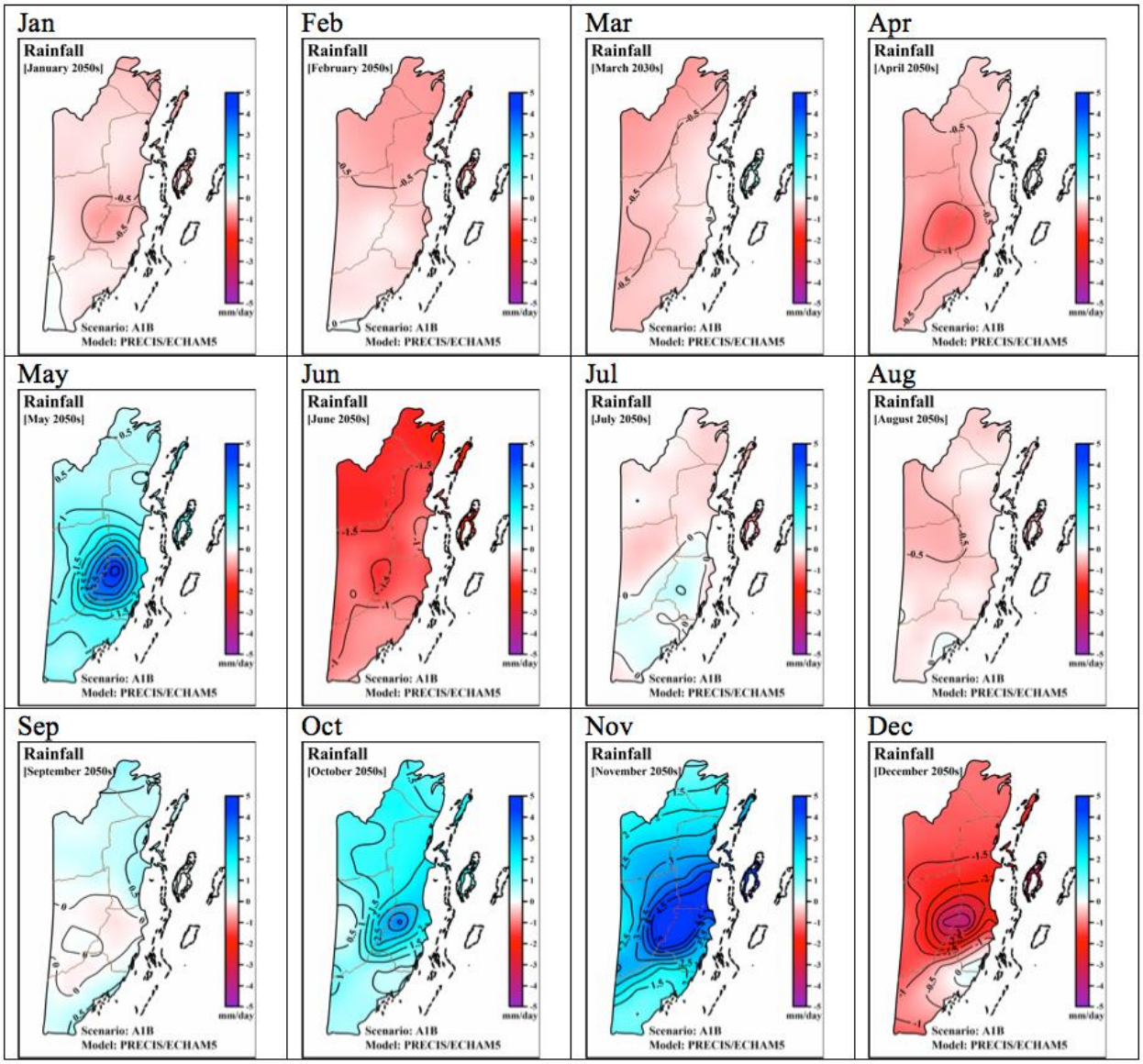


Figure 2.15: Projected difference in monthly precipitation rate for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

In the decades of the 2070s (*Figure 2.16*) and 2090s (*Figure 2.17*) the surge in precipitation in the early part of the wet season (May) is no longer apparent, but instead, the Belize landscape is marked by reduced rainfall from December through to September. The largest reduction of up to -7 mm/day is projected in the Stann Creek District during the mid-wet season dip in June. The end of the wet season (Oct - Nov) maintains increased rainfall of 2 – 5 mm/day in the western Toledo, Stann Creek, Orange Walk and Corozal Districts.

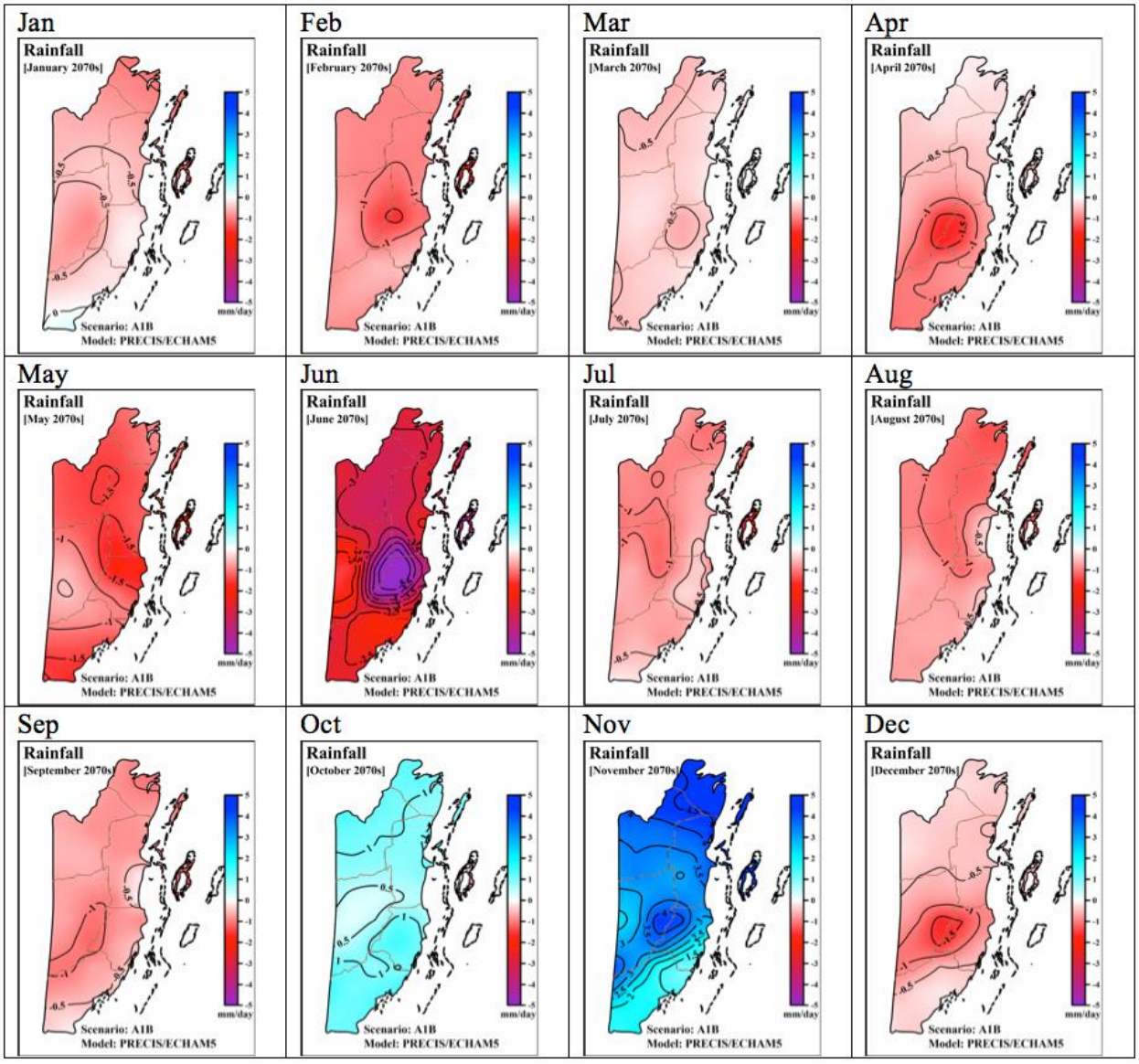


Figure 2.16 Projected difference in monthly precipitation rate for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

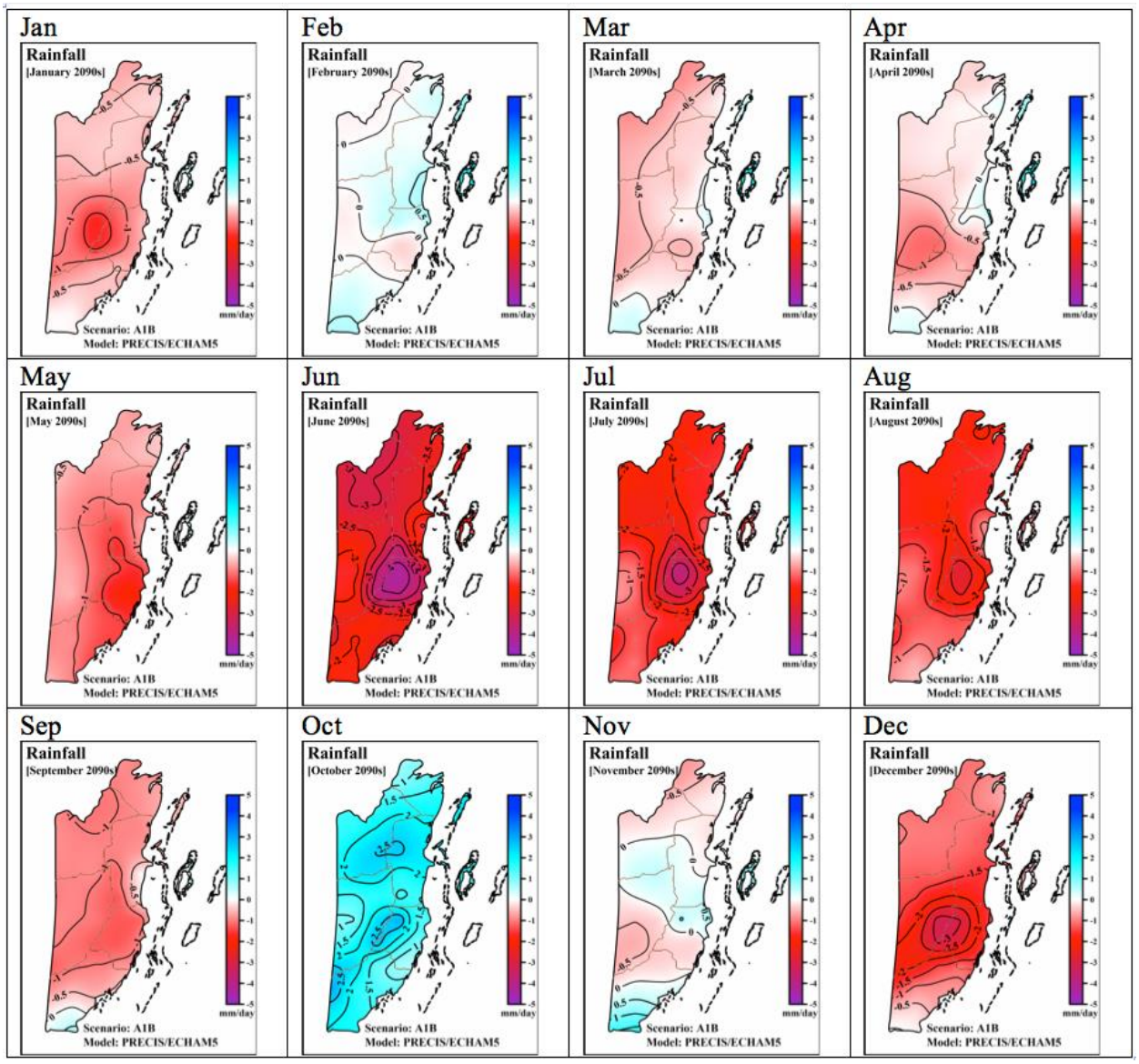


Figure 2.17: Projected difference in monthly precipitation rate for Belize in the decade of the 2090s over the 1961-1990 period, using the PRECIS/ECHAM5 model with A1B scenario.

2.4.2 Temperatures (PRECIS/ECHAM5 Model)

2.4.2.1 Mean Temperature

Figures 2.18 to *2.22* present the changes in mean monthly temperature change (in degrees Celsius) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean monthly temperature during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario. Through each decade, a broad nation-wide increase of approximately 1^{o}C is projected in the decade of the 2020s, 1-1.8^{o}C in the 2030s, 1.8 – 2.9^{o}C in the 2050s, 2.5 - 4.3^{o}C in the 2070s and 3.2 – 4.9^{o}C in the 2090s

over the 1961-1990 values respectively. While there does not appear to be a proportional rate of increase as defined by the characteristic spatial variations which existed during the warm (March - October) and cool (Nov - Feb) periods in *Figure 2.4*, the rate of warming is projected to be consistently lowest along the coastal section of the Belize District.

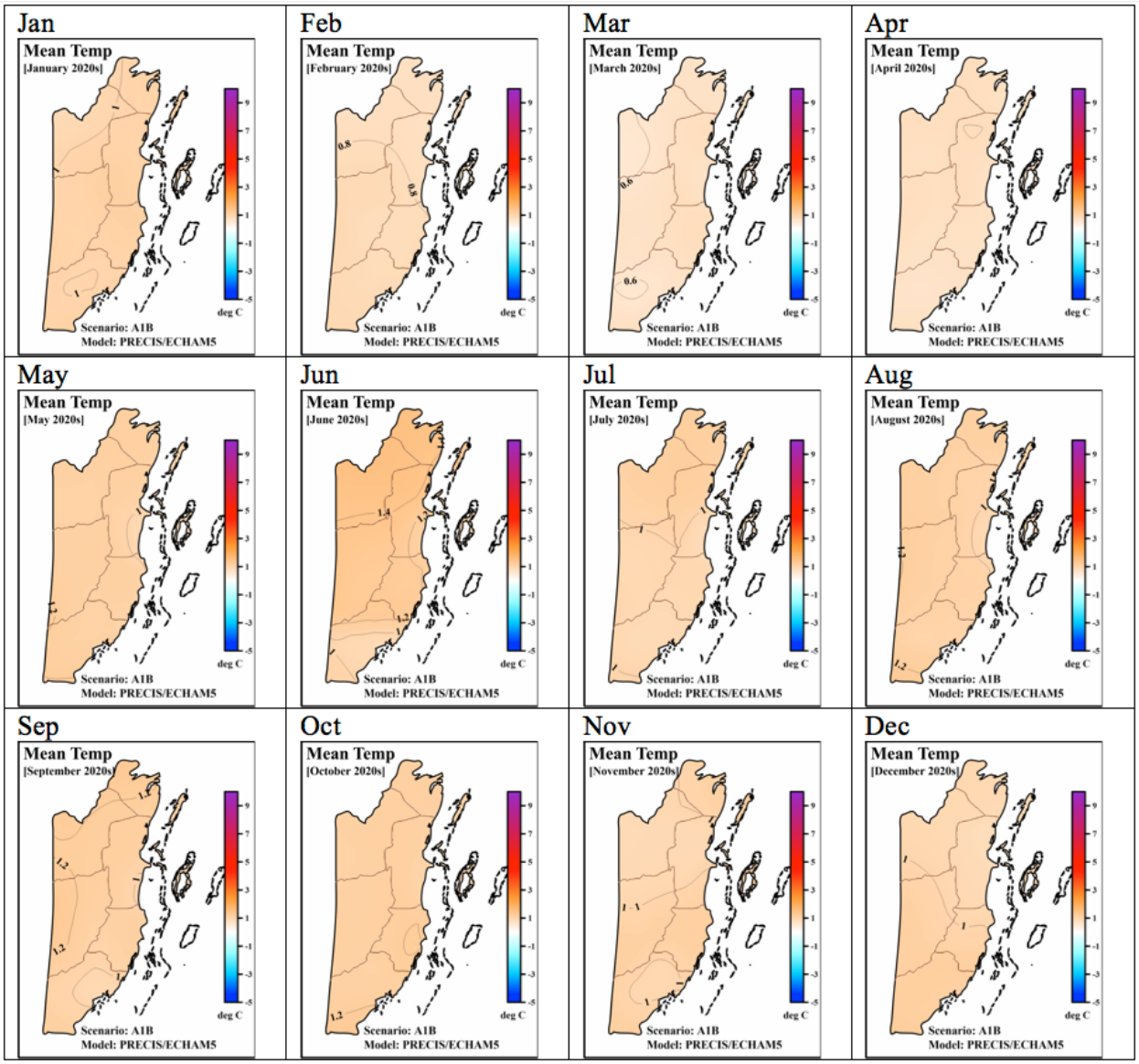


Figure 2.18: Projected difference in mean monthly temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

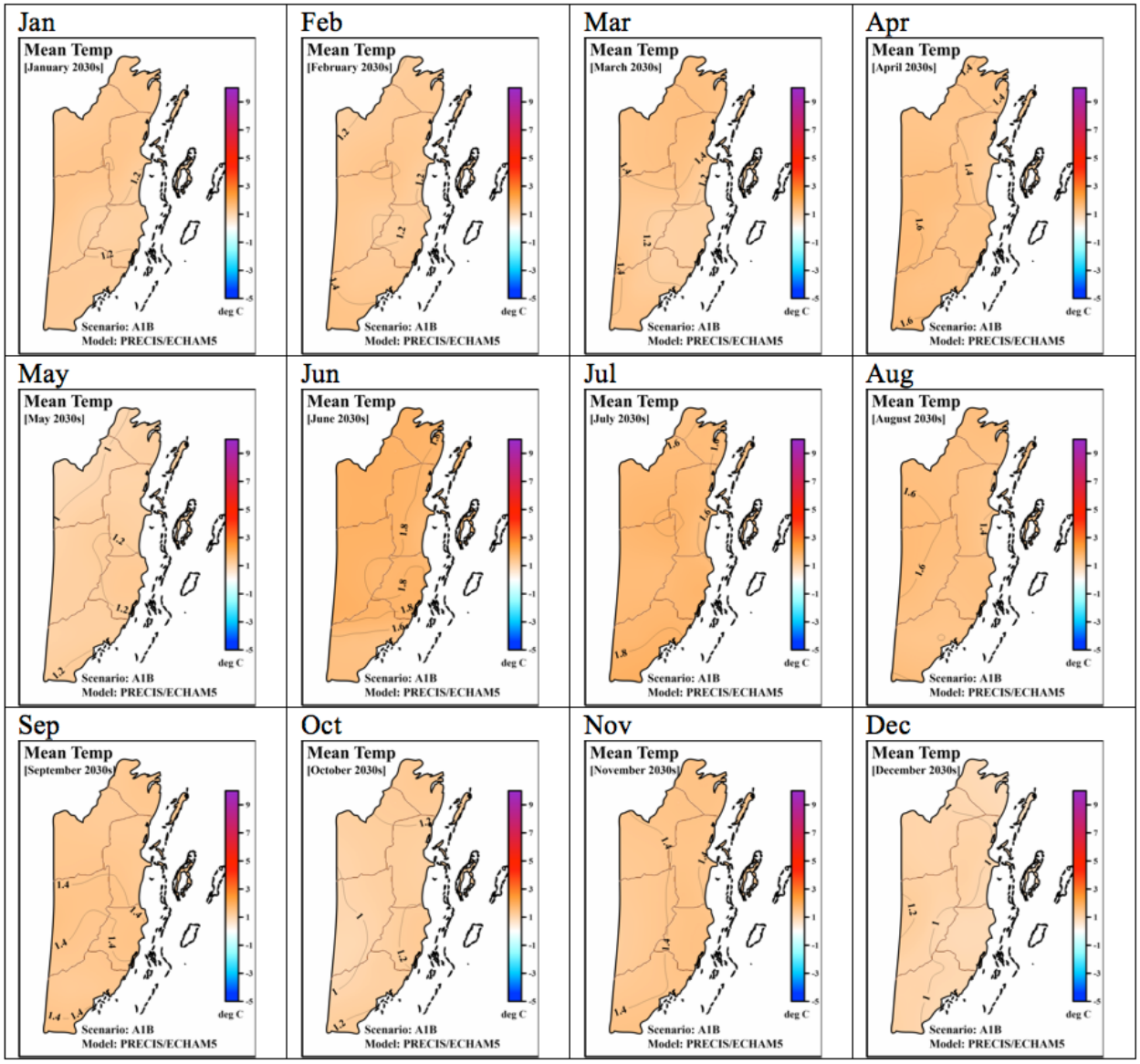


Figure 2.19: Projected difference in mean monthly temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

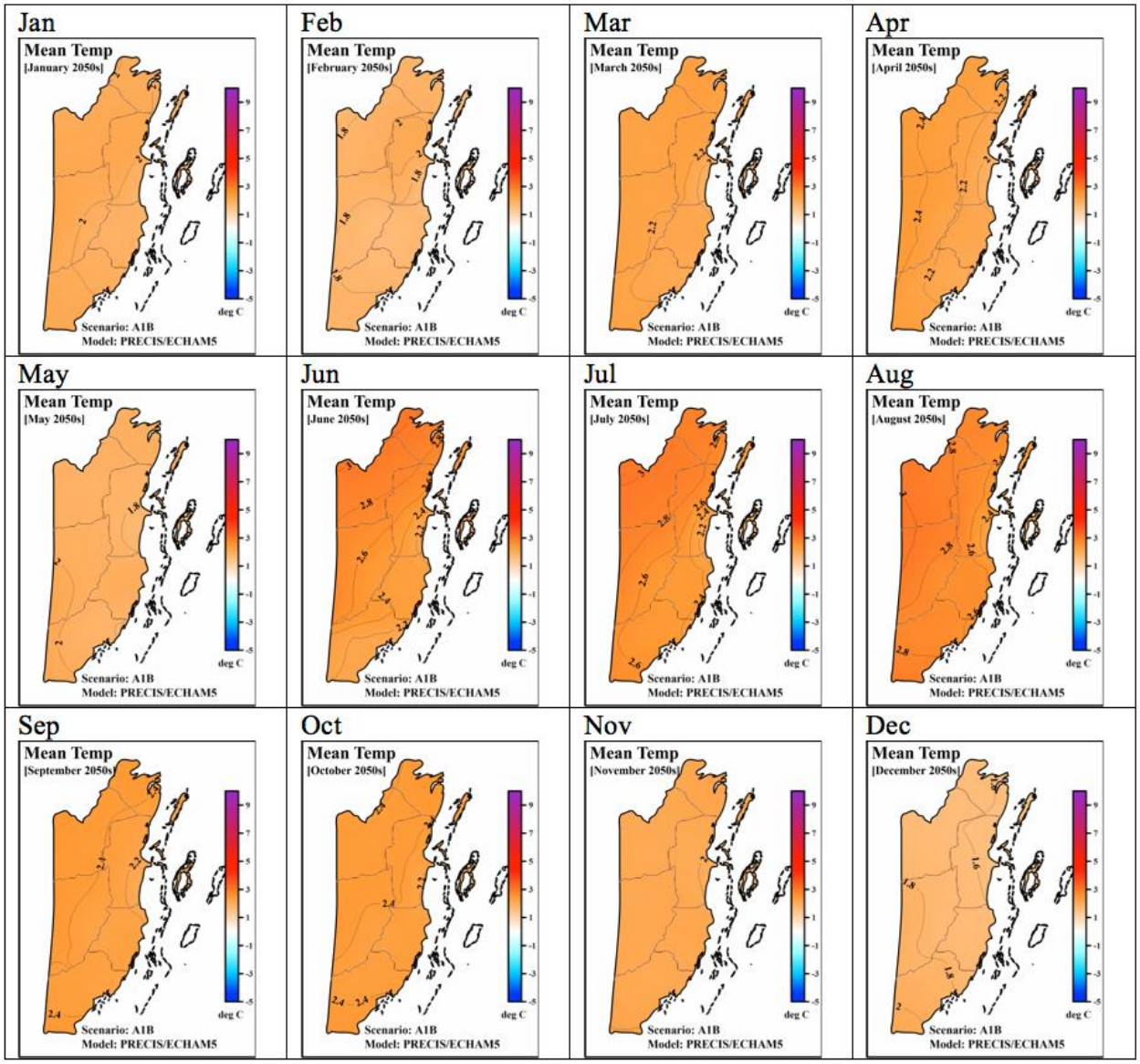


Figure 2.20: Projected difference in mean monthly temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

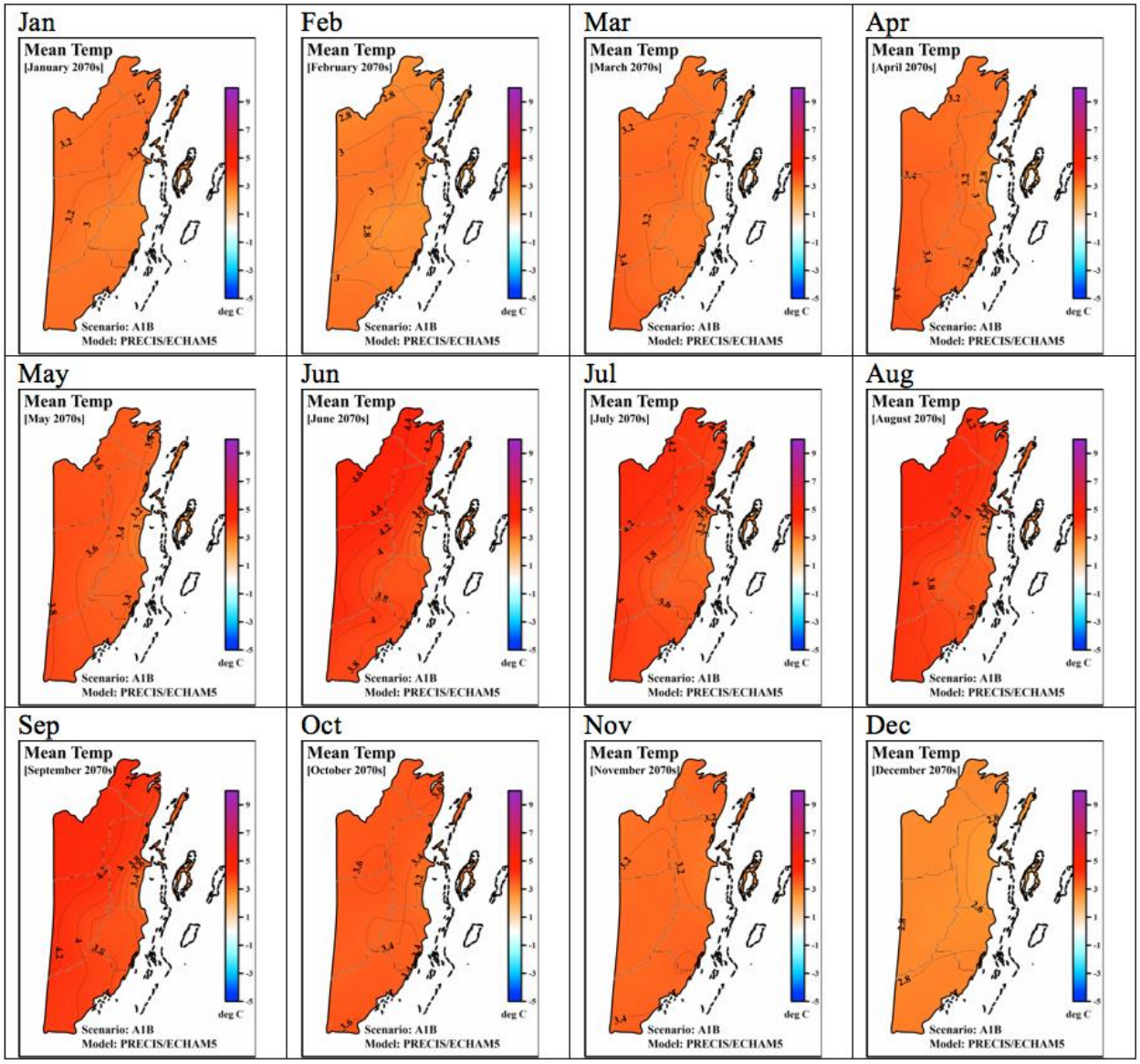


Figure 2.21: Projected difference in mean monthly temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

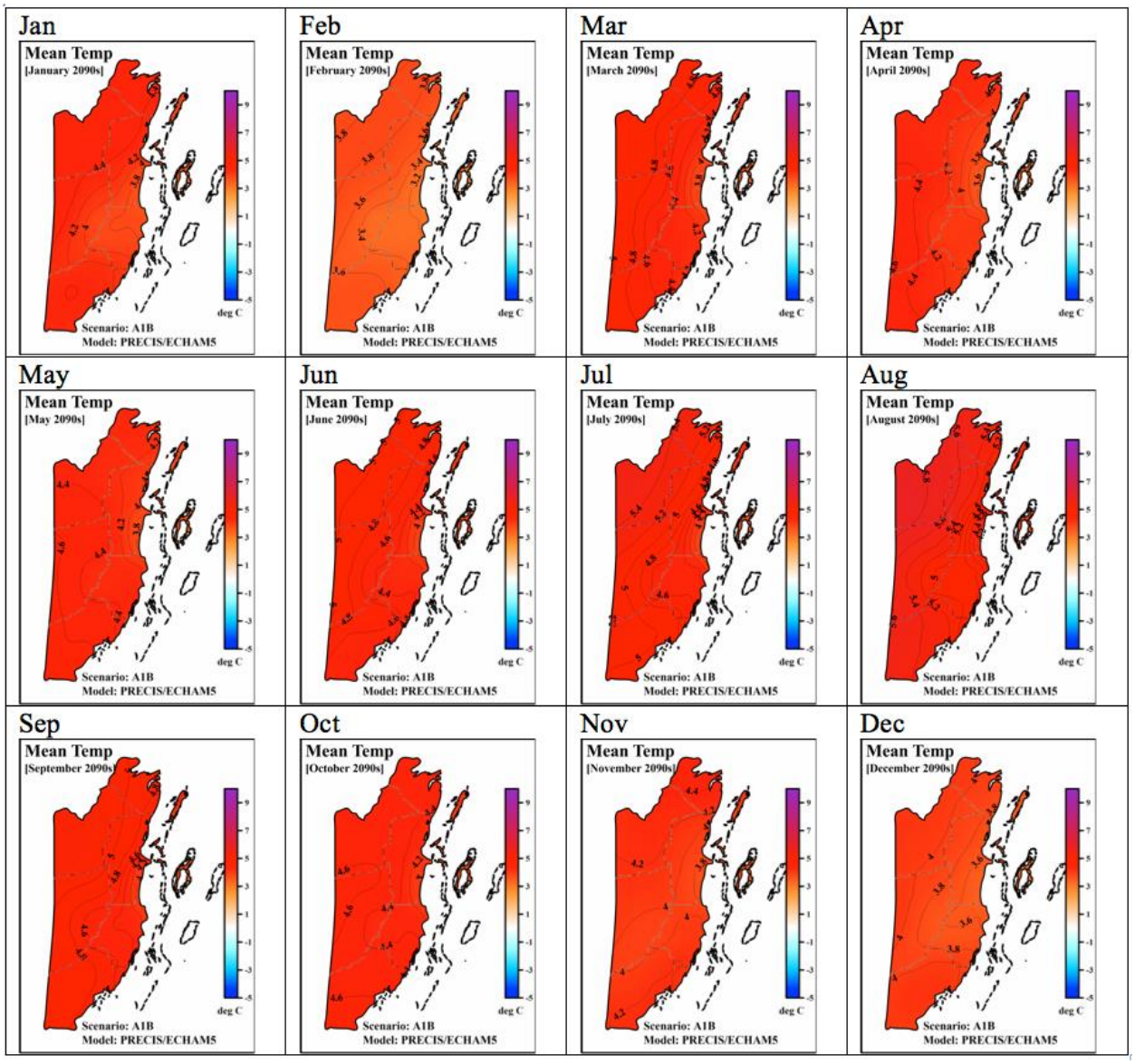


Figure 2.22: Projected difference in mean monthly temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

2.4.2.2 Mean Maximum Temperature

Figures 2.23 to *2.27* present the changes in mean monthly maximum temperature change (in degrees Celsius) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean monthly maximum temperature during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario.

Mean monthly maximum temperatures are projected to increase between 0°C – 1.4°C during the decade of the 2020s over the 1961-1990 values (see *Figure 2.23*). In the 2030s (*Figure 24*), largest increases of 1.2°C – 2.2°C are projected for the cooler season (Nov – Feb). In the

remainder of the year (March – October), a different pattern is presented. Cooler mean maximum temperatures are projected for the western half of the country (western Toledo, Cayo, Orange Walk), with the largest reduction of -0.5°C to -1.5 °C in the western section of the Cayo District, while increased values of 0.5°C – 1.5 °C cover the eastern half of the country.

In the decades of 2050s (*Figure 2.25*), 2070s (*Figure 2.26*) and 2090s (*Figure 2.27*), the projected pattern changes to a steady increase in mean maximum temperatures of 1.5°C – 3.5°C in the 2050s to 2.6°C – 3.9°C in the 2070s and then to 3.4°C – 6.6°C in the 2090s over the values of the 1961 – 1990 period. For each of the time slices, the largest increases are primarily located in the Orange Walk Districts and to a lesser extent, the western sections of Corozal and Cayo Districts.

