Government of Jamaica

CLIMATE CHANGE POLICY FRAMEWORK FOR JAMAICA

March 2023

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MINISTER'S MESSAGE

Andrew Holness ON PC MP
Prime Minister and Minister of
Economic Growth and Job Creation

Extreme weather events, induced by worsening climate change, are impacting countries all around the globe. Droughts, more intense hurricanes and typhoons, as well as increased frequency and intensity of floods, impact both lives and livelihoods. The Intergovernmental Panel on Climate Change has stated that "the rise in weather and climate extremes, has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt." At the local level, it has been projected that Kingston would be the second city to experience climate departure and this was projected to occur in 2023.

Despite Jamaica's low contributions to global greenhouse gas emissions, as a small island developing state, climate change poses a serious threat. Jamaica's economy and the well-being of our people are highly dependent on vulnerable sectors such as tourism and agriculture. In addition to the economic impacts of climate change, Jamaica's biodiversity is also particularly at risk, including possible extinction of endemic species and ecosystem degradation. Climate change will also impact food and water security, as well as, health.

Having realized the importance of addressing climate change, the Government of Jamaica approved a Climate Change Policy Framework in 2015. However, since then there have been a number of developments in the climate change arena including Jamaica's ratification of the Paris Agreement in 2017. This has led to the finalization of this updated Climate Change Policy Framework for Jamaica. The Policy will support the achievement of sustained growth and prosperity for all Jamaicans by, *inter alia,* strengthening Jamaica's adaptive capacity and resilience to reduce our vulnerability to climate change, pursuing low carbon development, enhancing access to and the mobilization of climate finance and promoting public education and awareness raising, as well as research and technology transfer towards ambitious climate action.

I would like to take this opportunity to thank the Environment and Risk Management Branch of the Ministry of Economic Growth and Job Creation for leading the development of this Policy, the Ministries, Departments and Agencies and the general public which provided valuable feedback which assisted in its finalization, as well as our international partners which continue to provide support for climate change adaptation and mitigation activities locally.

The Government, with the support of the international donor community as well as the private sector, is implementing a number of initiatives which will be bolstered by the implementation of this Policy, but its successful implementation will require all hands on deck. It is our responsibility to stay informed and to use the information we acquire to make choices which will help to reduce the impact of climate change on Jamaica's economy and our lives.

Andrew Holness ON PC MP
Prime Minister and Minister of Economic Growth and Job Creation

ABBREVIATIONS AND ACRONYMS

AOSIS	Alliance of Small Island States
CCADRR	Climate Change Adaptation and Disaster Risk Reduction Project
CCCCC	Caribbean Community Climate Change Centre
CDM	Clean Development Mechanism
CCAB	Climate Change Advisory Board
CCD	Climate Change Division
CCFPN	Climate Change Focal Point Network
CTCN	Climate Technology Centre and Network
DAE	Direct Access Entity
DBJ	Development Bank of Jamaica
EIA	Environmental Impact Assessment
EU	European Union
GEF	Global Environment Facility
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoJ	Government of Jamaica
HRRACC	Hazard Risk Reduction and Adaptation to Climate Change
IPCC	Intergovernmental Panel on Climate Change
JAMPRO	Jamaica Promotions Corporation
JSIF	Jamaica Social Investment Fund
MDAs	Ministries, Departments and Agencies
MEGJC	Ministry of Economic Growth and Job Creation
MFAFT	Ministry of Foreign Affairs and Foreign Trade
MLGCD	Ministry of Local Government and Development
MOEYI	Ministry of Education, Youth and Information
MOFPS	Ministry of Finance and Public Service
MRECC	Ministry with Responsibility for Environment and Climate Change
MRV	Measurement, Reporting and Verification
MSET	Ministry of Science, Energy and Technology
N_2O	Nitrous Oxide
NAMAs	Nationally Appropriate Mitigation Actions
NBSAP	The National Strategy and Action Plan for Biological Diversity in Jamaica
NDA	National Designated Authority
NEPA	National Environment and Planning Agency
NGO	Non-governmental Organization
NIE	National Implementing Entity
NSWMA	National Solid Waste Management Authority
NWC	National Water Commission

NWA	National Works Agency
ODPEM	Office of Disaster Preparedness and Emergency Management
PAN	Policy Analysts' Network
PCJ	Petroleum Corporation of Jamaica
PIOJ	Planning Institute of Jamaica
PPCR	Pilot Program for Climate Resilience
RADA	Rural Agricultural Development Authority
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SAMOA	Small Island Developing States Accelerated Modalities of Action
SDGs	Sustainable Development Goals
SIDS	Small Island Developing State
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

Vision Statement

Jamaica achieves its goals of sustained growth and prosperity for its people with enhanced resilience and capacity to adapt to the impacts and to mitigate the causes of climate change.

Significant developments have taken place since the finalization of Jamaica's Climate Change Policy Framework in 2015 leading to the decision to update the Policy Framework to revise the strategies to effectively respond to climate change impacts over the next 10 years (2020–2030). The Policy defines Jamaica's goal, strategies and key activities/measures for implementation.

Since becoming a Party to the Paris Agreement on Climate Change in 2017, Jamaica has committed to increasing its level of ambition in mitigating and adapting to climate change. There is growing evidence that climate change is taking place at an accelerated rate due to human activities, especially those related to the use of fossil fuels and land clearing, exacerbated by population growth. According to the Intergovernmental Panel on Climate Change (IPCC), human activities are estimated to have caused approximately 1.1°C of global warming above pre-industrial levels[1] and global warming is likely to reach 1.5°C in the early 2030 if greenhouse gas emissions continue to increase at the current rate.[2]

Jamaica, as a small island developing state (SID), is particularly vulnerable to the impacts of climate change not only in terms of our natural resources, but also our social well-being and our economic development, as key sectors such as tourism, agriculture, fisheries, health, forestry and water are very climate sensitive. It is imperative that Jamaica builds its resilience to the impacts of climate change to support national development and contribute to the reduction of poverty.

The severe weather events which have impacted the country over the years have severely affected the country's economic growth and development. Between 2001 and 2017 Jamaica experienced 12 storm events (including 7 major hurricanes). The period from 2000 to 2010 was the most intense decade on record with 35 flood events (State of the Jamaican Climate 2019). These events combined resulted in

[1] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press

[2] IPCC, 2018: Summary for Policymakers. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, Maycock, M. Tignor, and T. Waterfield (eds.)]. *World Meteorological Organization, Geneva, Switzerland, 32 pp.*

loss and damage amounting to approximately J$132.54 billion.[3] In one case (Hurricane Ivan, 2004), the loss was equivalent to 6.8% of GDP.[4] Hurricane Sandy (2012) accounted for J$9.9 billion or 0.8% of 2011 GDP in direct and indirect damage as well as increased expenditure by private and Government entities. One death and 291 injuries resulted from Hurricane Sandy (Economic and Social Survey Jamaica, 2012). Jamaica was impacted by three named storms during the 2021 Atlantic Hurricane season – Tropical Storms Elsa, Grace and Ida. Tropical Storm Grace was the only one to make landfall. Damage and losses associated with the impact of these three systems on infrastructure and agriculture was $3.5 billion (Economic and Social Survey Jamaica, 2021). Jamaica has also experienced rising temperatures and severe, more frequent drought events.

At the international level, Jamaica as a Party to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement, has been active in negotiations advocating for attention to the specific circumstances and vulnerabilities of small island developing states (SIDS) to the impacts of climate change and the need for substantial reductions in the global level of greenhouse gases (GHG) as well as the provision of adequate financing to assist SIDS in undertaking adaptation and mitigation measures at the national level. It is well recognized that SIDS are not the main contributors to global greenhouse gas emissions. Jamaica is nonetheless, playing its part in reducing its GHG emissions through 'no regrets' mitigation actions which can lead not only to reduced emissions, but also cost savings and social and environmental benefits for the country. Jamaica will also continue to focus in the negotiations on approaches to addressing loss and damage associated with the adverse effects of climate change, including impacts related to extreme weather and slow onset events.5 This is especially important as where there are constraints and limitations to adaptation, then other means of addressing economic loss and damage from climate change impacts will have to be identified.

At the national level, a number of projects on adaptation to climate change have been implemented. These include community-based adaptation initiatives to raise the awareness of the public in general, and vulnerable groups in particular, regarding the impacts of climate change and how it can be addressed. Some of the key activities taken by the Government since 2012 include establishing a Climate Change Division within the Ministry with responsibility for the environment and climate change (MRECC) portfolios, with a specific mandate to address climate change issues; the establishment of a Cabinet-appointed Climate Change Advisory Board and the establishment of the Climate Change Focal Point Network to facilitate a multi-sectoral approach to climate change.

It is recognized that, given the cross-cutting nature of climate change, there is an urgent need to develop an integrated approach in order to effectively build resilience at all levels and to have the required enabling policies in place. *The Climate Change Policy Framework* was first prepared under the GoJ/EU/ UNEP Climate Change Adaptation and Disaster Risk Reduction (CCADRR) Project and updated under a Contribution Agreement between The Canadian Department of Foreign Affairs, Trade and Development (DFATD) (now Global Affairs Canada) and the University of the West Indies, Cave Hill Campus.

[3] State of the Jamaican Climate Report; Macro Socio-Economic and Environmental Impact Assessment of the Damage and Loss caused by the March to June Rains 2017 (PIOJ 2017).

[4] Various Damage and Loss Assessment Reports, Planning Institute of Jamaica

[5] Slow onset events include sea level rise, increasing temperatures, ocean acidification, glacial retreat and related impacts, salinization, land and forest degradation, loss of biodiversity and desertification as referred to in the Decision of the Conference of the Parties to the United Nations Framework Convention on Climate Change, Decision 1/CP.16. Extreme weather events include flood, drought, heatwave, hurricane.

The policy development process involved a number of consultations, using as a basis, Vision 2030 Jamaica - National Development Plan and Jamaica's Third National Communication on Climate Change to the
United Nations Framework Convention on Climate Change. The first output was approved as 'The Climate
Change Policy Framework and Action Plan Green Paper' and was subject to extensive review in accordance with Government of Jamaica guidelines, before receiving the approval of the Cabinet.

Goal and Objectives

The Climate Change Policy Framework for Jamaica (updated) is intended to support the goals of Vision 2030 Jamaica - National Development Plan, specifically Goal 4 'Jamaica has a healthy natural environment' and National Outcomes 13 and 14 on sustainable management and use of environmental and natural resources, and hazard risk reduction and adaption to climate change, respectively. This alignment to the
National Development Plan is achieved by reducing the risks posed by climate change to all of Jamaica's sectors and development goals.

Specifically, the goals of this Policy Framework are as follows:

1) Strengthening of Jamaica's adaptive capacity and resilience to reduce its vulnerability to climate change;

2) Pursuit of low carbon development and enhancement of access to and mobilization of climate finance; and

3) Promotion of public education and awareness raising, research and technology transfer towards ambitious climate action.

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The Policy Framework outlines the objectives, principles and strategies that the country will employ in order to effectively respond to the impacts and challenges of climate change, through measures which are appropriate for varying scales and magnitudes of climate change impacts.

The objectives of the Policy Framework are:

Goal 1: Strengthening of Jamaica's adaptive capacity and resilience to reduce its vulnerability to climate change

1.1 Governance: Improve the governance framework for climate action and ensure transparency and accountability.

1.2 Adaptation: Reduce Jamaica's vulnerability and increase Jamaica's capacity to respond to the harmful impacts of climate change

Goal 2: Pursuit of low carbon development and enhancement of access to and mobilization of climate finance

2.1 Mitigation: Reduce Jamaica's overall GHG emissions in support of low carbon development.

2.2 Finance: Facilitate access to and mobilization of climate financing for climate action.

Goal 3: Promotion of public education and awareness raising, research and technology transfer towards ambitious climate action

3.1 Public Awareness and Education: Increase public awareness of climate change impacts, climate actions and responses at the national and local levels to facilitate behaviour change

3.2 Research: Promote research, innovation, and science-based data collection and analyses and to facilitate, *inter alia,* climate modelling as well as the formulation of appropriate adaptation and mitigation measures, to inform decision-making and strategic actions at all levels

3.3 Technology Transfer: Promote the development, transfer and diffusion of environmentally sound technologies for mitigating, adapting to and addressing loss and damage associated with climate change.

It is expected that, on the basis of this Policy Framework, the relevant sectors will develop or update, as appropriate, plans addressing climate change adaptation and mitigation. In the development and implementation of sectoral climate change adaptation and mitigation plans, the following principles are to be taken into account:

i. Sustainable development
ii. Multi-sectoral approach
iii. Public participation and collaboration
iv. The Precautionary Approach
v. Transparency and accountability
vi. Best available science
vii. Polluter Pays Principle
viii. Inter- and intra-generational equity
ix. Equality and non-discrimination

The Ministry with responsibility for climate change oversees and supports the implementation of ***The Climate Change Policy Framework for Jamaica***. The Climate Change Division (CCD) within the Ministry, has administrative oversight for climate change initiatives and obligations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement and serves as the Designated National Authority (DNA) for the Green Climate Fund. The functions of the CCD include the preparation of national GHG inventories, other reporting requirements such as the preparation of National Communications, Biennial Update Reports and Biennial Transparency Reports as well as the coordination and facilitation of mitigation and adaptation actions. The CCD, in its coordinating role, ensures the systematic dissemination of information among ministries, departments and agencies

(MDAs) and the provision of technical support and guidance to facilitate the development of sectoral adaptation and mitigation strategies and action plans.

There are various coordinating mechanisms for climate action, among them: the Climate Change Advisory Board, the Climate Change Focal Point Network (CCFPN) and the National Transparency Working Group (NTWG). The Climate Change Advisory Board was established to comprise members from the public and private sector, academia, and NGOs to provide advice to the Minister with responsibility for Climate Change. The CCD acts the Secretariat to the Board. The Climate Change Focal Point Network (CCFPN) was established to comprise duly nominated focal points from MDAs to, inter alia, facilitate climate change considerations in coordinating, monitoring, evaluating and reporting on the development of sectoral strategies and action plans. The MDAs are required to share with the CCD, relevant information and reports necessary for the proper collaboration, coordination, integration, monitoring and evaluation of climate change initiatives. The NTWG was established in 2021 to support the work of Jamaica's measuring, reporting and verification (MRV) system.

Legislation will be enacted to strengthen the governance framework for climate change mitigation and adaptation and establish mechanisms for this purpose. This legislation will *inter alia,* institutionalize the coordinating role of the CCD regarding matters relating to climate change.

The Policy Framework will be reviewed every 5 years or earlier period as prescribed by the Cabinet. The Ministry with responsibility for climate change shall conduct a public review of this Policy Framework to determine its effectiveness in achieving the stated goals and objectives.

1. INTRODUCTION

1.1 Background and Rationale

Climate change refers to a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.[6]

Global atmospheric concentrations of greenhouse gases (GHGs): carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) emissions due to human activities have grown since pre-industrial times (1750) and at 2014 were the highest in history.[5] Global surface temperature in the first two decades of the 21st century (2001–2020) was 0.99°C higher than 1850–1900.[7]

About half of CO_2 emissions from anthropogenic sources between 1750 and 2011 have occurred in the last 40 years of that period. About 40% of these emissions have remained in the atmosphere; the rest was removed from the atmosphere and stored on land (in plants and soils) and in the ocean. The ocean has absorbed about 30% of the emitted anthropogenic CO_2, causing ocean acidification (IPCC 2014). The estimated 0.74°C rise in temperatures over the past ten decades[8] and the predicted increases over the next two decades will have significant impacts, including:

- sea level rise which can be expected to significantly increase inundation, storm surge, erosion and other coastal hazards, thus threatening natural buffer zones which offer protection to inland assets, vital infrastructure located in the coastal zone such as major roadways, power plants, hospitals, human settlements and other real estate assets and facilities that support livelihoods;
- increased ambient air temperature;
- ocean warming and thermal expansion;
- increased acidification of oceans;
- increased threats to human health, such as the spread of vector-borne diseases due to increasingly high temperatures;
- increased variability in rainfall patterns;
- increased frequency of extreme weather events such as storms, droughts and hurricanes; and

[6] Climate Change definition under Article 1 of the 1992 United Nations Framework Convention on Climate Change (UNFCCC) [5] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

[7] IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press

[8] The IPCC has noted that it is expected that average temperatures will increase an additional 1.8°C which would be 4°C above pre-industrial levels by the year 2100 if no action is taken.

- reduced quality and quantity of water resources due to the impacts of climate change on the hydrological cycle.

Jamaica's vulnerability to climate change impacts is further compounded by social issues such as poverty, the location of human settlements and critical infrastructure in high-risk areas approximately 5 km from the coast, environmental degradation and instances of poorly constructed infrastructure and housing.[9]

The dependence on natural resources by key economic and climate sensitive sectors such as tourism, agriculture, fisheries, forestry and water, means that climate change is a major threat to the island's food security and overall development based on the projected changes in climate and the expected associated impacts. The threat to development as a result of the adverse impacts of climate change could result in a reduction in the country's Gross Domestic Product (GDP), including a possible loss of Government revenue from unemployment, underemployment and loss of assets and corporate taxes. In response, the Government will be required to expend additional resources to institute mitigation and adaptation measures. Based on recent climatic trends observed over the past 100 years, climate change is likely to alter and have an adverse impact on Jamaica's natural resource base, thereby adversely affecting not only the natural environment but the livelihoods of its people. Tables 1 and 2 below show the impact of extreme climate-related events on Jamaica's GDP as well as the major impacts of climate change forecasted for Jamaica.

Table 1. Impact of Extreme Climate-related Events on Jamaica's GDP 2001-2021[10]

EVENT	Year	Saffir-Simpson Hurricane Wind Scale (1)	Cost ($JB)	Cost as the share of GDP (%)
Drought	1999/2000	-	0.73	0.2
Hurricane Michelle	2001	4	2.52	0.7
May/June Flood Rains	2002	-	2.47	0.6
Hurricane Charley	2004	4	0.44	0.1
Hurricane Ivan	2004	3	36.9	6.8
Hurricanes Dennis & Emily	2005	4	5.98	1
Hurricane Wilma	2005	5	3.6	0.6
Drought	2005	-	0.52	0.1
Hurricane Dean	2007	4	23.8	3
Tropical Storm Gustav	2008	-	15.5	1.8
Drought	2008		0.04	0
Tropical Storm Nicole	2010	-	20.6	1.9
Hurricane Sandy	2012	2	9.9	0.8
Drought	2014	-	0.9	0.1

[9] Third National Communication of Jamaica to the United Nations Framework Convention on Climate Change (2018)

[10] Third National Communication to United Nations Framework Convention on Climate Change (2018); The State of the Jamaican Climate (2015); The Planning Institute of Jamaica

EVENT	Year	Saffir-Simpson Hurricane Wind Scale (1)	Cost ($JB)	Cost as the share of GDP (%)
March to June Flood Rains	2017		4.05	0.2
Tropical Storms Zeta and Eta	2020		6.7	
Tropical Storm Elsa	2021		0.84	
Tropical Storm Ian[11]	2022	-	0.90	
Total			136.39	1.3
Note: Figures for drought only capture losses to the Agriculture sector				

Sources: DaLA Reports (Planning Institute of Jamaica) & Ministry of Industry, Commerce Agriculture and Fisheries

Note:

(1) Some of the events listed in the table are not hurricanes. These are events are denoted by a " - " and no rating ascribed in this column.

Table 2: Major Impacts Expected Across Jamaica[12]

Parameter	Predicted Change
Air and sea surface temperature	Rise of 1.1 to 3.2 ˚C degrees by the 2090s
Sea level rise	Rise of 0.28 to 0.98 m
Precipitation	Less summer (June, July, August) precipitation
Extreme weather events	Greater number of flood events, landslides, droughts
Tropical storms/hurricanes	Likely (>66% certainty) increase in hurricane intensity
Marine Ecosystems	More acidic/warmer seas; coral mortality

Source: State of the Jamaican Climate 2015

Jamaica's sustainable development imperatives are guided by Vision 2030 Jamaica - National Development Plan which provides the framework to ensure that climate change issues are mainstreamed into national policies and development activities. The issue of adaptation to climate change is specifically addressed under the National Outcomes in Goal 4 of Vision 2030: Jamaica has a healthy natural environment. These National Outcomes are: National Outcome #14 'Hazard Risk Reduction and Adaptation to Climate Change' and #13 on 'Sustainable Management and Use of Environmental and Natural Resources'. The key related national strategies are: (i) develop measures to adapt to climate change, and (ii) develop mechanisms to influence the global rate of climate change. In addition, measures aimed at climate change mitigation are supported through National Outcome #10 'Energy Security and Efficiency' which addresses energy efficiency, conservation and renewable energy and National Strategy 12-5 'Promote Eco-efficiency and Green Economy' which promotes the use of clean technologies within the manufacturing sector. Achieving these and other National Outcomes will also help Jamaica to meet the Sustainable Development Goals (SDGs). Of note are #11 on Sustainable Cities and Communities, #13 on Climate Actio, #14 on Life Below Water (marine resources) and #15 on Life on

[11] https://jis.gov.jm/damage-to-road-network-by-tropical-storm-ian-at-889-million/#:~:text=Andrew%20Holness%2C%20has%20said%20that,Storm%20Ian%20is%20%24889%20million

[12] State of the Jamaican Climate 2015

Land (biodiversity, forests and desertification). A table showing the linkages with Jamaica's goals under Vision 2030 and its SDGs is included in Appendix B.

The Medium-Term Socio-Economic Policy Framework (MTF) 2018- 2021 outlines a prioritized package of policies, strategies and programmes aligned to the budget at the macro level that will be implemented primarily by Ministries, Departments and Agencies (MDAs) over the next three years. Future MTFs will be required which build on the work undertaken in previous MTFs.
The short- and long-term threats posed to the island from the accumulated GHGs in the atmosphere have made it imperative that Jamaica seeks to engage the international community in its efforts to mitigate and adapt to climate change. It is also important that Jamaica undertakes the development of a framework within which climate change is addressed at the local and national levels. In this regard, the climate change policy for Jamaica was first developed, as a key deliverable under the GoJ/EU/UNEP Climate Change Adaptation and Disaster Risk Reduction Project (CCADRR) (2011-2013). Several consultations were undertaken during the policy formulation process which involved representatives of the public and private sectors, and civil society. In addition, a workshop was convened in July 2012 by the then Ministry of Water, Land, Environment and Climate Change with the support of the United States Agency for International Development (USAID) involving government and non-government participants from across critical sectors to identify key ways in which climate change and other threats could affect Jamaica's long-term development goals, and the critical actions, policies, and institutional roles necessary to respond to these threats and achieve the country's vision.

The update to the Policy Framework was undertaken as a part of IMPACT Justice, a civil society project implemented under a Contribution Agreement between The Canadian Department of Foreign Affairs, Trade and Development (DFATD) (now Global Affairs Canada) and the University of the West Indies, Cave Hill Campus.

This updated Climate Change Policy Framework for Jamaica, takes into consideration the provisions of the Paris Agreement and other relevant international, regional and national developments in sectors, including the energy and transport sectors as well as the Fifth and Sixth Assessment Reports (AR5 and AR6) of IPCC and other relevant UNFCCC reports and material.

1.2 The international context

The United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement

Jamaica has, since 1995, been a Party to the United Nations Framework Convention on Climate Change (UNFCCC) which is the main international treaty on climate change. The objective of the Convention is "to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system…such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner" (UNFCCC). The MRECC (Climate Change Division) is Jamaica's focal point for the UNFCCC.

Jamaica's commitments under this Convention include:

- to develop and periodically submit national reports containing information on the greenhouse gas emissions of that Party and describing the steps it has taken and plans to take to implement the Convention;
- to put in place national programmes and measures to control emissions and to adapt to the impacts of climate change; and
- to promote the development and use of climate-friendly technologies and the sustainable management of forests and other ecosystems.

In 1999, Jamaica joined 192 countries and became a Party to the Kyoto Protocol to the UNFCCC, which sought to strengthen the global response to climate change, including the establishment of legally binding emission reduction targets for developed country Parties. The first commitment period for developed countries to meet their targets began in 2008 and ended in 2012. Before a second commitment period for 2013 to 2020 could enter into force, countries negotiated the Paris Agreement in 2015, which in effect became the successor to the Kyoto Protocol.

The primary objective of the Paris Agreement is to keep the increase in global temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C. Unlike the Kyoto Protocol, there are no binding GHG emission targets in the Paris Agreement and all countries, both developed and developing countries, are required to make voluntary commitments every five years to reduce GHG emissions through mitigation actions that reflect their highest possible ambition and specify their adaptation goals (referred to as the Nationally Determined Contributions). While there are no sanctions if Parties fail to meet their commitments, Parties also agreed to mandatory transparency, verification and public reporting measures to ensure all are able to monitor their progress. As at September 2022, 194 Parties to the Convention, including Jamaica, had ratified the Paris Agreement. Jamaica ratified the Paris Agreement on April 10, 2017.

The Warsaw International Mechanism for Loss and Damage was established in 2013 under the UNFCCC to assist developing countries that are particularly vulnerable to the adverse effects of climate change by:

- enhancing knowledge and understanding of comprehensive risk management approaches to address loss and damage;
- strengthening dialogue, coordination, coherence and synergies among relevant stakeholders; and
- enhancing action and support, including finance, technology and capacity-building.

Article 8 of the Paris Agreement reaffirms the Warsaw International Mechanism for Loss and Damage as the main vehicle under the UNFCCC process to avert, minimize and address loss and damage associated with climate change impacts, including extreme weather events and slow onset events. The Agreement provides that Parties should enhance understanding action and support on a cooperative and facilitative basis, areas that include early warning systems, emergency preparedness, slow onset events, risk management strategies, insurance facilities and noneconomic loss.

Nations adopted the Glasgow Climate Pact, aiming to turn the 2020s into a decade of climate action and support. The package of decisions consists of a range of agreed items, including strengthened efforts to build resilience to climate change, to curb greenhouse gas emissions and to provide the necessary finance for both. Nations reaffirmed their duty to fulfill the pledge of providing 100 billion dollars annually from developed to developing countries. And they collectively agreed to work to reduce the gap between existing emission reduction plans and what is required to reduce emissions, so that the rise in the global

average temperature can be limited to 1.5 degrees. For the first time, nations are called upon to phase down unabated coal power and inefficient subsidies for fossil fuels.

As part of the package of decisions, nations also completed the Paris Agreement's rulebook as it relates to market mechanisms and non-market approaches and the transparent reporting of climate actions and support provided or received, including for loss and damage.

Climate Finance

Several international financial mechanisms have been established to support climate action in developing countries. The Green Climate Fund (GCF) is one such mechanism. The Fund was created in 2010 under the UNFCCC to help developing countries limit their GHG emissions and to adapt to climate change. The GCF, which receives contributions from developed and developing countries, also serves the Paris Agreement. At COP 15 to the UNFCCC in 2009, developed countries committed to mobilizing US$100 billion every year by 2020 for climate action in developing countries.[13] This commitment was however not met by the deadline and COP 26 (2021) reiterated this pledge and extended the deadline for its realization to 2025. Additionally at COP 26, Jamaica was selected by the Taskforce on Climate Finance[14] as one of five pioneer countries to receive support in accessing climate finance for projects.