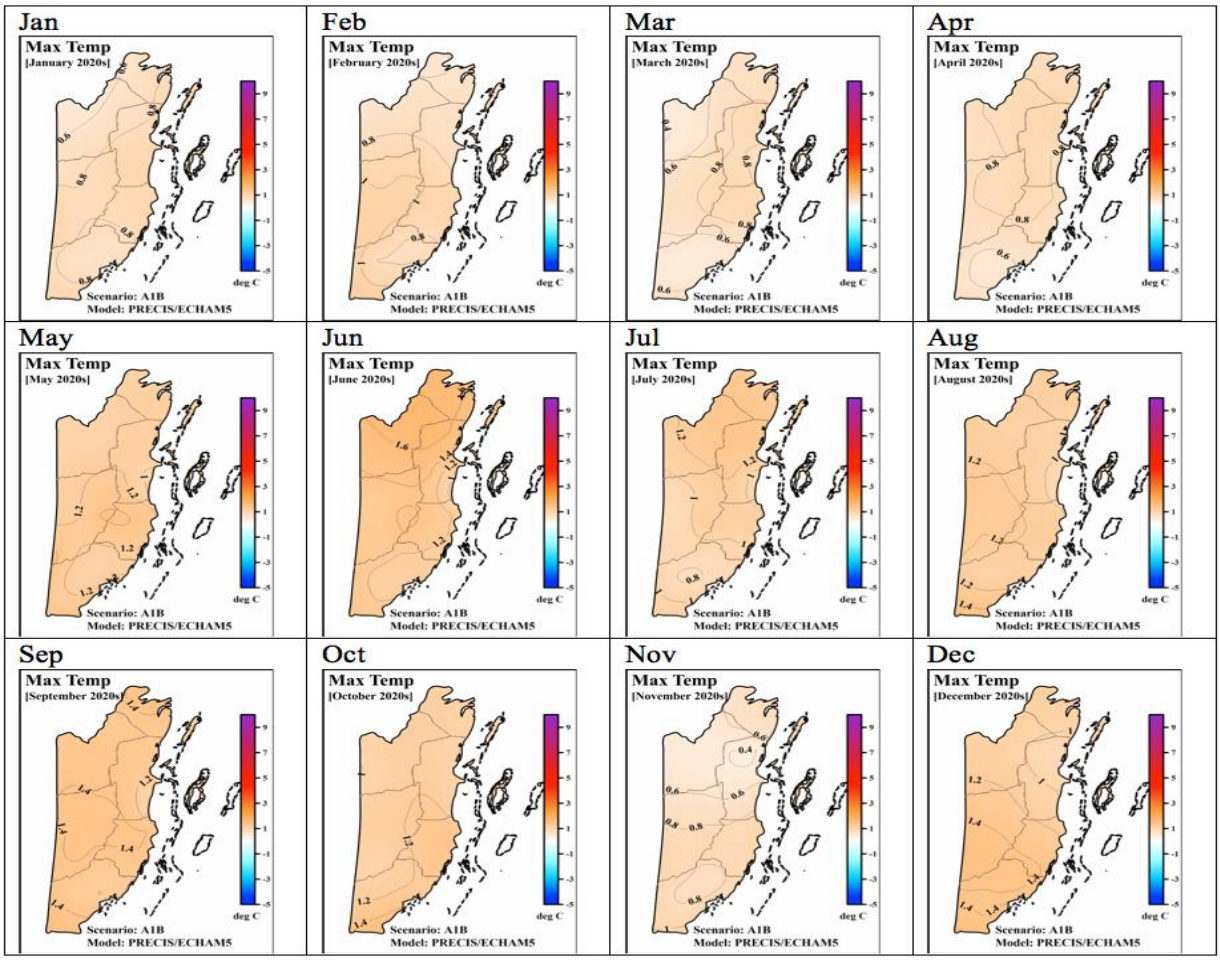


Figure 2.23: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

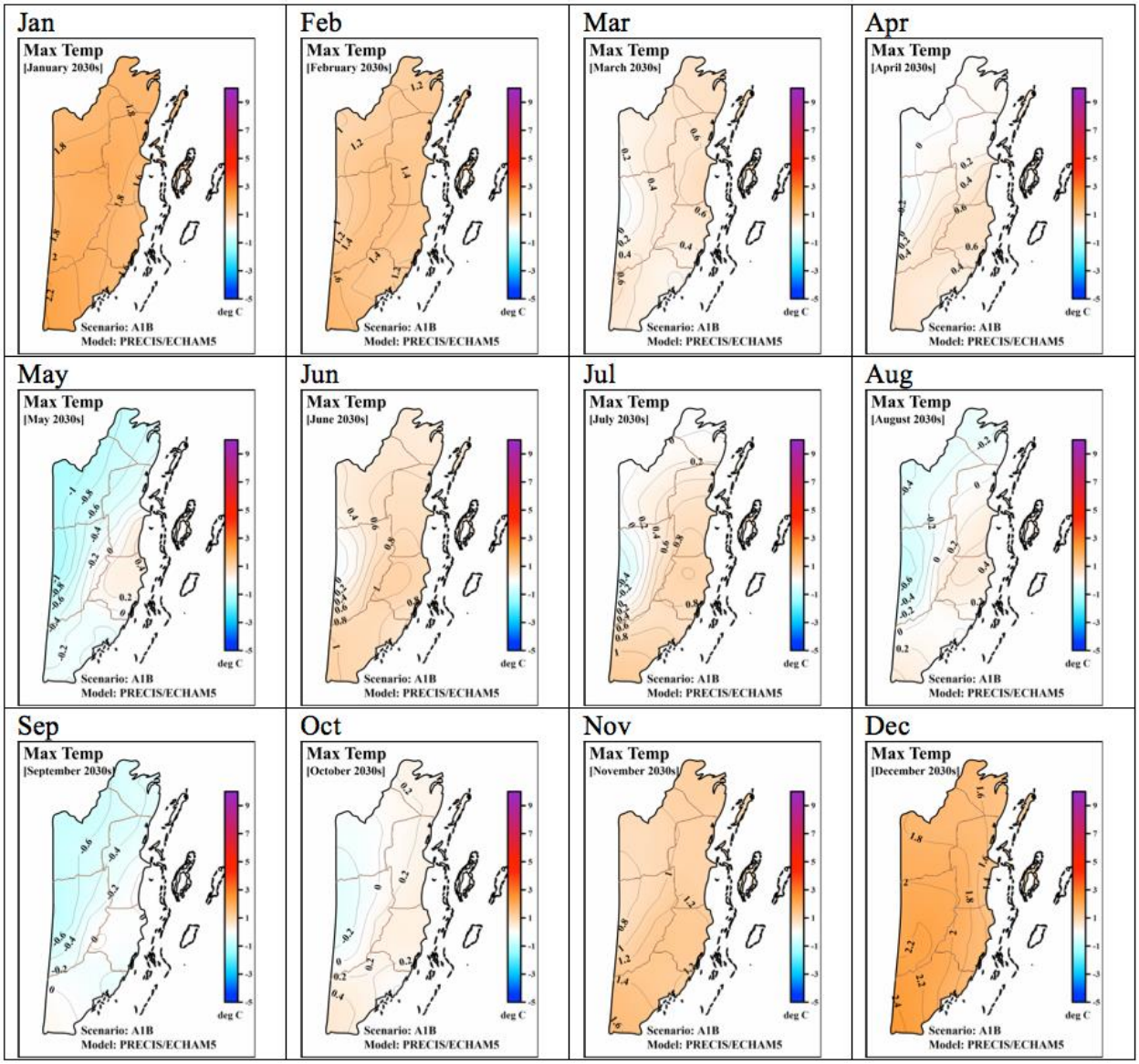


Figure 2.24: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

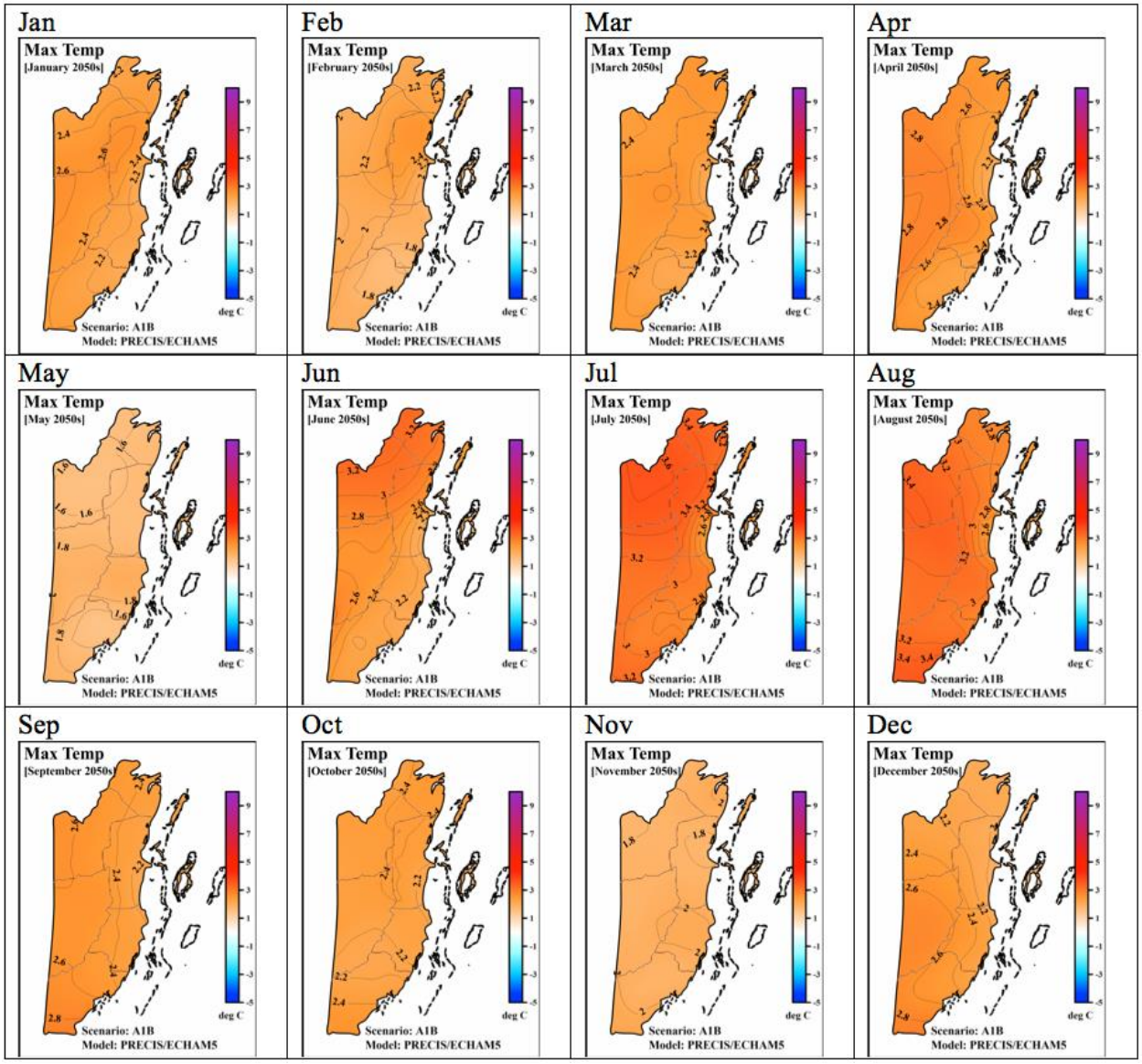


Figure 2.25: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

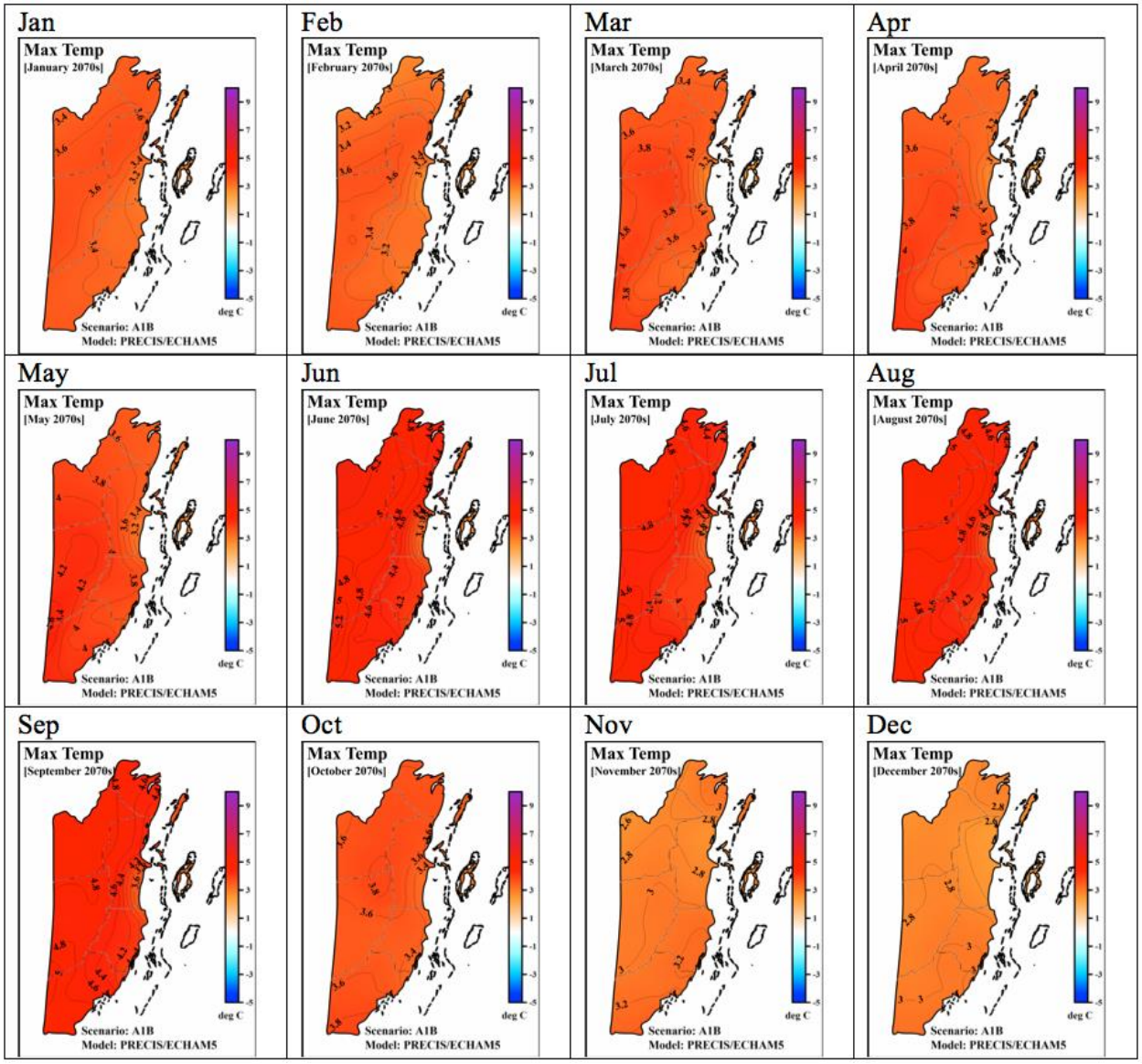


Figure 2.26 Projected difference in mean monthly maximum temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

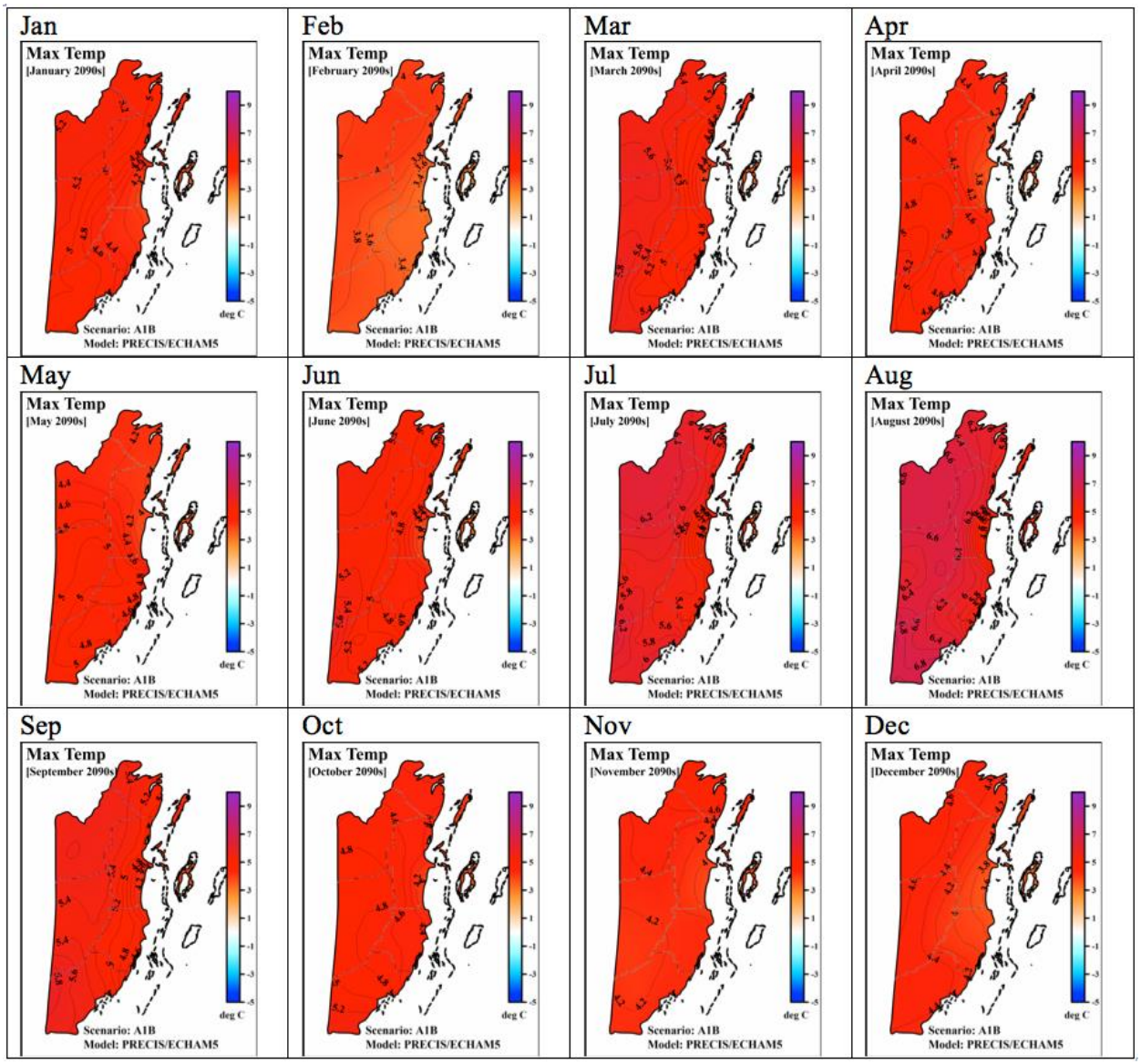


Figure 2.27: Projected difference in mean monthly maximum temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

2.4.2.3 Mean Minimum Temperature

Figures 2.28 to *2.32* present the changes in mean monthly minimum temperature change (in degrees Celsius) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean monthly minimum temperature during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario.

A steady increase in the values of the mean monthly minimum temperatures over the 1961 – 1990 era is projected through to 2100. The decade of the 2020s (*Figure 2.28*) depicts an increase of 0.5^{o}C - 1.5^{o}C. In the 2030s (*Figure 2.29*) the increase is between 0.5^{o}C – 1.2^{o}C. The

increase is projected to be 0.5°C – 2.5°C during the decade of the 2050s, 2.5°C – 3.6 °C in the 2070s and 3.3°C – 5.3°C in the 2090s over the 1961-1990 values (see *Figure 2.30* to *2.33*). For each of the time slices, the smallest increases are projected to be in the region of the western Stann Creek and eastern Cayo Districts.