The Global Environment Facility (GEF) is one of two financial mechanisms for the UNFCCC. The fund also serves the Paris Agreement. Under the GEF, eligible countries can receive support for climate change-related projects through the climate change window under the System for Transparent Resource Allocation (STAR) of recipient countries, such as Jamaica, as well as two special funds, namely the Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF). There is also the Adaptation Fund (AF) established under the Kyoto Protocol in 2001.

The Loss and Damage Fund is the latest fund that will be established under the UNFCCC. The establishment of this fund was adopted at the 27th meeting of the Conference of the Parties to the UNFCCC. This new fund will assist developing countries that are particularly vulnerable to the adverse effects of climate change in responding to loss and damage. Once this Fund is operationalized it is anticipated that Jamaica will be able to access this Fund.

Aside from the aforementioned mechanisms, there are a number of climate funds available. For example, the Pilot Program for Climate Resilience (PPCR) is a funding mechanism under the Climate Investment Funds (CIF) which helps developing countries, including Jamaica, to integrate climate resilience into development planning and investment. The Government of Jamaica (GOJ) in collaboration with the Inter-American Development Bank (IDB) and the World Bank developed Jamaica's Strategic Programme for Climate Resilience (PPCR) to help the country to strengthen its resilience to climate through enhancing adaptive capacity across priority sectors.

[13] A new timeline of 2025 was adopted at COP 26 (decision 1/CP.26 paras 25 to 27)

[14] This Taskforce was established in March 2021 and is co-chaired by the UK and Fiji and its steering committee comprises Belize, Bhutan, Germany, Malawi, Rwanda, Senegal, Sweden, the USA, the GCF and the World Bank.

Nationally Determined Contributions (NDCs)

All Parties to the Paris Agreement are required to submit Nationally Determined Contributions (NDCs) every five (5) years detailing their commitment to reduce their national greenhouse gas (GHG) emissions post 2020.[15] Jamaica is taking a 'no regrets' approach by employing mitigation actions, which can lead to reduced emissions as well as cost savings and social and environmental benefits for the country. In Jamaica's first NDC (2017)[16] Jamaica has committed to initially reducing its GHG emissions by 7.8% below the business as usual (BAU) scenario. Under the BAU scenario, GHG emissions would increase by 37% by 2030.

This NDC target is predicated on the current level of implementation of the National Energy Policy and the existing pipeline of renewable energy projects. Jamaica will conditionally increase its reduction of GHG emissions to 10% below BAU which is dependent on the level of international support (Jamaica's First NDC). Plans are underway to revise Jamaica's NDC to include other sectors which are also major emitters of GHGs, including the transportation sector.

National Communications

Parties to the UNFCCC are required to periodically submit National Communications which outline their circumstances and efforts in addressing the impacts of climate change. Jamaica's Third National Communication (TNC) on Climate Change to UNFCCC outlines Jamaica's inventory of its GHG emissions for 2006 – 2012. Total GHG emissions trended downward during this period due primarily to the reduced fuel consumption in the mining/bauxite industrial sector. The TNC also assessed climate change impacts for some key sectors, namely agriculture, energy, transportation, water, health, tourism, coastal zones, forests and takes into consideration impacts on poverty and gender. The most vulnerable sectors, such as Agriculture, Water, Coastal and Marine Resources and Human Settlements and Infrastructure will be those impacted by:

(1) drought conditions, given the expected drying in Jamaica induced by climate change;
(2) sea level rise, with a significant percentage of Jamaicans living near the coastline; and
(3) floods and storms, given the likelihood that more intense rainfall will occur, though less frequently.

Jamaica's TNC also includes an assessment of potential mitigation options to reduce GHG emissions over the period 2020 to 2050 in energy, agriculture, transport, the bauxite and alumina industry, and waste and wastewater sectors. The TNC provides an outline of proposed strategies for awareness raising, capacity building, and a technology needs assessment.

Biennial Update Report (BUR) and Biennial Transparency Reports (BTR)

Parties to the UNFCCC are required to update and report periodically on their inventory of anthropogenic emissions and removals of GHGs not controlled by the Montreal Protocol.[13] Jamaica submitted its first Biennial Update Report (BUR) to the UNFCCC in 2016. BURs are intended to provide updates on actions undertaken by a Party to implement the Convention, including the status of its greenhouse gas emissions and removals by sinks, as well as on the actions to reduce emissions or enhance sinks, and support needed and received to implement these actions. The Paris Agreement replaced the requirement to produce BURs with Biennial Transparency Reports (BTR) which contains a national greenhouse gas

[15] Art. 4(2), The Paris Agreement.

[16] Jamaica submitted its Initial Nationally Determined Contributions (INDC) to UNFCCC in Nov 2015 which became the country's First NDC on ratification on April 10, 2017. [13] Art. 4.1(a) and 12, UNFCCC.

inventory and the information necessary to track progress made in implementing and achieving their NDCs. BTRs should be submitted by all Parties (SIDS and LDCs at their discretion), on a biennial basis, no later than end of 2024.

Jamaica is implementing a Capacity Building Initiative for Transparency (CBIT) project, funded by the GEF, to strengthen its institutional and technical capacity to meet its reporting requirements under the Paris Agreement and UNFCCC. The initiative will allow Jamaica to better monitor and report on climate action and also its implementation and support needs.

National Adaptation Plan

Parties to the UNFCCC have committed to formulating and implementing national adaptation plans (NAPs) as a means of identifying medium- and long-term adaptation needs and developing and implementing strategies and programmes to address those needs. Jamaica has commenced the development of its first NAP. The goal of the NAP project is to develop an inclusive, systematic, and participatory national adaptation planning and implementation for Jamaica by 2025. Previous and ongoing initiatives relating to sector strategies and action plans for key sectors along with vulnerability studies and stocktaking exercises will contribute to the identification and prioritization of activities in the NAP. Among the most vulnerable sectors to climate change that will be considered are: tourism, agriculture, fisheries, water, human settlements and coastal resources, and human health.

Work will also be pursued to have vertical integration of the NAP with local level planning mechanisms, including local governments (Municipal Corporations (MCs)). As a participating country of the Local Climate Adaptive Living Facility (LoCAL) managed by the United Nations Capital Development Fund (UNCDF), Jamaica will seek to enhance the capacity of MCs to integrate climate change in development planning and implementation, and also to access climate finance.[17]

Other international instruments

The Samoa Pathway

The SIDS Accelerated Modalities of Action (SAMOA) Pathway is the outcome document of the Third International Conference on SIDS held in Apia, Samoa from 1-4 September 2014. The document lists priority areas for small islands for the period 2015-2025 and promotes international assistance to address these challenges. The SIDS Partnership Framework was designed to monitor the progress of existing, and stimulate the launch of new, genuine and durable partnerships for the sustainable development of SIDS. Nearly 300 partnerships were announced at the conference and monitored through the Partnership Platform. One of the priority areas in the Samoa Pathway is addressing climate change. It calls for support:

a) To build resilience to the impacts of climate change and to improve their adaptive capacity through the design and implementation of climate change adaptation measures appropriate to their respective vulnerabilities and economic, environmental and social situations;

[17] Jamaica's Adaptation Communication 2022 (https://unfccc.int/sites/default/files/ACR/2022-12/Adaptation%20Communication%20for%20Jamaica.pdf)

b) To improve the baseline monitoring of island systems and the downscaling of climate model projections to enable better projections of the future impacts on small islands;

c) To raise awareness and communicate climate change risks, including through public dialogue with local communities, to increase human and environmental resilience to the longer-term impacts of climate change; and

d) To address remaining gaps in capacity for gaining access to and managing climate finance.

In the document, SIDS also support the gradual phasing down of the consumption and production of hydrofluorocarbons and to address global warming and the importance of scaling up support for REDD+ activities. The MRECC (Environment and Risk Management Branch) is Jamaica's focal point for the Samoa Pathway.

The Sendai Framework for Disaster Risk Reduction 2015-2030

The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) outlines seven global targets and four priority actions to prevent the creation of new risk, reduce existing risk and increase resilience. These are (i) Understanding disaster risk; (ii) Strengthening disaster risk governance to manage disaster risk; (iii) Investing in disaster reduction for resilience and; (iv) Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

The Framework recognizes that disasters, many of which are exacerbated by climate change, and which are increasing in frequency and intensity, significantly impede progress towards sustainable development. Among other things, the Framework calls for the promotion of comprehensive surveys on multi-hazard disaster risks and the development of regional disaster risk assessments and maps, including climate change scenarios and calls for the incorporation of disaster risk reduction measures in bi-lateral assistance programmes in sectors related to adaptation to climate change. The Office of Disaster Preparedness and Emergency Management (ODPEM) is Jamaica's focal point for the Sendai Framework.

Regional Climate Change Initiative and Institutions

The Caribbean Community Climate Change Centre (CCCCC)

The Caribbean Community Climate Change Centre is the regional institution established by CARICOM to coordinate the region's response to climate change. It provides a Clearing House on climate change information and develops climate modelling for projected impacts of climate change on the region in cooperation with regional partners. CCCC is one of two regional entities currently accredited to the GCF and can assist developing country governments in, *inter alia,* developing funding proposals as well as the monitoring and management of projects and programmes.

The Caribbean Institute for Meteorology and Hydrology

The Caribbean Institute for Meteorology and Hydrology (CIMH) is a training and research organization formed by the amalgamation of the Caribbean Meteorological Institute (CMI) and Caribbean Operational Hydrological Institute (COHI). It serves the member states of the Caribbean Meteorological Organization (CMO) by developing and providing climate services and products to the Caribbean region including: (i)

drought and precipitation monitoring and forecast products, (ii) climate data products and services, (iii) agrometeorological products and services, and (iv) applied meteorology and climate training services.

CCRIF SPC

CCRIF SPC is a Caribbean segregated portfolio fund that provides parametric insurance policies to Caribbean and Central American governments to limit the financial impact of hurricanes, earthquakes and excess rainfall events. Jamaica is one of 23 current members of the CCRIF.

Climate Studies Group Mona

The Climate Studies Group Mona (CGSM) was formed in 1994 to explore Caribbean climate and the ocean and atmospheric influences that modulate how the climate manifests. The CSGM has developed statistical models using historical weather data and has also examined historical and future climate change and the potential impacts on the lives and livelihoods of the Caribbean. The CGSM has contributed to a number of international publications, carried out research and participated in a number of pioneering projects related to climate change.

2. SITUATIONAL ANALYSIS

2.1 Jamaica's Climate

Climate model projections show increasing temperatures for the Caribbean region that could result in changes in the frequency and intensity of extreme weather events; greater climate variability and rising sea-levels. These changes will adversely affect Jamaica's critical sectors including the fresh-water resources, coastal and marine resources, human settlements and infrastructure, terrestrial resources and biodiversity, agriculture, fisheries, tourism, human health and energy. The information listed below is taken primarily from the State of the Jamaican Climate 2015 report which summarizes the climate model projections for Jamaica and the Caribbean region.

Temperature, Rainfall and Drought

The mean annual temperature for Jamaica is projected to increase between 0.49°–0.57°C by the 2020s; 0.65-0.84°C by the 2030s, 0.85°-1.80°C by the 2050s and 0.82- 3.09°C for 2081-2100. (State of the Jamaican Climate 2015).

More frequent and severe drought events are projected. Climate change will result in more frequent El Niño events during which time, the Caribbean will be drier and hotter than usual and particularly during the late wet season from August through November. Rainfall records averaged across the Caribbean region for 100 years (1900–2000) show a consistent reduction in rainfall (IPCC 2014). Rainfall will decrease by 0 – 2% in the mid-2020s; 4% in the 2030s and up to 10% in the 2050s. By the 2080s the country as a whole may be up to 40% drier (State of the Jamaican Climate 2015).

Storm Surges, Sea-Level Rise and Hurricanes

Increased sea levels and changes in the severity or frequency of storms are likely to result in changes to the frequency or magnitude of storm surges on Jamaica's coast. The likelihood of more severe hurricanes will increase. While there may be an overall decrease in the frequency of tropical cyclones, there is a

projected 80% increase in category 4 and 5 hurricanes[18] over the next 80 years (State of the Jamaican Climate 2015; Jamaica Biennial Update Report 2016).

Sea level is projected to rise between 0.26-0.82 m by 2100 relative to 1986-2005 levels with the highest sensitivity models indicating a possible rise of just over 1 m for Jamaica's coasts (State of the Jamaican Climate 2015).

Sea Surface Temperature and Ocean Acidification

There will be continuing increases in sea-surface temperatures for Jamaican waters with projected increases ranging between +0.9˚C and +2.7˚C by the 2080s (State of the Jamaican Climate 2015). The ocean has absorbed about 30% of the anthropogenic carbon dioxide, resulting in a 0.1 pH unit decrease and ocean acidification that is unprecedented for at least the last 65 million years. A decrease of 0.2 pH units (by 2100 under RCP4.5) relative to the pre-industrial period is projected (IPCC Special Report on Global Warming of 1.5^{o}C).[19]

Ocean acidification and increasing sea surface temperatures will result in the loss of marine life including coral reefs. Higher sea temperatures may be one of the drivers[20] resulting in the overabundant presence of the Atlantic Sargassum seaweed in the Caribbean region. This seaweed threatens Jamaica's fisheries and coastal ecosystems by smothering sea grass beds, coral reefs and mangroves. In addition to making beaches unsuitable for recreational use due to factors such as the discoloration of the water and fish kills, Sargassum also impacts beaches by causing erosion as the waves that come up on shore are made heavier by the floating seaweed removing sand which is washed offshore.[21] The Sargassum has particularly impacted the beaches on Jamaica's south coast.

Greenhouse Gas Emissions

There was a decreasing trend in GHG emissions during the period 2006 and 2012. This trend and large year to year fluctuations were due to substantial changes in annual CO_2 emissions in the mining/bauxite industry, which was affected by global economic factors, and in particular the price of aluminium. Table 3 and Figure 1 provide the total GHG emissions (Gg CO_2 eq) for the period 2006 and 2012 and Table 4 provides an overview of GHG emissions by sector, as outlined in The Biennial Update Report of Jamaica (2016).

Table 3. Emissions of Greenhouse Gases (Gg, CO_2, EQ) (Sourced from: The Biennial Update Report of Jamaica)

[18] According to the Saffir-Simpson scale for measuring hurricane intensity, Category 4 and 5 hurricanes are considered to be major with the potential to cause catastrophic damage. Category 4 hurricanes have sustained winds at 130-156 mph, 113-136 kt or 209-251 km/h and Category 5 hurricanes have sustained winds of 157 mph or higher, 137 kt or higher or 252 km/h or higher.

[19] Hoegh-Guldberg, O., D. Jacob, M. Taylor, M. Bindi, S. Brown, I. Camilloni, A. Diedhiou, R. Djalante, K.L. Ebi, F. Engelbrecht, J.Guiot, Y. Hijioka, S. Mehrotra, A. Payne, S.I. Seneviratne, A. Thomas, R. Warren, and G. Zhou, 2018: Impacts of 1.5ºC Global Warming on Natural and Human Systems. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R.
Matthews, Y. Chen, X. Zhou, M.I.Gomis, E. Lonnoy, T.Maycock, M.Tignor, and T. Waterfield (eds.)]. In Press.

	2006	2007	2008	2009	2010	2011	2012
CO_2	11,205	9,857	10,658	7,918	7,285	7,870	7,387
CH_4	818	835	841	857	847	831	852
N_2O	3,870	4,985	6,874	6,662	6,643	4,426	6,594
HFC	87	92	95	95	93	92	89
LULUCF	-1,685	-1,638	-1,631	-1,622	-1,618	-1,616	-1,626
Total excluding LULUCF	**15,918**	**15,770**	**18,468**	**15,532**	**14,868**	**13,220**	**14,922**
Total including LULUCF	**14,296**	**14,131**	**16,836**	**13,911**	**13,250**	**11,604**	**13,296**

Figure. 1 Total GHG Emissions (Gg CO_2 EQ) (Sourced from The Biennial Update Report of Jamaica)

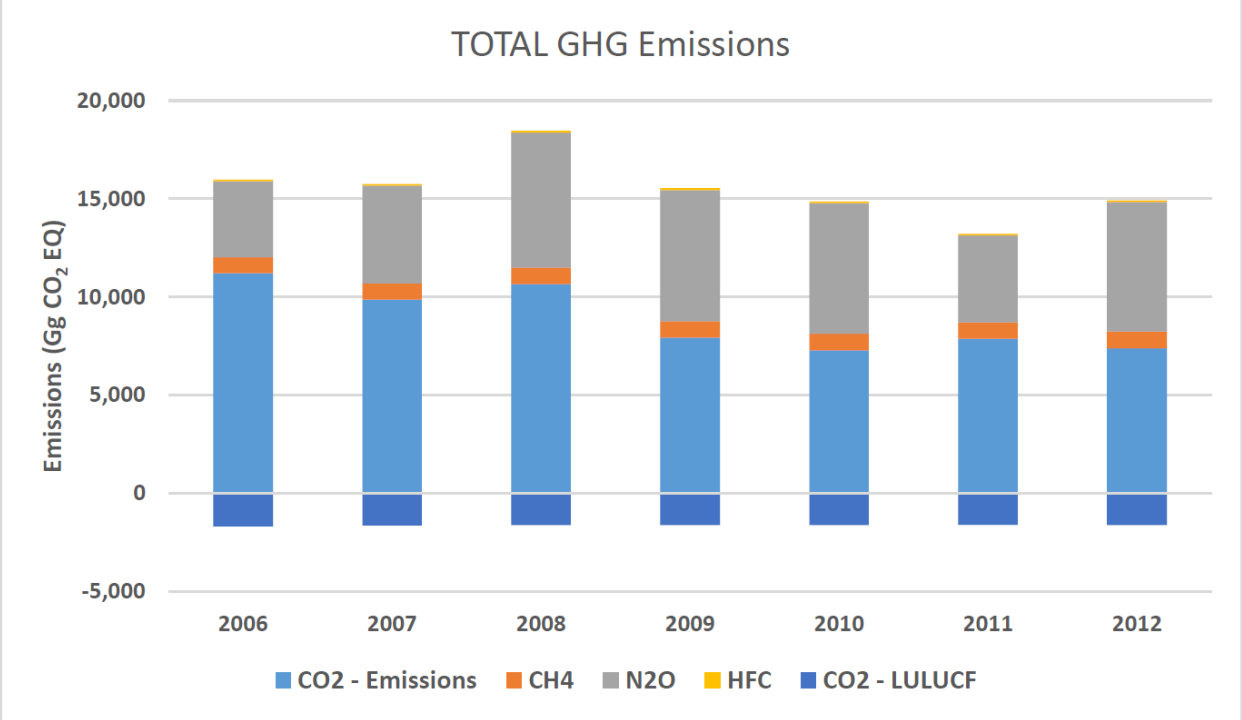


Table 4. Emissions of CO_2 (Gg CO_2) by sector (adapted from The Biennial Update Report of Jamaica)

	2006	2007	2008	2009	2010	2011	2012
Public electricity and heat production	3,004	3,171	3,062	3,130	3,093	3,062	2,825
Mining/Bauxite	4,600	2,964	4,146	1,547	1,239	1,673	1,525
Other Industrial Combustion	361	457	573	393	264	434	465

Road Transport	**2,062**	**1,993**	**1,889**	**1,979**	**1,886**	**1,876**	**1,726**
Other Transport/Mobile	**49**	**42**	**39**	**19**	**25**	**18**	**17**
Commercial, Residential (inc. Ag/For)	**539**	**703**	**361**	**319**	**321**	**332**	**351**
Energy	**10,614**	**9,330**	**10,070**	**7,387**	**6,828**	**7,394**	**6,909**
Cement & Lime	**542**	**478**	**535**	**482**	**414**	**433**	**435**
Other (Flaring, Non-E Prod Agriculture, Waste)	**49**	**49**	**53**	**49**	**43**	**43**	**43**
Total Excluding LULUCF	**11,205**	**9,857**	**10,658**	**7,918**	**7,285**	**7,870**	**7,387**
Land-Use Change - Forest remaining Forest	**-1,834**	**-1,786**	**-1,779**	**-1,770**	**-1,767**	**-1,766**	**-1,777**
Land-Use Change - Other	**148**	**148**	**147**	**148**	**149**	**150**	**151**
LULUCF	**-1,685**	**-1,638**	**-1,631**	**-1,622**	**-1,618**	**-1,616**	**-1,626**
Total including LULUCF	**9,520**	**8,219**	**9,026**	**6,296**	**5,667**	**6,254**	**5,761**

2.2 Threats and Potential Impacts of Climate Change in Jamaica

The Climate Change Policy Framework outlines threats and potential impacts of climate change to these areas identified as a priority in the Third National Communication through vulnerability assessments and consultations:

- Coastal and Marine Resources
- Water Resources
- Human Settlements and Infrastructure
- Agriculture and Fisheries
- Tourism
- Human Health
- Biodiversity
- Finance

Sectors that are major contributors to GHG emissions are examined in The Policy Framework along with their mitigation potential. These sectors are:

- Transport
- Waste Management
- Forestry
- Energy

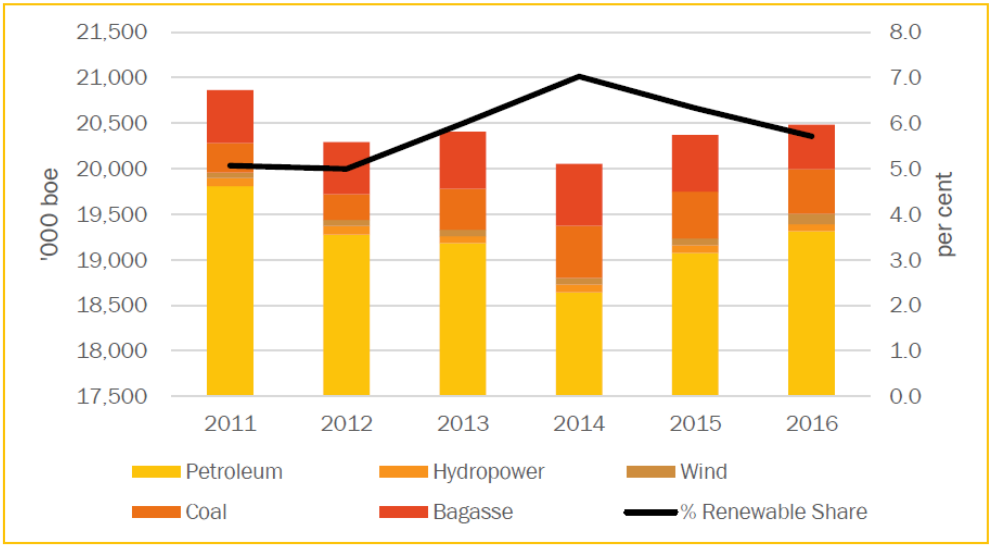
The cross-cutting themes of the impact on Youth and Gender are also considered in the Policy Framework.

2.2.1 Energy

Climate change threatens the efficient production of renewable energy and given the high dependence on foreign energy sources across all sectors, this could increase Jamaica's overall economic vulnerability.

Between 2011 and 2016, the share of renewables in total energy consumption was on average 5.9% per year. The share of renewables was highest in 2014 at 7.0%.[22]

Figure 2. Total Energy Supply and Alternative Energy as a Proportion of Total Energy Supply, 2011- 2016.
Source: STATIN (2018) Jamaica. Voluntary National Review Report on the Implementation of the 2030 Agenda for Sustainable Development- Statistical Annex.

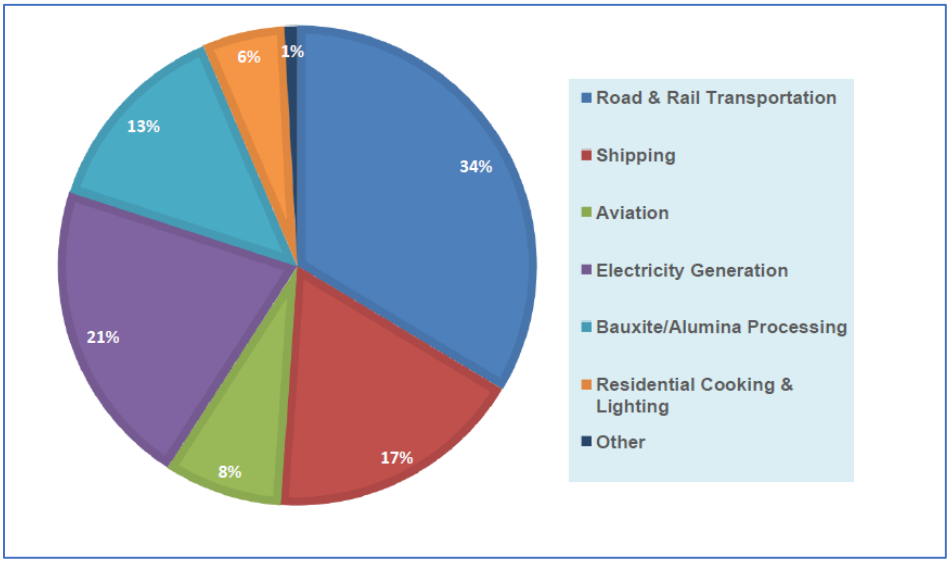


The single largest electricity consumer is the National Water Commission accounting for nearly 40% of annual revenue in electricity costs.[23] Electricity accounts for the largest proportion of household expenditure on utilities with households spending on average 5.9% of their total household consumption or an average of $6,388 monthly, on electricity (Jamaica Survey of Living Conditions 2019).

[22] STATIN. (2018). Jamaica- Voluntary National Review Report on the Implementation of the 2030 Agenda
[23] National Water Sector Policy and Implementation Plan

In 2008, the quantity of oil imported was approximately 27 million barrels at a cost of US$2.7 billion, (Jamaica's National Energy Policy 2009-2030) one-third of which was used by the bauxite/alumina sector. In 2018, the total quantity of oil imported was 22.3 million barrels at a cost of US$1.6 billion.[24] The energy sector remains the largest consumer of foreign exchange and so it is incumbent on the country to reduce its dependency on oil imports and its attendant emissions of greenhouse gases. This can be achieved by taking actions for mitigating climate change through abatement options, in particular, conservation and renewable energy production and use.

Figure 3. Share of Petroleum Consumption by Activity, 2018. Source: MSET (2019)



Jamaica's National Energy Policy 2009 - 2030, states that the country aims to increase the percentage of renewables in the energy mix with proposed targets of 12.5% by 2015 and 20% by 2030. This target is also in Jamaica's First NDC. In 2018, Jamaica was producing 120 megawatts of renewable electricity power on the grid which amounted to between 15 and 18 percent of electricity generation. It is estimated that by 2030, the percentage of renewable energy could increase to 50%.