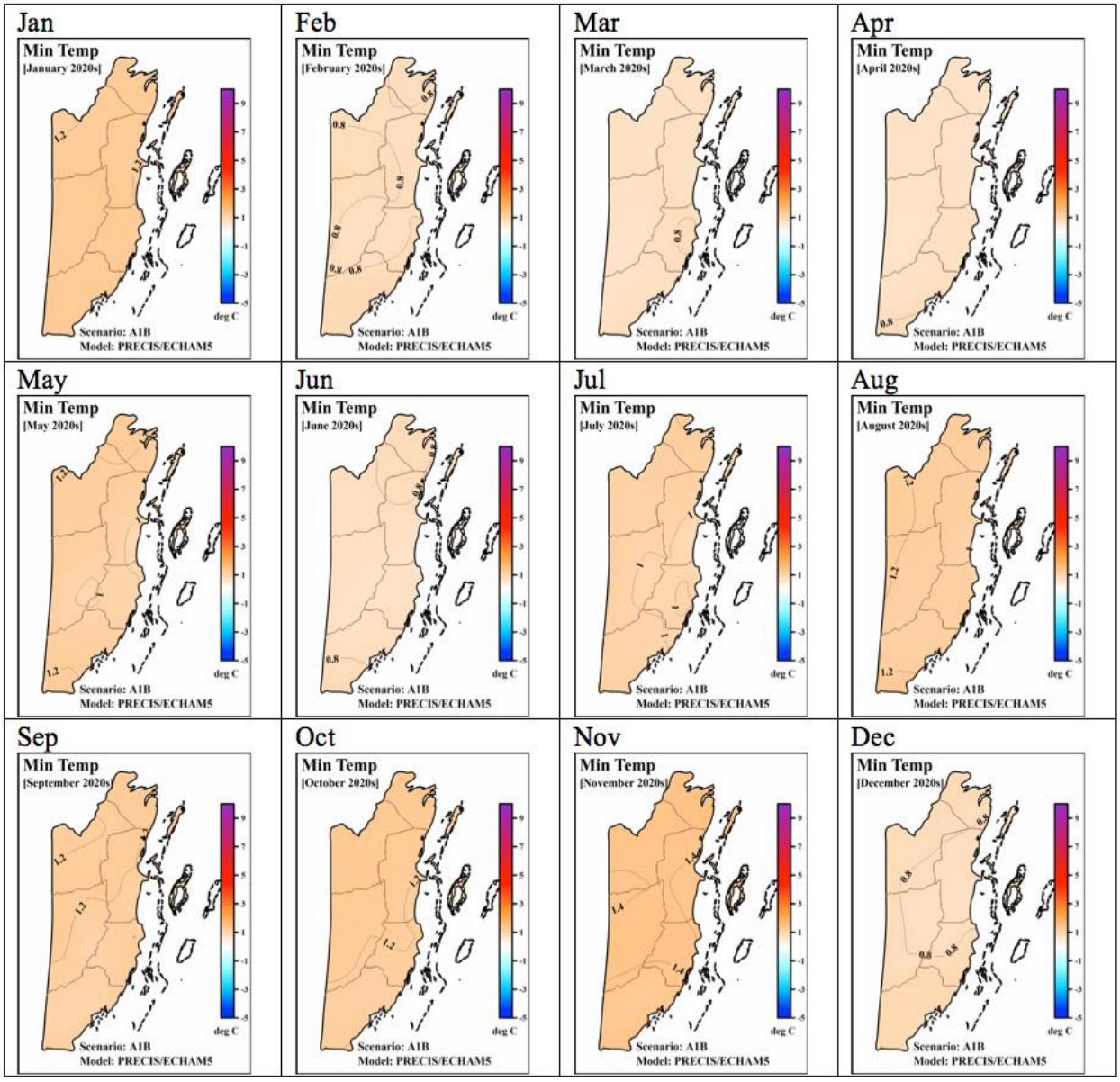


Figure 2.28: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

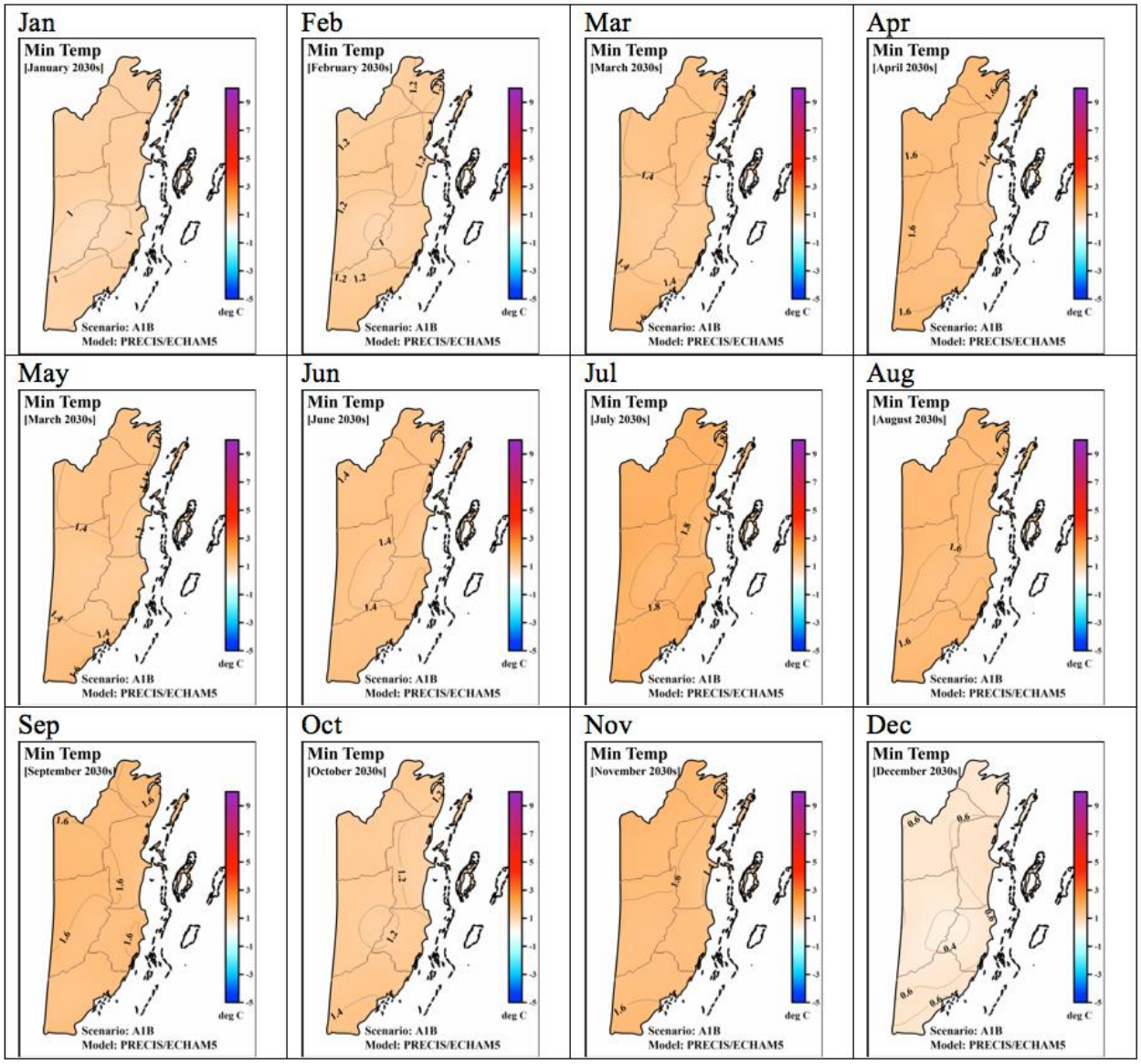


Figure 2.29: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

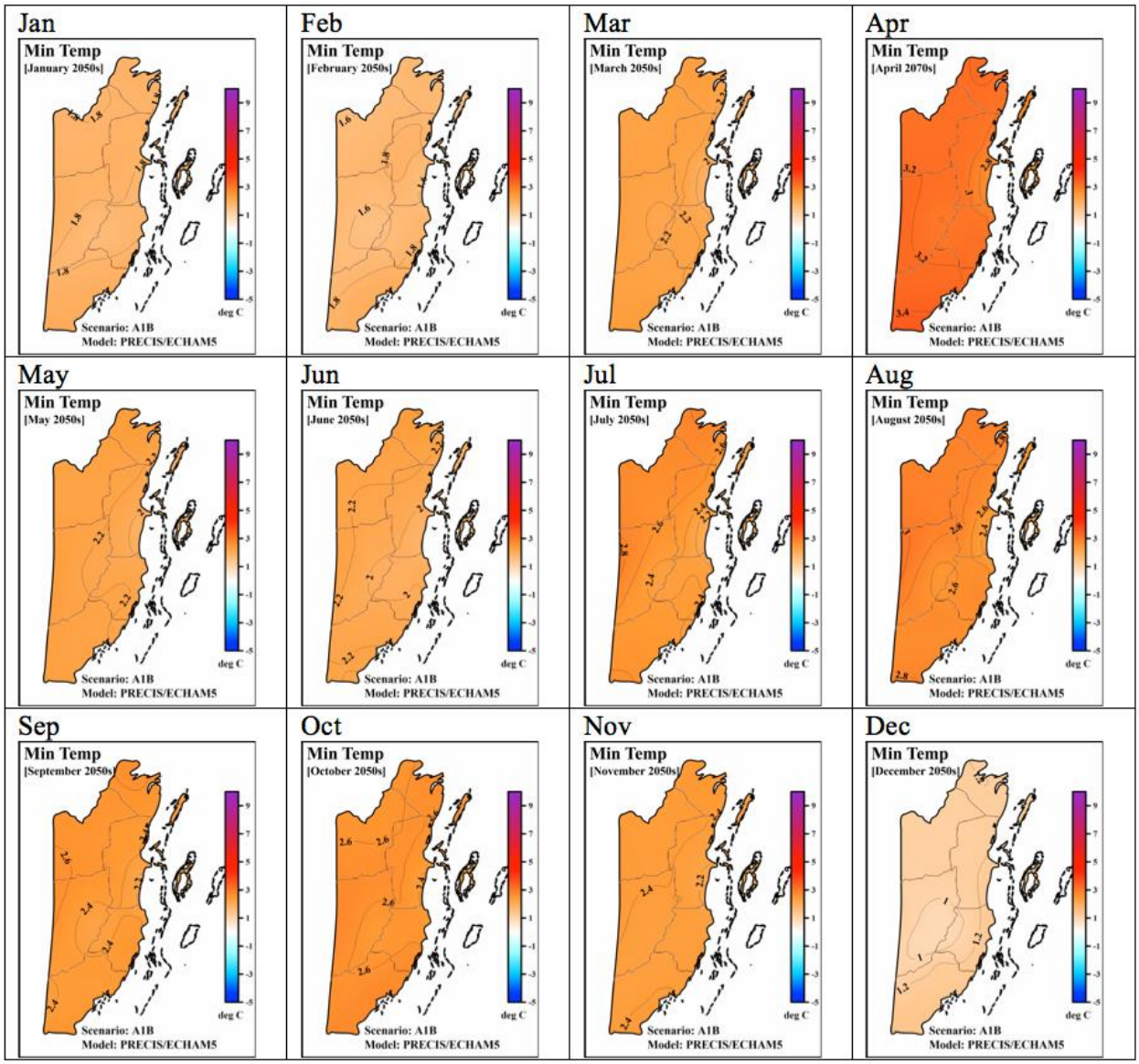


Figure 2.30: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

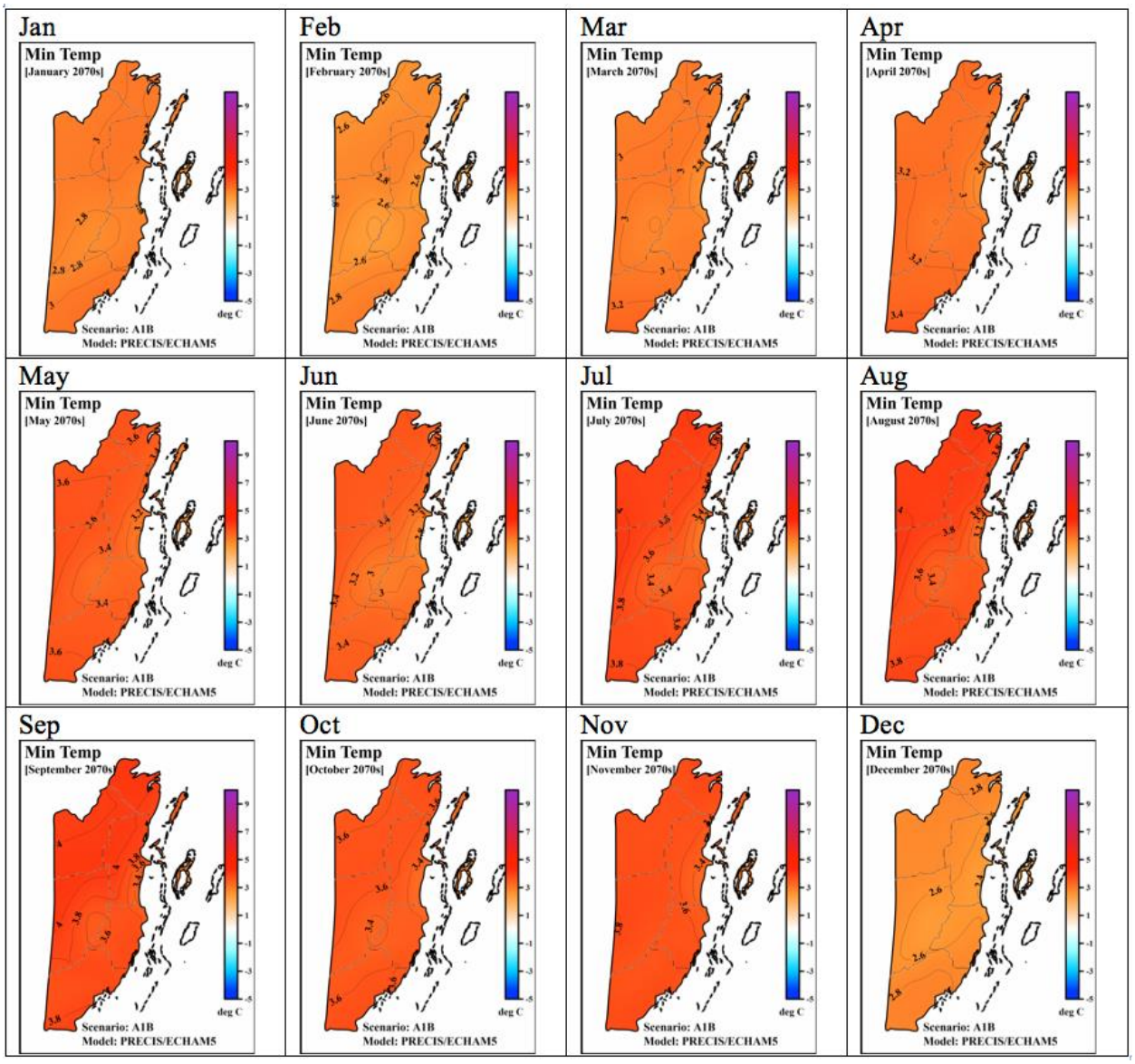


Figure 2.31: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

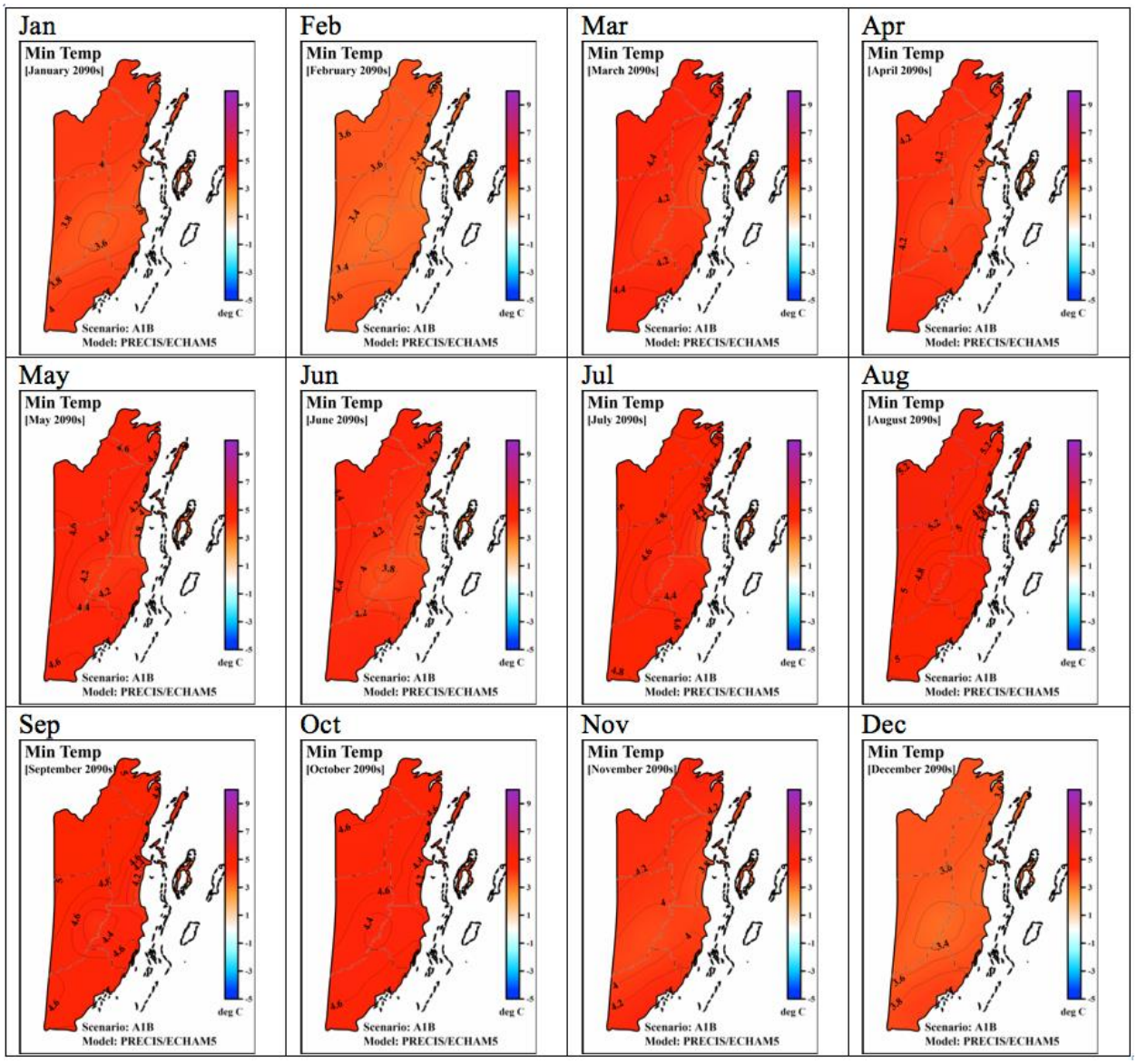


Figure 2.32: Projected difference in mean monthly minimum temperature for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

2.4.3 Relative Humidity (PRECIS/ECHAM5 Model)

Figures 2.33 to *2.37* present the changes in mean monthly relative humidity change (in percentage) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean monthly relative humidity during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario.

A general progressively drier atmosphere over the 1961 – 1990 era is projected through to 2100. With the exception of three months (Jan, Oct and Nov) in the decade of the 2020s (*Figure 2.33*), which showed increases in relative humidity of 1 – 5%, all the other months indicated

reductions in the same -1 to -5% range. In the 2030s (*Figure 2.34*), increases of 0 – 2% were indicated in the months of May and September to November, while decreases of 3 – 5% were depicted in the other months. This pattern continued in the 2050s (*Figure 2.35*), followed by a progressive further drying of -5 to -15% during the 2070s (*Figure 2.36*) and the 2090s (*Figure 2.37*). The largest decreases were consistently located in the Orange Walk and Corozal Districts.

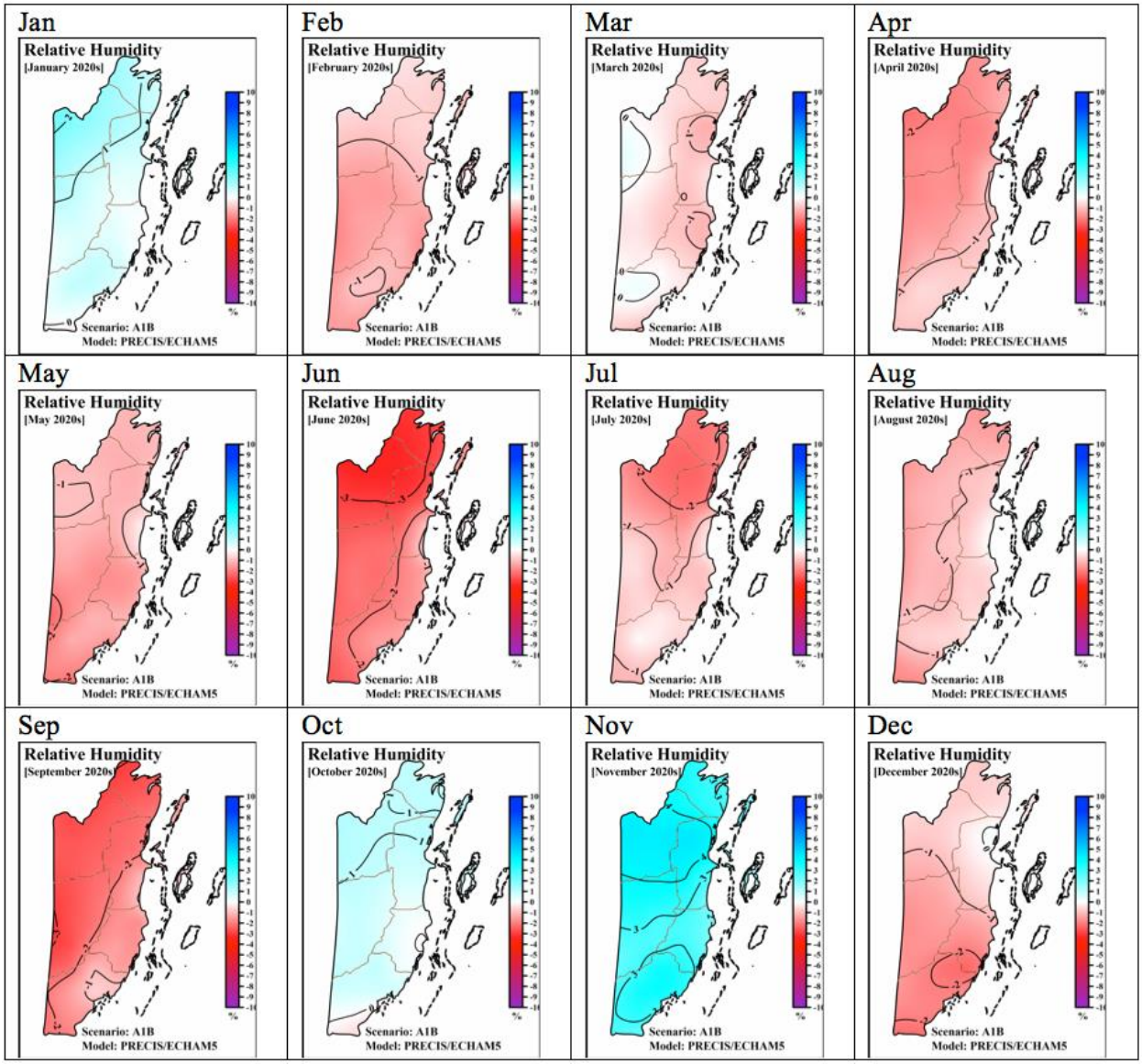


Figure 2.33: Projected difference in mean monthly relative humidity for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

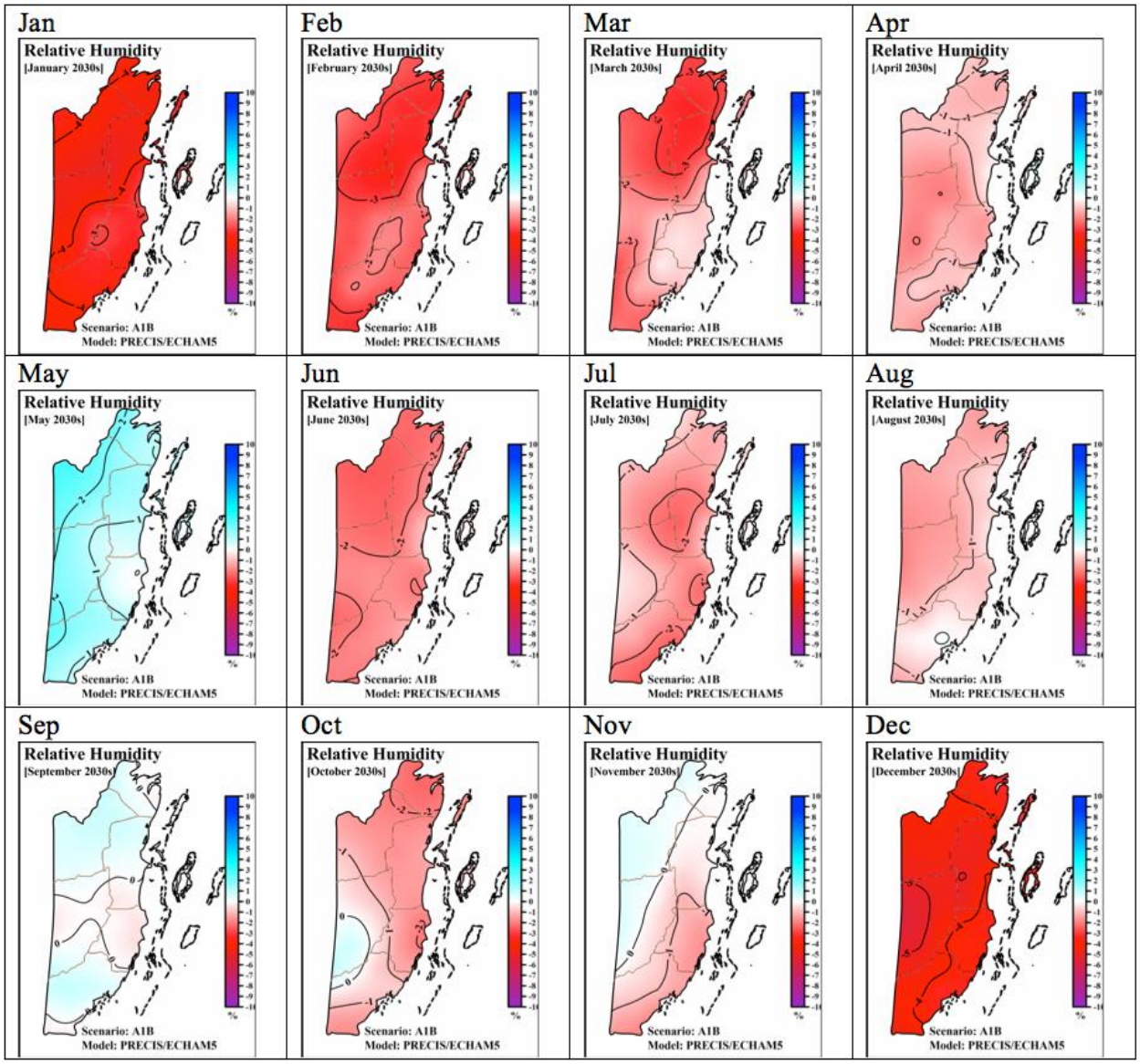


Figure 2.34: Projected difference in mean monthly relative humidity for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

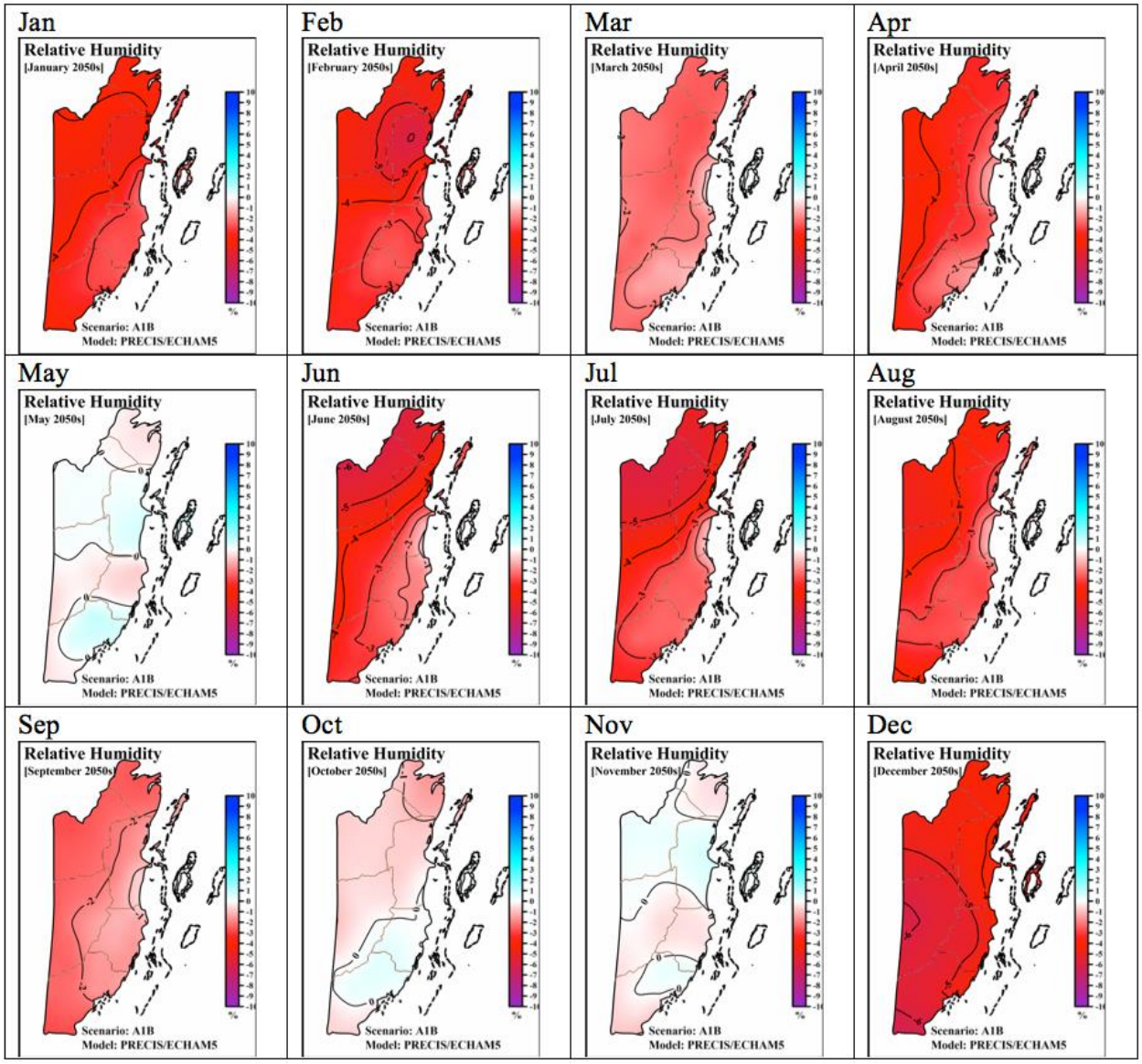


Figure 2.35: Projected difference in mean monthly relative humidity for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

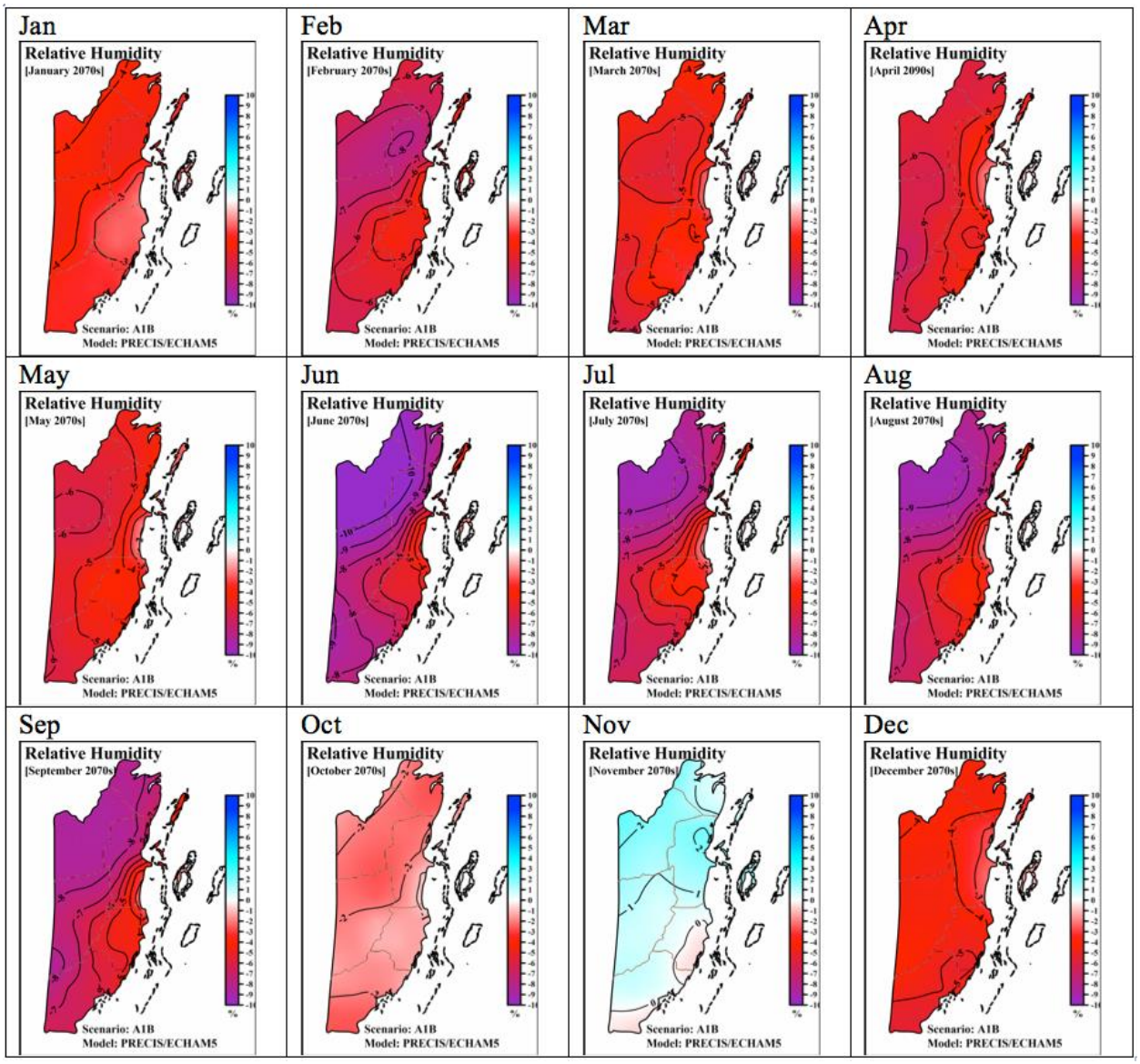


Figure 2.36: Projected difference in mean monthly relative humidity for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

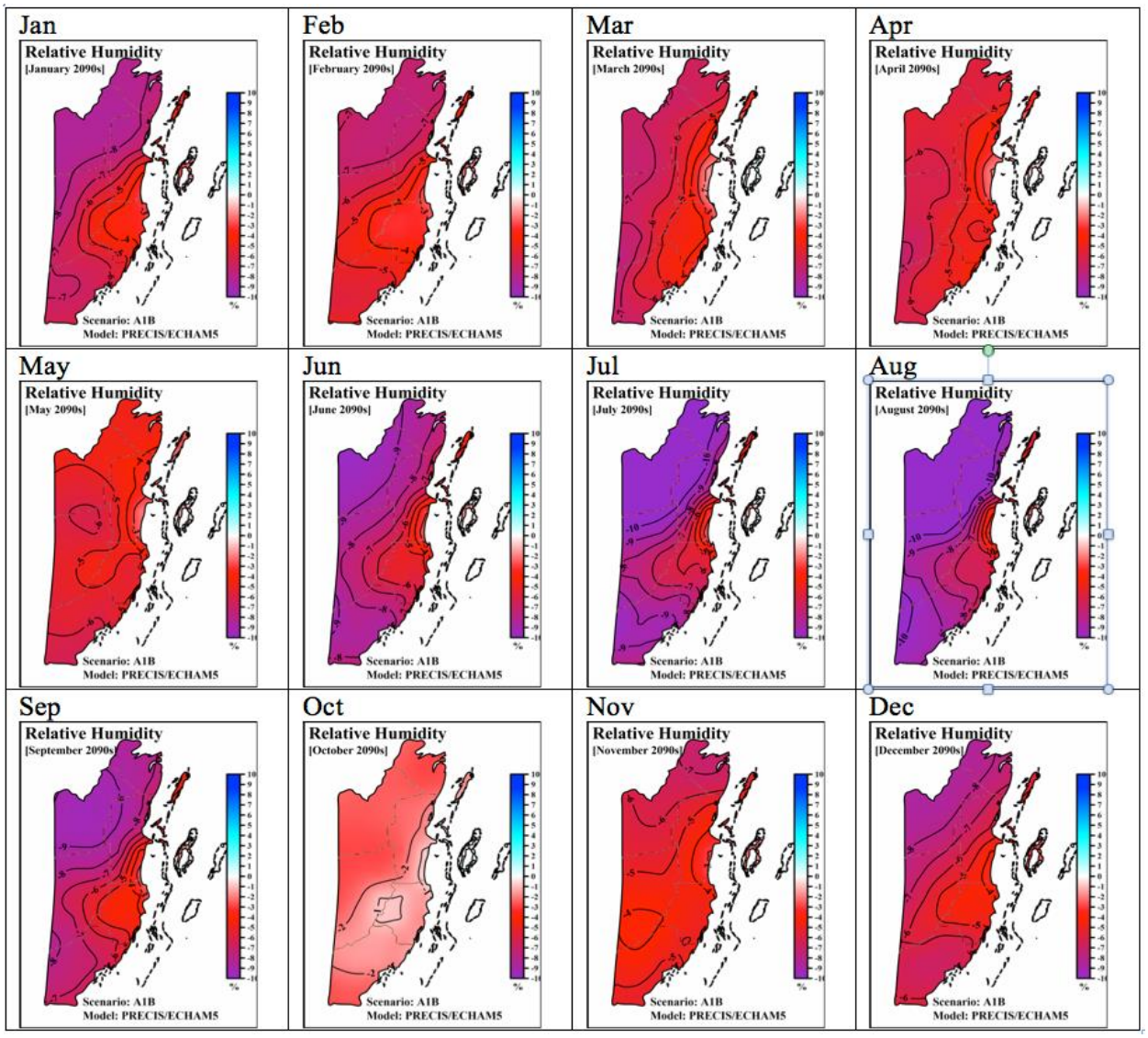


Figure 2.37: Projected difference in mean monthly relative humidity for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

2.4.4 Wind Speed (PRECIS/ECHAM5 Model)

Figures 2.38 to *2.42* present the changes in mean monthly wind speed (in meters per second) for each month in the decades of the 2020s, 2030s, 2050s, 2070s and 2090s respectively, over the mean monthly relative humidity during the period 1961-1990, using the PRECIS RCM with ECHAM5 boundary data, under the SRES A1B scenario.

The decadal change in wind speed over the 1961 – 1990 era is minimal with the variations frequently less than 1 ms^{-1} for most of the time slices (*Figures 2.38 – 2.41*). Not until the summer months of the 2090s (*Figure 2.42*) does the wind speed difference exceed 1 ms^{-1} over the values of the 1961 – 1990 period. Even then, the difference was frequently less than 1.5 ms^{-1}.

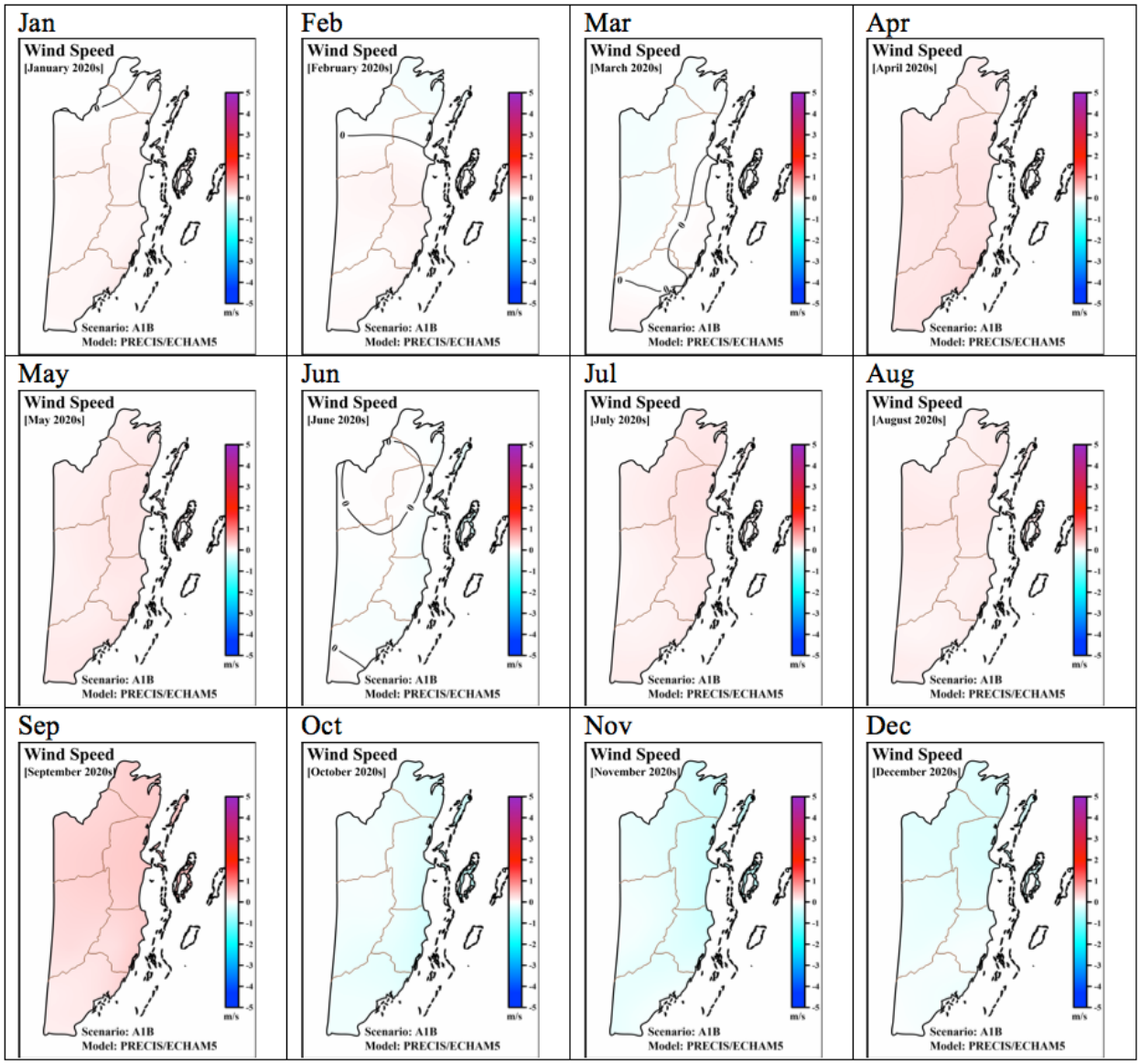


Figure 2.38: Projected difference in mean monthly relative humidity for Belize in the decade of the 2020s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

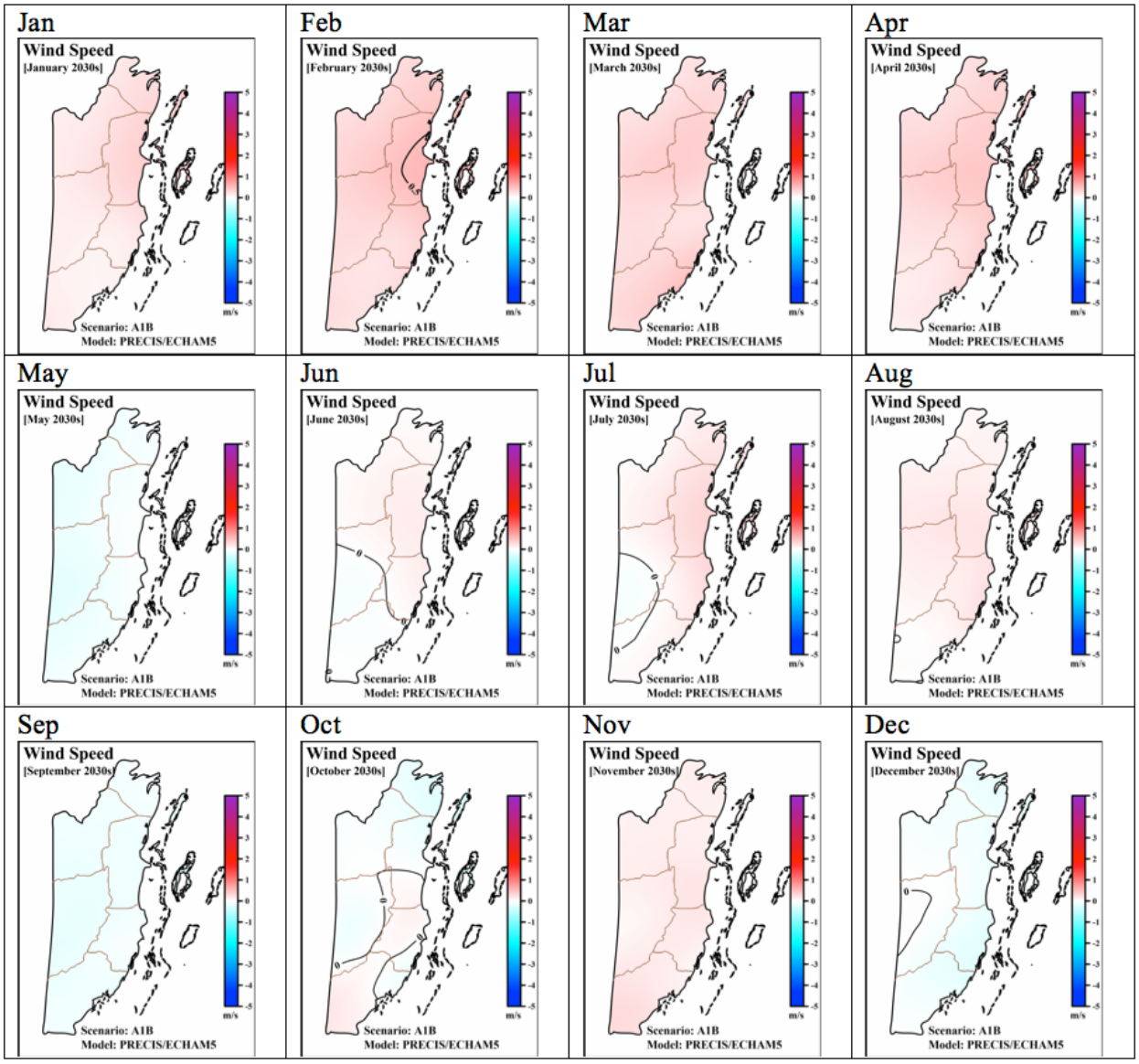


Figure 2.39: Projected difference in mean monthly relative humidity for Belize in the decade of the 2030s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

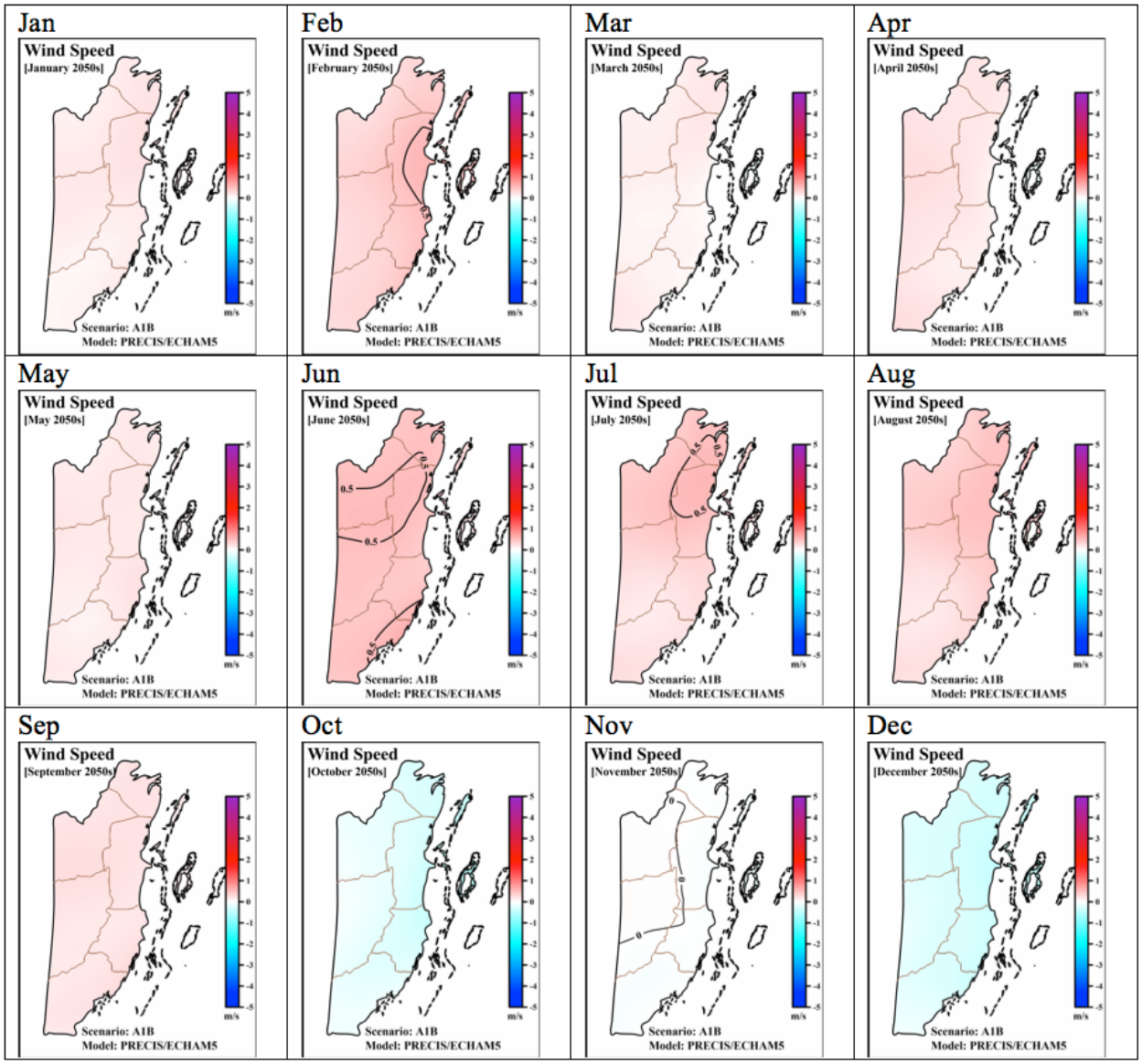


Figure 2.40: Projected difference in mean monthly relative humidity for Belize in the decade of the 2050s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

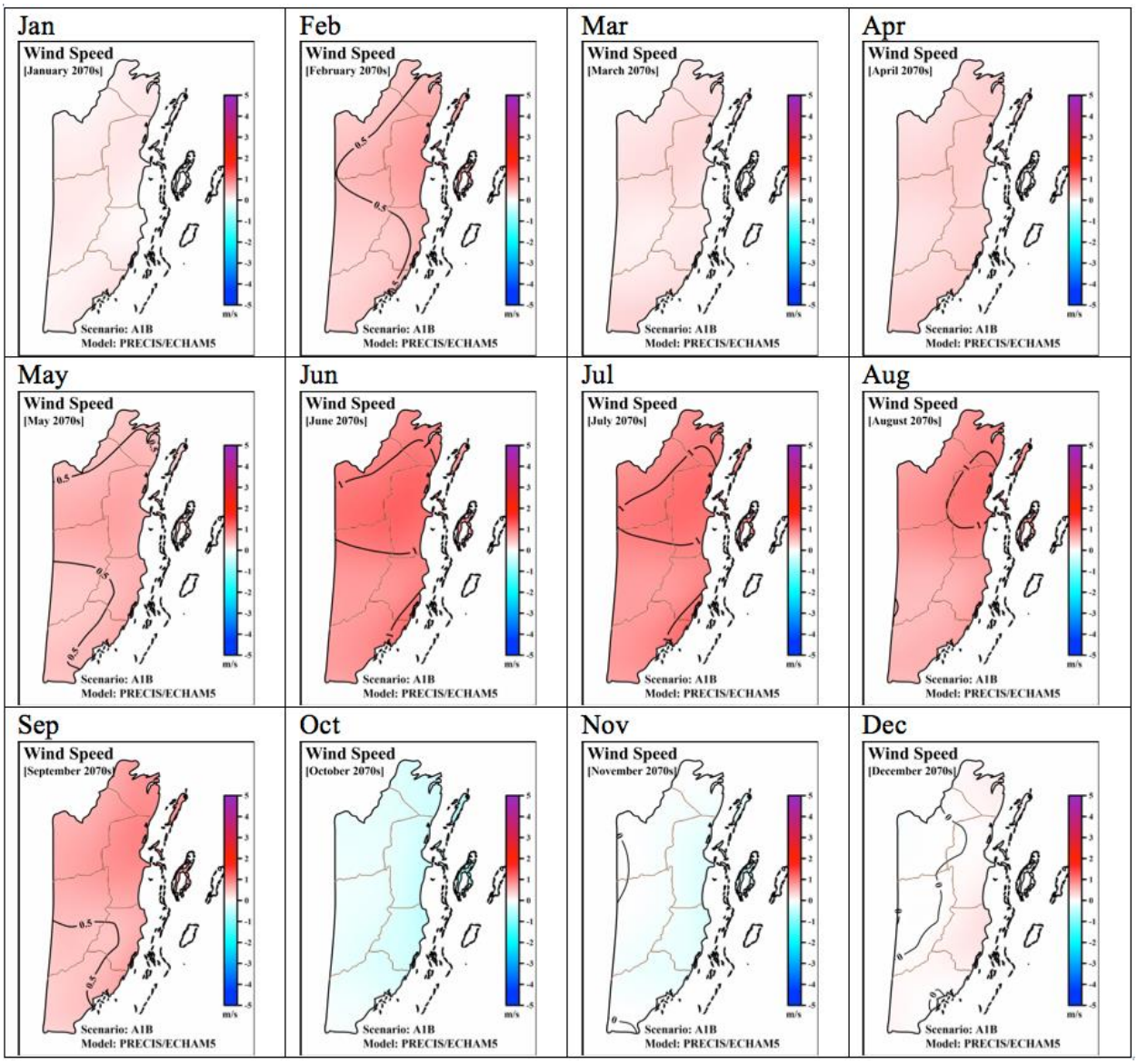


Figure 2.41 Projected difference in mean monthly relative humidity for Belize in the decade of the 2070s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

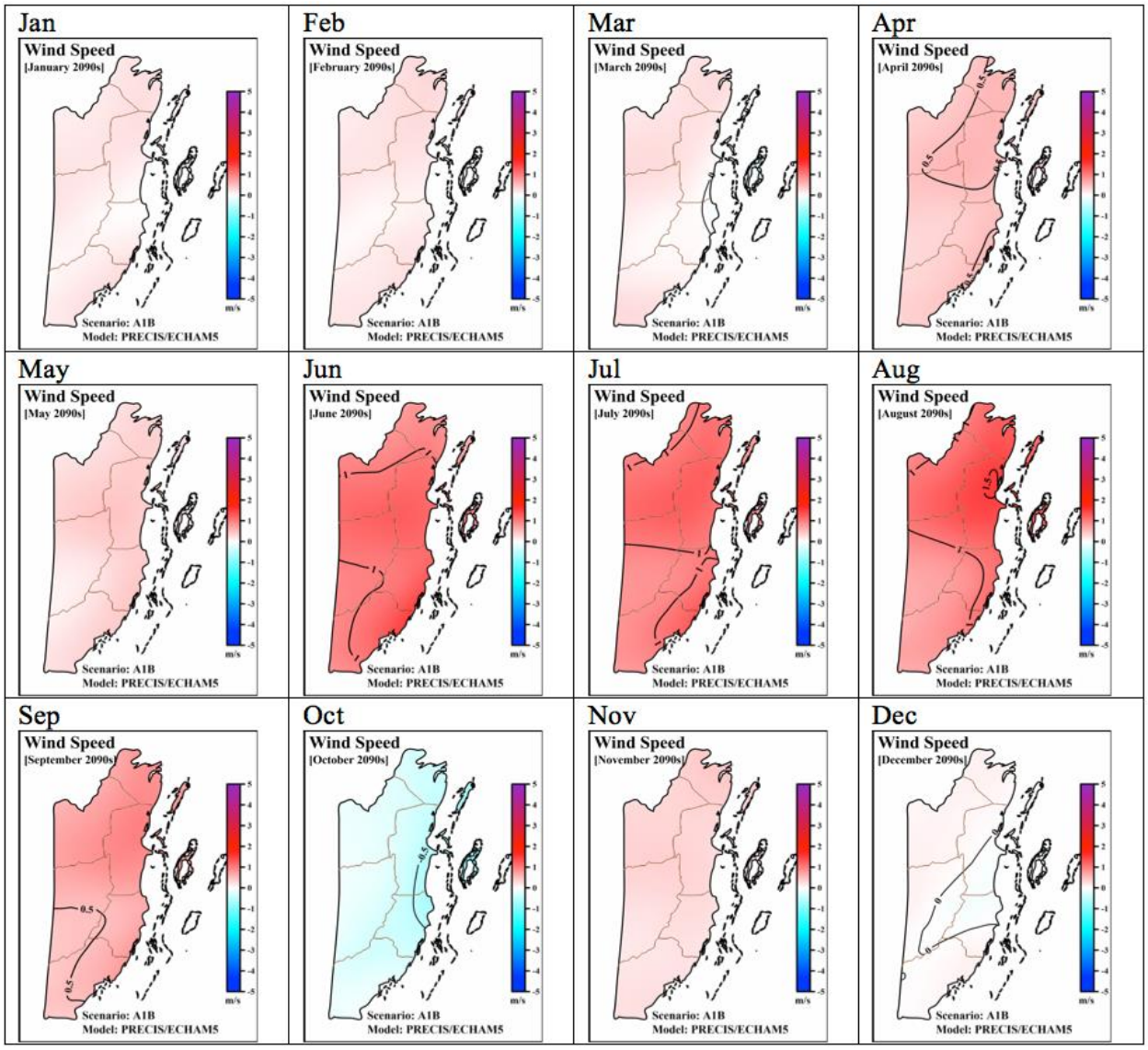


Figure 2.42 Projected difference in mean monthly relative humidity for Belize in the decade of the 2090s over the 1961-1990 period using the PRECIS/ECHAM5 model with A1B scenario.

2.5 Sea Level Rise (HadGEM2-ES Model)

Further to the data on sea level rise provided for the coastal waters of Belize (Longitude 88°W) by the IPCC reports (IPCC 2007, 2013), *Table 2.2* provides some additional data for the three Representative Pathways Projection for the scenarios RCP 2.6 (low emission scenario), RCP 4.5 (medium emission scenario) and RCP 8.5 (high emission scenario) from the Hadley Centre's Unified GCM, HadGEM2-ES. In all three scenarios, the coastal sea level is projected to exceed 10 cm by the 2030s. Heights of 22, 23 and 38 cm respectively are projected for the low, medium and high emission scenarios by 2050 and 34, 56 and 120 cm respectively by the end of the Century.

Table 2.2: Sea Level Rise Projection Along the Coast of Belize (Longitude 88) for RCP2.6, RCP4.5 and RCP8.5 from GCM model HadGEM2-ES (Unit = cm)

Year	Latitude	RCP2.6	RCP4.5	RCP8.5
2000	16.5	2.23	2.30	2.40
	17.5	2.05	2.11	2.20
	18.5	2.12	2.19	2.30
2010	16.5	1.43	2.28	3.60
	17.5	1.31	2.13	3.20
	18.5	1.24	2.02	3.20
2020	16.5	4.99	5.11	8.10
	17.5	5.03	5.45	8.50
	18.5	4.68	5.01	8.40
2030	16.5	11.01	11.54	17.20
	17.5	11.42	11.81	17.80
	18.5	10.99	11.67	17.50
2040	16.5	17.99	18.59	28.40
	17.5	18.19	18.73	28.30
	18.5	17.94	18.56	28.30
2050	16.5	21.99	23.55	38.60
	17.5	21.90	24.03	38.60
	18.5	21.86	23.93	38.40
2060	16.5	24.54	30.96	52.90
	17.5	24.45	31.14	53.00
	18.5	24.37	31.07	52.70
2070	16.5	25.13	35.97	66.80
	17.5	24.93	36.33	67.00
	18.5	24.87	36.36	66.50
2080	16.5	29.09	43.44	84.20
	17.5	29.10	43.31	84.20
	18.5	29.37	43.42	83.70
2090	16.5	34.12	52.05	100.00
	17.5	33.79	52.07	100.50
	18.5	33.86	51.94	99.80
2100	16.5	34.67	56.95	120.40
	17.5	34.24	57.32	120.80
	18.5	34.35	56.96	120.00

2.6 Summary

According to the UNDP Country Profiles studies, an increase in air temperature ranging from 2°C - 4°C is projected by 2100 for Belize. Similarly a general decrease in annual rainfall of about 10 % is projected by 2100.

With the PRECIS/ECHAM5 modelling, a slight increase in rainfall in the 2020s is suggested in the early (May) and late (Oct-Nov) parts of the wet season with peak increases of about 2-4 mm/day in the Stann Creek District. The dry season and the mid-wet season dip (June), on the other hand, are characterized by further decreases with largest reductions of about 4 mm/day in the Stann Creek and Cayo Districts. By the 2030s, reduced precipitation characterizes the entire country with exceptions only in the early (May) and late (November) sections of the wet season. Largest decreases of 2-5 mm/day are projected in the Stann Creek District.

The months of May and November are marked by increases of 1-3 mm/day in the Stann Creek, Cayo and Orange Walk Districts. In the 2050s, an enhancement of the 2030s pattern of reduced rainfall is projected to continue (-1 to -4 mm/day) in the dry season (December – April). Increased precipitation of 2-7 mm/day is projected during the early (May) and late (October - November) segments of the wet season in the Stann Creek and Cayo Districts. The surge in precipitation which characterized the early part of the wet season (May) in the earlier part of the century disappears altogether by the 2070s. The largest reduction of up to -7 mm/day is projected in the Stann Creek District during the mid-wet season dip in June. The end of the wet season (October - November) maintains increased rainfall of 2 – 5 mm/day in the western Toledo, Stann Creek, Orange Walk and Corozal Districts for the remainder of the century.

Through each decade, a broad nation-wide increase of approximately 1°C is indicated in the decade of the 2020s. Increases of 1-1.8°C in the 2030s, 1.8 – 2.9°C in the 2050s, 2.5 - 4.3°C in the 2070s and 3.2 – 4.9°C in the 2090s are projected over the 1961-1990 values. The rate of warming is projected to be consistently lowest along the coastal section of the Belize District.

Mean monthly maximum temperatures are projected to increase between 0 – 1.4°C during the decade of the 2020s over the 1961-1990 values. In the 2030s, largest increases of 1.2 – 2.2°C are projected for the cooler season. In the remainder of the year (March – October), cooler mean maximum temperatures are projected for the western Toledo, Cayo, Orange Walk, with the largest reduction of -0.5 to -1.5°C in the western section of the Cayo District, while increased values of 0.5 – 1.5°C cover the eastern half of the country. In the decades of 2050s, 2070s and 2090s, the projected pattern changes to a steady increase in mean maximum temperatures of 1.5 – 3.5°C in the 2050s to 2.6 – 3.9°C in the 2070s and then to 3.4 – 6.6°C in the 2090s over the values of the 1961 – 1990 period. For each of the time slices, the largest

increases are primarily located in the Orange Walk Districts and to a lesser extent, the western sections of Corozal and Cayo Districts.

A steady increase in the values of the mean monthly minimum temperatures over the 1961 – 1990 era are projected through to 2100. The decadal increases are 0.5 - 1.5^{o}C in the 2020s, 0.5 – 1.2^{o}C in the 2030s, 0.5 – 2.5^{o}C during the decade of the 2050s, 2.5 – 3.6^{o}C in the 2070s and 3.3 – 5.3^{o}C in the 2090s. For each of the time slices, the smallest increases are projected to be in the western section of Stann Creek and the eastern section of the Cayo Districts.

A general progressively drier atmosphere is projected through to 2100. In the 2030s through to the 2050s, increases of 0 – 2% were indicated in the months May and September to November, while decreases of 3 – 5% were depicted in the other months. A more rapid and further drying of -5 to -15% is projected in the final quarter of the 21st Century. The largest decreases were consistently located in the Orange Walk and Corozal Districts.

The decadal change in wind speed is minimal with the variations frequently less than 1 ms^{-1} for most of the time slices. Not until the summer months of the 2090s does the wind speed exceed 1 ms^{-1} over the values of the 1961 – 1990 period. Even then, the difference was frequently less than 1.5 ms^{-1}.

Sea level is projected to rise steadily along the coast of Belize. In the low, medium and high emission scenarios, sea level rise is projected to exceed 10 cm by the 2030s. Heights of 22, 23 and 38 cm respectively are projected for the low, medium and high emission scenarios by 2050 and 34, 56 and 120 cm respectively by the end of the Century.

3.0 SECTOR VULNERABILITY AND ASSESSMENTS

According to the 2008 Vulnerability Assessment of the Belize Coastal Zone(Neal, Ariola, & Muschamp, 2008)[7], the major impacts predicted on biophysical resources "will be from sea level rise, increased sea surface temperatures, changes in weather patterns and increased storm activity. Corals will be lost due to their susceptibility to increased sea surface temperature and frequent storm events as well as to coral bleaching, disease and physical damage."

This point was reinforced by Singh et al[8] in the 2014 integrated vulnerability and adaptation assessment within priority development sectors, namely coastal development, water, agriculture, tourism, human health and fisheries. In that study they noted that Belize, on the whole, is very susceptible to Climate Change and sea level rise and extreme storm surges. They noted further, that the coastal zone of Belize, where a significant percentage of the population is located and where the bulk of economic activity takes place (tourism and agricultural production), is for the most part below the high tide level. As a result, this places the coastal zone in a very precarious position with regards to climate-driven sea level rise, especially when augmented by storm surges.

The key impacts of Climate Change in Belize are the rising sea level, changes in weather patterns possibly resulting in increasing intensity, size and duration of storms and other such catastrophic events, and flooding, and anomalies in precipitation. Many marine and coastal ecosystems and coastal zone communities are inherently sensitive to Climate Change. The Inter-Governmental Panel on Climate Change (IPCC) Fourth (2007) and Fifth Assessment (2014) reports also noted that coastal wetlands are particularly sensitive to Climate Change and long-term sea-level rise as their location is closely linked to sea level.

The serious adverse effects of climate variability and Climate Change, particularly those on crop production and food security, natural ecosystems, marine and coastal areas, water resources and human health, as well as on housing and infrastructure, are particularly obvious and have been documented in various studies (Singh et al, 2014). These impacts (see Table 3.1: Impacts of Climate Change on Priority Sectors) pose major impediments to efforts being implemented to promote sustainable economic and social development and poverty reduction, which are the first and overriding priorities of the national government.

[7] http://www.hydromet.gov.bz/downloads/Coasta_Zone_Report_June2008.pdf

[8] Enhancing Belize's Resilience to Adapt to the Effects of Climate Change: Project Number 00083646; Contract Number: GCCA/PS/2013/01

TABLE 3.1: IMPACTS OF CLIMATE CHANGE ON PRIORITY SECTOR

Sector	Impacts
Agriculture	▪ Higher temperatures will favour some crops like rice however, economically important crops in Belize such as sugarcane and citrus will be adversely affected. ▪ Warmer weather resulting from high temperatures will cause soil aridity, lead to proliferation of pests and diseases, and put pressure on water resources for water irrigation purposes. ▪ Rain-fed agricultural production will be affected, demanding improved management techniques and consequently increasing the cost of production. ▪ Sea level rise will cause saline intrusion and soil salinization. ▪ The combined impact is low agricultural yields, decrease in food production and higher food prices.
Forestry	▪ Increase in the intensity of storms and hurricanes will negatively impact forestry resources, including flora and fauna ▪ Changes in climatic, hydrologic and soil conditions could lead to changes in the composition of natural vegetation. ▪ Extreme weather events (hurricanes and storms) cause uprooting of trees, and loss of commercial value and revenue ▪ Increased overall aridity could exacerbate drought potential over the long term, thus causing habitat loss and contributing to decline and death in some tree species. ▪ Increases in pests and diseases (bark beetle) and forest fires.
Fisheries & Aquaculture	▪ Rising sea level will adversely impact on fish habitat including wetlands, coral reefs and sea grasses where fish spawn, breed, feed and or grow to maturity. ▪ Rising near-surface water temperature and increasing acidification may cause massive bleaching and dieback of corals. ▪ Decrease in fish production ▪ Damage to and losses in aquaculture
Coastal & Marine	▪ Sea level rise will lead to, increased erosion, loss of beaches ▪ Damage to valuable infrastructure, increased inundation, loss of agricultural lands and crops, coastal wetlands, mangroves sea grass beds and ecosystems, and displaced coastal communities. ▪ Flooding and marine inundation ▪ Saline intrusion into freshwater lenses ▪ High temperature will result in loss of coral reefs and reduction in fish stock.
Tourism	▪ Climate Change, along with sea level rise, would result in loss of beaches, properties and public infrastructure, and result in a decrease in aesthetics and a loss of attractiveness of the destination. ▪ Coastal areas in Belize will experience high levels of saltwater intrusion and rising water tables, thereby reducing water quality, driving up the cost of water ▪ Higher temperatures will discourage older visitors, because of their susceptibility to heat stress. ▪ Tropical storms and hurricanes, compounded by sea level rise, are also likely to increase in intensity, size and duration, causing flooding and damage to transport and other infrastructure.

Sector	Impacts
	▪ Decrease in tourism arrivals could ultimately result in loss of employment for large numbers of persons who are currently employed in the tourism sector.
Human Health	▪ Climate Change will lead to higher levels of some air pollutants, will lead to an increasing number of extreme weather events and increased outbreaks and transmission of diseases through unclean water ▪ Higher temperature will increase the spread of vector diseases. ▪ Higher temperatures will also cause heat stress and will also lead to psychological stresses. ▪ Decrease in rainfall will affect potable water supply.
Human Settlements	▪ Increase in frequency and intensity of storm surge will cause more flooding and disrupt or destroy coastal settlements. ▪ Increase in frequency and intensity of storm surge and extreme rainfall will cause damages to infrastructure from flooding and erosion. ▪ Damage to transport facilities (roads, ports, airports) ▪ Damage to public facilities (water supply, energy generation) ▪ Damage to health and safety infrastructure ▪ Damage to cultural assets
Water Resources	▪ Less rainfall combined with increase in temperature will result in increased evapotranspiration and loss of available surface water. ▪ Changes in the hydrological cycle will decrease water levels and adversely impact on the generation of hydropower. ▪ Decrease in precipitation will reduce groundwater and aquifer recharge. ▪ As an effect, available water resources will be reduced
Energy	▪ Increasing use of fossil fuels increase the amount of GHG emissions into the atmosphere. ▪ The demand for electricity is likely to increase as a response to rising temperatures and a demand for air-conditioning, and among increasing populations ▪ Oil price fluctuations and consequent fluctuations in costs of production of electricity; and ▪ Changes in the hydrological cycle will decrease water levels and adversely impact the generation of hydropower.

Changes in weather patterns and storm events will result in physical damage and changes in biological processes such as reproduction for mangroves and sea grass beds. Mangroves are expected to retreat sequentially to maintain their position within the ecosystem. Rising sea levels and increase in storm events will most likely cause inundation, erosion and storm surges effects in coastal areas, beaches and cays. The socioeconomic impacts will be from loss of habitat and coastal areas which in turn will directly affect the tourism and fisheries industries.

Responding to Belize's climate vulnerabilities requires making simultaneous advances on adaptation, disaster risk reduction, environmental sustainability and poverty reduction. This requires an integrated approach which addresses the underlying causes of disaster risk, seeks to improve preparedness for future disasters, and ensures integration and alignment with national developmental programmes and Millennium Development Goals (MDGs) goals with

respect to the environment. Belize's disaster risk management framework is principally framed by the Disaster Preparedness and Response Act of 2002, which established the National general policy of the government related to the mitigation of, preparedness for, response to and recovery from emergencies and disasters".

The integrated and inclusive approach to Climate Change, which is being recommended, is needed to ensure the implementation of robust and comprehensive strategies and actions. Such an approach must be cross-sectoral and multidisciplinary in nature, covering adaptation and mitigation. This shall allow the country to transition strategically to low-carbon economic development while bolstering its resilience to the impacts of Climate Change.

4.0 POLICY, INSTITUTIONAL AND LEGISLATIVE FRAMEWORK

Policy, institutional and legislative frameworks for Climate Change response provide a coherent governance architecture which not only establishes the legitimacy of those measures, but set goals, define objectives, regulate the conduct, and establishes the monitoring mechanisms that can ensure compliance. In that regard, for Belize NCCPSAP to be fully and effectively implemented, a sound and enabling policy, legislative, and institutional framework must be defined and established.

4.1 Policy Instruments to address Climate Change

GOB has to date, issued no formal, overarching, national policy in respect of Climate Change mitigation and adaptation. In 2008, a draft Adaptation Policy was developed but was never finalized or adopted. However, since the publication of its First National Report to the UNFCCC the GOB has sought, through several line ministries, to initiate policy-based activities, at the sector level, to address (adapt and mitigate) the impending impacts of Climate Change.

Some of the key ministries are the Ministry of Forestry, Fisheries and Sustainable Development, the Ministry of Natural Resources and Agriculture, the Ministry of Energy, Science and Technology and Public Utilities, and the Ministry of Finance and Economic Development.

Some of the key policy initiatives undertaken to date are as follows:

- **Integrated Coastal Zone Management Plan (2013):** The Plan outlines a vision and implementation plan for sustainable use of coastal resources, supports an integrated approach to development planning and adapting to Climate Change. The Plan contains critical measures for Climate Change adaptation relevant to this sector, which includes the identification of short, medium and long-term strategies to address the threats of Climate Change on coastal communities as well as coastal and marine resources. The management plan also takes into consideration the necessary adaptive measures to mitigate projected Climate Change impacts and recommends that all developments within the coastal areas of Belize include an adaptation strategy to mitigate the effects of Climate Change. It also recommends the prioritization of ecosystem-based adaptation as it builds resilience and reduces the vulnerability of local communities to Climate Change.

- **Ministry of Energy, Science & Technology and Public Utilities (MESTPU) Strategic Plan 2012-2017:** This strategy document which was adopted in 2012 outlines Belize's National Sustainable Energy Strategy which includes a number of programmes and activities to support the development of the country's non-renewable and renewable

energy resources. The strategy is aimed improving energy efficiency and conservation, and developing Belize's domestic energy resources to facilitate private sector participation and investment in the new low carbon energy sector. It also seeks to empower rural communities to participate in income-generating activities, particularly women and young people; and to encourage and advise the public and private sectors and the general public to become more aware of the critical energy issues and to take appropriate actions and response measures. The Plan also commits to building MESTPU's institutional capacity in order to accomplish its mandate.

- **Sustainable Energy Action Plan for Belize:** The Sustainable Energy Action Plan ('the Action Plan') is a tool to achieve Belize's renewable energy (RE) and energy efficiency (EE) potential while meeting Government's economic, social, and environmental goals. This Action Plan provides the framework of actions and tasks to overcome the barriers to sustainable energy.

- **Integrated Water Resource Management Policy:** In 2008, the Government of Belize approved the preparation of an Integrated Water Resource Management Policy for Belize. This policy document acknowledges the growing threats of Climate Change to the water resources sector and articulates a strategic and comprehensive approach to water management by promoting programmes to enhance the protection and restoration of forest ecosystems and water catchment areas as well as the adoption of standards and best practices for the extraction, production, and distribution of water in order to build resilience relating to freshwater resources in Belize. In 2010, the MNRA adopted the National Integrated Water Resources Act (NIWRA) which forms the foundation for water resource management in Belize. This new legislation recognizes the roles of the various institutions involved with the management of Belize's water resources and the various legislations administrated by these agencies allowing for a more nationally coordinated and integrated management approach, through the establishment of the National Integrated Water Resources Authority.

- **Food and Agriculture Policy (2012):** The Food and Agriculture policies are guided by the following major challenges/constraints that are facing the sector: labour productivity, inadequate/inappropriate credit, opportunity for improving food security, inadequate infrastructure, maintaining plant/animal health status, increase agro-processing and linkage to the tourist industry, greater diversification. For Fisheries, emphasis is placed on ensuring a sustainable supply of marine products, particularly, lobster, shrimp and conch, while continuing to contribute to food production, foreign exchange earnings and an increasingly globally competitive sector. Acknowledging that the issue of Climate

Change is not adequately addressed in this policy document, the MNRA, is currently working on the preparation of a National Agriculture Sector Adaptation Strategy to address Climate Change in Belize. This adaptation strategy is expected to be completed later this year.

- **Belize Health Sector Strategic Plan 2013-2017:** This Strategic Plan 2013-2017 outlines the management of both communicable and non-communicable diseases and highlights means to improve health metric goals on primary care whilst stimulating growth in secondary and tertiary care systems. The Plan provides a clear overview of the vision for the health sector which is to maximize health and health equity throughout the sector in alignment with their core values. A situation analysis of the relationship between health and political and demographic forces; economic activity and employment; geography and access; poverty alleviation; environmental health; safety and security; agriculture and nutrition, self-management of health is further provided.

- **National Sustainable Tourism Master Plan of Belize (2010):** This master plan identifies and describes the four strategic goals for the Belize Tourism sector as: leadership; optimization; sustainability and competitiveness. An economic overview of Belize Tourism Sector and the identification of new strategic commercial segments are detailed. Further details are delineated with respect to building the competitiveness of the tourism sector in terms of product development, an integrated destination development, experiential quality enhancement, empowerment of stakeholders and a proactive solution to funding resources, governance and sustainability. Sustainability indirectly pertains to potential Climate Change issues insofar as it includes the identification, assessment and monitoring of specific natural and cultural safeguards needed to avoid degradation of tourism assets. Nonetheless, reference to Climate Change is virtually absent from this document.

- **Second National Communication to UNFCCC (2012)**

  This study details vulnerability assessments of the following sectors as they are considered critical to the development of Belize: agriculture; coastal zone; fisheries and aquaculture; health; tourism and water resources. The study also outlined greenhouse gas emissions on a sectoral basis to develop recommendations for Climate Change mitigation and to facilitate renewable energy initiatives. It further substantiates the need for effective and efficient technology systems in building climate resilience.