The energy landscape is changing rapidly, with policy measures being implemented to increase renewables and reduce dependency on fossil fuels through the expansion of Wigton windfarm, the

[24] Total Petroleum Imports (2014-2018), Sources: Petrojam Ltd., Marketing Companies and Bauxite/Alumina Companies (https://www.mset.gov.jm/wp-content/uploads/2019/06/PETROLEUM-IMPORT-2018.pdf)

introduction of the solar farms, conversion to LNG including the commissioning of the floating LNG storage and regasification terminal in Old Harbour in 2019, the introduction of electric buses for the public passenger fleet and the introduction of hybrid and electric private passenger vehicles. Incentives are being provided by the government (National Housing Trust and Development Bank of Jamaica) for solar water heaters and energy efficiency-based items. Forty-five kilowatts (45 KW) floating solar panels were commissioned at the Mona Reservoir, St. Andrew in October 2022.

Climate change impacts include:

- Damage to coastal power plants, offshore wind turbines power lines, substations and related infrastructure due to sea-level rise, storms, and hurricanes;
- Decreased river flow that will affect the efficiency of hydropower due to inadequate rainfall; and
- Greater fuel demand and pressure on electricity consumption to operate cooling aids such as fans and air-conditioning due to increasing temperatures.

Strategies and actions proposed in the Energy Policy include:

- Develop diversification priorities based on cost, efficiency, environmental considerations, and appropriate technologies and competitiveness;
- Prioritize renewable energy sources by economic feasibility criteria and environmental considerations including carbon abatement;
- Promote the development of efficient and low-cost renewable energy plants with a size of 15 MW or more on a competitive basis; and
- 20% of renewable energy in the energy mix by 2030 (in 2018, Prime Minister Andrew Holness announced that the target would be increased to 50% by 2030).

Reliance on renewable energy initiatives to assist in mitigating climate change will not be sufficient. Jamaica's efforts to mitigate climate change must be far-reaching and concerted to extend beyond the energy sector to implement measures that include minimizing GHG emissions.

2.2.2 Transport

Transportation is a major contributor to the emission of GHGs due to fossil fuel consumption. The transport sector uses almost as much fossil fuel as electricity generation.[25] Attempts to reduce GHG emissions include replacing Methyl tert-butyl ether (MTBE) in all gasoline blends with 10% ethanol and the provision of ultra-low sulphur diesel fuel on the market. The Jamaican National Energy Policy for 2009-2030 includes a strategy proposed for more efficiency and conservation in the transportation sector. An Emissions Framework Policy for Jamaica is also being developed and was approved as a Green Paper in 2021.

Climate change will have adverse impacts on the transport sector. In 2018, a Vulnerability Assessment was undertaken for the transport sector which identified the following impacts to the sector:

- Storms surges, hurricanes, flooding, and sea-level rise increase risks of exposure, flooding and damage to road networks, bridges and, in particular, ports and airports which are located along or

[25] Jamaica's Third National Communication to the UNFCCC (2018)

near the coast. The Norman Manley International Airport is an average elevation of 3 meters (m) above sea level. Sections of the Donald Sangster International Airport in Montego Bay are located below 1 m elevation;

- Higher temperatures can result in the following impacts:
    - Health risks from heat exposure to those using the public transportation system, especially for children and the elderly;
    - Disruption in the maintenance and construction crew schedules to protect workers from heat risks;
    - Increased need for adequate cooling in public transportation vehicles;
    - Aircraft payload restrictions, flight cancellations and service disruptions, which would have critical impacts on the tourism industry; and
    - Buckling of paved roads and runways.

The Vulnerability Assessment for the transport sector will be used to inform a revised National Transport Policy and ensure that climate change impacts and GHG emissions reduction are incorporated in this sector. Other measures being implemented include: tail pipe testing, standards for vehicle emissions[26], transitioning to electric mobility, increasing the number and efficiency of public passenger fleet and the conversion of fuel used by the Jamaica Urban and Transport Corporation (JUTC).

2.2.3 Waste Management

Jamaica can mitigate its GHG emissions through the efficient management of waste. Methane and other GHG emissions are released from the anaerobic breakdown of the waste at disposal sites, through industrial and domestic wastewater treatment, open burning and waste incineration. The NSWMA only services 70% of the island and 27.7% of Jamaican households dispose of their garbage by burning[27] notwithstanding that open burning in public is prohibited as per the Natural Resources Conservation Authority Act (Environmental Protection Measures) Order, 2016 and the Public Health (Nuisance) Regulations,1995 and under specific circumstances under the Country Fires Act, 1942. Besides CO_2 emissions, burning of waste can also release dangerous pollutants, including dioxins, depending on the type of refuse burnt.

There are currently eight (8) waste disposal sites in Jamaica with Riverton Disposal Site accommodating approximately 60% of Jamaica's waste.[28] A 2015 waste characterization study undertaken by NSWMA shows that the majority of the waste collected is compostable and paper material (~68%) with the second largest material in the waste stream being plastics at ~15%.[29] Jamaica's National Energy-from-Waste Policy 2010 – 2030 seeks to foster the development of an energy-from-waste sector by creating economic infrastructure and planning conditions conducive to the sector, using environmentally-friendly

[26] The recently promulgated Road Traffic Regulations, 2022 under the Road Traffic Act, includes the Jamaica Motor Vehicle Exhaust Emission Standards which apply to new, future imported and used vehicles. It is an offence under the Regulations for a motor vehicle, when tested, to exceed the limits specified in the standard.

[27] Jamaica Survey of Living Conditions 2017

[28] Other disposal sites are Church Corner (St. Thomas),Doctorswood (Portland), Hadden (St. Ann), Tobolski (St. Ann), Myersville (St. Elizabeth), Martin's Hill (Manchester), Retirement (St. James)

[29] NSWMA Waste Characterization Study (2015), available at http://www.nswma.gov.jm/resources/NSWMA%20%20Waste%20Characterization%20Studies%20-%202015.pdf

technologies and through partnerships between the energy sector and the waste management and agriculture sectors.

2.2.4 Forests

Forests play an important role in mitigating climate change. Forests can act as carbon sinks, capturing carbon dioxide from the atmosphere. Carbon is sequestered, stored and accumulates through photosynthesis in the form of plant material (biomass) and in forest soils. Forest destruction, through harvesting and burning of forest wood can also release carbon into the atmosphere and therefore the management and preservation is essential for supporting Jamaica mitigation goals. Climate change can have negative impacts on forests including, loss of trees and forest dependent species as a result of rising temperatures, increase in pests and extreme events (e.g., drought, storms and hurricanes).

Approximately 439,937.8 hectares or 40% of the island is classified as forest. Jamaica currently has a reforestation rate of approximately 0.41%. The Government is committed to maintaining a 'no net loss' of forest cover. A sub-goal of Jamaica's Forest Policy, 2017 is to maintain and restore forest cover by providing appropriate incentives to support the protection of forested lands and the reforestation of denuded lands to address mitigation and adaptation to climate change. Initiatives under the Forest Policy include:

(i) the initiation of specific activities geared towards preventing the conversion of forests to non-forested areas (deforestation) thereby maintaining the carbon stock;
(ii) instituting re-planting programmes; and
(iii) the development of a portfolio of activities to engage in Reducing Emissions from Deforestation and Degradation (REDD+).

REDD+ is a mechanism to provide incentives for developing countries to reduce emissions from deforestation and forest degradation, and ensure the conservation, sustainable management of forests and the enhancement of carbon stocks. Jamaica is committed under articles 4(1)(d) of the UNFCCC and Article 5 of the Paris Agreement to take action to conserve and enhance GHG sinks and reservoirs, including forests. Parties are encouraged to implement and support REDD+ through results-based payments, the existing Warsaw Framework for REDD+ adopted in COP 19, and alternative policy approaches such as sustainable management of forests.

In pursuance of this objective, the Government of Jamaica has received funding from the Green Climate Fund's (GCF) Readiness and Preparatory Support Programme to prepare the country for REDD+ through the establishment of an appropriate management network, organize and consult REDD+ stakeholders in a consultative process and apply REDD+ methodological tools for the development of Jamaica's REDD+ Strategy.

Other initiatives being implemented are the 3-year National Tree Planning programme aiming to plant 3 million trees, the National Fruit Tree Planting Programme to plant 5 million fruit trees and a mangrove replanting initiative managed by the Forestry Department. The forestry sector has been included in Jamaica's updated NDC to the UNFCCC (submitted July 2020).

2.2.5 Coastal and Marine Resources

Jamaica's coastline is approximately 886 kilometres long and is the habitat for many of the island's diverse species and ecosystems including sandy beaches, rocky shores, estuaries, wetlands, seagrass beds and coral reefs. It is also the location for most of the critical infrastructure, formal and informal housing, as well as a high percentage of the island's economic activities, including tourism, mixed farming, fishing, shipping and mining. Jamaica's reef-related fisheries provide valuable jobs and revenue for the country, contributing US$34.3 million per year (Waite *et al*, 2011). In 2020, there were 24,039 registered fisherfolk and overall marine fish production is estimated at 11,226 tonnes in 2020 (Economic Social Survey of Jamaica 2020).The removal of mangroves, seagrass beds, and coral reefs occasioned by this multi-purpose use of the coastal zone has increased Jamaica's vulnerability to hurricanes and storm surges and poses a major threat to coastal ecosystems and marine wildlife. The following impacts of climate change are likely to occur:

- Beaches including coastal lands will be eroded as a result of sea level rise and changing processes that affect the coastline;
- Fish production will be reduced due to increases in sea surface temperatures and a rise in sea level;
- Reduction in percentage of healthy reef cover and calcareous species due to ocean acidification;
- Fish kills and coral bleaching due to increases in sea surface temperatures;
- Destruction of coastal ecosystems and marine habitats and spawning grounds by hurricanes and tropical storms are expected to become more frequent and intense.
- Northern migration of Caribbean coral reefs and fish stock due to rising sea surface temperatures;
- Increase in Sargassum seaweed which will smother sea grass beds, coral reefs and mangroves and decline of sea grass due to ocean acidification and increasing sea surface temperatures;
- Decline of sea grass dues to increased runoff from upstream sources as a result of heavy rainfall;
- Degraded wetlands and landward migration of mangroves due to sea level rise; and
- Decrease in sea turtle nesting dues to sea level rise

Jamaica has developed National Coastal Management and Beach Restoration Guidelines to assist stakeholders to make informed choices concerning the selection, design, engineering, and construction of technical interventions to prevent coastal flooding and erosion and to make these resilient against climate change. Under the PPCR, the project "Promoting Community-Based Climate Resilience in the Fisheries Sector" seeks to strengthen the fisheries policy and regulatory framework including making it climate-smart, diversify and present viable alternative livelihoods that enhance sustainable fisheries and raise awareness among the fishing and fish farming communities. Appendix C lists policies and plans (draft and approved) that contribute to strengthening Jamaica's resilience to climate change impacts including the National Policy on Ocean and Coastal Zone Management 2002 and the National Mangrove & Swamp Forests Management Plan.

2.2.6 Water Resources

Water is a critical input for many sectors including agriculture, energy, mining and quarrying, manufacturing, tourism, housing, sanitation and health services and areas such as natural resource management, urban planning and regional development. Adverse impacts on water resources will also

negatively affect these sectors. Sea water intrusion has resulted in the loss of 100 million cubic metres of groundwater (10% of local supply) annually (State of the Jamaican Climate 2015).

Household access to safe drinking water declined between 2017 and 2019 with 76.6% of households reporting access to improved water sources such as indoor or outdoor tap/pipe, public standpipe, bottled water and trucked water, as their main source of drinking water. Albeit, 44.2% of Jamaicans that access water from a public source, travel 500 metres or more to obtain water (Jamaica Survey of Living Conditions 2019).

In the 30-day period preceding the survey, 60.3% of households with piped water reported experiencing at least one water lock-off. The average number of lock-off was 10.6. This was an increase from 7.6 in 2018. (Jamaica Survey of Living Conditions 2019).

Changing rainfall patterns, sea-level rise, extreme events and increasing temperatures are the projected associated impacts of climate change and are anticipated to have the following potential impacts on water resources:

- Changes in temporal and spatial distribution due to increased climate variability and occurrences of severe weather events, in particular, droughts and tropical cyclones;
- Saltwater intrusion: Contamination of groundwater resources due to the intrusion of seawater into coastal aquifers as sea level rises;
- Greater levels of sedimentation in reservoirs and dams and sediment transport to coastal areas as soil erosion increases with the greater incidence of more intense rainfall and hurricane events;
- Changes in temperature are expected to result in adverse shifts in climatic conditions for agricultural cultivation;
- Increasing degradation and destruction of watersheds caused by the displacement of traditional activities/ livelihoods such as farming;
- Shortage of water during periods of prolonged droughts; and
- Damage to infrastructure (roads, bridges, electricity generation and transmission systems, seaports, airports, pipelines, dams) caused by extreme and slow onset events

In 2019, Jamaica adopted a new National Water Sector Policy and Implementation Plan. The Policy seeks to, *inter alia*, reduce GHG emissions in the sector by ensuring agencies in the sector use economically viable energy-efficient and renewable energy technologies, promote rainwater harvesting, improve irrigation services, develop water protection zones, flood bank monitoring, water harvesting farms, reforestation of degraded water catchment areas and establish emergency water supply systems. The Government is also seeking to reduce the distance travelled to obtain water through the various modalities outlined in the Water Sector Policy and Implementation Plan.

An updated Water Resources Master Plan was prepared in 2022 and is being finalized. This Master Plan takes into account climate change considerations. In addition, a Watershed Policy for Jamaica is being developed.