- **National Development Framework:** The National Development Framework provides a holistic approach to building Climate Change resilience in accordance with national developmental goals in addition to regional and international obligations.

- **Growth and Sustainable Development Strategy 2014 – 2017**: The Growth and Sustainable Development Strategy (GSDS) is the guiding development plan for the period 2014 – 2017. It adopts an integrated, systemic approach and encompasses medium-term economic development, poverty reduction and longer-term sustainable development issues. The GSDS builds on previous documents including especially Horizon 2030: National Development Framework for Belize 2010 – 2030. The GSDS is Belize's primary planning document, providing detailed guidance on priorities and on specific actions to be taken during the planning period.

- **National Agenda for Sustainable Development (2013):** The Strategy document acknowledges the various development strategies and policies being implemented in Belize and advocates the mainstreaming of sustainable development principles and goals in national planning processes. Therefore, it seeks to integrate sectoral policies with sustainable development principles and priorities. This agenda is guided by Horizon 2030 as the latter identifies the core values and long-term vision for development of the Government of Belize. At the national level, The National Agenda for Sustainable Development will facilitate the mainstreaming of core values and principles of sustainable development into national visions and goals across sectoral strategies and activities. At the institutional level, this agenda will facilitate strategic planning, management and monitoring of Belize's initiatives to ensure their alignment with sustainable development goals, values and principles.

- **The National Climate Resilience Investment Plan (2013)**

  This plan promotes a well-coordinated approach to national development by integrating planning processes across all sectors of the economy through participation among a broad spectrum of stakeholders. It therefore provides the framework for an efficient, productive and strategic approach to building economic and social resilience and development. Special importance is given to building climate resilience and improving disaster risk management capacities across all sectors.

- **Enhancing Belize's Resilience to Adapt to the Effects of Climate Change - Vulnerability and Adaptation Assessment (2014)**

  This project provides an in-depth analysis of the impacts of Climate Change on the following key sectors in Belize: coastal zones; water resources; agriculture; fisheries;

tourism and human health. It further delineates substantial recommendations for adaptation and mitigation measures for each sector in short, medium and long terms in order to build national climate resilience.

- **Management and Protection of Key Biodiversity Areas**

  In September 2014, the GoB received a US $6.0856 million grant from the Global Environmental Facility (GEF) to strengthen natural resource management and biodiversity conservation in Key Biodiversity Areas (KBAs) of Belize. The Project will achieve this by (i) supporting forest protection and sustainable forest management plans and practices in targeted Protected Areas (PAs), rehabilitation of critical areas of high conservation values by local communities, and community-based sustainable use of ecosystem goods and services; (ii) improving management and monitoring of PAs, including development and implementation of management plans in the targeted PAs, and improving legal framework for the protection of biodiversity and forests; and (iii) strengthening capacity for enhanced enforcement of environmental regulations, including increased coordination for balancing environmental management and development, and improving environmental screening tools and processes. Six protected areas have been targeted based on the disquieting threats including agricultural encroachment, illegal logging and hurricane damage.

  The KBA project will serve as a critical counterpart in addressing some of the key drivers of deforestation by supporting the promotion of improved forest management practices, revising forest legislation, strengthening forest fire management and response capacity, facilitating local level partnerships with communities, strengthening monitoring and compliance, and increased coordination for balancing environment and development agendas.

4.2 Institutional Framework

The cross cutting nature of Climate Change means that several sectors not only are exposed to the impacts of climate variability and sea level rise, but also have a role to play in the management of policies being designed to address the problems identified. In recognition of this imperative, the GOB established, in 2009, the Belize National Climate Change Committee (BNCCC)[9] and in 2012 a pro-tem National Climate Change Office (NCCO) in the Ministry of

[9]The BNCCC, which is Chaired by the Chief Executive Officer of the MFFSD, is comprised of three Sub-Committees: Vulnerability Assessment & Adaptation, Mitigation, and Public Education & Outreach, and a total membership of twenty-three, primarily governmental institutions, though it does have representation from the private sector and civil society.

Forestry, Fisheries and Sustainable Development (MFFSD), with the assigned responsibility of coordinating the country's national, regional and international response to Climate Change and ensuring the development of a consistent framework across line ministries and agencies for mitigating the effects of Climate Change. The NCCO is also charged with the responsibility of coordinating Belize's external response to the various reporting and other requirements of UNFCCC and attracting or sourcing funds to support the national effort.

Notwithstanding the establishment of the NCCO, it is also recognized that there are several institutions whose functions and ministerial responsibilities are critical for the effective implementation of Climate Change (See Table 4.1).

Table 4.1: Ministries, Agencies and Climate Change Management Functions

Ministry	Key Agencies	Key Functions
Ministry of Fisheries, Forestry and Sustainable Development	▪ Department of the Environment ▪ Forestry Department ▪ Fisheries Department ▪ National Climate Change Office ▪ Sustainable Development Unit ▪ Coastal Zone Management Authority ▪ Protected Areas Conservation Trust	Preservation, protection and improvement of the environment and the control of pollution Climate Change management, UNFCCC Focal Point Fisheries, forestry, and coastal zone management Sustainable development Sustainable development of Belize's natural and cultural resources.
Ministry of Finance and Economic Development	Economic Development	Economic Development
Ministry of Natural Resources and Agriculture	▪ Agriculture Department ▪ Land and Survey ▪ Physical Planning ▪ National Integrated Water Resource Authority ▪ Solid Waste Management ▪ Pesticide Control Board	Agriculture, Agroindustry & Aquaculture Physical Planning, land use planning and management of national lands Water Industry (except water supply and services) Solid waste management Pesticide control
Ministry of Works and Transport	▪ Works ▪ Road infrastructure	Public Works Road Construction and Maintenance Bridge Construction and Maintenance
Ministry of Health	Ministry of Health	Public Health, sanitation and diseases prevention and control.
Ministry of Energy, Science & Technology and Public Utilities	▪ Geology and Petroleum Department ▪ Public Utilities Commission ▪ Energy Department	Energy etc./Climate Change mitigation Energy efficiency and conservation
Ministry of Labour, Local Government Rural Development and National Emergency Management	▪ Meteorological Office ▪ National Emergency Management Organisation (NEMO) ▪ Department of Local Government and Rural Development	IPCC Focal Point National Meteorological Service. Municipalities, Village Councils National Emergency Management Organisation (NEMO), National Fire Service
Ministry of Tourism, Culture and Civil Aviation	▪ Belize Tourism Board	Tourism Development and Regulation Sustainable tourism Planning and

Ministry	Key Agencies	Key Functions
		Management Monitoring and Quality Management Marketing and Promotion of Tourism Assets
Ministry of Housing and Urban Development	▪ Housing and Planning Department ▪ Central Building Authority	Housing and Planning Department, Central Building Authority Regulation of land use, housing and infrastructural development Approve building plans Issue building permits

The responsibilities assigned to the various Ministries/Agencies stems, in some cases, from their statutory mandate e.g, Department of the Environment (DOE), Fisheries Department, Forestry Department, and the Land Utilization Authority. In other cases it relates to their Ministerial responsibility (e.g. energy, agriculture, roads and works, housing, tourism etc.) that is constitutionally assigned to each Minister on appointment and is part of their portfolio responsibility. Some Government Departments and agencies (Tourism, Health, Municipal bodies, and Coastal Zone) having recognized the extent to which climate variability and Climate Change is impacting on the respective resource sectors are working with the NCCO to ensure that Climate Change adaptation and mitigation measures are incorporated into their revised policies.

The growing awareness of the need to address Climate Change impacts is therefore welcomed, but also raises the issue of coordination of effort. To be effective it is important that collaboration amongst these ministries and departments takes place in order to make the best use of limited financial and human resources. It is imperative, therefore, that under the new dispensation that sufficient attention is paid to the need for a national coordination of Climate Change efforts. This will ensure that there is a coherent national approach and avoid the duplication of policies or even promulgating conflicting polices leading to the inefficient use of resources and the achievement of limited results.

4.3 Legislative and Regulatory Framework

Apart from the Environmental Protection (Clean Development Mechanism) Regulations, 2011, drafted under the Environmental Protection Act, there is no specific Climate Change legislation in Belize. There are however a wide range of environmental, planning and natural resource legislation that are germane to the effective mainstreaming of Climate Change in Belize. The articulation of a new governance structure and ultimately, the mainstreaming of Climate Change into the development planning agenda and framework is predicated not just on individual policy initiatives but on a coherent legislative and regulatory framework which emphasizes the national importance of Climate Change and reinforces a sense of responsibility towards development which is environmentally friendly and climate resilient.

The Convention specifically mentions public health and impact assessment. These matters are specifically dealt with by the Public Health Act and the Environmental Protection Act and EIA Regulations. A major area where mainstreaming of Climate Change is of critical importance is in the area of land use planning (this will include statutes such as the Land Utilization Act, the National Lands Act and the Housing and Planning Act). Increasingly countries are coming to realize that, in the long term Climate Change adaptation and mitigation need to be supported by an integrated, cross-cutting approach – in other words, mainstreamed into national development planning. Of equal importance will be areas such as the Forest and Fisheries Acts. See Table 4.2 below for a full list of legislative instruments which are supportive of Climate Change adaptation and mitigation and which, over time, will require revision and modification in order to facilitate the mainstreaming of Climate Change adaptation and mitigation.

It should be noted that unlike the Constitution of several other Caribbean and Commonwealth countries e.g., India (see Article 48A), (Government of India) or the Constitution of Guyana (Chapter II[10]) (Government of Guyana) which both contains explicit constitutional provisions for the protection of the environment in the body of the Constitution, there are no such provisions in the Constitution of Belize. Article 48A[11] of the Constitution of India provides, "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country". Environmental protection is a fundamental duty of every citizen under Article 51-A(g)[12] which states, "…it shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures."

There is nothing in the Constitution of Belize comparable to Article 48A and 51-A. In addition, the Constitution of Belize does not mention or expressly refer to Climate Change. It is to be noted, also, that the Preamble to the Constitution does not form part of the Constitution. However, at the end of the Preamble, the following words appear, "NOW, THEREFORE, the following provisions shall **have effect as the Constitution** of Belize." Thus it is clear that the Constitution of Belize only starts at after Part I.

In the absence of such specific national legislative instruments, obligations for compliance with or adherence to national, regional and international treaties, conventions, agreements and policies one has to look to those instruments themselves, of which there are several.

[10]Constitution of Guyana http://www.constitution.org/cons/guyana.htm
[11]Constitution of India, Part IV, Article 48A http://www.constitution.org/cons/india/p04048a.html
[12] Constitution of India, Part IVA, Article 51A(g) http://www.constitution.org/cons/india/p4a51a.html

TABLE 4.2: SUMMARY OF ENVIRONMENTAL INSTITUTIONS & LEGISLATIVE FRAMEWORK

Ministry	Portfolio Responsibility	Legislation
Ministry of Forestry, Fisheries and Sustainable Development,	Environmental Protection and Natural Resources Management (Pollution prevention and control, EIA, Climate Change, Biodiversity, Fisheries, Forestry, Protected Areas and Coastal Zone Management),	Environmental Protection Act Cap 328
		Fisheries Act Cap 210, High Seas Fishing Act Cap.210.01
		Forest Act Cap 213, Forest Fire Protection Cap 212 Act, Private Forest (Conservation) Act Cap 217, Wildlife Protection Act Cap. 220, National Parks System Act Cap 215
		Coastal Zone Management Act Cap 329
		Protected Areas Conservation Trust Act Cap 218
Ministry of Natural Resources and Agriculture	Land Administration & land Management, land Use Planning, Mining, Integrated Water Resource Management, Solid Waste Management, Agriculture, Agroindustry, Aquaculture, Animal and Plant Health, quarantine, Bio-safety, agriculture and fishing Cooperatives	National Lands Act Cap 191, Land Tax Act Cap 58, Aliens Landholding Act Cap 179, Land Acquisition (Promoters) Act Cap183, Land Acquisition (Public Purposes) Act Cap184, *Land Adjudication Act Cap 185,* Land Reform (Security of Tenure) Act Cap 186,Land Surveyors Act Cap187, Land Utilization Act Cap188, Registered Land Act Cap194, Strata Titles Act Cap 196,
		Veterinary Surgeons Act 326Agriculture Fires Act Cap 204
		Mines and Minerals Act Cap 226
		Belize Agricultural Health Authority Act Cap 211
		Pesticides Control Act Cap 216
		Solid Waste Management Authority Act Cap 224
		National Integrated water resources Act No. 19, 2010
Ministry of Energy, Science and Technology and Public Utilities	Petroleum, energy. Public utilities (water, electricity, telecommunications, postal service) science and technology	Petroleum Act Cap 225
		Public Utilities Commission Act Cap 223 Electricity Act Cap 221
Ministry Of Health	potable water quality monitoring, sanitation and environmental health, registration of pharmaceuticals, public clinics and medical facilities	Public Health Act Cap 40, Chemists and Druggists Act Cap 311, Food and Drugs Act Cap 291, Medical Services and Institutions Acts Cap 39. Medical Practitioners' Registration Act Cap 318
Ministry of labour, Local Government, Rural Development and National Emergency Management	Occupational health and safety, disaster prevention, emergency management[oil and chemical spill, rural water supply	Labour Act Cap 297
		Disaster Preparedness and Response Act Cap 145
		Fire Brigades Act Cap137 Fire (Negligent Use Of) Act Cap 117
		Reconstruction and Development Corporation Act
Ministry of Tourism, Culture and Civil Aviation	Tourism Development Culture, Archaeology, Abandoned Wrecks, Archives, Arts and Culture, Cultural Development, Museums	Belize Tourism Board Act Cap 275 ;Hotels and Tourist Accommodation Act Cap 285
		Belize National Tourism Council Act Cap 276 Belize Airports Authority Act Civil Aviation Act Border Management Agency Act
		National Institute Of Culture and History Act Cap 331
		Belize Archives Act Cap 333
		Abandon Wrecks Act Cap 235

4.4 Comparative Legislative Instruments

As countries seek to develop policies, strategies and action plans to address Climate Change adaptation and mitigation the question always arises as to the need for or extent to which changes should be made to existing legislation or even the need for new, overarching legislation. Our examination of practices in several jurisdictions seems to suggest that while a few countries have made changes to legislation, or in some cases, passed new legislation, that really, is not the norm. The United Kingdom Parliament passed the Climate Change Act in 2008. It set the world's first legally-binding Climate Change target, requiring the UK to reduce its greenhouse gas emissions by at least 80 per cent by 2050 compared with 1990. The primary focus of the UK Climate Change Act is reduction of greenhouse gas emissions.

A number of countries have followed the example set by the UK and have reinforced their international commitments about action on Climate Change through national legislation. A study by the Global Legislators Organisation and the Grantham Research Institute (Townshend et al., 2013) found that 32 of 33 major economies have progressed or are progressing significant climate and/or energy-related legislation. It concluded that much of the substantive progress on legislative activity on Climate Change in 2012 took place in emerging economies, including China, which will provide the motor of global economic growth in coming decades.

The only other country in Europe with a Climate Change Act is Austria. Five countries or federal states (Hungary, Slovenia, the Autonomous Community of the Basque Country, and two federal states of German: Baden Wurttemberg and Berlin) have already drafted bills on climate protection, but these have not yet been adopted.

In 2012 Mexico became the second country in the world to pass a far-reaching Climate Change Act that will impose binding emission reduction targets on successive governments. The Bill is broadly similar to the UK's Climate Change Act and will require future governments to meet periodic emission reduction targets with the end goal of cutting carbon emissions 50 percent by 2050.

In the Philippines, the Climate Change Act establishes a Climate Change Commission which is set up as an independent and autonomous body and attached to the office of the President. The Commission is comprised of the President of the Republic of the Philippines and three Commissioners appointed by the President. The Commissioner has an advisory board comprised of senior civil servant, members of the academia, NGOs and the public sector.

The Act calls for the development of a Framework Strategy and Programme on Climate Change. In addition the Act contains requirements for a National Climate Change Action Plan as well as local Climate Change Action Plans.

The Kenyan Government adopted a Climate Change Authority Bill in 2012 which seeks to provide a framework for mitigating and adapting to the effects of Climate Change on various sectors of the economy. The Bill seeks to achieve this by establishing a Climate Change Authority and vesting the Authority with specific powers and functions relating to mitigating and adapting to the effects of Climate Change and development of response strategies to the effects of Climate Change.

4.5 International Obligation

UNFCCC:

The GOB ratified the UNFCCC in 1994, and in 2003 the country became a signatory to the Kyoto Protocol. Article 4(f) of the UNFCCC requires each Party to the Convention to:

"(f) Take Climate Change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions, and employ appropriate methods, for example, impact assessments formulated and determined nationally with a view to minimizing adverse impacts on the economy, on public health and on the quality of the environment, of projects or measures undertaken by them to mitigate or adapt to Climate Change."

The focus of the Convention (Article 4(f)) is on policies and actions. As legislation is closely linked to policies and in fact is an expression of policy – it will be necessary to review existing policies and legislation to determine the extent to which mainstreaming of Climate Change is necessary. The UNFCCC enjoys near universal membership of 165 Signatories and 195 parties.[13] Under the principle of common but differentiated responsibility, Belize is obliged to act within the wider framework of global Climate Change.

Kyoto Protocol:

Linked to the UNFCCC is the Kyoto Protocol[14], which sets binding targets for reducing GHG emissions. Recognizing that developed countries are principally responsible for the current high levels of GHG emissions in the atmosphere as a result of more than 150 years of industrial activity, the Protocol places a heavier burden on developed nations under the principle of "common but differentiated responsibilities." Therefore, the major distinction between the Protocol and the Convention is that while the Convention encouraged industrialized countries to stabilize GHG emissions, the Protocol commits them to do so.

Under the Treaty, countries must meet their targets primarily through national measures. However, the Kyoto Protocol offers them an additional means of meeting their targets by way of three market-based emissions trading mechanisms – known as "the carbon market"; Clean Development Mechanism (CDM); and, Joint Implementation (JI). The Kyoto Protocol is generally

[13] 194 States and 1 regional economic integration organization, the European Union.
[14] The Protocol was adopted in Kyoto, Japan, on 11 December 1997 and entered into force on 16 February 2005.

seen as an important first step towards a truly global emission reduction regime that will stabilize GHG emissions, and provides the essential architecture for any future international agreement on Climate Change.

Also of importance is the ***Convention on Wetlands of International Importance (Ramsar, 1971)*** which addresses wetland preservation and promotes sustainable utilization and facilitate adaptation of wetlands to current climate trends. From the adaptation point of view, the existing legal frameworks in Belize (including the international framework provided by the Convention on Wetlands), has the ability to protect existing wetlands, although enforcement is not always ideal and many wetlands are still being lost. However, there is no legal statute that would authorize protection of lands that may become wetlands as sea level rises. This poses an important impediment to adaptation.

Prevention of development could occur through regulatory action or through purchase of properties, either outright or of the development rights to the property. Regulatory prohibition of development occurs most often through setbacks. Setbacks have a long legal history and have been used extensively in urban planning and for water quality (stream setbacks for example). Aside from the legal and compensatory issues associated with setbacks, there is a practical issue of just where to draw the setback line, given the uncertainty of the magnitude of future sea level rise. The second practical issue is what to do when shoreline retreat eventually reaches the setback line.

There are two (2) wetlands in Belize recognized as important under the Ramsar Convention:

1. The Crooked Tree Wildlife Sanctuary – Ramsar Site #946 (6,637 hectares) under co-management of the Forest Department and Belize Audubon Society; and
2. The Sarstoon-Temash National Park - Ramsar Site #1562 (16,955 hectares) under co-management of the Forest Department and the Sarstoon Temash Institute for Indigenous Management (SATIIM).

4.6. Regional Obligations

'Regional Framework for Achieving Development Resilient to Climate Change

In October 2007, the CARICOM Heads of Government requested the Caribbean Community Climate Change Centre (CCCCC) to prepare a strategy that addresses Climate Change in the region. In July 2009 the Heads of Government approved the 'Regional Framework for Achieving Development Resilient to Climate Change' (the Regional Framework). The Regional Framework defines CARICOM's strategic approach for coping with Climate Change and is guided by five strategic elements and some twenty goals designed to significantly increase the resilience of

the CARICOM Member States' social, economic and environmental systems. The strategic elements are as follows:

1) Mainstreaming Climate Change adaptation strategies into the sustainable development agendas of CARICOM States.

2) Promote the implementation of specific adaptation measures to address key vulnerabilities in the region.

3) Promote actions to reduce greenhouse gas emissions through fossil fuel reduction and conservation, and switching to renewable and cleaner energy sources.

4) Encouraging action to reduce the vulnerability of natural and human systems in CARICOM countries to the impacts of a changing climate.

5) Promoting action to derive social, economic, and environmental benefits through the prudent management of standing forests in CARICOM countries.

The Regional Framework provides a roadmap for action by Member States and regional organisations over the period 2009-2015, while building on the groundwork laid by the CCCCC and its precursor programmes and projects in Climate Change adaptation. It also builds upon the extensive work undertaken by governments, regional organisations, NGOs and academic institutions in recent years assessing the impacts of a changing climate. The Heads of Government subsequently mandated the CCCCC to prepare an Implementation Plan (IP) to take forward and deliver the strategic elements and goals identified in the Regional Framework.

In March 2012, at the Twenty-Third Inter-Sessional Meeting of the Conference of Head's of CARICOM, held in Paramaribo, Suriname, the Heads of Governments approved the IP which seeks to do for things as detailed below:

1) "Seeks to guide the identification and prioritization of actions by regional and national stakeholders under each strategic element and goal area of the Regional Framework through the use of risk management approaches to decision making;
2) Considers responsibilities and functional co-operation between regional organizations and national governments;
3) Recognizes that there are existing significant resource and capacity challenges that hold back the region's sustainable development and growth and proposes building on a process known as the 'three-ones' to assist in resource mobilization and co-ordination of actions; and
4) Proposes a monitoring and evaluation (M&E) framework"[15]

[15] Delivering Transformational Change 2011-21: Implementing the CARICOM 'Regional Framework for Achieving Development Resilient to Climate Change' March 2012, pg 19

The Liliendaal Declaration

CARICOM countries have considerable concerns about the severe threats posed by a changing climate to their development prospects. These concerns were reflected in the Liliendaal Declaration which the CARICOM Heads of Government endorsed at their meeting in Guyana in July 2009. The Liliendaal Declaration is the CARICOM political statement on Climate Change. It defines the national and international positions of the CARICOM Member States and makes a number of declarations which can only be delivered by transformational change. These include:

1) Long-term stabilization of atmospheric greenhouse gas (GHG) concentrations at levels which will ensure that global average surface temperature increases will be limited to below 1.5^0 C of pre-industrial levels;

2) Adaptation and capacity-building must be prioritized and a formal and well-financed framework established within and outside the UNFCCC to address the immediate and urgent, as well as long-term, adaptation needs of vulnerable countries, particularly SIDS and Least Developed Countries (LDCs).

3) The need for financial support to SIDS to enhance their capacities to respond to the challenges brought on by Climate Change and to access the technologies that will be required to undertake needed mitigation actions and to adapt to the adverse impacts of Climate Change.

In the Declaration, the Heads of Government expressed grave concern that the region's efforts to promote sustainable development and achieve the Millennium Development Goals (MDGs) are under severe threat from the devastating effects of Climate Change and sea level rise. The Declaration emphasized that dangerous Climate Change is already occurring in all SIDS regions including the Caribbean, requiring urgent, ambitious and decisive action by CARICOM States and by the international community.

Central American Commission for Environment and Development (CCAD)

The CCAD is an organ of the Central America Integration System (SICA), whose mission is to strengthen regional integration with respect to the environment, in order to propel the region’s development along the path of economic, social and ecological sustainability. To achieve this, the CCAD works at the regional level to harmonize environmental management policies and systems, and to promote common and concerted positions at extra-regional and global forums.

Since 1992, the CCAD has been responsible for the important task of coordinating and promoting compliance with regional commitments, as well as those stemming from the CBD. Significant progress in this respect has been made during the past decade. The Forest Department is the National Focal Point.

Alliance for the Sustainable Development of Central America (Alianza Centroamericana Para El Desarrollo Sostenible (Alides)) (1994)

Formed on October 12, 1994, the Alliance for Sustainable Development (ALIDES) consists of a comprehensive strategy for regional development covering four priority areas: democracy, socio-cultural development, economic development and sustainable management of natural resources and improving environmental quality.

Belize was present at the meeting in Managua, Nicaragua when the Central American Countries adopted the concept of sustainable development mentioned above and the principles, with the bases, general objectives and instruments of ALIDES. Parties agreed to create a National Councils on Sustainable Development (NCSDs) in their respective countries as well as the Central American Sustainable Development Council (CASDC), made up of the Presidents and Prime Minister or their Delegates.

In addition there are several other international environmental agreements to which Belize is a party which contain measures that will help to address impending impacts of Climate Change. Of particular significance are the ***Conventions on Biodiversity (CBD)***, and the ***United Nations Convention to Combat Desertification (UNCCD)***, which, together with the UNFCCC, derive directly from the 1992 Earth Summit. Each instrument represents a way of contributing to the sustainable goals of Agenda 21. The three conventions are intrinsically linked, operating in the same ecosystems and addressing interdependent issues. The CBD, in particular, is of special significance as it seeks to promote the conservation of biodiversity and stabilize ecosystem functioning in situations where there is environmental fluctuation - some species may be able to compensate for the function(s) of species that are lost. By enhancing collaboration among the conventions, synergy will be increased and there will be reduced duplication of activities.

Another regional Convention of great importance in supporting Climate Change adaptation measures is the ***Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena, 1983)*** and it's Three Protocols. The Cartagena Convention, as it is more popularly known, is a legally binding treaty. It is a wide-ranging treaty which is in part a framework treaty (articles 3), general provisions, and (article 4), general obligations. Three protocols have been formulated under its auspices: the Oil Spills (Cooperation in Combating Oil Spills), SPAW (Specially Protected Areas and Wildlife), and LBA (Pollution from Land-based Sources and Activities) Protocols. Belize is currently party to the treaty and these three Protocols.

Article 10 of the convention, pertaining to 'specially protected areas', is very important for Belize. This section states that, "The Contracting Parties shall, individually or jointly, take all appropriate measures to protect and preserve rare or fragile ecosystems, as well as the habitat of depleted, threatened or endangered species, in the Convention area. To this end, the

Contracting Parties shall endeavour to establish protected areas. The establishment of such areas shall not affect the rights of other Contracting Parties and third States. In addition, the Contracting Parties shall exchange information concerning the administration and management of such areas."

The SPAW Protocol was adopted in 1990 and entered into effect in 2000, and sets out some specific obligations for parties that are important for Belize. Article 3 states:

> *Each Party to the SPAW Protocol shall, in accordance with its laws and regulations and the terms of the Protocol, take the necessary measures to protect, preserve and manage in a sustainable way, within areas of the Wider Caribbean Region in which it exercises sovereignty, or sovereign rights or jurisdiction:*
>
> *(a) areas that require protection to safeguard their special value; and*
>
> *(b) threatened or endangered species of flora and fauna.*

Each Party shall regulate and, where necessary, prohibit activities having adverse effects on these areas and species. Each Party shall endeavour to co-operate in the enforcement of these measures, without prejudice to the sovereignty, or sovereign rights or jurisdiction of other Parties. Any measures taken by such Party to enforce or to attempt to enforce the measures agreed pursuant to this Protocol shall be limited to those within the competence of such Party and shall be in accordance with international law.

Each Party, to the extent possible, consistent with each Party's legal system, shall manage species of fauna and flora with the objective of preventing species from becoming endangered or threatened.

Belize has made significant strides in protecting its flora and fauna with the adoption of the Protected Area Conservation Trust Act in 1995, which establishes a trust fund to provide funds to operate, maintain, and enhance protected areas for their conservation and visitor enjoyment. That was further enhanced with the adoption of a National Protected Area System Plan (2005) which detail plans for the governance and management of protected areas in Belize.

Efforts at enhancing the protection of sensitive areas in light of growing threats of Climate Change, receive a major boost with the announcement in August 2014 that the Kyoto Protocol's Adaptation Fund has approved a US$6 million Marine Conservation and Climate Adaptation (MCCA) project for Belize. The project, which will be implemented by the World Bank and executed by the Belize Protected Areas Conservation Trust (PACT), is geared towards strengthening the climate resilience of the Belize Barrier Reef System by implementing priority ecosystem-based marine conservation and climate adaptation measures. Applying an approach

that combines ecosystem-based adaptation with enabling policy and legal frameworks, the project will support: the reef's protection regime, including by expanding and enforcing marine protected areas (MPAs) and replenishment zones; viable and sustainable livelihoods for affected users; and awareness raising and information sharing on the health of the reef ecosystem and climate resilience of coral reefs.[16]

[16] http://larc.iisd.org/news/adaptation-fund-approves-project-in-belize-accredits-namibian-nie/

5.0 DRAFT NATIONAL CLIMATE CHANGE POLICY

5.1 Preamble

The Government of Belize, a member state of the Caribbean Community, (CARICOM), ratified the United Nations Framework Convention on Climate Change (UNFCCC) on October 31, 1994, the Kyoto Protocol in 2003, and submitted its Initial National Communication (INC) to the UNFCCC in 2002, and it's Second National Communication in the second quarter of 2012. By ratifying the UNFCCC, Belize has committed itself to develop, adopt and implement policies and measures to mitigate the adverse effects of Climate Change and adapt to these changes. Climate Change policies, strategies and actions shall thus be developed in accordance with the principles held therein the UNFCCC. In the regard for regional and national commitments, The Government of Belize shall also adhere to the principles upheld in the "***CARICOM Regional Framework for Achieving Development Resilient to Climate Change,"*** the "***Sistema de la Integración Centroamericana"*** (SICA) Regional Strategy on Climate Change "***National Development Framework for Belize 2010-2030"*** so as to ensure that regional and national prospects for economic, human and environmental sustainability, development and prosperity are not compromised in the pursuance of Climate Change adaptation and mitigation measures.

Accepting the findings of the IPCC, and of other scientific bodies, which state that global temperatures are increasing due to a rise in the levels of greenhouse gases in the atmosphere due to the burning of fossil fuels and other human activities; Government recognizes the scientific forecasts that global warming is likely to persist for several decades, whether or not causative activities were to cease with immediate effect;

It is further accepted that global warming will give rise to Climate Change, which may be manifested, inter alia, by:

- Sea level rise resulting in the loss of coastal lands, seasonal flooding and expansion of wetlands;
- Alterations in local and regional temperature regimes causing changes in weather patterns;
- Alterations in rainfall patterns, leading to uncertainties in crop production and possibly increased flooding;
- The increase in frequency of severe weather events such as droughts, rainstorms and hurricanes and tornadoes;

Taking cognizance of the threats global warming and Climate Change poses to developing states such as Belize, which are projected to be rather severe given limited adaptive capacity and particular social, cultural and economic vulnerabilities;

Recognizing that Climate Change is already having a negative effect on the social, economic and productive sectors such as the coastal zone and human settlement, fisheries and aquaculture, agriculture, forestry, tourism, water, energy and health; the physical environment including land, and infrastructure, such as roads and coastal structures; as well as the sustainability of natural resources such as marine and coastal areas, natural ecosystems, and biodiversity;

Further recognizing that even though Belize contributes only a small percentage of total global greenhouse gas emissions, it is confronted by an alarming disproportionate level of threat from the impacts of global warming and Climate Change, due to its inherent vulnerability;

Aware of the relevant provisions of the UNFCCC; the Kyoto Protocol; the Convention on Biological Diversity (CBD); the 1983 Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region; the 1994 Barbados Programme of Action for the Sustainable Development of Small Island Developing States (BPoA); the 2002 Johannesburg Declaration on Sustainable Development, the Millennium Development Goals; the Plan of Implementation of the World Summit on Sustainable Development; the 2005 Mauritius Strategy for the Implementation of the Barbados Programme of Action; the 2014 SIDS Accelerated Modalities of Action (S.A.M.O.A) Pathway;

Aware of the transboundary nature of this phenomenon and the increasing subsequent threats to the development and prosperity of CARICOM states as reflected in the Revised Treaty of CARICOM, and the Liliendaal Declaration endorsed by the CARICOM Heads of Government (CARICOM, 2009); and the work by the Caribbean Community Climate Change Centre in producing an Implementation Plan to guide the delivery of the 'Regional Framework for Achieving Development Resilient to Climate Change' (the Regional Framework);

Recognizing that national adaptation planning modelled on the implementation strategy 'Delivering Transformational Change 2011-21' can enable all Member States of CARICOM to mainstream Climate Change and to address adaptation and mitigation in a coherent and coordinated manner;

Also recognizing that because of their vulnerabilities Climate Change impacts will increase their development challenges;

Acknowledging the need to situate planning in the broader context of sustainable development planning;

Committed to taking all necessary and feasible actions at the national, regional and international levels to meet the stipulations of the UNFCCC and the Kyoto Protocol, which includes implementing and effectively executing adaptation and mitigation measures;

Declaring the need for a policy to guide the national action plan and strategy to address the effects of Climate Change; such a policy entails a well-coordinated and holistic approach across various economic sectors including sectoral and cross-sectoral adaptation and mitigation measures.

Have Agreed to the articulation of a National Climate Change Policy, Strategy and Action Plan which will serve as a Road Map for all governmental entities as they seek to develop and implement adaptation and mitigation policies and programme in their respective Sectors.