Under Jamaica's PPCR Project, the Government of Jamaica facilitated the uptake of water adaptation measures in the housing sector across Jamaica, including the use of rainwater harvesting systems, water

efficient taps and showers, low flush toilets, efficient irrigation systems and grey water recycling facilities through the project “Financing Water Adaptation in Jamaica´s New Urban Housing Sector”.

2.2.7 Human Settlements and Infrastructure

Currently, approximately 82% of Jamaica’s population lives along the coastline, or within 5km of the coast.[30] Critical infrastructure such as port facilities, tourism centres and the airports are also located in the coastal zone. Jamaica’s susceptibility to natural disasters has proven to be a major threat to the stability of human settlements and infrastructure. Between 2001 and 2017, Jamaica experienced 12 storm events (including 7 major hurricanes) and several flood events. These events combined resulted in loss and damage amounting to approximately J$132.54 billion.[31] In the case of Hurricane Ivan in 2004 the resulting loss and damage was equivalent to 8.0% of GDP. Hurricane Sandy (2012) accounted for J$9.7 billion or 0.8% of 2011 GDP in direct and indirect damage (J$9.4 billion in damage and J$0.3 billion in losses, including expenditure for vector control) as well as increased expenditure by private and Government entities. The health, housing and education sectors experienced the greatest impact accounting for 48% of the total costs in damage. One death and 291 injuries resulted from Hurricane Sandy (Economic and Social Survey Jamaica, 2012).

In 2016, Hurricane Nicole caused damage to road networks and bridges resulting in losses totalling JMD14 billion. In 2017, heavy rainfall resulted in loss and damage amounting to $4.4 billion or 2% of Jamaica’s 2016 GDP. Some communities in Clarendon experienced up to 5.2 metres (17 feet) of flood waters. (Economic and Social Survey Jamaica, 2017). Jamaica was impacted by three named storms during the 2021 Atlantic Hurricane season – Tropical Storms Elsa, Grace and Ida. Tropical Storm Grace was the only one to make landfall. Damage and losses associated with the impact of these three systems on infrastructure and agriculture was $3.5 billion (Economic and Social Survey Jamaica, 2021).

With increased development activities taking place within the coastal zone, the risks of loss of life, property damage and displacement of human settlements from natural disasters has heightened significantly. Sea level rise will also exacerbate coastal erosion and saltwater intrusion of underground coastal aquifers. Potentially, one of the major consequences will be increased insurance costs for properties and infrastructure. The most threatened settlements are those that have been created outside the formal physical planning system, and do not meet the required planning and building standards. It is anticipated that climate change impacts will increase the vulnerability of human settlements to floods, storm surges, sea level rise and hurricanes. This may lead to increased migration such as from threatened coastal areas towards inland areas.

In this regard, the Government continues its work on the rationalization of the land use planning and development process, strengthening of institutional capacity, development of policies and enforcement of legislation to guide settlement and infrastructural planning and development. The Building Act was enacted in 2018 to ensure that construction is done in accordance with the National Building Code. The Act also seeks to discourage new squatter settlements from being built, promote sustainable development, and establish and enforce internationally accepted building standards and rules for

[30] The Climate Change Policy Framework for Jamaica (2015)

[31] The State of the Jamaican Climate 2012 Report; Macro Socio-Economic and Environmental Impact Assessment of the Damage and Loss caused by the March to June Rains 2017 (PIOJ 2017).

individuals and entities providing construction material and services. Local authorities can intervene to prevent building on land that is deemed hazardous.

Since 2013, the Government of Jamaica has done a comprehensive review and updating of Development Orders to include among other things climate change considerations and Local Sustainable Development Plans have also been developed for some parishes to guide sustainable development.

Climate change is also expected to have a range of impacts on seaports, airports and other points of entry which are located along the coastal zone and are either below or close to sea level. Ports are primarily located in wetlands and low-lying areas which are characterized by high-exposure potential and low adaptation capability. Any interruption in operations at seaports, airports, other points of entry and related infrastructure resulting from climate change may potentially cause import and export delays, loss and damage to goods and other challenges in global supply chains which have severe negative implications for international trade.

The Government, through the MEGJC, launched the Jamaica Systemic Risk Assessment Tool (J-SRAT). This tool will increase the country's capacity to undertake more informed climate risk analyses to assist in decision-making within the public sector with respect to major infrastructural investments.

2.2.8 Agriculture and Fisheries

The agriculture and fisheries sector is one of the sectors most susceptible to climate change impacts. Agriculture and fisheries remains central to the Jamaican economy primarily for employment and foreign exchange generation, despite the decline in the number of persons involved. The proportion of the labour force in agriculture and fisheries has significantly decreased from a high in 1943 of 45% to 24.4% in 1994, down to 13.5 % in July 2022. The sector contributed 28 % to GDP in 1943. By 2020, the contribution of the agriculture, forestry and fishing sectors to GDP had declined to 7.8% (Economic and Social Survey Jamaica 2021). Growth of 8.3 per cent was recorded for the Agriculture, Forestry and Fishing industry in 2021 (Economic and Social Survey Jamaica 2021). Farmers make up 1% of the workforce (Economic and Social Survey Jamaica 2021). Evidence of the fragility of the agriculture sector and the potential for destruction from climate change impacts can be seen in the tremendous losses suffered by the sector during extreme weather events and conditions, including hurricanes and tropical storms.

In 2020, the average rainfall was 1,734mm, compared with the 1,773mm the 30-year mean. Rainfall has fluctuated over the previous years; between 2011 and 2020, at least six years recorded volumes of rainfall below the 30-year mean, and one year, above (Economic and Social Survey Jamaica 2020). In 2018, the increased intensity of rainfall gave rise to widespread flooding that damaged crops and livestock at an estimated $792.4 million (Economic and Social Survey Jamaica 2017). The category 1 Hurricane Sandy in 2012 caused damage amounting to J$1.452 billion in domestic and agricultural crops alone (Jamaica's Biennial Report 2016). In 2012, farmers lost J$140 million worth of crop in damages as a result of the Beet Army Worm which thrives in high temperatures (State of the Jamaican Climate 2015). The agriculture sector is also one of the main consumers of energy and water with a demand of 75% of the local water supply and, therefore, key to addressing Jamaica's GHG emissions.[32]

[32] National Water Sector Policy and Implementation Plan, p. 16

Climate change will exacerbate current threats to the sector as well as introduce new ones. The potential impacts to the sector associated with climate change are as follows:

- Decrease in the availability of water resources due to increased temperatures, changes in rainfall patterns (frequency and duration) and prolonged periods of drought;
- Reduction in water quality due to saline intrusion into ground water sources caused by rising sea-levels;
- Increases in agricultural pests, weeds, bacteria and diseases due to increasing temperature;
- Accelerated soil erosion and inundation of production fields due to the occurrence of extreme events (floods, hurricanes etc.);
- Reduction in soil fertility and soil degradation due to soil salinization caused by rising sea levels and drought;
- Reduction in crop yields such as citrus and root crops due to changes in agro-climatic conditions (temperature and precipitation) and in standing export crops such as banana, sugar cane and coffee due to the occurrence of hurricanes and tropical storms;
- Loss of marine resources due to destruction of spawning grounds caused by the occurrence of severe weather events;
- Damage to agricultural infrastructure and assets due to extreme events;
- Severe weather events will also lead to a mass disruption in food security, increased water and production costs, food costs, costs of insurance and higher rates for capital cost loans;
- Adverse impacts on livestock such as chickens, goats, sheep and cattle include higher mortality, decreased reproduction, lower birth weight and growth rate, increased susceptibility to diseases due to increasing temperatures and drought.
- Loss of employment and income earning opportunities;
- Loss of foreign exchange due to potential reduction in agricultural exports; and
- Increased demand for foreign exchange for food imports.

The 2023/24 Estimates of Expenditure include an allocation of 313 million dollars for a project which aims to enhance resilience to climate change among targeted fishing and aquaculture communities in Jamaica. In addition to activities related to fisheries, a number of other activities in the agriculture sector have been initiated with the aim of enhancing resilience to climate change. These include: farmer field school training, climate smart agriculture, installation of rain water harvesting systems, installation of ponds and solar pumps, and expanded use of greenhouse technology.

Jamaica's Food and Nutrition Security Policy (2013) identified climate change as a risk to the country's food and nutrition security and includes a number of recommendations to mitigate against this. These include: pursuing climate resilient development which focuses on adaptation as well as mitigation strategies for the food and agriculture sector; enhancing the capacity of relevant institutions to provide climate related information in collaboration with relevant regional bodies; integrating climate management considerations into the National Agricultural Disaster Risk Management Programme; and reducing the impact of climate change on food production.

2.2.9 Tourism

Between 2016 and 2019, the tourism sector (represented by hotels and restaurants) contributed an average of 6% of GDP to the Jamaican economy (Economic and Social Survey Jamaica, 2020). In 2020, however, it fell to 3.2% due to the COVID-19 pandemic. The local tourism product is dominated mainly by resort tourism located in coastal areas such as Montego Bay, Ocho Rios, and Negril. Tourism remains one of the most important sectors to the nation's development given the substantial linkages with other sectors (agricultural production: as a local market for local farmers; water sector; coastal and marine resources, fisheries). Hurricanes, storm surges and tropical storms have posed the greatest threat to the sector in recent times. In 2007, Hurricane Dean resulted in an estimated US$43.7 million loss to the sector. Strong winds and storm surges associated with the hurricane resulted in extensive damage to tourism infrastructure, facilities and attractions such as the island's beaches. Impacts to the industry include:

- Diminished marine and terrestrial biodiversity;
- Increased presence of Sargassum seaweed will cover beaches and discolour near shore waters in many coastal areas thereby compromising the quality of the local tourism product;
- Damage to and destruction of hotels and other tourism infrastructure located in coastal areas susceptible to storm surges, beach erosion and sea-level rise;
- Reduction in freshwater resources and food production arising from changes in precipitation amounts and spatial distribution, loss of forest-cover and related factors. This may include increasing demand for limited water resources caused by changing rainfall patterns and possible reduction in supplies due to competing interests for the resources among tourism and other sectors.
- Altered seasonality, heat stress for Jamaicans and tourists, increased cooling costs, changes in wildlife and insect populations and distribution and infectious disease caused by warmer temperatures;
- Loss and damage to archaeological, cultural and heritage attraction sites due to sea level rise, flooding and hurricanes;
- Extensive coastal erosion caused by sea level rise, storm surges and hurricanes, resulting in the loss of beach areas. During the period 2012 to 2013 there was a net erosion of about 20.8m among 36 monitored beaches;[33]
- Increased cost to protect coastline through the erection and maintenance of sea defences;
- Increased coral bleaching and degradation of marine resources due to increases in sea surface temperature;
- Acidification of the seas and oceans
- Increases in insurance costs/ loss of insurability and business interruption costs caused by increasing frequency and intensity of extreme storm events;
- Loss of economic returns due to the possible changes in, or loss of: coral reefs, beaches, natural forests and other natural resources and attractions

- Reduced visitor arrivals as a result of a higher frequency of extreme weather events such as hurricanes, as well as reduced inducement for travel as a result of higher temperatures in traditional tourism marketplaces; and

[33] Jamaica's Fifth National Report to the Convention on Biological Diversity 2010-2013 p. 10; Beach Erosion: Status and Trends 2013. NEPA, 2014

2.2.10 Human Health

Human health is affected by several key factors including the physical environment, and social and economic support systems/networks. Climate change is said to affect the most fundamental determinants of health: air, water, food, shelter, and freedom from disease. The impacts on human health are largely be determined by several factors, including available health services, the state of the natural and built environments (including air, water, and sanitation services) and the availability of life sustaining resources such as water and food.

Jamaica's vulnerability to extreme hazards and its location in the tropics also increases the risks posed to human health, as local conditions are 'favourable' for the expansion of both tropical (vector-borne) and water-related diseases. Increased temperatures, rainfall, and drought conditions that lead to necessary water storage create the ideal conditions for the breeding of vectors like the Aedes aegypti mosquito (SNC, 2011)[34]. The Chikungunya virus, transmitted by mosquitos, is believed to have affected 60% of the Jamaican population (although only 5,180 cases were reported up to 2015), cost the Jamaican economy in 2014, some thirty million Jamaican dollars, due to work stoppage of the Jamaican labour force and the recovery time of 5-10 days (Jamaica Survey of Living Conditions 2016 and State of the Jamaican Climate 2015).

Climate change will bring about more storms, floods, droughts, and heat waves, which are all expected to threaten all the determinants of health, resulting in the following anticipated impacts:

- An increase in the incidence of vector-borne diseases (such as dengue fever, malaria, chikungunya and yellow fever) as higher temperatures favour the proliferation of mosquitoes and other disease carriers: a threefold increase in dengue transmission is likely in Jamaica[12];
- Food shortages as a result of drought conditions, may lead to malnutrition;
- A higher occurrence of respiratory diseases and heat and stress-related illnesses and conditions caused by the 'urban heat island effect.' This could directly increase morbidity and mortality rates, particularly in the young and the elderly; and
- An increase in water-related diseases such as dysentery, typhoid, leptospirosis and cholera particularly following extreme rainfall events, and exacerbated by poor sanitation, unplanned settlements and pollution of water sources

It is further recognized that the impacts of climate change on coastal and terrestrial resources, food supply, water production and the various economic sectors are likely to have indirect and significant effects on human health:

- More frequent extreme weather events can lead to potentially more deaths and injuries caused by storms, floods and landslides; and

[34] See also, An Assessment of the Economic Impact of Climate Change on the Health Sector in Jamaica (UN Economic Commission for Latin America and the Caribbean, 22 October 2011) (LC/CAR/L.316).

- Given the vulnerability of the agricultural sector to climate variability, rising temperatures and more frequent droughts and floods can compromise food security. This could result in increases in malnutrition, given the high dependency on rain-fed subsistence farming.

2.2.11 Biodiversity

Jamaica's biodiversity is rich, with approximately 8000 species of plants and animals and the 5th highest number of endemic plants among islands in the world.[35] The sustainable management and use of Jamaica's environment and natural resources is one of the National Outcomes under Vision 2030, Jamaica's roadmap to national development.[36]

The most vulnerable ecosystems to climate change impacts are the coral reefs, highland forests and mangrove wetlands.[37]

The likely impacts on climate change on biodiversity include[38]:

- Increasing air and sea temperatures will lead to fish kills, coral reef bleaching, overabundance of algae, decreased quantity and quality of water resources, changes in species abundance & distribution (migration to higher altitudes), increase in invasive species, genetic changes, change in reproduction timings (life cycle), reduction in male sea turtle due to increased sand temperatures, changes in growing seasons for plants and increase in extinction rate of species and loss of mangroves as a result of prolonged periods of drought

- Increasing sea level rise will lead to changes in marine ecosystems including flooding of wetlands, loss of coastal species, saltwater intrusion in freshwater areas, loss of nesting and feeding habitats particularly for endangered turtle species and crocodiles.

- Changes in frequency and intensity of hurricanes can lead to loss of vulnerable species, changes in the range of invasive species, increased damage and loss of sensitive habitats, nests & nesting sites (coral reefs, mangrove ecosystems, forests).

Jamaica's most recent National Biodiversity Strategy and Action Plan was prepared for the period 2016-2021. Work has commenced to revise this document to align it with the Kunming-Montreal Global Biodiversity Framework which includes climate change in one of its targets.

2.2.12 Finance

Jamaica's poverty rate as at 2019 was 11.3%[39] . The country has historically struggled with low growth and high public debt although it is classified as an upper middle-income country by the World

[35] Jamaica Country Profile, https://www.cbd.int/countries/profile/default.shtml?country=jm#facts
[36] Vision 2030 Jamaica National Development Plan, National Outcome #13
[37] Jamaica's Fifth National Report to the Convention on Biological Diversity 2010 - 2013
[38] Jamaica's Fifth National Report to the Convention on Biological Diversity 2010 - 2013; Climate Change Impacts on Jamaica's Biodiversity, Dr Dale Webber (undated presentation)

Bank. In 2013, Jamaica began the implementation of an economic reform programme under an agreement with the International Monetary Fund (IMF) to stabilize and grow the economy and reduce debt. Since the start of the reform programme, Jamaica's economy has grown. GDP for 2018/2019 grew by 1.9% relative to the period 2017/2018[40] and public debt fell below 100 percent of GDP in 2018/19 for the first time in 18 years.[41] In April 2019, the unemployment rate was 7.8% with the number of employed persons increasing by 2% compared to April 2018.[34]

Building resilience to the impacts of climate change can support national development and contribute to the reduction of poverty. Jamaica's vulnerability to the impacts of climate change, including extreme weather events such as hurricanes, storms and drought, has had negative impacts on Jamaica's economy including unplanned budgetary expenditures, reallocation of financial resources to aid in reconstruction and rehabilitation efforts, decline in budgetary revenues and increased pressure on central bank reserves. During the period 2001 to 2017, Jamaican incurred loss and damages totalling over J$120 billion due to hurricanes, storms and drought. To adequately address these impacts, Jamaica has purchased insurance coverage with the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company and is developing a Disaster Financing Risk Policy.

In 2018, Jamaica signed a US$285-million contingency credit facility with the Inter-American Development Bank (IDB). This credit facility will provide the country with immediate financing during the emergency recovery phase after a sudden event and is intended to buffer the financial shock of a disaster on Jamaica's fiscal balance. This will increase the country's financial stability and efficiency as well as its disaster preparedness and response. The contingent financing, funded from the IDB's Ordinary Capital, has a maturity period of 25 years, a grace period of 5.5 years, and an interest rate based on the London Inter-bank Offered Rate.

In April 2019, Jamaica's Minister of Finance joined the Coalition of Finance Ministers for Climate Action convened by the World Bank Group and International Monetary Fund which seeks to promote national climate action through fiscal policy and the use of public finance by the sharing of good practices and experiences on macro, fiscal, and public financial management policies for low-carbon transformation.

Jamaica has also been a recipient of catastrophe bonds from the World Bank. Most recently, in 2021, the World Bank priced a catastrophe bond that will provide the Government of Jamaica with financial protection of up to US $185 million against losses from named storms for three Atlantic tropical cyclone seasons ending in December 2023.

In March 2023, the IMF Executive Board approved Jamaica's request for special drawing right (SDR) 727.51 (approximately US$968 million) under the Precautionary and liquidity line (PLL) arrangement as well as SDR 574.35 million (Approximately US$764 million) under the newly created Resilience and Sustainability Facility. This is a 24-month programme which will provide insurance against risks

[39] Jamaica's Survey of Living Conditions 2019
[40] STATIN
[41] World Bank, Jamaica Country Overview, available at https://www.worldbank.org/en/country/jamaica (accessed 24.7.2019)
[34] Labour Force Survey, April 2019 (STATIN)

from higher commodity prices, a global slowdown, tighter-than-envisaged global financial conditions, new COVID outbreaks and in strengthening physical and fiscal resilience to climate change.

An International Climate Finance Strategic Framework for Jamaica is being prepared by the Planning Institute of Jamaica in collaboration with the Climate Change Division of the Ministry of Economic Growth and Job Creation.

2.2.13 Youth

In observing International Youth Day in 2008, Secretary-General of the United Nations, Ban Ki-moon described the relationship between youth and climate change in developing countries, stating "Today's young people will bear the consequences of climate change, thanks to the unfortunate legacy of their elders. In many developing countries in particular, youth -- especially girls and young women -- are often responsible for…tasks (which) will be rendered more difficult … as climate change affects the availability of water, agricultural productivity and the survival of ecosystems." At the Economic and Social Council (ECOSOC) Youth Forum in February 2015, the Secretary-General also stated "2015 is not just another year – it is a chance to change the course of history. Ours is the first generation with the potential to end poverty – and the last to act to avoid the worst effects of climate change."

Children, in particular, experience extreme sensitivity to external shocks. The United Nations Children's Fund (UNICEF) has noted that children will suffer malnourishment and food insecurity due to climate change, are at risk of becoming environmental refugees and will experience higher vulnerability to disease, heatstroke and resource shortages. Policy instruments must contribute to the provision of an institutional framework that supports the building of an environment conducive to child protection and development.

Youth, in particular, unemployed inner-city youth have been identified as one of the most vulnerable to the impacts of climate change.[42] Through its 2012 Climate Change Knowledge, Attitude, Behavioural Practice Study, Jamaica has acknowledged that public awareness and education at the very youngest level should be focused on not only increasing general knowledge of climate change but also focused on engendering behavioural change and a change in cultural attitudes. A National Strategy and Action Plan 2012 - 2017 for Communication for Climate Resilience has been developed under Jamaica's Pilot Program for Climate Resilience (PPCR) project. One of the specific goals of this Communications Plan was that by the end of 2017, at least 20% of Jamaica's teachers and 20% of students (at all levels) will be able to articulate what climate change is and why adaptation is important for climate resilience. A new survey was conducted in 2021 which found that knowledge of climate change was quite high for both household respondents as well as sector respondents. However, while there was a high awareness of climate change there was a comparatively low awareness of specific components of climate (greenhouse gases, greenhouse effect and carbon

[42] *Report on Climate Change Knowledge, Attitude, Behavioural Practice Study,* Planning Institute of Jamaica (2012)

footprint). The survey also noted that there still seems to be a gap in understanding of the major contributor to climate change[43].

Despite the special challenges that youth[44] will face in the short, medium and long-term, they are well placed to combat the adverse effects of climate change. Jamaica, with over 530,000 youth[45] representing approximately 19% of the total population, stands to gain significantly from the creative and transformational power of its youth. *The Climate Change Policy Framework* will therefore support, the abilities of young people to lead the country towards positive, 'climate-friendly' changes in lifestyles, infrastructure, entrepreneurship, governance and decision-making.

Along these lines, Jamaica has created several opportunities to spread awareness and mobilize youth on climate change. These include, the appointment of Climate Change Youth Ambassadors, the Youth Environmental Advocacy Programme dedicated to fostering environmental awareness and promoting advocacy for environmental issues, among high school youth and staging a 2017 Youth Climate Change Conference and 2019 Post Conference of Parties (COP) Youth Consultation on Climate Change.

2.2.14 Gender considerations

Gender, like climate change, is a cross-cutting issue and presents specific challenges in tackling the adverse effects of climate change. Generally, males and females experience different vulnerabilities based on different economic, social and environmental realities. They may therefore have different concerns and inputs into decision making processes. The State of the Jamaican Climate 2015 outlines a myriad of ways in which climate change affects women and men differently.[38]

Women's socioeconomic circumstances are worsened during disasters due to their higher rates of poverty which make them more vulnerable to risks of displacement and hamper their ability to respond and recover from disasters. At the national level, several policies have been established to address gender equality and gender-based violence. Jamaica's National Development Plan, Vision 2030, recognizes the long-term systemic discrimination against women and seeks to address this by identifying and overcoming the limitations to the empowerment of women and men. Gender and youth issues are identified as challenges that must be address through climate action. A climate change and gender strategy and action plan is being developed.

[43] Improving Climate Data & Information Management Project Knowledge, Attitudes and Practices Survey Consultancy: Improving Climate Data & Information Management Project, Planning Institute of Jamaica (2021)

[44] The United Nations, for statistical purposes, defines 'youth', as those persons between the ages of 15 and 24 years, without prejudice to other definitions by Member States. See Secretary-General's Report to the General Assembly Resolution A/36/215 and resolution 36/28, 1981)

[45] Figure as at the end of 2013. Statistical Institute of Jamaica, http://statinja.gov.jm/Demo_SocialStats/newEndofYearPopulationbyAgeandSex2008.aspx [38] State of the Jamaican Climate 2015, p. 97 – 98.

2.2.15 The Elderly

By the year 2050, it is estimated that there will be 1.5 billion people aged 65 and above, constituting one sixth of the world's population.[46] In addition to youth and women, the elderly are a vulnerable population to the adverse effects of climate change. Older persons are affected by increasing spread of vector-borne diseases, heat stress and the increasing frequency and intensity of climate related events which can impact their physical and mental health as well as their wellbeing. Climate action must give consideration to the needs of this vulnerable community, taking into account existing infrastructure and initiatives which cater to the needs of the elderly.

2.3 Challenges Facing Jamaica within the Context of Climate Change

2.3.1 Poverty

The high incidence of poverty, particularly in the rural areas of the island, is increasing. In 2016, the proportion of Jamaica's population living below the poverty line of $175,297.00 (the least amount needed to maintain a minimum acceptable standard of living) was 17.1% down from 21.2% in 2015 (Jamaica's 102019). In order to ensure that persons live in ways that are less environmentally intrusive (e.g., harmful forestry practices), and to maximize their capacity to adapt to climate change, it is necessary to ensure that poverty alleviation remains high on the national sustainable development agenda.

2.3.2 Limited Financial Resources

In Jamaica's First National Communications to the UNFCCC on Climate Change (2000) it was estimated that a 1m rise in sea level would see US$462 million being required to protect Jamaica's coast. There is a great need for sustained sources of funding for climate change mitigation and adaptation efforts as well as for managing impacts which are beyond adaptation such as massive coral bleaching which will require significant funding for rehabilitation activities.

The Government of Jamaica has been able to mobilize funding to facilitate adaptation and mitigation measures. In 2010, The Planning Institute of Jamaica (PIOJ) was accredited as a National Implementing Entity (NIE) by the Adaptation Fund Board to receive direct financial transfers from the Fund in order to carry out adaptation projects and programmes. Jamaica established the Adaptation Fund Programme (amounting to US$10 million) in 2013 which focuses on protecting livelihoods and food security among vulnerable communities by improving land and water management for the agriculture sector, strengthening coastal protection, and building institutional and local capacity for climate change adaptation.

In 2015, the CCD was designated as the National Designated Authority (NDA) for the Green Climate Fund (GCF) and is responsible for collaborating with accredited entities to facilitate the review process within government for project proposals to the GCF. The Development Bank of Jamaica (DBJ), Planning Institute of Jamaica (PIOJ) and the Jamaica Social Investment Fund (JSIF) — were

[46] Department of Economic and Social Affairs, World Population Ageing 2019: Highlights (United Nations publication, 2019), p. 5, available at www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2019-Highlights.pdf

nominated to become Direct Access Entities to directly access financing from the GCF. The JSIF received accreditation in 2022. The Environment and Risk Management Branch of the Ministry responsible for the Environment is the focal point for the Global Environment Facility (GEF) and has benefitted from access to financing.[40]

Although it is estimated that Jamaica has directly accessed over US$500M dollars in finance for climate action, specifically public, private and community-based interventions, between 2009-2018,[41] sustained and progressively greater financing is required to achieve adaptation goals and mitigation targets. Of the approved Official Development Assistance (ODA) for 2018, only US$9.5 million ($1.2 billion) of the total amount received of US$220.7 million ($28.6 billion) was directly focused on the Environment and Climate Change sector (Economic and Social Survey Jamaica 2018).