5.2 Vision

Demonstrating leadership and commitment in ensuring the challenges of Climate Change and sea level rise are fully addressed, harnessing necessary resources in support of the development of special programmes that is effective, resilient and sustainable.

5.3 Goal

The goal of the National Climate Change Policy is to guide the short, medium and long-term processes of adaptation and mitigation of Climate Change in accordance with national prospects for sustainable development in addition to regional and international commitments. This policy shall ensure an integrated and well-coordinated approach to Climate Change adaptation and mitigation by fostering the development of appropriate administrative and legislative mechanisms in alignment with national sectoral policies and adaptation plans. The policy will further provide guidance to mainstreaming along a low emission development pathway by focusing on the reduction of anthropogenic emissions of greenhouse gases.

5.4 Objectives

The objectives of the National Climate Change Policy are to:

1 Integrate Climate Change adaptation and mitigation into key national developmental plans, strategies, laws, regulations and budgeting.
2 Build Climate Change resilience in order to prevent, reduce or adapt to the negative impacts of Climate Change on key sectors, economic activity, society and the environment through policies and strategic processes.
3 Promote capacity building and networking across all implementing/involved agencies in addition to securing adequate financing over the short, medium and long term periods for effective and timely adaptation and mitigation responses

4 Capitalize on opportunities currently available through Climate Change negotiation processes that can also enhance development prospects of the nation
5 Ensure that all national sectors are adequately prepared to address the negative impacts of global Climate Change
6 Encourage the private and public sectors to invest in Climate Change adaptation and mitigation initiatives by providing economic incentives
7 Enhance diplomatic and negotiating capacities to better address Climate Change concerns and interests on the regional and international stage
8 Promote the development of efficient and relevant institutional mechanisms that will enhance the planning and response capacity to Climate Change

6.0 GUIDING PRINCIPLES

The National Climate Change Policy, Strategy and Action Plan for the Government of Belize shall adhere to the following guiding principles:

A. The response to Climate Change shall be in alignment with the principles of the UNFCCC

In due consideration of national circumstances and the subsequent best suited approach to effective Climate Change adaptation and mitigation in Belize, the National Climate Change Policy shall be guided by the principles endorsed by the UNFCCC.

B. The principle of equity shall be observed

The Government of Belize, under Article 3.1 of the UNFCCC should aim to protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities.

C. The specific needs and vulnerability of the Country and of its citizens shall be given full consideration

Under Article 3.2 the specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of Climate Change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration.

D. The response to Climate Change shall follow the precautionary approach

Under Article 3.3, where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures, taking into account that policies and measures to deal with Climate Change should be cost-effective so as to ensure global benefits at the lowest possible cost. To achieve this, such policies and measures should take into account different socio-economic contexts, be comprehensive, cover all relevant sources, sinks and reservoirs of greenhouse gases and adaptation, and comprise all economic sectors. Efforts to address Climate Change may be carried out cooperatively by interested Parties.

E. The approach to Climate Change shall be in alignment with sustainable development

The Government of Belize, under Article 3.4 of the UNFCCC shall promote sustainable development. Climate Change adaptation and mitigation strategies, actions and

programmes must also be environmentally sustainable and in the interest of economic growth and development.

F. Cooperation among member states of the UNFCCC

The Parties shall cooperate to promote a supportive economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties, thus enabling them to better address the problems of Climate Change. Measures taken to combat Climate Change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade.

G. The principles endorsed by the Rio Declaration on Environment and Development shall be fully observed

Under the Rio Declaration human and environmental rights are acknowledged as an integral part in sustainable development.

H. The response to Climate Change shall be in alignment with the strategic elements outlined in the Regional Framework for Achieving Development Resilient to Climate Change, and the goals designed to significantly increase the resilience of Member States' social, economic and environmental systems; The strategic elements are as follows:

a. Mainstream Climate Change adaptation strategies into the sustainable development of agendas of Member States;
b. Promote the implementation of specific adaptation measures to address key vulnerabilities;
c. Promote actions to reduce greenhouse gas emissions through fossil fuel reduction and conservation, and switching to renewable and cleaner energy sources;
d. Encourage action to reduce the vulnerability of natural and human systems …to the impacts of a changing climate;
e. Promote action to derive social, economic, and environmental benefits through the prudent management of standing forests in CARICOM countries.

I. An integrated approach to Climate Change

An integrated approach is important in minimizing the use and costs of limited technical, administrative, and financial resources.

J. Effective and sustained involvement of civil society

Support the sustained involvement of private sector entities, and NGOs/CBOs at the community level as they seek to implement innovative measures to adapt to Climate Change impacts and climate variability within the broader sustainable development context'.

K. Aggressive, innovative and on-going public awareness programme that targets all sectors in Belize

To be effective, there must be an aggressive, innovative and sustained Climate Change education and public awareness programme that targets all sectors of Belizean society.

L. An evidence based response to Climate Change

Consistent with the precautionary principle and in recognition of the uncertainties associated with Climate Change projections, encourage research, and support data collection at the national, regional and international levels which could inform on policies to address impacts of Climate Change on Belize.

M. The response to Climate Change shall also be in alignment with the 'three-ones' principle for resource mobilisation

As outlined in 'Delivering Transformational Change 2011 – 21: Implementing the CARICOM Regional Framework for Achieving Development Resilient to Climate Change'**,** the 'three-ones' principle advocate the pursuit of:

a. One Plan
b. One Co-ordinating Mechanism
c. One Monitoring and Evaluating System

N. The approach to Climate Change shall reflect the concerns outlined by the Central American Commission for Environment and Development;

In keeping with the Central American Commission for Environment and Development's pathways to prosperity, the Government of Belize will engage in environmental cooperation among member states to conserve the environment, promote sustainability in order to encourage growth and prosperity. The importance of environmentally friendly production processes and increased citizen participation in environmental decision making are also substantiated.

O. The response to Climate Change shall also be in alignment with the core values outlined in the Growth and Sustainable Development Strategy

The Growth and Sustainable Development Strategy affirms the integrity of sustainable development initiatives of the nation.

P. Sustaining a strong and diverse cultural background

Multi-culturalism, collective identity and patriotism will maintain and enhance the vibrancy and resourcefulness of decision-making, governance and management of Climate Change, and conserve the integrity of the national cultural heritage (archaeological or living; tangible or intangible).

Q. Gender equity and non-discrimination in access to opportunities

Taking account of the gender-differentiated needs and roles of the society, encourage equity and non-discrimination and provide equal access opportunities to all in all livelihood development initiatives.

R. Excellence

Determined to achieve the most efficient and effective methods for building Climate Change resilience for the nation.

S. Democratic governance for effective public administration and sustainable development

Building upon Pillar 1 of the National Development Framework, the above is held in high regard as a means to developing an efficient governance framework that guarantees citizen participation, accountability, transparency and proficient management of public resources in order to address Climate Change concerns.

T. Education, Training and Capacity Building for Development through continuous Learning

Under Pillar II of the National Development Framework, quality education for all citizens is essential for sustainable economic growth and national prosperity.

U. Monitoring mechanisms

Development of mechanisms to ensure that the information generated through research and monitoring is incorporated into the decision-making process

V. Protection of the environment while promoting sustainable social and economic development

As one of Belize's high level goals, the protection of the natural heritage and economic resources is attributed high importance especially given the profound appreciation for Belize's natural resources by its citizens. As such, environmental sustainability will be incorporated into development planning and initiatives for achieving sustainable development.

This policy, which shall be considered a living document and which shall be revised from time to time whenever new scientific findings dictates; shall direct all government and non-government organizations, the private sector, civil society and all citizens in the pursuance of Climate Change adaptation and mitigation plan to help enhance the resilience of the natural resource sectors and built infrastructure and reduce its potential vulnerabilities to the effects of Climate Change and variability.

7.0 STRATEGY AND ACTION PLAN

7.1 Strategy

Taking into consideration the guiding principles, vision, goals, and objectives which inform the National Climate Change Policy articulated in the preceding section, the Government of Belize (GOB) will seek to have this Policy implemented through the adoption of a strategy which is consistent with the overall goal of the GSDS 2014-2017 which projects an integrated, systematic approach and encompasses medium-term economic development, poverty reduction, and longer-term sustainable development. In that regard the objective of the National Climate Change Policy, Strategy and Action Plan (NCCPSAP) is to ensure the mainstreaming and integration of Climate Change adaptation and mitigation at all levels of the development planning and operational processes of governance.

In addition, the strategy should encourage the use of new economic and financial mechanisms including National Appropriate Mitigation Actions NAMAs and markets. It should also encourage the development of instruments to facilitate public-private sector partnership, research, innovation, development and adjustment to climate technologies and strengthening of capacities, as well as ensuring that policy makers and negotiators, civil society have access to relevant and best available scientific information for decision-making. In addition, it will also seek to encourage the development of the country's Intended National Determined Contribution[17] (INDC) and communicate same to the UNFCCC.

The implementation of this policy and action plan shall be coordinated by the NCCO in the Ministry of Forestry Fisheries and Sustainable Development (MFFSD) which is the National Focal Point for the UNFCCC and the Kyoto Protocol to which Belize is a signatory. Given the multitude of sectors likely to be impacted by Climate Change and the cross-cutting sectoral responses in adapting to, and mitigating the impacts, several agents and agencies, in both the public and private sectors will be called upon to assume responsibility and assist in the implementation of the action plan by designing and adopting relevant sectoral policies, and strategic plans to ensure adequate adaptation and mitigation measures are executed to achieve the national goals of low carbon development resilient to Climate Change.

[17] See *Information on intended nationally determined contributions* in the context of the 2015 agreement. Ad Hoc Working Group on the Durban Platform for Enhanced Action. ADP.2014.7. 7th July 2014. Paragraph 7.

In coordinating the implementation of the NCCPSAP, the NCCO shall have regard to the need to:

d) provide adequate support on Climate Change adaptation and mitigation measures to stakeholders in the public and private sectors, and at the community level;
e) monitor the impact of the strategy against the goals and objectives that have been set; and,
f) adjust the policy and strategy in light of intended or unintended changes in the general environment.

An integrated and inclusive approach to Climate Change management is therefore needed to ensure the implementation of robust and comprehensive strategies and actions. Such an approach should be consistent with international and regional commitments stemming from obligations arising from various multilateral agreements (e.g. UNFCCC, Kyoto Protocol and Liliendaal Declaration) and membership in regional organisations (e.g., CARICOM and SICA). It must also be cross-sectoral and multidisciplinary in nature, addressing both adaptation and mitigation measures. This approach shall allow the country to transition strategically to low-carbon economic development while bolstering its resilience to the effects of Climate Change.

The Government shall implement this policy through the incorporation and integration of elements of this policy into existing and proposed sectoral policies by revising relevant policies where applicable. It will also facilitate, wherever necessary, the implementation of this Climate Change Policy through the revision and drafting of relevant legislation and the allocation of adequate human resources and financial flows and technology transfer to ensure the goals are realised.

7.2 Climate Change Action Plan

The Climate Change Action Plan is a five year programme (2015-2020) to build the capacity and resilience of the country to meet the challenges of Climate Change. The Action Plan is divided into two thematic areas namely adaptation and mitigation. The choice of these two thematic areas is based on the fact that the country has, in its First and Second National Communication report to the UNFCCC, identified a number of sectors, namely, coastal zone, human settlement, fisheries and aquaculture, agriculture, forestry, tourism, water, energy and health as national priorities for Climate Change mitigation and adaptation efforts.

Climate Change adaptation, the first of the two action themes refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation. The adaptation

measures identified, while not exhaustive will seek to identify both generic and specific measures which can be employed by various sectors in anticipation of the threats of Climate Change.

The primary aim of mitigation initiatives is to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks. In Belize, like most SIDS, GHG emissions are relatively small, but commitments to international treaties as well as opportunities to benefit from associated mitigation initiatives (reduced deforestation and energy conservation) has prompted their inclusion in the development of the NCCPSAP. Agriculture, land-use change and the forestry sector, though usually considered prime areas for Climate Change adaptation are also known to be contributors to GHG emissions and will require the development of policy initiatives to reduce such threats. The energy and transportation sectors, because of the benefits to be derived through the pursuit of sustainable energy and low-carbon development initiatives, will also require policy initiatives which seek to limit emissions of GHGs. The sectors for which adaptation and mitigation strategy and action plans will be addressed are therefore:

- Agriculture
- Forestry
- Fisheries and Aquaculture
- Coastal and Marine Resources
- Water Resources
- Land use and Human Settlements
- Human Health
- Energy
- Tourism
- Transportation
- Solid Waste

7.2.1 Agriculture

The policy framework for the agriculture sector is currently The National Food and Agriculture Policy. The aforementioned makes no direct reference to Climate Change mitigation and adaption measures relevant to this sector. That is expected to change as the Government of Belize, with assistance provided by the CCCCC/GCCA Intra-ACP Programme, has undertaken a review of the country's agriculture policy with a view to determining the impacts of Climate Change on agriculture and formulating a strategy and action plan for addressing those potential impacts. The document acknowledges that agriculture is critical to Belize's development, given its importance both in terms of food self-sufficiency, employment, and one of the country's major exports. However, like other developing countries, particularly SIDS, Belize is very vulnerable to the adverse effects or impacts of Climate Change.

Climate Change, it is noted, will "impact agriculture systems and practices such as soils and land preparation, pest and disease control, and water requirements (excess and deficits), while high temperatures will cause increased stress on current commodities such as livestock breeds, crop types and varieties." It is also noted, that "the most detrimental effect is likely to be the seasonal distribution of rainfall, leading to conditions of periodic drought and flooding." As a consequence, the Programme of Action for the agricultural sector will be based primarily on the adaptation measures recommended in the National Agriculture Sector Adaptation Strategy to Address Climate Change in Belize, in order to combat the detrimental effects of Climate Change. These recommendations include both short and long-term measures to address critical gaps in technological developments relevant to crop production, better soil management practices, diversification into drought resistant crops and livestock, and farm production adaptations which include, but is not limited to, land use, land topography and increasing use of low-water irrigation systems. The implementation of this Action Plan is based on a coordinated approach among key stakeholders and is motivated by the broader developmental goals of food security and sustainability. A more detailed listing of the action plan is presented in Table 7.1.

Table 7.1: Agriculture (Crops & Livestock): Climate Change Strategy and Action Plan

Sector Factors:	Adaptation Measures/Mitigation Measures
Strategic Aim/Goal	Development of climate resilient cropping/livestock agricultural systems
Rationale	Agriculture is critical to Belize's development, given its importance both in terms of food self-sufficiency, employment, and being one of the country's major exports and earnings of foreign exchange. However, like other developing countries, particularly SIDS, Belize is very vulnerable to the adverse effects or impacts of Climate Change. Climate Change will impact agriculture systems and practices such as soils and land preparation, pest and disease control, water requirements (excess and deficits), while high temperatures will cause increased stress on current commodities such as livestock breeds, crop types and varieties. Most significant, however, is the likelihood there will be the seasonal distribution of rainfall, leading to conditions of periodic drought and flooding. Increasing temperatures together with prolonged drought and irregular rainfall will require the adoption of measures to combat drought-like conditions or flooding.
Overall Strategy	Diversify livestock, increase access to drought resistant crops and livestock feeds; adopt better soil management practices; and provide early warning/meteorological forecasts and related information to be competitive in the region
Action	1. Review national agricultural policies and regulations to ensure the incorporation of Climate Change adaptation and mitigation measures in all aspects of the planning, decision-making and operational processes and related programmes including water resource management, erosion and flood control, soil conservation, drought, agricultural research, livestock, seeds, crops, markets, food security, disaster risk management and technology transfer. 2. Implement soil fertility management mechanisms and soil- water management systems to address soil quality issues. 3. Promote and ensure the use of drought resistant crop development techniques or climate smart agriculture technology and associated water management

Sector Factors:	Adaptation Measures/Mitigation Measures
	techniques that will increase yield per unit area. 4. Develop and endorse the use of climate-resilient seeds and livestock breeds that are better adapted to the increased temperatures. 5. Initiate Integrated Pest Management (IPM) practices to keep pests below economic threshold levels in order to minimize risks to human health, organisms and the environment. 6. Promote the reduction of agricultural GHG emissions through: altering crop cultivation methods; implementing effective livestock management that involves changing the feeding practices of livestock; and improved manure management that controls the way in which the manure is decomposed. 7. Strengthen agricultural research and development and improve on the data collection capacity and analysis capabilities of the sector. 8. Facilitate greater public-private initiatives to implement cost-effective measures to address crop development, livestock production, and improving soil quality in the interest of building resilience to Climate Change. 9. Initiate and enhance community-based agricultural extension services to support Climate Change adaptation . 10. Initiate education awareness programmes to draw attention to the impacts of Climate Change on the sectors and measures to adapt and mitigate those anticipated impacts. 11. Incorporate Early Warning system. 12. Provide support for institutional strengthening of the Ministry. 13. Facilitate Market access for agricultural products and incentives to add value along the production line. 14. Undertake research on the usefulness and applicable models of crop insurance to facilitate and provide recovery from various disasters affecting the agricultural sector.
Time Frame	Medium to long term
Lead Agency	Ministry of Agriculture
Links to other Policies, Programmes & Agencies	Water, Forestry
Resources/Estimated Cost	The implementation of the activities listed above will require investment in infrastructure and equipment, research and training, education and early warning systems and matching funds for a public/private sector partnership commodity insurance scheme. The estimate for full implementation over the five year period is approximately BZD $26,000,000.

7.2.2 Forestry

Belize, well known for its pristine forests is reported to have the highest forest cover in both Central America and the Caribbean (62% as a percentage of land, 37% of which are primary forests). However, the forests of Belize, like other natural resource sectors, are anticipated to be impacted by the various manifestations of Climate Change. It is acknowledged that warmer

temperatures and changes in precipitation can affect tree growth, engender an increased proliferation of insects and pest and ultimately, the productivity of the forestry sector. Also, extreme weather events (hurricanes and storms) can result in uprooting of trees, and loss of commercial value and revenue. It is estimated that adverse Climate Change impacts will contribute to the destruction of forests and thereby promote the emission of greenhouse gases, which in turn will enhance global warming.

According to the Second National Communication to the UNFCCC (July 2012), over 91% of the country's emission of GHGs come from Land Use, Land Use Change and Forestry (LULUCF). Further, it is noted in the National Communication report that Belize is in a unique position to reduce emissions from deforestation and forest degradation and to increase carbon stocks through enhancement of conservation and sustainable management of forests (REDD+). As such, and in keeping with obligations under the Bali Action Plan, the country is mandated, like all countries, to adopt policy approaches and provide positive incentives in an effort to reduce emissions.

The main policy framework for the forestry sector is currently the Draft Forest Policy of Belize (Revised 2012). The Policy document acknowledges the importance of this sector to the national economy and national development and the different ways in which it will continue to play an integral role in providing and sustaining livelihoods in a sustainable manner. However, it is also noted in the policy document that Climate Change impacts and mitigation have not been given serious consideration. Notwithstanding this oversight, it is stated that one of the objectives of the National Forest Policy is to:

- Provide guidance for actions to be taken with regards to the direct and indirect threats posed by global Climate Change on forests and forest dependent people in order to reduce their vulnerability, increase their resilience and adapt to Climate Change;

In that regard, the policy document states that Government shall seek to:

- Mainstream adaptation and mitigation to Climate Change in its management objectives under the national forest programme;
- Systematically assess the potential impacts of Climate Change on Belize's forests and the extent of the vulnerability of forests to these impacts and actions for adaptation; and
- Develop a comprehensive monitoring system to evaluate changes in the forest cover, carbon stocks and forest biodiversity and to use this information for further planning in light of Climate Change mitigation and adaptation.

The Forestry Department, in acknowledgement of the need to address both adaptation (sustainable management of forest resources) and mitigation (reduce GHG emissions) measures has submitted a Readiness Preparation Proposal (R-PP) to the Forest Carbon Partnership Facility

(FCPF) for funding as part of the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD) programme. This initiative is intended to provide the vehicle through which Belize can achieve the goals and objectives of sustainable land use management and sustainable forest management while also ensuring commitment to international obligations of reducing GHG emissions.

While this might be seen as primarily aimed at mitigating Climate Change, it has an adaptive component of preserving species richness, continuity of forest ecosystems and resilience. As a result, the activities being promoted to be undertaken as part of the development of a REDD+ strategy and action plan are aimed not only at addressing issues of deforestation and afforestation but the maintenance of a healthy forest ecosystems by sustainable forest management, in order to increase the resilience of human communities, especially those whose livelihoods depend on the use of forestry resources. Adaptation and mitigation of Climate Change on the forestry sector in Belize are therefore based on the goals and objectives outline in the Draft Forestry Policy as well as those activities contained in the RR-P. Together, they will provide the platform on which a sustainable forestry management, Climate Change mitigation and low carbon development program can be pursued. See Table 7.2 below for a more detailed outline of the activities being proposed.

Table 7.2: Forestry Sector Adaptation and Mitigation Strategy and Action Plan

Sector: Factor	Adaptation and Mitigation Measures
Strategic Aim/Goal	Ensure the conservation, utilisation and sustainable use of the forest resources by mainstreaming Climate Change into the Revised Forest National plan and supporting the development and enhancement of a low carbon economy by limiting GHG emissions resulting from deforestation and forest degradation while also enhancing GHG sinks.
Rationale	1. Impact of storm surges and hurricanes on forestry Increase in storms and hurricanes will significantly impact on forestry resources 2. Changes in natural vegetation Changes in climatic, hydrologic and soil conditions could lead to changes in the composition of natural vegetation 3. Loss of commercial value Extreme weather events (hurricanes and storms) cause uprooting of trees, and loss of commercial value and revenue 4. Habitat Loss Increased overall aridity could exacerbate drought potential over the long term, thus causing habitat loss and contributing to decline and death in some tree species. Main drivers of deforestation and forest degradation a. Agriculture (Large scale and small scale crop and livestock development, farming on slopes) Infrastructure Expansion (roads, urban/community expansion)

Sector: Factor	Adaptation and Mitigation Measures
	b. Unsustainable and Illegal Logging c. Hurricanes d. Pests e. Wildfires
Overall Strategy	Mainstream adaptation and mitigation to Climate Change will be achieved by providing guidance for actions to be taken with regards to the direct and indirect threats posed by global Climate Change on forests and forest dependent people in order to reduce their vulnerability, increase their resilience and adaptation to Climate Change; Systematically assess the potential impacts of Climate Change on Belize's forests and the extent of the vulnerability of forests to these impacts and actions for adaptation; Develop a comprehensive monitoring system to evaluate changes in the forest cover, carbon stocks and forest biodiversity and to use this information for further planning in light of Climate Change mitigation and adaptation; and Maintain and restore healthy forest ecosystems by sustainable forest management, increasing afforestation and reforestation in order to increase the resilience of human communities.
Action	Adaptation and mitigation of Climate Change on the forestry sector in Belize are based on the goals and objectives outline in the Draft Forestry Policy as well as those activities contained in the RR-P. Together, they will provide the platform on which a sustainable forestry management, Climate Change mitigation and low carbon development program can be pursued. The RRP proposal which outlines the REDD+ strategy initiatives identified a number of initiatives for the development of the strategy for REDD+. These are as follows: 1. Organize and Consult a. National Readiness Management Arrangements b. Information Sharing and Early Dialogue with Key Stakeholder Groups c. Consultation and Participation Process 2. Prepare the REDD-plus Strategy a. Assessment of Land Use, Land Use Change Drivers, Forest Law, Policy and Governance b. REDD-plus Strategy Options c. REDD-plus Implementation Framework (Institutional Strengthening & Capacity building) d. Social and Environmental Impacts during Readiness Preparation and REDD-plus Implementation 3. Develop a National Forest Reference Emission Level and/or a Forest Reference Level a. Design and establishing a reference scenario model in readiness framework b. Develop reference models c. Conduct Independent assessment 4. Design Systems for National Forest Monitoring and Information on Safeguards a. National Forest Monitoring System b. Designing an Information System for Multiple Benefits, Other Impacts, Governance, and Safeguards Component 6: Design a Program Monitoring and Evaluation Framework

Sector: Factor	Adaptation and Mitigation Measures
Time Frame	Four years
Lead Agency	The Forest Department (FD), under the MFSSD, will lead the formulation and implementation of REDD+ readiness activities and will foster collaboration with the relevant ministries and departments including the Climate Change Office to ensure there is high level participation in the development and execution of activities with regards to reduction of emissions from deforestation and degradation.
Links to other Policies, Programmes, Agencies	▪ Draft Revised National Forest Policy ▪ Growth and Sustainable Development Strategy, ▪ National Land Use Policy for Land Resource Development ▪ National Integrated Planning Framework ▪ Land Suitability Mapping System for Belize ▪ Management and Protection of Key Biodiversity Areas Project (KBA) The Ministry of Natural Resources and Agriculture, Ministry of Finance and Economic Development.
Resources/Estimated Cost	BZD $10,316,000.00

7.2.3 Fisheries and Aquaculture

The fisheries sector in Belize is important both as a food source and the income which it provides for thousands of Belizeans. A significant contributor to the fisheries sector is the Belize Barrier Reef and mangrove systems, which provide a habitat for juvenile fisheries. The reef system also supports livelihoods for local communities and contributes to the national economy through fisheries and growing tourism revenues. It has been estimated that the value of ecosystem services (fishing, tourism, shoreline protection) generated by the coral reefs and mangroves contributes between 15 and 22 per cent of GDP in Belize. In addition, commercial fisheries in Belize have been an important foreign exchange earner. Whilst it is acknowledged that Climate Change will result in upward movements of air temperature, resulting in rising sea-surface temperature, other factors such as changes in sea level and ocean acidity are likely to result in increasing acidification which may cause massive bleaching and dieback of corals.

The main policy framework for the fisheries sector is currently the Fisheries Management Plan. Whilst this policy does not directly include essential measures necessary for effective Climate Change adaptation, it is acknowledged that the effect of Climate Change and sea level rise on the fisheries sector of Belize will be mostly indirect, but significant, given its contribution to other sectors and the economy, in general. As a result, the goal of the NCCPSAP in respect of the fisheries sector will be to facilitate a better understanding of the impact of Climate Change on fisheries resources and thus support the implementation of effective socio-economic monitoring systems in order to guide the development of response mechanisms which

minimise impacts of Climate Change on persons whose livelihoods are directly dependent on this sector.

That will require the support for sustainable fisheries management including a detailed vulnerability assessment and the adoption of necessary policy measures and statutory obligations. Under the recently approved MCCA the fisheries sector will benefit from several initiatives intended to address the impacts of Climate Change on that sector. The major objective of that project is to implement priority ecosystem-based marine conservation and climate adaptation measures to strengthen the climate resilience of the Belize Barrier Reef System and specifically provide measure to increase the livelihood of affected users of the reef and raise awareness and disseminate information regarding the overall health of the reef ecosystem and the climate resilience of coral reefs. Though the project is primarily targeted at building resilience of the reef ecosystem, the ecosystem approach being advocated has the potential to provide tremendous benefits to the fisheries sector as the expansion of MPAs and the development of climate adaptations measures to protect the reef system will result in enhancement of the fish stock and contribute to the overall conservation of resources. See Table 7.3 for a detailed account of the goals, strategies and action plan which should guide the introduction of adaptation measures in the Fisheries sector to address the impacts of Climate Change.

Table 7.3: Fisheries Sector Adaptation Strategy and Action Plan

Sector Factors	Adaptation Measures
Goal/Strategic Aim	To guide the short, medium and long-term processes to sustain the Fishing Industry of Belize from the impacts of Climate Change and strengthen the resilience of the reef and associated habitats
Rationale	The fisheries sector is important to Belize because it is an important food source, provides an income and livelihood for several persons as well as an earner of important foreign exchange. Climate Change, as it is understood, will result in rising temperatures, and consequently warming of the ocean surfaces which can influence fish populations, fish varieties and zooplankton that provide food for fishes. It could also lead to migration of fish species as well as growing acidification. Acidification of the waters could have negative impacts on coral reefs and fishery resources (particularly commercial species such as lobsters and conch) which thrive in that habitat. More importantly, gradual and consistent increases in sea surface temperature could result in increasingly frequent bleaching events and ultimately, impair the health of coral reef ecosystem. Given the importance of the fisheries sector as a source of food and earner of foreign exchange, it is imperative that management measures are introduced to ensure its sustainability including addressing the threats of Climate Change.
Overall Strategy	Sustainable management of the fisheries resources, and the conservation and preservation of fisheries resources and marine habitats in promoting reef ecosystem resilience.

Sector Factors	Adaptation Measures
Action	Effective Management Approaches 1. Develop and Implement management approaches and polices that strengthen the livelihood asset bases, and improve understanding of existing response mechanism to climate variability to assist in planning adaption. 2. Adopt the new Fisheries Resources Bill and subsidiary regulations that incorporate international principles and approaches which are required for responsible and sustainable fisheries management. 3. Develop policy and plan to conserve and protect sensitive and healthy habitats (mangrove, sea grass, reefs) to improve resilience of main commercial species to Climate Change. Develop Conservation Programmes, Policies and Plans 4. Support mangrove and fisheries conservation and management plans to protect wetlands and sea grass beds for fisheries to become resilient to Climate Change. Encourage diversification in fish species. 5. Enhance marine protected areas of natural significance into climate smart sanctuaries. 6. Develop marine spatial plans, area-based fisheries management approaches, regulated coastal development, and embark on ecosystem rehabilitation. 7. Explore the development of alternative livelihood plans for fishers who are affected by the establishment of restricted fishing measures. 8. Develop an information clearing house to provide regular and accessible public information on Climate Change effects in the marine ecosystems and coastal zone to promote behavior change designed to minimize climate risks in MPAs and replenishment zones. 9. Consolidate and strengthen the MPA system by establishing Fisheries Reserve or expand no-take zone in MPAs. Effective Monitoring 10. Monitor compliance with EIA regulations requirements for coastal mangroves alterations. 11. Conduct annual reef health and fisheries stock assessments. 12. Monitoring biophysical, social, and economic indicators linked to management and policy responses and adopt multi-sector adaptive strategies, such as instituting species specific management plans on fishing seasons, to minimize negative impacts. Conduct further research on marine resources 13. Conduct further research on the vulnerability and sustainability of marine resources to Climate Change. 14. Conduct specie-specific studies (e.g. determine impacts of sea surface temperature and ocean acidification on conch and lobster). Mariculture /Aquaculture 15. Improved feeds and selective breeding for higher temperature tolerance strains to cope with increasing temperatures and shifting to more tolerant strains of molluscs to cope with increased acidification. 16. Undertake integrated water use planning taking into account the water requirements (availability and quality) and social and economic importance of

Sector Factors	Adaptation Measures
	fisheries and aquaculture in addition to other sectors. 17. Improve the efficiency of water use in aquaculture operations and other adaptation options; and 18. Strengthen and endorse outputs from the National Water Quality Working Group (develop baseline and monitoring program and identify trends with respect to marine and fresh water fishery).
Time Frame	Short term (1-3 years)
Lead Agency	MFFSD/Fisheries Department
Links to other Policies, Programmes, Agencies	Other agencies: Forest Department, DOE, Ministry of Natural Resources and Agriculture (in relation to other protected areas, environmental impacts, land use, aquaculture, etc.) NPASP, Biodiversity Programme. It is also aligned with the current World Bank's Country Partnership Strategy (CPS) for Belize (2011-15) which is aimed at supporting the country's efforts to achieve Inclusive and Sustainable Natural Resource-Based Growth and Enhanced Climate Resilience. Also: SEA, BAS, TIDE (Co-managers)
Resources/Estimated Cost	BZD$ 1,000,000 - $1,500,000

7.2.4 Coastal and Marine Resources

Over the past decades, rapid economic development, directly attributed to tourism and recreational activities and population growth, have led to increasing pressures on coastal and marine resources, with implications to the livelihoods of those that depend upon them. These anthropogenic threats are compounded by natural hazards, global warming and rising sea levels and the vulnerability of sensitive coastal ecological systems to Climate Change. It is also acknowledged that other factors such as wave action, rising surface temperature of the water, its salinity and tide-related meteorological factors can also pose serious hazards and can exacerbate coastal erosion, giving rise to more serious coral bleaching, and a reduction in the attractiveness of areas renowned for their tourism appeals (ECLAC, 2012). Thus, it is imperative now, more than ever, to ensure that the coastal zone is managed and utilized in a manner that will continue to support important ecological functions, as well as social, cultural and economic prosperity for current and future generations.

The main policy framework for the coastal and marine resources sector is currently the Belize Integrated Coastal Zone Management Plan (ICZMP). The Plan outlines a vision and implementation plan for sustainable use of coastal resources, supports an integrated approach to development planning and adapting to Climate Change. Critical measures for Climate Change adaptation relevant to this sector, which include the identification of short, medium and long-term strategies to address the threats of Climate Change on coastal and marine resources, are adequately addressed in this plan.

In this regard, the National Climate Change Policy will seek to promote, in cooperation with the Coastal Zone Management Authority and Institute (CZMAI), appropriate strategies to deal with the current threats of Climate Change to coastal communities through the formulation and implementation of land-use planning policies, fortification of sea and river defences and the further implementation of early warning systems for storm surges. Longer term strategies will include the development of substantial physical infrastructure and more complex land-use planning policies. Such policy strategies shall be integrated with economic development policies, disaster mitigation and management plans and ICZMP. See Table 7.4 for a detailed outline of the adaptation strategy and action plan for the coastal zone sector.

Table 7.4: Coastal Zone Management: Climate Change Adaptation Strategy and Action Plan

Sector Factors:	Adaptation Measures
Goal/Strategic Aim	Promote the adoption and implementation of the Belize Integrated Coastal Zone Management Plan which will ensure responsible and sustainable use of Belize's coastal and marine resources in the face of Climate Change.
Rationale	Rising sea levels together with changes in wave action, increasing surface temperatures of the water and other climatic factors can pose serious hazards and exacerbate coastal erosion which will negatively impact the attractiveness as well as the ecosystem support functions provided by the coastal zone and its resources. Adoption and Implementation of the Belize Integrated Coastal Zone Management Plan will ensure responsible development of coastal areas and sustainable use of coastal and marine resources. This will be achieved through the implementation of a marine spatial plan based on ecosystem service valuation. The ecosystem services considered include tourism/recreation, lobster fishery, coastal vulnerability, coastal protection and habitat risk. Coastal development considering these ecosystem services will lead to a sustainable resource base and increased Climate Change resilience and adaptation.
Overall Strategy	The overall strategy is as follows: ▪ Encourage sustainable coastal resource use ▪ Support integrated development planning ▪ Build alliances to benefit Belizeans ▪ Promote adaptation to Climate Change
Action	1. Increase and strengthen the capacity of the CZMAI to ensure developments within the coastal areas of Belize include an adaptation strategy to mitigate the effects of Climate Change. 2. Implement recommendations in respect of the development of a coastal management plan to ensure proper land use. 3. Develop a programme and acquire equipment to monitor and provide early warning in respect of storm surges. 4. Implement mangrove restoration or sea and river defense structures to prevent coastal erosion. 5. Implement monitoring techniques to assess beach erosion and water quality. 6. Manage further development of the coastline, especially in vulnerable areas such as the Belize and Corozal districts. 7. Inclusion of adaptation strategies in management planning in all coastal and

Sector Factors:	Adaptation Measures
	marine sectors. 8. Undertake restoration projects to increase the coastline resilience to sea level rise. 9. Review and amend the Building Code, especially as it relates to coastal constructions. 10. Revise and streamline the current legislation and policies that relate to the management of the coastal zone to eliminate overlaps and close existing gaps.
Time Frame	Four years (2015 – 2019)
Lead Agency	Coastal Zone Management Authority & Institute
Links to other Policies/Programmes	Marine Conservation and Climate Adaptation Project; National Climate Change Adaptation Policy.
Resources/ Estimated Cost	Minimum $BZD 1,000,000 (Annually)

7.2.5 Water Resources

Due to its geographic location, relatively high level of forest cover, and 18 different water catchment areas, Belize is recognized as having an adequate supply of freshwater. However, like other resource sectors, a number of anthropogenic factors (increases in demand due to expansion in the agricultural, industrial and tourism sectors, a growing population and accompanying water pollution and watershed destruction), together with impending threats of Climate Change, are placing a heavy strain on the sustainability of this resource. The anticipated impact of Climate Change is expected to intensify the global hydrological cycle and as such will have major impacts on water resources. The 2014 IPCC Report has noted that concerns over the status of freshwater availability in the Caribbean have been expressed for at least the past thirty years (IPCC, 2014). These concerns arise against a background of decreasing rainfall and increasing temperatures. Rainfall models, undertaken as part of this exercise, indicate a progressive decrease in rainfall, across all regions of Belize, from the 2030s to the 2090s across all seasons and all emissions scenarios.

What this means is that changes in the volume (reduction) and distribution of water will have a negative effect on both the ground and surface water supply which provides the freshwater used by the country's terrestrial and coastal ecosystems, irrigation systems, and domestic and industrial users. This is further compounded by the fact that rising temperatures will also result in changes in precipitation leading to floods in some instances, drought in others, and overall water shortages and biodiversity stress.

The main policy framework for the water resources sector is currently the Integrated Water Resources Management Policy which advocates "planned development, coordinated management, sustainable use and protection of Belize's water resources consistent with the social, economic and environmental needs of present and future generations." Also, the National Adaptation Strategy and Action Plan to Address Climate Change in the Water Sector,

which acknowledged the growing threats of Climate Change to the water resources sector, advocates the development of programmes to enhance the protection and restoration of forest ecosystems and water catchment areas. It also recommends the adoption of standards and best practices for the extraction, production, and distribution of water in order to build resilience relating to freshwater resources in Belize.

Five key adaptation actions are presented in the National Adaptation Strategy and Action Plan which includes the establishment of an agency to execute integrated water resources management; strengthening the existing institutional and human resources capacities in the water sector for improved management practice, formalizing the legal mandate and operations of the National Climate Change Committee, strengthening the trans-boundary relationships to cover the impacts of Climate Change on the water sector and increasing public awareness and education in water culture and Climate Change.

The successful implementation of the Action Plan will require effective trans-boundary cooperation between Belize and Mexico and Guatemala, two of the neighbouring countries with which Belize shares important watersheds. It will also require the cooperation of several different governmental and non-governmental agencies such as, Forestry, Agriculture, Tourism, Met Office, and the Association of Protected Areas Management Organisation (APAMO). See Table 7.5 for a detailed listing of activities which are planned to be undertaken as part of the Climate Change adaptation measures in order to build resilience in the Freshwater Resources sector in Belize.

Table 7.5: Water Resources Climate Change Adaptation & Mitigation Strategy and Action Plan

Sector Factors	Adaptation/Mitigation Measures
Goal/Strategic Aim	To enhance the protection and restoration of forest ecosystems and build the resiliency of water catchment areas.
Rationale	Global Climate Change is predicted to lead to increased extreme climactic events by frequency and magnitude featuring higher temperatures, less frequent but more intense rainfall, rising sea levels leading to coastal inundation and salt water intrusion in coastal aquifers. Declines in freshwater resources due to loss of gathering structures and grounds are already occurring in tandem as a result of land demand and exploitation pressures. Some of the effects arising from these climatic events may be benign but almost all changes need attention and effective strategic responses such as adaptive mechanisms. Consideration is also required to be given to conflict and conflict resolutions especially in those places where competition for a scarce resource will arise. Although there are various water management institutions in existence, the country however lacks the complete range and integrated responses required for

Sector Factors	Adaptation/Mitigation Measures
	adaptation to Climate Change.
Overall Strategy	Enabling and enacting measures aimed at a more rational and efficient use of water resources.
Action	1. Design and implement an IWRM programme in watersheds to reduce the impacts of Climate Change. 2. Enhance the protection of water catchment (including groundwater resources) areas and make improvements to the management and maintenance of existing water supply systems, 3. Strengthen the existing Human Resource capacities in the water sector for improved management practice including an improved hydrology and meteorology observation network and data collection 4. Develop Water Conservancy Management Systems including improvements to the management and maintenance of existing water supply systems taking into consideration the: a. protection and restoration of ecosystems and water management infrastructure; b. adoption of forest management plans to prevent and control soil erosion; c. introduction of water harvesting; d. prevention and control of water pollution; and, e. raising awareness to promote the effective and efficient use of water. 5. Conduct water resource assessment (especially ground water). 6. Undertake water policy reform including pricing and irrigation policies, 7. Develop flood controls and drought monitoring. 8. Improve trans-boundary cooperation regarding water resources 9. Strengthen the compliance monitoring capacity of staff in the MFFSD's DOE and other key agencies including provision of equipment and training in thematic areas such as compliance monitoring, use of new equipment, site inspection techniques, environmental audits, interpretation of lab analyses, and water quality monitoring to ensure the critical input to assess the health of the ecosystems therein and ensure long-term ecosystem services.
Time Frame	Five years
Lead Agency	National Integrated Water Resources Management Authority
Links to other Policies/Programmes	Draft Forest Policy for Belize (Revised 2012), KBA project, and R-PP
Resources/ Estimated Cost	TBD

7.2.6 Land Use and Human Settlements

Concerns in respect of land use range from emission of CO^2 from the LULUCF, primarily deforestation and soil carbon from agriculturally impacted soils, to practices which leaves communities prone to disasters and impairs the country's resilience to such climatic events. Belize is not unique in that deforestation is a major contributor to GHG emissions. Its large

expanse of forests coupled with increasing demands for land for agriculture, tourism development and other infrastructural development activities, particular coastal resources (mangroves etc.) will diminish the country's capacity to limit emissions from deforestation.

As noted earlier in this report, close to fifty per cent of Belize's population are concentrated in coastal areas and the country's economy is highly dependent on commodity exports (sugar, citrus and bananas) and tourism all of which are located in the narrow coastal belt. The country's exposure to natural disasters is further exacerbated, by the fact that climate-related meteorological events (tropical storms, storm surge, heavy and persistent rainfall and flooding) have historically had devastating impacts on communities and infrastructure impairing the nation's economic and social support systems. The demand for land for the various purposes, together with the climatic events, have combined to make the physical economic and socio-cultural landscape very vulnerable to extreme weather events and Climate Change.

The main policy framework for the Land Use and Human Settlements sector is currently the National Land Use Policy for Land Resource Development. This document, approved by Cabinet in 2011 and based on principles enshrined in the National Development Plan for Belize, Horizon 2030 and concerns for sustainable development and environmental security acknowledges that Climate Change poses a series of challenges that must be met through the efforts of diverse actors including the public and private sectors, citizens and social organizations, academia, regional institutions and the international community. As such, it is noted that all aspects of land use and land development need to be weighed against both their vulnerability and resilience to expected Climate Change effects.

Considering these potential impacts there is a need to develop strategies that prevent these impacts from adversely affecting Belize and the region, while at the same time developing strategies that increase resilience against them. As a consequence, the Action Plan as part of the National Climate Change Policy will be geared towards ensuring that significant policy gaps with respect to Climate Change adaptation are addressed by promoting the adoption of an integrated land tenure and land classification policy, developing and implementing programmes which discourage the establishment of human settlements in areas prone to natural hazards (flooding, land slippages, high winds and storm surges), develop housing and settlement patterns/practices that enhance Climate Change adaptation and are resilient to Climate Change, developing and adopting building codes and measures to enforce those codes, and encouraging the updating of legislation to account for setbacks and inefficiencies. See Table 7.6 for a more detailed listing of the strategy and action guiding the formulation of programmes to address Climate Change adaptation in respect of Land Use planning and Human Settlements.

Table 7.6: Land Use and Human Settlements: Climate Change Adaptation & Mitigation Strategy & Action Plan

Sector Factors	Adaptation Measures
Strategic Aim/Goal	Promoting the adoption of integrated land tenure, land classification and housing policies and programmes which enhance Climate Change adaptation and are resilient to Climate Change.
Rationale	▪ Disruption of coastal settlement Increase in frequency and intensity of storm surges will cause more flooding and disrupt or destroy coastal settlements ▪ Damages to infrastructure Increase in frequency and intensity of natural hazards, particularly extreme rainfall, floods and storms, due to Climate Change will cause severe damage to infrastructure
Overall Strategy	Promoting the adoption of an integrated land tenure and land classification policy and developing and implementing programmes which discourage the establishment of human settlements in areas prone to natural hazards (flooding, land slippages, high winds and storm surges), and developing housing and settlement patterns/practices that enhance Climate Change adaptation and are resilient to Climate Change.
Action	1. Undertake a comprehensive assessment of human settlements and related infrastructure at risk from the effects of Climate Change, using inter alia, risk mapping and incorporate findings into the National Land Use Management Plan, and into the planning processes of NEMO. 2. Develop strategic land-use and settlements policy to adapt to potential rise in sea level, and integrate with land use, flooding and drainage plans. 3. Build the appropriate infrastructural defences to protect communities from damage caused by flooding and sea level rise. 4. Improve drainage and sanitation facilities in rural and urban areas. 5. Develop Climate Change infrastructure risk assessment guidelines and methodology. 6. Creation of marshlands/wetlands as buffer against sea level rise and flooding, thereby offering protection to existing natural barriers. 7. Evaluate the feasibility of relocation of vulnerable communities 8. Review and modify housing designs and building codes to climate-proof existing and future housing and other infrastructure. 9. Enforce existing regulations and develop new regulations, which promote good building practices to meet the threat of sea level rise and dangerous storms and hurricanes.
Time Frame	Medium to Long-term
Lead Agency	Land and Survey Department – Land Utilization Authority – Physical Planning Unit – Land Information Unit Housing and Planning Department

Sector Factors	Adaptation Measures
Links to other Policies/ Programmes	National Sustainable Tourism Master Plan, Integrated Coastal Zone Management Plan, R-PP REDD+, the National Land Use Policy and Integrated Planning Framework, Growth and Sustainable Development Strategy, and Horizon 2030 National Development Planning Framework for Belize 2010-2030.
Resources/ Estimated Cost	TBD

7.2.7 Tourism

In Belize, like most other SIDS, most of the tourist assets are located within the narrow coastal belt and the growth of the industry is perceived as having a potential detrimental effect on the environmental resources on which it is dependent. With its close connections to the environment and climate itself, tourism is considered to be a highly climate-sensitive economic sector similar to agriculture, insurance, energy, and transportation (Simpson, 2008). Examples of such climate-sensitive connectivity include storm/flood damage to tourism infrastructure (beaches, hotels, golf courses, ports etc.), historic/architectural and cultural assets and other natural areas which impair their attractiveness and earning capacities once damaged or destroyed. The challenge for Belize is, how best to move forward with tourism development whilst maintaining healthy, functional ecosystems that support the tourism industry, sustain livelihoods and, provides resilience to Climate Change.

The main policy framework for the tourism sector is the National Sustainable Tourism Master Plan. The document describes strategies to improve the competitiveness of the tourism sector. However, the elaboration of Climate Change adaptation and mitigation policy is significantly absent. In response to this omission, the World Wildlife Fund (WWF) in partnership with CARIBSAVE, CZMAI, Ministry of Tourism, Culture and Civil Aviation, Belize Tourism Board (BTB), and the Belize Environmental Research Institute (ERI) are collaborating on a project called "Identifying Opportunities for Climate-compatible Tourism Development in Belize." The overall goal of the project is to assess the vulnerability of Belize's tourism system to Climate Change, including the coastal ecosystems on which it depends, and determine how current policies facilitate or hinder climate-compatible tourism development based on healthy coastal ecosystems. The assessment will also explore policy reforms and adaptation strategies required to enhance ecosystem resilience to Climate Change and foster tourism development, at a local and national scale (CZMAI, 2014).

Given the importance of tourism to the economy of Belize, and the perceived impacts of Climate Change on critical tourism resources and infrastructure, the NCCPSAP will seek to ensure the integration of Climate Change adaptation measures that not only advance the sector's competitiveness but ensure its environmental and socio-economic sustainability by

having these measures mainstreamed into ongoing development activities. See Table 7.7 for a more detailed listing of proposed activities for mainstreaming Climate Change into the sustainable tourism sector.

Table 7.7: Tourism Sector Climate Change Adaptation Strategy and Action Plan

Sector Factors	Adaptation Measures
Strategic Aim/Goal	Assess the vulnerability of Belize's tourism system to Climate Change and ensuring the mainstreaming of Climate Change throughout the sector to enhance ecosystem resilience, equitable distribution of tourism activities and fostering of sustainable tourism development, at a local and national scale.
Rationale	Climate Change is adversely affecting ecosystems and people, especially those who live and work along the coast. Mangroves, coral reefs and beaches are the corner stone of the marine-based tourism industry which supports livelihood as well as the national economy. The challenge is how to best promote Sustainable Tourism Development (STD) at a national level while maintain functional ecosystems as well as guarantee economic returns. Changes in climate and weather, and climate-related factors, can affect the attractiveness of tourist destinations, the type of holidays they can offer – such as sea, sun and sand, and nature tourism – and their levels of customer satisfaction and future demand. Tourist infrastructure such as pools and golf courses, as well as accommodation, may be vulnerable to water scarcity. Deterioration in water quality can make recreational activities less appealing or pose health risks. Specific ecosystems or landscapes may be vulnerable to Climate Change and some destinations such as small tropical islands may be entirely climate-dependent. Flooding damage to historic architectural and cultural assets, damage to tourism infrastructure, altered seasonality (beaches, biodiversity, river flow). Coastal erosion, loss of beach area, higher costs to protect and maintain waterfronts and sea defences. Increased coral bleaching and marine resources and aesthetic degradation in dive and snorkel destinations. Loss of natural attractions and species from destinations, higher risk of diseases in tropical-subtropical countries. Loss of natural attractions, increase of flooding risk, damage to tourism infrastructure. Loss of archaeological assets and other natural resources, with impacts on destination attractions and agriculture.
Overall Strategy	Identifying and assessing coastal tourism areas in Belize that are vulnerable to Climate Change and providing support to coastal planners and policy makers in selecting appropriate policies and adaptation strategies that meet climate adaptation, developmental and environmental goals.
Action	1. Undertake a sea level rise vulnerability mapping exercise as part of a revision of the Tourism Master Plans and Land Use Plans. Of particular concern should be assessment of the impacts of Climate Change on specific areas designated for tourism development and sites of historic and cultural importance.

Sector Factors	Adaptation Measures
	2. Coastal management policies should be reviewed and revised to account for sea level rise and storm surge—with specific attention on regulations related to setback requirements, mangrove and coral reef conservation, beach nourishment, and property decommissioning. 3. Identify coastal tourism areas in Belize that are vulnerable to Climate Change, and which should be prioritized for adaptation actions. 4. Analyse the current policy environment to determine whether pertinent public policies support or undermine sustainable tourism development, ecosystem health/function, and climate adaptation. 5. Develop and implement management strategies for enhancing the resilience of coral to Climate Change for example, by reducing pollution and overfishing through the establishment and demarcation of fish sanctuaries. 6. Acquire and use high-resolution remote sensing data to monitor and evaluate engineering adaptations and support insurance risk assessments. 7. Implement maximum carrying capacity limits for areas that are impacted negatively from excessive human activity, such as mining, engineering and building or re-building operations. 8. Improve infrastructure to facilitate increased access to sites and resources. This includes the paving of roads, renovation of docking facilities for water taxis and installation of professional signage at critical junctions. 9. Engage communities for the development of responsible tourism practices.
Time Frame	Medium to Long-term
Lead Agency	Ministry of Tourism, Culture and Civil Aviation.
Links to other Policies/Programmes	WWF/CARIBSAVE project "Identifying opportunities for climate-compatible tourism development in Belize"; Belize MCCA Project; and, Key Biodiversity Areas management project.
Resources/ Estimated Cost	TBD

7.2.8 Human Health

It is generally acknowledged that increasing temperatures, sea-level rises, changes in precipitation patterns and extreme events will lead to an increase in health risks. These risks range from the direct effects of heat waves, floods and storms, to creating a more conducive environment for the transmission of infectious diseases (vector-borne, waterborne and foodborne diarrhoeal diseases), to impacts on the natural systems and socioeconomic sectors that ultimately underpin human health.

The main policy framework for the health sector is the Belize Health Sector Strategic Plan 2013-2017. While the Plan emphasises the development and delivery of Primary Health Care services network nationwide its overall goal and mission is to consistently deliver standardized, quality health and wellness goods, services and communication to all concerned in an environment of stability, equity, efficiency and wellbeing. As no reference is made to Climate Change in that document, the National Climate Change Policy will seek to ensure that Climate Change

adaptation measures are mainstreamed into the planned initiatives. In that regard, emphasis will be placed on providing support to the Ministry of Health in commissioning and undertaking a Vulnerability and Capacity assessment for the health sector such that the country is well informed of the impacts of Climate Change on the health sector and the adoption of practices and technologies that will reduce exposure and health impacts from extreme heat, and improve physical infrastructure of health institutions and their functional capacity. See Table 7.8 for more detailed initiatives aimed at Climate Change adaptation in the health sector.

Table 7.8: Human Health: Climate Change Adaptation Strategy and Action Plan

Sector Factors	Adaptation Measures
Strategic Aim/Goal	Strengthen and improve public health, disease prevention and environmental sanitation and reduce human exposure to Climate Change-related health risks
Rationale	Climate Change will lead to higher levels of some air pollutants; will lead to increasing number of extreme weather events and increased outbreaks and transmission of disease through unclean water. Higher temperature will also create a conducive environment for important infectious diseases, leading to an increase in the spread of vector diseases. Also, decrease in rainfall will affect potable water supply leading to an increase in water-borne diseases.
Overall Strategy	Undertake a Climate Change Vulnerability and Capacity Assessment and embark on a programme to minimize human exposure to Climate Change-related health risks.
Action	1. Undertake a Climate Change Vulnerability and Capacity Assessment for the health sector a. Assessment of impacts of Climate Change on human health and well being b. Establish baseline conditions by describing the human health risks of current climate variability and recent Climate Change, and the public health policies and programmes to address the risks c. Describe current risks of climate-sensitive health outcomes, including the most vulnerable populations and regions d. Identify vulnerable populations and regions e. Describe risk distribution using spatial mapping f. Analyse the relationships between current and past weather/climate conditions and health outcomes g. Identify trends in Climate Change-related exposures h. Take account of interactions between environmental and socioeconomic determinants of health i. Describe the current capacity of health and other sectors to manage the risks of climate-sensitive health outcomes 2. Improve the capture, management and monitoring of diseases and vectors affected by Climate Change and related forecasting and early-warning systems 3. Increase human resources capacity and improve efficiency 4. Develop education awareness programme to educate population on adaptation measures as it relates to family health and hygiene. 5. Enhance the epidemiology capacity of our health sector to address efficiently epidemics/ outbreaks.

Sector Factors	Adaptation Measures
	6. Implement community-based participatory approaches to empower local communities to manage disease vectors in an integrated manner and thus increase their capacity to protect their health and climate resilience 7. Improve disease control and prevention; 8. Support capacity-building, including institutional capacity, for preventive measures, planning, preparedness and management of disasters relating to Climate Change, including contingency planning, especially for droughts and floods in areas prone to extreme weather events 9. Promote greater investment in health Infrastructure to ensure increased access of population to improved health care. These could include: a. Retrofitting health facilities and equipment (eg. Mobile Health Clinics, Amphibious Ambulance Services) b. New Building Codes for Health Facilities
Time Frame	Five (5) years
Lead Agency	Ministry of Health
Links to other Policies/Programmes	Integrated Water Resources Management Policy
Resources/ Estimated Cost	TBD

7.2.9 Energy Sector

The Government of Belize, in recognition of the twin challenges of Energy Security and Climate Change endorsed, in January 2012, a draft National Energy Policy (NEP) which was intended to put sustainable energy at the centre of Belize's Development Agenda. Later that same year, MESTPU published its Strategic Plan 2012-17, which identified specific outcomes that are required in order to achieve the sustainable energy goals identified in the NEP by the end of this decade.

This strategy document builds on work plans formulated under the NEP and commitments made under the Sustainable Energy for All (SE4ALL) initiative, the CARICOM regional energy strategy and the Central American regional energy strategy. It outlines Belize's National Sustainable Energy Strategy and includes a number of programmes and activities to support the development of the country's non-renewable and renewable energy resources while also helping to reduce the country's GHG emissions.

The strategy is aimed at improving energy efficiency and conservation, and developing Belize's domestic energy resources to facilitate private sector participation and investment in the new low carbon energy sector. It also seeks to empower rural communities to participate in income-generating activities, particularly women and young people; and to encourage and advise the public and private sectors and the general public to become more aware of the

critical energy issues and to take appropriate actions and response measures. The Plan also commits to building MESTPU's institutional capacity in order to accomplish its mandate.

In consideration of the development objectives of the country and the low carbon development goals articulated in the National Climate Change Policy the mitigation objectives of the energy sector are to address energy efficiency in the short-term by reducing greenhouse gas emissions. In the longer term strategies will seek to promote the development and implementation of regulatory standards and measures that focus on renewable energy, energy conservation and the provision of sustainable energy supply, providing incentives to undertake research and development in this field. See Table 7.9 for a detailed listing of the adaptation and mitigation strategies and activities to be pursued.

Table 7.9: Energy: Climate Change Mitigation/Adaptation Strategy and Action Plan

Sector Factors	Mitigation and Adaptation Measures
Strategic Aim/Goal	To "Plan, promote and effectively manage the production, delivery and use of energy, through Energy Efficiency, Renewable Energy, and Clean Production interventions for the sustainable development of Belize."
Rationale	The inefficient ways in which Belize produces and uses energy, and the continued over-dependence on imported fossil fuels and electricity, particularly transport fuels, have been identified as major hurdles for achieving sustainable economic growth. This "energy challenge" is compounded by the deleterious impacts which the burning of fossil fuels is having on the environment. Belize, like other SIDS is particularly vulnerable to the effects of Climate Change. In consideration of the development objectives of the country and the low carbon development goals established in the National Climate Change Policy, encourage the adoption of activities to mitigate against Climate Change and contribute to GHG reduction and make a positive contribution to sustainable development of Belize.
Overall Strategy	Development of appropriate policy tools and instruments to drive energy efficiency, accelerate the uptake of renewable energy, and shift to clean production, while facilitating universal access to modern energy carriers.
Action	Belize's Sustainable Energy strategy has the following strategic elements: 1. Improve Energy Efficiency to dramatically lower energy intensities across key economic sectors Transport, Industry, Buildings (Commercial & Residential), Public lighting and Agriculture a. Improve energy efficiency in buildings and appliances. b. Promote transition to sustainable transportation. c. Develop appropriate financial and market-based mechanisms that support energy efficiency and renewable energy. 2. Develop Renewable Energy to shift the energy matrix away from fossil fuels (especially oil) to alternative renewable energy technologies. a. Develop Belize's human, technological and institutional capacity to accelerate the uptake of appropriate clean energy and clean production technologies. 3. Promote and facilitate Clean Production systems in the processing of Agriculture and Forestry outputs to co-produce bio-fuels and/or electricity.

Sector Factors	Mitigation and Adaptation Measures
	a. Promote the adoption of appropriate processing technologies to convert biomass from waste, forestry, agriculture and microbial production into food, feed, fibre, chemicals and energy (electricity, heat and bio-fuels). 4. Enhancing national capacity in clean energy and clean production by developing human, technological, and institutional resources. a. Build the capacity of the Ministry of Energy, Science & Technology and Public Utilities and supporting institutions with regard to effectively fulfilling their mandates. b. Strengthen the ongoing development of an appropriate legal and regulatory framework, and other policy mechanisms to support the mainstreaming of the clean energy and clean production technologies. c. Strengthen the Planning and Coordination functions of the MESTPU 5. Promote and support Universal Access to affordable modern energy services including energy infrastructure. a. Expand access to electricity, clean fuels, water and sanitation for under-served communities and households. b. Upgrading the electric grid and supply infrastructure to make it a smarter, more unified and integrated energy system
Time Frame	Five years
Lead Agency	Ministry of Energy, Science & Technology, and Public Utilities MESTPU
Links to other Policies/Programmes	Growth and Sustainable Development Strategy
Resources/ Estimated Cost	TBD

7.2.10 Transportation

Several of Belize's roads and bridges are vulnerable to seasonal floods. Belize's waterways also become un-navigable during certain periods. Sea level rise and changes in rainfall patterns could increase the episodes of flooding which will impact the nation's transportation. Also of note is the fact that transport (the largest source of GHG emissions in the energy sector) is a major energy consumer, consuming almost half (½) of final energy used in Belize. It is also a major source of urban air pollution, which impacts the local environment and human health. Given Belize's stated sustainable development goals as well as the sustainable energy goals pursued as part of the NEP there is a critical need to make interventions in the fuels sub-sector, specifically (i) formulate and implement a Sustainable Transport policy to reduce economy-wide fuel intensity, and (ii) implement a bio-fuels policy within an overarching upgrading of the regulatory and business environment for fuel production, delivery, storage and end-use.

In the absence of a transport policy, it is imperative that a vulnerability assessment is undertaken with greater focus being placed on assessing the vulnerability of the transport infrastructure, particularly in urban areas and other areas which are critical in sustaining the country's productive sectors (tourism, agriculture and ports). An improved and energy efficient transport sector will not only reduce the country vulnerability to storm surges and floods, but also assist in reducing GHG emission. See Table 7.10 for a more detailed listing of the mitigation and adaptation strategy and action plan for the transport sector.

Table 7.10: Transportation: Climate Change Mitigation/Adaptation Strategy and Action Plan

Sector Factors	Adaptation and Mitigation Measures
Strategic Aim/Goal	To take necessary measures to reduce vulnerability of critical transportation and communications infrastructure to Climate Change impacts and increase the resilience of the transportation/communication sectors.
Rationale	Several of Belize's roads and bridges are vulnerable to seasonal floods. Belize's waterways also become un-navigable during certain periods. Sea level rise and changes in rainfall patterns could increase the episodes of flooding which will impact the nation's transportation. Also of note is the fact that transport (the largest source of GHG emissions) is a major energy consumer, consuming almost half (½) of final energy used in Belize.
Overall Strategy	Undertake risk assessment and risk reduction measures to increase the resilience of the transportation and communications sectors.
Action	1. Comprehensive assessment of transportation/communications infrastructure and their vulnerability to storm surges, floods and other forms of natural disasters, especially the major productive (tourism, agriculture, etc) sectors. 2. Review and update standards for construction and maintenance of transportation infrastructure to include an additional protective margin for the expected risks associated with Climate Change. 3. Develop risk assessments and response plans, including mapping and identification of high-risk and critical infrastructure (related to the productive

Sector Factors	Adaptation and Mitigation Measures
	sectors), and implementing key infrastructure reinforcements and relocations. 4. Promote energy efficiency in the transport sector through appropriate policies and investments: These improvements should include: a. Undertaking a traffic management study aimed at reducing traffic congestion in urban areas and along the Philip Goldson Highway into Belize City b. Improving public transportation c. Upgrading maintenance of bus fleet d. Improving scheduling e. Upgrading the industrial fleet f. Promoting the use of bio-fuels
Time Frame	Five years
Lead Agency	Ministry of Works
Links to other Policies/Programmes	NEP (Energy efficiency)
Resources/ Estimated Cost	TBD

7.2.11 Solid Waste Management

Municipal solid waste (MSW) including everyday waste from households, schools and business places, contains biodegradable organic matter such as kitchen waste, garden waste, and paper which generates a mixture of carbon dioxide and methane upon their degradation. Municipal solid waste landfills are the third largest source of global methane emissions, while the practice of open garbage burning emits black carbon and other toxic compounds as well as greenhouse gases.[18]

Until a few years ago, the uncontrolled dumping and burning of garbage, as a form of final disposal throughout Belize, was quite common. Such practices, compounded by inadequate waste collection systems and the lack of technical and environmental controls, are not only worrisome, because of the emissions into the atmosphere, but also because of the impact on the health of the population and pollution of the nearby ocean, thereby affecting coral reefs and affecting the livelihood of thousands of Belizeans whose livelihoods are directly and indirectly linked to fishing and eco-tourism.

Since 2010 the GOB has made significant strides in addressing its garbage disposal problem, by closing the large open dump sites close to Belize City (Mile 3) and San Ignacio, and commissioned the new regional sanitary landfill facility at mile 24 to serve the Western Corridor (San Pedro Ambergris Caye, Caye Caulker, Belize City and San Ignacio/Santa Elena). The

[18] http://www.unep.org/ccac/Initiatives/MunicipalSolidWasteSector/tabid/130321/Default.aspx#sthash.IHLt3KJF.dpuf

responsibility for ensuring that solid waste is managed in an environmentally sound manner lies with the Belize Solid Waste Management Authority (BSWaMA) which was formally established under the Solid Waste Management Authority Act, 1991, Chapter 224 of the laws of Belize Revised Edition 2000. With the establishment of this new disposal facility just outside of Belmopan, it is now estimated that fifty per cent of the waste generated in Belize is now disposed of through landfilling.

With half the country still not served by proper means of collection and disposal the potential threats to the health of local population, the environment, and the economy are significant. Added to this is the fact that increased flooding and hurricanes, a direct impact associated with Climate Change, will lead to increasing demands for landfill space to dispose of hurricane/disaster generated wastes. More importantly, commitments to international obligations require the introduction of measures to limit emissions.

Having achieved closure of open dumps and established the disposal facility in the Western Corridor, the challenge ahead is to achieve closure of all open dumps nation-wide, and the development of a national programme for integrated management of solid waste while also limiting emissions which contribute to global warming.

Addressing the impacts of Climate Change on the solid waste sector will involve a combination of interventions involving adaptation and mitigation. It will look at the potential of existing waste management options for decreasing emissions as well as efforts to address related impacts associated with flooding, disasters and sea level rise. See Table 7.11 for more information on the proposed strategy and action plan to address impacts of Climate Change on the waste management sector of Belize.

Table 7.11: Waste Management Adaptation & Mitigation Strategy and Action Plan

Sector Factors	Mitigation and Adaptation Measures
Strategic Aim/Goal	Nation-wide improvements in the management of solid waste and reduction in the generation of GHG emissions.
Rationale	Waste management practices in Belize are far from ideal with the common form of waste disposal being uncontrolled dumping and burning of garbage. Such practices, compounded by inadequate waste collection systems and a lack of technical and environmental controls, are not only worrisome, because of the emissions into the atmosphere, but also because of the impact on the health of the population and pollution of the nearby ocean, thereby affecting coral reefs and affecting the livelihood of thousands of Belizeans whose livelihoods are directly and indirectly linked to fishing and eco-tourism. A major portion of the municipal solid waste generated in Belize is composed of organic materials which produce methane (CH_4) as they decompose. Such methane and other toxic compounds are a significant contributor to global warming. The GoB can contribute to mitigation of Climate Change by developing a national programme for integrated solid waste management including measures to reduce the generation of waste and capturing

Sector Factors	Mitigation and Adaptation Measures
	and reusing methane and thus contributing to lowering emissions.
Overall Strategy	Implementation of a National Integrated Waste Management Programme including programmes to reduce, reuse, recover and recycle, solid waste and reduce GHG emissions into the atmosphere.
Action	Develop and implement a National (country-wide) Integrated Solid Waste Management Programme for Belize. Such a programme will seek to address and enhance current initiatives including: ▪ Institutional strengthening ▪ Waste segregation, storage, collection and transport ▪ waste minimization, re-use and recovery ▪ Cost recovery ▪ Education awareness and stakeholder communications Develop a solid waste mitigation strategy, and a detailed nationally appropriate mitigation action (NAMA) plan, including measuring, reporting and verification (MRV) and financing options for CDM capping and closing open dumps, capturing and utilizing landfill gas, and ensuring proper waste handling and organics management.
Time Frame	Medium – long-term
Lead Agency	Belize Solid Waste Management Authority (BSWaMA)
Links to other Policies/Programmes	MESTPU Strategic Plan 2012-17
Resources/ Estimated Cost	TBD

7.3 Action Plan Application

The strategies and actions identified above constitute a comprehensive package that will facilitate Climate Change mainstreaming and effective implementation of the NCCPSAP. Accordingly, the separate actions identified above are closely interlinked as evident by the other various policies and programmes to which they are associated. That linkage, however, masks underlying challenges given the complexities of the issues (ecological, economic, social, legislative and institutional arrangements) which have to be addressed in order to sustain or achieve the desired development objectives.

The activities identified in the various Sector Plans above, while they point to strategies, choices and actions that will allow for adaptation to and mitigation of the effects of Climate Change will require further refinement by the sectors agents themselves and the construction of an overarching framework or management mechanism to guide the process. That process should include the necessary institutional capacities, supportive legislation, and adequate financial resources.

8.0 INSTITUTIONAL ARRANGEMENTS AND MANAGEMENT MECHANISMS

Given the complexities and cross-cutting nature of Climate Change impacts, and the need for appropriate responses to ensure mainstreaming of adaptation and mitigation measures, it is evident that no single policy or legislative instrument is adequate to ensure the mainstreaming of Climate Change as envisaged by the various international, regional and national obligations. What is evident is that there is a need for a coherent, overarching governance structure, consisting of clear policy directives and supported by an enhanced institutional framework which can provide direction, but most importantly, coordinate the efforts of other entities and line ministries, all of which have equally important roles to play in Climate Change adaptation and mitigation. This policy and the institutional arrangements being recommended, should be buttressed by appropriate legislative and regulatory instruments which acknowledge the obligations and commitments of the country to its global and regional partners to adopt and implement policies and measures to mitigate the adverse effects of Climate Change and adapt to these changes as it seeks to build resilience in the development of a low carbon economy.

In the absence of specific legislative or national policy, responses to Climate Change mitigation and adaptation have become the responsibility of various ministries or departments of government, depending on the perceived impacts Climate Change is anticipated to have on that sector, the need to address mitigation concerns, and the relative opportunities and availability of financial flows to that sector. In that regard, there are several line ministries whose primary mandate, based either on statutory instruments or Cabinet directive, is responsible for the management of resources of those various sectors, including sustainable development and resource conservation.

By extension, therefore, these line ministries and agencies have been identified as also having an interest in promoting and pursuing the principles and goals of Climate Change adaptation and mitigation (See Table 1: Ministries, Agencies and Management Functions). Understanding the existing governance framework requires an institutional mapping to explore the institutional linkages between and among these different agencies and the modalities through which resource management translates into or is capable of addressing Climate Change threats which are likely to impact on the respective sectors.

The GOB has to date undertaken a number of initiatives to create a system of governance and management of Climate Change. The formal preparation of a NCCPSAP has resulted, not only in identifying the activities to be undertaken but demonstrating the critical need for a governance structure which is responsive to the cross-sectoral challenges of Climate Change adaptation and mitigation and can facilitate the pursuit of a low carbon climate resilient development pathway. The establishment of such a structure requires, to some extent, transformational change in thinking and leadership as old systems of sectoral pursuits have to give way to cooperation and collaboration. It is in

this regard that the BNCCC and the National Climate Change Office were established. However, as noted in the ZEPHYR[19] and David Simmons & Associates[20] reports, the effectiveness and efficiency of the BNCCC was weighted down by its size and the positioning of the NCCO, low down in the decision-making hierarchy for the MFFSD, does not permit or provide for effective coordination. It is in that regard that recommendations have been made for the re-configuring and rationalising of the roles and functions of the BNCCC and for the elevation of the NCCO to a Climate Change Department (CCD) in the MFFSD.

8.1 Climate Change Department

The establishment of a CCD to replace the NCCO is an effective way of acknowledging that the management of Climate Change needs to be focused and committed to the implementation of the NCCPSAP. An important aspect of mainstreaming is the need for a governmental entity to be strategically placed so that it can effectively coordinate the implementation of Climate Change adaptation and mitigation action in development planning and decision-making and resource mobilization and allocation. The CCD, by virtue of its dedicated mandate, will play a crucial role in spearheading the implementation of the Climate Change programme approved by Cabinet. The strength of a CCD lies in its adeptness to seamlessly facilitate collaboration, on the one hand, and coordinate implementation of programmes by the various Ministries and diverse stakeholders, on the other. It will also seek to create partnerships among various stakeholders to ensure integrated and systematic implementation of the national Climate Change response agenda.

In alignment with a functionalist approach, it is suggested that the implementation of the NCCPSAP should become the full responsibility of the CCD and as such, will have full responsibility for coordinating all relevant Climate Change mitigation and adaption policies, strategies, actions and programmes across various sectors and Ministries of Government. Based on this functionalist approach, the establishment of the CCD will facilitate cooperation among diverse entities and actors and the effective coordination of efforts. As such, duplication of efforts and disparities across sectoral policies will be significantly diminished.

As the executive arm for the coordination and implementation of Climate Change adaptation and mitigation, the CCD will be provided with competent staff to ensure adequate fulfilment of the goals of the NCCPSAP.

The principal functions of the new CCD shall therefore be to:

- Lead the coordination and implementation of government's NCCPSAP;
- Coordinate Belize's response to its international and regional Climate Change obligations;

[19]. Zephyr Services Ltd. (2014) "Consultancy to Conduct a Capacity Needs Assessment and to Develop an Organizational Framework Supporting National Climate Change Governance".
[20] . Organizational Framework for Managing Climate Change Mitigation and Adaptation (Draft Report), 2014.

- Ensure the mainstreaming of Climate Change adaptation and mitigation actions across the public and private sectors;
- Coordinate and develop a Climate Change resource mobilization strategy that undergirds a long term low emission development pathway;
- Undertake a review of the NCCPSAP every 5 years;
- Conduct independent analysis into Climate Change science, economics and policy;
- Stimulating scientific research in order to ensure timely and transparent access to current Climate Change knowledge;
- Develop and implement a Climate Change communications strategy and ensure it is updated every three years;
- Coordinate and facilitate capacity development at the human, institutional and system-wide levels;
- Act as a repository for all matters relating to Climate Change in Belize; and
- Provide analytical and corporate support to the BNCCC.

The New CCD shall be headed by a Director whose responsibilities will include:

a. strategic planning;
b. inter-ministerial coordination;
c. resource mobilization; and,
d. corporate communications

8.2 The New Belize National Climate Change Committee

The re-configuration and streamlining of the BNCCC is more in-keeping with its perceived role in providing policy guidance and facilitating the mainstreaming of Climate Change adaptation and mitigation. The large number of sector agencies with an interest in Climate Change adaptation and mitigation requires that they also have a hand in shaping the policy. This requires the establishment of a governance structure which will provide overarching leadership and guidance. It was this imperative which gave rise to the establishment of the existing BNCCC. Under the new arrangement it is proposed that the size of the BNCCC shall be reduced to a total of eleven (11) members with three sub-committees (Vulnerability Assessment and Adaptation, Mitigation, and Public Education and Outreach).

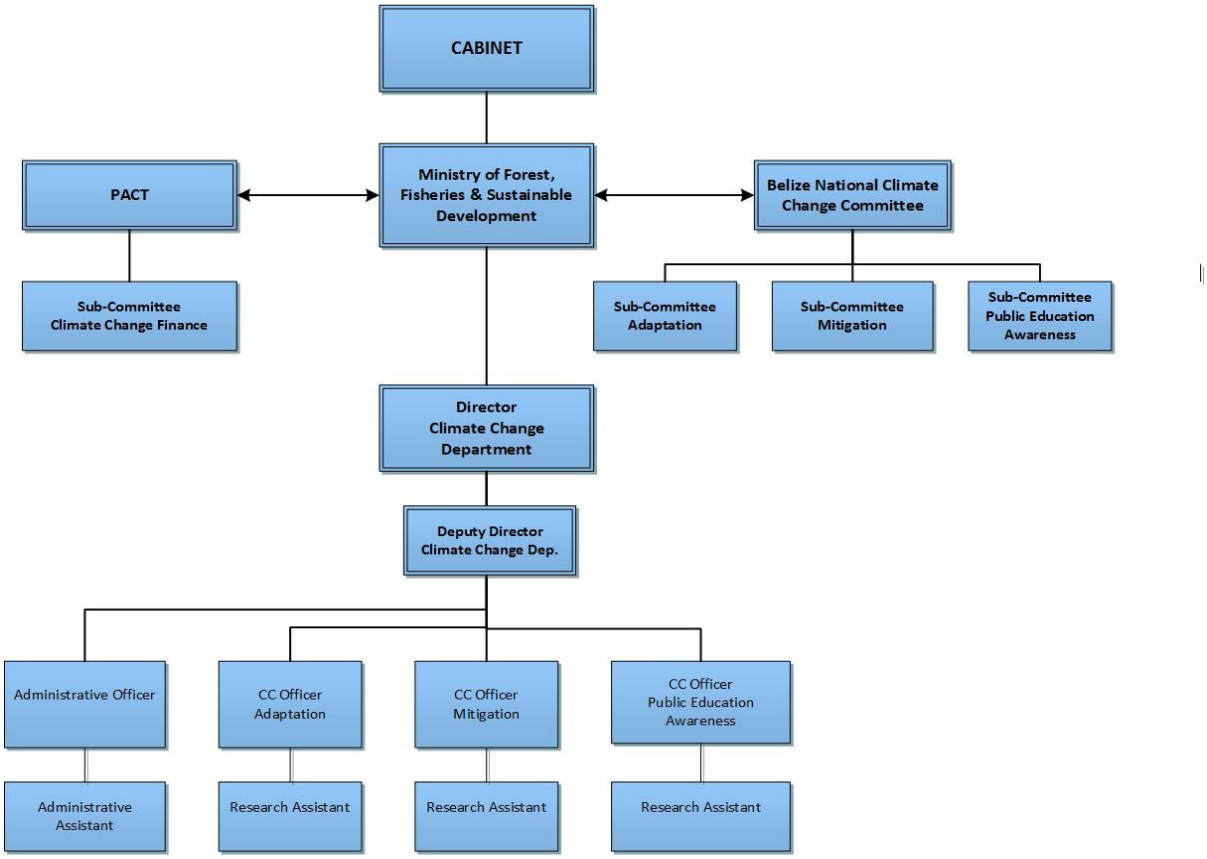
Under this new arrangement the governmental agencies recommended to serve on the BNCCC is based on the fact that the particular Ministry, or other agencies in that Ministry, have a responsibility (legislation/regulation or policy) over a sector on which the impacts of Climate Change are manifested in a direct way. Also, that Ministry/Department/Authority will be at the forefront of measures to implement adaptation and mitigation programmes and promote the overall goal of low carbon development. On that basis, the composition of the BNCCC shall consist of the following:

- Ministry of Forestry, Fisheries and Sustainable Development — Chair
- Ministry of Economic Development- Vice Chair
- Ministry of Natural Resources and Agriculture

- Ministry of Health
- Ministry of Works and Transport
- Ministry of Tourism, Culture and Civil Aviation
- Ministry of Labour, Local Government, Rural Development and NEMO
- Ministry of Energy, Science and Technology, and Public Utilities
- Representative from the Private Sector (Vice Chair)
- Representative from NGO/CBO Umbrella Group
- Representative from the University of Belize

The BNCCC shall be chaired by the Chief Executive Officer (CEO) in MFFSD and will report to Cabinet through the Minister in that same Ministry. See Figure 8.1 which outlines the organizational structure and reporting relationships of the CCD.

Figure 8.1: New Governance Architecture for Climate Change Management in Belize



8.3 Legislative and Regulatory Mechanism

The legislative and regulatory changes required to facilitate Climate Change mainstreaming and low-carbon resilient development are not significant given the fact that Belize does have sufficient statutory

instruments governing environmental management. Also, it is generally recognized that though statutory changes could assist in providing for greater regulatory controls, particularly where enforcement measures may be the most efficient form of deterrence or compliance, adaptation and mitigations measures could be adopted through policy instruments. It is for this reason the revamped CCD will have as one of its main undertakings, ensuring that relevant policies are reviewed and brought in line with the requirements of the NCCSAP.

Notwithstanding the above, there are areas and aspects of legislative and regulatory control which will require the immediate attention of local Authorities. The EIA regulations, for example requires immediate attention to ensure that Climate Change adaptation and mitigation measures form an integral part of the EIA review process. Likewise, given the huge demand for land and housing requirements, the prevalence of unauthorised building associated threats of Climate Change related increased rainfall, land slippage and flooding, there is need for amendment to the Act designate areas where human settlements are prohibited, e.g. because of flood risks. See Table 8.1 for a listing of recommended changes to legislation.

Table 8.1: Recommendations for Mainstreaming Climate Change in the Legislative Framework

Current Act	Link to Climate Change	Recommendations
Environmental Protection Act EIA Regulations; Effluent Limitation Regulations; Pollution Regulations; Hazardous Waste Regulations; Environmental Protection (CDM)	Protection of the Environment	Review EIA regulations to ensure that Climate Change adaptation and mitigation measures form an integral part of the EIA review process.
Public Health Act	Protection of human health through control and prevention of pollution	Legislation is out-dated. A new Act and accompanying regulations is need to mainstream Climate Change considerations
Forest Act – Forest Rules, Mangrove Regulations Act is vague in the rationale for creating, and managing forest reserves, as well as in removing forest reserve status	Preservation and sustainable use of forests.	Enact new Forest Act and Rules, to mainstream Climate Change; strengthen Mangrove Regulations. Revision needed to statutory provisions relating to granting of licences for biodiversity prospecting. Comprehensive new Act needed.
National Parks System Act Minister can withdraw Protected status.	Protection of the environment; Mitigation	Enact draft National Protected Areas System Act 2000
Wildlife Protection Act	Protection of fauna	Needs to be modernized and made more consistent with the requirements of the CBD
Fisheries Act	Sustainable fisheries, for the conservation and preservation of	Existing Act is out-dated. New Act and Regulations pending. New legislative

Current Act	Link to Climate Change	Recommendations
	the marine environment	framework will mainstream Climate Change in the fisheries sector.
Integrated Water Resources Management Act	Conserve and protect water resources. Improvement of water resource management.	Implement Act. Water management is a key aspect of mainstreaming Climate Change.
Disaster Preparedness and Response Act	Mitigation of, preparedness for, response to and recovery from emergencies and disasters.	Amend Act to designate areas where human settlements are prohibited, e.g. because of flood risks.
National Lands Act, National Lands (Amendment) Act	Prevention of use of steep land where there is risk of erosion or ecological damage; preservation of land adjoining running stream, river, or open water.	Strengthen legislation re allocation of land; take into account Climate Change considerations
Land Utilization Act	Protection of watersheds and forests; prevention of soil erosion; regulation of type of development in designated areas.	Revisions needed to Land Utilization Act. Also proclaim and enforce special Development Areas.
Housing and Town Planning Act Planning schemes lacking for Belize as a country; schemes prepared for Belize City and Ambergris Caye not adopted.	Land use; Preservation of views and prospects and of amenities; Preservation and protection of forests, woods, trees, shrubs, plants and flowers.	Enact the National Planning Bill and mainstream Climate Change in physical planning.
Belize Building Act Need for energy efficiency building regulations.	Adaptation and mitigation to Climate Change.	Revise the Building Act.
Private Works Construction Act	Land use on banks or shores of water ways and bodies.	Revise Private Works Construction Act to increase penalties, enforcement needed.
Standards Act	Protection of the environment	Revise Standards Act to provide for the use of energy efficient equipment.

8.4 Resource Mobilisation

A pressing concern of small states already experiencing development challenges and now faced with the imminent threat of Climate Change (sea level rise, increasing temperatures, unpredictable, but heavier and more intense storms and hurricanes) is the issue of financial assistance to build resilience and sustainable development. The ZEPHYR Services Report identified several funding option, including locally pursued options (carbon tax and tax on vehicles) which the country can explore in order to generate sufficient funds to meet its operational cost as well as some project support. Notwithstanding this important statement of intent to be self-supportive, the quantum of resources required in anticipation of the infrastructure changes and other transformational changes in all of the sectors

identified in the action plan above, suggests it is beyond the capacity of the government. However, given the various funding opportunities such as the Green Climate Fund which are being structured and becoming available to meet the challenges of Climate Change, a more prudent and strategic approach would be to establish a Climate Change Trust Fund (CCTF).

Notwithstanding the desire and recommendation for the establishment of a CCTF, it should be noted that the Government of Belize has considerable experience with the management of trust funds having established the Protected Areas Conservation Trust (PACT). PACT, formally established in 1996, is intended to encourage and promote, for the benefit and enjoyment of the present and future generations of the people of Belize, the provision, protection, conservation and enhancement of the natural and cultural resources of Belize. In that regard, PACT is currently serving as the fiduciary manager for the National Protected Areas Secretariat (NPAS) and will exercise similar administrative responsibility for the recently announced US$ 6.0 million Marine Conservation and Climate Change Adaptation (MCCA) project which is funded by the UNFCCC Adaptation Fund, and the US$ 6.0 million from the GEF for the Protection of Key Biodiversity Areas (KBA) project. Based on the above it is the recommendation of this study that GOB not only establish, by an Act of Parliament, a CCTF, but also confer on PACT, responsibility for the management of that Fund. It is also recommended that Cabinet establish a Climate Change Finance Committee (CCFC) as a standing committee of the PACT whose main function will be resource mobilization in support of Climate Change. The CCFC will work exclusively assistance to PACT and the CCD in attracting investments to assist with the implementation of the Climate Change adaptation and mitigation programmes identified in the NCCPSAP.

The proposed reconfiguration of the governance structure for Climate Change management in Belize has financial implications for GOB, notwithstanding the recommendation for the establishment of the CCFT. It the organizational study undertaken by ZEPYR Services it was acknowledged the CCD must have access to adequate and predictable sources of finance for operational effectiveness. In that regard, it was estimated that the average operational cost of maintaining a full complement of staff (13) and other related programmes would cost an average of $700,000 per annum over the first five years.

While the report acknowledges that cost of recurrent expenses should come from the consolidated Fund, it also noted the possibility of innovative sources of funding-namely the establishment of two revenue streams. The two potential revenue streams identified, which can be implemented immediately are: (a) a carbon levy and (b) a vehicle efficiency levy. These revenue streams, it was noted, are in alignment with MESTPU's strategic goal to halve importation of refined fossil fuels from 1,000,000 barrels to 500,000 barrels.[21]

[21] MESTPU Strategic Plan 2012-2017, pg 3

8.5 Monitoring and Reporting

The BNCCC will have responsibility for monitoring the implementation of the NCCPSAP. Government shall review the mandate, terms of reference and composition of the BNCCC with a view to better equipping it to fulfil its monitoring role. The BNCCC shall report to the Cabinet of Ministers through the Minister on a semi-annual basis, as well as at any other time deemed necessary. The BNCCC shall keep this policy under regular review, and shall monitor implementation of the directives of this policy, and shall present to Cabinet and the House of Assembly an annual report on measures that have been undertaken to implement this policy. On the fifth anniversary of the date of this policy, the BNCCC shall conduct a public review of this policy to determine its effectiveness in achieving its goals and objectives.

9.0 CONCLUSION AND RECOMMENDATIONS

The implementation of the NCCSAP will require that the Cabinet give approval to the following:

1) Adopt the National Climate Change Policy and Strategy as the official government policy and strategy to enable the country achieve the adaptation and mitigation goals.

2) Amend key sectoral laws to make them consistent with the UNFCCC and to ensure that all actions under the Ministry responsible for Climate Change have the legislative basis to be implemented and translated from concept to practice. This can be done either through single Statute (Miscellaneous) Amendments Bill or through a raft of separate amendments of the relevant sectoral laws.

3) Establish a CCD, in the Ministry responsible for Climate Change with the role of primary coordination, policy direction, oversight and guidance across all levels of government. The CCD should ensure mainstreaming of Climate Change by national government agencies and departments. The CCD is expected to coordinate Climate Change issues through an inter-ministerial and inter-agency committee as required by the UNFCCC.

4) The CCD will be the primary national government technical agency for Climate Change response and should be located within the sectoral ministry responsible for climate affairs.

5) Approve the revised mandate of the BNCCC to provide policy guidance and oversee the operations of the CCD. Among the duties of the BNCCC will be the regular revision of the NCCPSAP, oversee the implementation of the Climate Change Strategy and Action plan, ensure there is adequate compliance with, and enforcement of policies and regulatory provisions, and monitor and report on progress achieved in implementing these policies and action plan.

6) Establish, by an Act of Parliament, a CCTF, and confer on PACT, responsibility for the management of that Fund, and establish a CCFC as a standing committee of the PACT whose main function will be resource mobilization in support of Climate Change.

In order to fulfil its mandate, the CCD will be provided with annual GOB budget allocation and adequate staffing capacity that support the performance of these key functions.

REFERENCES

Belize National Meteorological Service. 2008. "Vulnerability Assessment of the Belize Coastal Zone: Enabling Activities for the preparation of Belize's Second National Communication (SNC) to the United Nations Framework Convention on Climate Change (UNFCCC) Project. " Accessed June 2, 2014. http://www.hydromet.gov.bz/downloads/Coasta_Zone_Report_June2008.pdf

Caribbean Community Climate Change Centre. 2009. "Regional Framework for Achieving Development Resilient to Climate Change." Accessed June 10, 2014. http://dms.caribbeanclimate.bz/M-Files/openfile.aspx?objtype=0&docid=948

Charlery J. and L. Nurse - Areal Downscaling of Global Climate Models: An Approach That Avoids Data Remodeling. Climate Research 43, 2010, pp 241-249.

Christensen J H, Hewitson B, Busuioc A, Chen A, Gao X, Held I, Jones R, Kolli R K, Kwon W-T, Laprise R, Magaña Rueda V, Mearns L, Menéndez C G, Räisänen J, Rinke A, Sarr A and Whetton P. 2007. Regional Climate Projections. In: "Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change" [Solomon S, Qin D, Manning M, Chen Z, Marquis M, Averyt K B, Tignor M and Miller H L (eds)]. Cambridge University Press. Cambridge, United Kingdom and New York, NY, USA

Climate Investment Funds. 2013. "The National Climate Resilience Investment Plan." Accessed July 4, 2014. https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Belize_PPCR-SC_Presentation_110113%20MFC.pdf

Coastal Zone Management Authority and Institute. 2013. "Belize Integrated Coastal Zone Management Plan." Accessed May 25, 2014. http://www.coastalzonebelize.org/wp-content/uploads/2013/06/DRAFT%20BELIZE%20Integrated%20Coastal%20Zone%20Management%20Plan%20_MAY%2020.pdf

Eldis. 2008. "National Integrated Water Resources Management Policy (Including Climatechange) For Belize." Accessed June 1, 2014. file:///C:/Users/Nikita/Downloads/National%20Integrated%20Water%20Resource%20Management%20Policy%20(Including%20Climate%20Change)%20For%20Belize.pdf

Government of Belize: The Official Government Portal. 2010. "Belize Medium Term Development Strategy 2010-2013." Accessed July 4, 2014. http://www.gov.bz/index.php/belize-medium-term-development

Government of Belize: The Official Government Portal. 2010. "National Development Framework for Belize: Horizon 2010-2030." Accessed June 1, 2014.

http://www.cdn.gov.bz/belize.gov.bz/images/documents/NATIONAL%20DEVELOPMENT%20FRAMEWORK%202010-2030%20NEW%20USER%20FRIENDLY%20VERSION%202.pdf

Government of Belize. (2002). *First National Communication to the Conference of the Parties of the United Nations Framework Convention on Climate Change.*

Government of Guyana. (n.d.). Constitution of the Co-operative Republic of Guyana.

Government of India. (n.d.). Constitution of India.

Grinsted, A., Moore, J. C. and Jevrejeva, S. (2009): *Climate. Dynamics:* 34, 461–472.

Horton, D. E., Skinner, C. B., Singh, D., & Diffenbaugh, N. S. (2014, June 22). Occurrence and Persistence of Future Atmospheric Stagnation Events. *Nature Climate Change, 4*, 698-703.

Horton, R. et al., 2008. Sea level rise projections from current generation CGCMs based on the semi empirical method. Geophys. Res. Lett. 35.

G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi: 10.1017/CBO9781107415324.

IPCC, 2013: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

IPCC Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007), ([Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller, eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

IPCC (2007a): Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., Qin, D., Manning, M., Marquis, M., Averyt, K., Tignor, M.B., LeRoy Mil H., (eds.)]. Cambridge University Press.

IPCC (2007b): Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., Hanson, C.E., (eds.)]. Cambridge University Press.

Intergovermental Panel on Climate Change. 2007. “Climate Change Synthesis Report 2007.” Accessed June 15, 2014. http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf

Intergovermental Panel on Climate Change. 2014. "Climate Change 2014: Impacts, Adaptation and Vulnerability." Accessed June 15,2014. http://www.ipcc.ch/report/ar5/wg2/

Intergovermental Panel on Climate Change. 2014. "Climate Change 2014: Mitigation of Climate Change."Accessed June 15, 2014. http://www.ipcc.ch/report/ar5/wg3/

Intergovermental Panel on Climate Change. 2014. "Climate Change 2014: The Physical Science Basis." Accessed June 15, 2014. http://www.ipcc.ch/report/ar5/wg1/

Kinahoi-Siamomua, Amelia. 2013. "National Agenda for Sustainable development." Draftreport, Division for Sustainable Development, UNDESA.

Mansourian, S., Belokurov, A., & Stephenson, P. J. (2009). The Role of Forest Protected Areas in Adaptation to Climate Change. (A. Perlis, Ed.) *Unasylva, 60*(231).

McSweeney, C., M. New, G. Lizcano, and X. Lu (2010). The UNDP Climate Change Country Profiles: Improving the Accessibility of Observed and Projected Climate Information for Studies of Climate Change in Developing Countries; Bulletin Of the American Meteorological Society, February 2010:157-166.

McSweeney, Carol and Richard Jones (2010): Selecting members of the 'QUMP' perturbed-physics ensemble for use with PRECIS, Met Office Hadley Centre, 8 p.

McSweeney, C., M. New, G. Lizcano, and X. Lu (2010). The UNDP Climate Change Country Profiles: Improving the Accessibility of Observed and Projected Climate Information for Studies of Climate Change in Developing Countries; Bulletin Of the American Meteorological Society, February 2010:157-166.

Meehl, G. A., and Coauthors, 2007: The WCRP CMIP3multi-model dataset: A new era in Climate Change research. *Bull. Amer. Meteor. Soc.,* 88, 1383–1394.

Ministry of Agriculture and Fisheries. 2002. "The National Food and Agriculture Policy."Accessed July 4, 2014. http://www.agriculture.gov.bz/PDF/Policy_Document.pdf

Ministry of Health. 2013. "Belize Health Sector Strategic Plan." Accessed July 4, 2014. http://health.gov.bz/www/attachments/article/801/Belize%20Health%20Sector%20Strategic%20Plan%202014-2024-April%202014.pdf

Nakicenovic, N., and Coauthors, 2000: *Special Report on Emissions Scenarios: A Special Report of Working Group III of the Intergovernmental Panel on Climate Change*, Cambridge University Press, Cambridge, U.K., 599 pp.

National Oceanic and Atmospheric Administration. (2002). *Climate Change Impacts on Land Use Planning and Coastal Infrastructure.* National Ocean Service.

Neal, D., Ariola, E., & Muschamp, W. (2008). *Vulnerability Assessment of the Belize Coastal Zone.* Belmopan.

Nurse L. and J. Charlery (2014): Projected SST trends across the Caribbean Sea based on PRECIS downscaling of ECHAM4, under the SRES A2 and B2 scenarios, Theoretical And Applied Climatology, DOI 10.1007/s00704-014-1346-1

Rahmstorf, Stefan: A new view on sea level rise: Has the IPCC underestimated the risk of sea level rise?Nature Reports: Climate Change, VOL 4, APRIL 2010, pp44-45.

Rahmstorf, S. 2007. A semi-empirical approach to projecting future sea level rise. Science 315: 368.

Richardson, R. B. (2009). *Belize and Climate Change: The Costs of Inaction.* Belmopan: United Nations Development Programme.

Roeckner, E. G. Bäuml, L. Bonaventura, R. Brokopf, M, Esch, M. Giorgetta, S. Hagemann, I. Kirchner, L, Kornblueh, E. Manzini, A. Rhodin, U. Schlese, U. Schulzweida and A. Tompkins (2003): The ECHAM 5 Atmospheric General Circulation Model-Part 1, Report No. 349, 140 p.

Simpson, M.C., Gössling, S., Scott, D., Hall, C.M. and Gladin, E. (2008) Climate Change Adaptation and Mitigation in the Tourism Sector: Frameworks, Tools and Practices. UNEP, University of Oxford, UNWTO, WMO: Paris, France.

Simpson, Murray, Daniel Scott, and Ulric Trotz 2011 "Climate Change Impact on the Caribbean's Ability to Sustain Tourism, Natural Assets and Livelihood" Inter-American Development Bank.

Singh, Bhawan, Calin Obretin and M. Savoie 2014. "Enhancing Belize's Resilience to Adapt to the Effects of Climate Change." Final Report, Climate Change Solutions, Belize.

Sustainable Tourism Programme. 2010. "National Sustainable Tourism Master Plan of Belize."Accessed June 1, 2014. http://www.sustainabletourismbz.org/dmdocfree/final_compiled_plan.pdf

The Caribbean Development Portal: From the United Nations Economic Commission for Latin America and the Caribbean. 2010. "Ministry of Energy, Science & Technology and Public Utilities (MESTPU) Strategic Plan 2012-2017." Accessed June1, 2014. http://estpu.gov.bz/images/media/mestpu%20strategic%20plan%20-%202012-2017.pdf

United Nations Development Programme in Belize.2013. "Draft country programmedocument for Belize, 2013-2017." Accessed June 9, 2014. http://www.bz.undp.org/content/dam/belize/docs/UNDP%20BZ%20Publications/Country%20Programme%20Document%202013%20to%202017.pdf

United Nations Framework Convention on Climate Change.2002. " Belize: First National Communication, United Nations Framework on Climate Change."Accessed June 1, 2014. http://unfccc.int/resource/docs/natc/blznc1.pdf

United Nations Framework on Climate Change.2012. " Belize: Second National Communication, United Nations Framework on Climate Change."Accessed June 1, 2014. http://unfccc.int/resource/docs/natc/blznc2.pdf

United Nations Environment Programme. (2010). *Waste and Climate Change: Global Trends and Strategy Framework.*

UNFCCC *Information on Intended Nationally Determined Contributions in the Context of the 2015 Agreement*. Ad Hoc Working Group on the Durban Platform for Enhanced Action. ADP.2014.7. 7th July 2014. Paragraph 7. http://unfccc.int/files/meetings/bonn_oct_2014/in-session/application/pdf/adp2-6_i3_24oct2014t1530.dt.pdf

United States Environmental Protection Agency. (2009). *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices.*

United States Environmental Protection Agency. (2014). *Land Use Planning*. Retrieved from EPA: http://www.epa.gov/statelocalclimate/local/topics/land.html

Contact Us:

CARIBBEAN COMMUNITY

CLIMATE CHANGE CENTRE
2nd Floor, Lawrence Nicholas Building
Ring Road, P.O. Box 563
Belmopan, Belize.

Tel: + (501)822-1094/822-1104
Fax: + (501)822-1365
Email: oed@caribbeanclimate.bz
Website: www.caribbeanclimate.bz

National Climate Change Office
Ministry of Forestry, Fisheries and Sustainable Development
2 Slim Lane, Belmopan
Belize

Tel: + (501)822-
Fax: + (501)822-
Email: coord.cc@fsd.gov.bz

David Simmons & Associates Ltd
92A Benjamin St., New Yalta, Diego Martin
Trinidad and Tobago
Tel: (868) 789-8923
dasimmons@mail.tt