2.3.3 Policy Frameworks and Legislative and Regulatory Support for Integrating Climate Change Considerations

There is need for greater collaboration, coordination and mainstreaming of climate change considerations in Jamaica's sectoral policies and plans. Sectoral policies must take into account the issue of climate change and how global warming could affect the sustainability of their respective sectors and integrate adaptation, mitigation and risk reduction strategies. The key areas are energy, agriculture, tourism, health, water, forestry, transportation, coastal resources, human settlements, fisheries, finance, and waste management.

Jamaica does not currently have legislation directly relating to climate change, although a number of policies and legislation, have been developed in the past decade which indirectly seek to address climate change impacts and actions, and several are currently in development. Appendix C includes a Table of policies and legislation to address climate change.

2.3.4 Institutional and Individual Capacity

The ability of public and private sector, particularly the small- and medium- enterprises, to address climate change issues is tied directly to the broader policy and regulatory system of Government. Inadequate financial and technical resources can limit their overall ability to develop and expedite key programmes, projects and action plans associated with climate change. The Government of Jamaica is seeking to overcome this challenge by building the capacity of MDAs through the Climate Change Focal Point Network.

2.3.5 Strengthening of the Physical Planning System

The vulnerability of Jamaica to natural hazards is largely due to geographic and bio-physiologic factors. However, its overall vulnerability has been heightened due to significant alterations made to the natural environment by the development of infrastructure and human settlements and the settlement patterns of the population, particularly within the coastal zone. With more than 70% of all major industries located within the coastal zone and approximately 82% of the population living within 5km of the coast, the country is faced with the considerable challenge of reducing the island's vulnerability, while improving its limited adaptive capacity to address climate change.

Steps have been taken to ensure orderly planning in Jamaica to address the challenges related to vulnerability. The entire island is covered by either confirmed or provisional Development Orders, with

the exception of Portmore, for which a Development Order is currently being developed as at 2019. Within the context of a changing socio-economic and environmental climate, the Orders will be used to guide and facilitate development by establishing where and which types of development ought to take place; control development/ facilitate enforcement; help to support the development of communities; provide opportunities for people to participate actively in the planning process; provide a planning system that bridges the gap between environment and economic development; improve local governance; build research capacity; and educate stakeholders.

Local Sustainable Development Plans (LSDPs) have also been developed for the parishes of Manchester, St. Elizabeth (and Treasure Beach), St. Catherine, Clarendon and Trelawny. Plans are underway for Westmoreland, St. Thomas and Portmore.

The Government of Jamaica has begun development of a National Spatial Plan which will achieve the following:

1. Rationalize the use of local land resources through the preparation of a National Physical Plan to:
    a) Specify broad spatial planning objectives and guiding principles for national and regional development;
    b) optimize the use of land and natural resources by providing a framework for making sustainable locational choices
    c) Improve governmental capacity to formulate, coordinate and implement integrated rural development policies and programmes in order to address spatially unbalanced development.
2. Set a national context for spatial planning at the local level.
3. Inform strategic infrastructure policy and public investment decisions which support the achievement of balanced regional development, by taking account of and highlighting the relationship between infrastructure and the economy, patterns of development within it, and quality of life.
4. Strengthen inter-sectoral coordination of the country's development within a spatial framework and provide the private sector with a clear context of Governmental investment decisions and commitments.[47]

A National Spatial Data Information Technology Platform is being developed through a JAMPRO competitiveness project funded by The World Bank to digitize information under the National Spatial Plan. The physical planning system has however been hampered by limited human, technical and financial resources. There is a greater need for the integration of land use planning into ocean and coastal zone management policies, in order to explicitly address all needs related to the management of natural resources. The capacity of development agencies to enforce guidelines or requirements for no-build zones and environmentally sensitive areas needs to be strengthened in order to reduce risks posed by natural disasters, such as flooding.[48]

[47] Review of Policy, Plans, Legislation and Regulations for Climate Resilience in Jamaica, (PIOJ, 2012)

[48] Macro Socio-Economic and Environmental Impact Assessment of the Damage and Loss caused by the March to June Rains 2017

2.3.6 Limited Research Capacity and Technological Development

Timely and accurate research is needed to ensure Jamaica is able to increase its adaptive capacity and resilience and to promote low carbon development while fulfilling its regional and international obligations and meeting its national development goals.

Global models do not provide sufficient information on climatic conditions in the Caribbean, resulting in a limited understanding of climatic processes. Jamaica is a part of The Caribbean Climate Modellers Consortium (CCMC) along with Cuba, Barbados, Suriname, Belize and other countries. CCMC is a network of researchers and practitioners that are collaborating to address data gaps and lack of relevant scientific information specific for understanding climate change impacts to the Caribbean. Through this collaboration, Jamaica has been able to benefit from Regional Climate Models showing predicted changes in climate for the Caribbean region.

Jamaica has made great improvements in the area of climate research. A number of institutions across Jamaica have been funding or conducting climate change research in specific areas. These include the Climate Studies Group, Mona (CSGM); the Centre for Marine Science, University of the West Indies (UWI); the School of the Built Environment - University of Technology; Northern Caribbean University; and the Sir Arthur Lewis Institute of Social and Economic Studies, UWI, Mona, the Climate Change Innovation Centre – Scientific Research Centre and the Caribbean Maritime University (CMU).

The Climate Change Policy Framework embodies the will to, *inter alia*, foster a greater culture of scientific research, technology and innovation to address climate change and ensure appropriate mechanisms for setting the research agenda to guide the development of sectoral action plans to address climate change.

Challenges faced by scientists in Jamaica include:

- Limitations in available climate data for use in monitoring and modelling climatic conditions and changes
- The cost of the requisite technology to accurately collect data such as ocean pH levels
- Lack of a coordinated central repository for climate related data and information[49]

Research and innovation needs span the spectrum of the natural and social sciences, and must address integration of science and technology into decision-making processes and resulting measures to combat the effects of climate change.

2.3.7 Limited Integration of Environmental Considerations into Socio-Economic Policies and Strategies

Socio-economic imperatives have tended to outweigh the longer term needs of the environment. Vision 2030 Jamaica has infused climate change considerations into national development planning. However, there is need for enhanced mainstreaming of environmental and climate change issues into national

[49] Under the PPCR project, 'Improving Climate Data and Information Management Project' a Climate Data Node is being established.

social and economic policies. There needs to be greater appreciation by decision-makers of the inter-relationship between environmental protection and management and socio-economic advancements to ensure that climate change is effectively addressed. Advancements made in key sectors such as transport, energy, tourism and agriculture have focused primarily on the social and economic achievements/ outcomes, without due consideration to the impacts these changes may have on the environment.

2.3.8 Labour Productivity

Local labour markets have been impacted by various phenomena such as globalization which have created several threats to the labour force. Among these threats are strong competition for highly skilled labour and increased application of technology which may reduce the dependence on and use of low skilled labour.[50] Jamaica's average employed labour force grew by 1.3 % to 1,215,975 persons in 2018 from 1, 200, 575 persons in 2017 (Economic and Social Survey Jamaica 2018).

Increasing atmospheric temperatures and relative humidity pose additional challenges for those segments of the labour force working in the open-air environments. Without the appropriate adaptation measures in place, it is anticipated that there may be significant negative impacts on labour productivity, especially for wage-labour dependent house-holds and workers engaged in open-field occupations such as construction, industry, agriculture and fisheries and some segments of the manufacturing and transportation industries.[51] In light of the conditions that are projected to arise from climate change, there will be the increased potential for heat stress, dizziness, fainting, earlier onset of worker fatigue and work-related accidents. By 2030 if global warming is limited to 1.5°C, 2.2 per cent of total working hours worldwide will be lost every year due to higher temperatures that mean workers will not be able to work or have to work at a slower pace thereby resulting in a loss equivalent to 80 million full-time jobs and global economic losses of US$2,400 billion.[52]

Though legislative measures are in place such as the draft Occupational Health and Safety Bill and the Factories Act, there may be need for exploration into additional targeted initiatives to create a more climate resilient labour force to protect and improve Jamaica's labour productivity.

2.3.9 Human Security and Mobility

Climate change poses significant risk to human security in multiple ways. The negative impacts on livelihoods that may result from the impacts of climate change can lead to changes in migration patterns and a rise in both internal and external migration. These changes may give rise to tension and conflict within communities, changes in cultural practices and a strain on the institutions that exist to manage the settlement and integration of migrants.53

[50] Vision 2030 Jamaica, Labour Market and Productivity Sector Plan 2009-2030

[51] Summary for Policymakers, Contribution of Working Group II to Fifth Assessment Report, Intergovernmental Panel on Climate Change, 2014

[52] *Working on a warmer planet: The impact of heat stress on labour productivity and decent work*, International Labour Office – Geneva, ILO, 2019

[53] Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, 2014

"Human mobility" in the context of climate change encompasses different types of movements: migration, displacement and planned relocation.54 Climate change with its resulting impacts such as more frequent and intense natural disasters and environmental degradation (e.g., drought, rising sea levels etc.) can be a driver of migration, displacement and/or planned relocation. When carefully planned, migration can be a potential adaptation or coping strategy to the adverse effects of climate change. For example, planned relocation in evacuation plans can be a part of preparedness efforts linked to disasters.

Human mobility can also have negative impacts on the environment and security when areas of relocation are not able to accommodate the influx of persons. This could lead to increased pressure on the infrastructure and basic services for urban centres, increased environmental degradation and potential national security threats that can contribute to the destabilization of societies and adverse economic impacts.

The economic costs to the country as a result of loss and damage to critical infrastructure and economic sectors such as agriculture and tourism have been far reaching. Increased frequency of natural disaster events will continue to negatively impact the economy as well as the environment.

[54] Human mobility is a generic term covering all the different forms of movements of persons. IOM (2018), International Migration Law N°34 - Glossary on Migration. See also, Implementation of the Workplan of the Task Force on Displacement under the Warsaw International Mechanism for Loss and Damage, United Nations Framework Convention on Climate Change (UNFCCC); Pillar I: Policy/Practice – National/Subnational Activity I.1:

3. THE CLIMATE CHANGE POLICY FRAMEWORK

3.1 Vision Statement

Jamaica achieves its goals of sustained growth and prosperity for its people with enhanced resilience and capacity to adapt to the impacts and to mitigate the causes of climate change.

3.2 Goals

The goals of this Policy Framework are as follows:

1. Strengthening of Jamaica's adaptive capacity and resilience to reduce its vulnerability to climate change;

2. Pursuit of low carbon development and enhancement of access to and mobilization of climate finance; and

3. Promotion of public education and awareness raising, research and technology transfer towards ambitious climate action.

3.3 Objectives

Each policy objective is aligned with a corresponding goal as follows:

Goal 1: Strengthening of Jamaica's adaptive capacity and resilience to reduce its vulnerability to climate change

1.1 Governance: Improve the governance framework for climate action and ensure transparency and accountability.

1.2 Adaptation: Reduce Jamaica's vulnerability and increase Jamaica's capacity to respond to the adverse impacts of climate change

Goal 2: Pursuit of low carbon development and enhancement of access to and mobilization of climate finance

2.1 Mitigation: Reduce Jamaica's overall GHG emissions in support of low carbon development.

2.2 Finance: Facilitate access to and mobilization of climate financing for adaptation and mitigation

Goal 3: Promotion of public education and awareness raising, research and technology transfer towards ambitious climate action

3.1 Public Awareness and Education: Increase public awareness of climate change impacts, climate actions and responses at the national and local levels to facilitate behaviour change.

3.2 Research: Promote research, innovation, and science-based data collection and analyses and to facilitate, *inter alia,* climate modelling, as well as the formulation of appropriate adaptation and mitigation measures, to inform decision-making and strategic actions at all levels.

3.3 Technology Transfer: Promote the development, transfer and diffusion of environmentally sound technologies for mitigating, adapting to and addressing loss and damage associated with climate change.

3.4 Principles[55]

The relevant Ministries, Departments and Agencies (MDA's) will take into account the following principles in the development and implementation of sectoral climate change adaptation and mitigation plans:

1. **Sustainable development**

Recognizing that the resilience of the natural environment is key to adapting to climate change, the response to the climate change challenge must be linked to the sustainable use of natural resources, the maintenance and restoration of ecosystems and an ecosystem-based approach to disaster risk management.

2. **Multi-sectoral approach**

The Government will mainstream climate change adaptation and mitigation considerations in the development of legislation, policies, strategies, programmes, plans and projects of all MDA's.

3. **Public Participation and Collaboration**

The Government will employ a consultative and collaborative approach to respond to climate change. Information on the impacts of climate change and proposed response measures will be provided to the public to ensure awareness and understanding and also to encourage changes in attitudes and practices. The Government, in the development of strategies and approaches to address climate change, will engage interested and relevant stakeholders which include local communities, media, academia, research institutions, public and private sectors, civil society organizations as well as those most vulnerable to climate change impacts, including women, children and the poor.

[55] Several principles are defined in the glossary.

4. **Precautionary Approach**

The Government will apply appropriate strategies and measures to ensure an effective response to the impacts of climate change even in the absence of full scientific certainty.

5. **Transparency and accountability**

The Government will employ measures to ensure that there is transparency and accountability in the development and implementation of adaptation and mitigation plans.

6. **Best available science**

The Government will apply sound technical and scientific analysis and principles and new scientific findings consistent with the precautionary approach. Traditional knowledge is recognized and will be utilized as an important complement to scientific information.

7. **Polluter Pays Principle**

The Government will apply the polluter pays principle in the implementation of the Policy Framework.

8. Inter-and Intra-generational equity

The Government will utilize the principles of inter-and intra-generational equity to ensure that the rights to development of both current and future generations are equitably fulfilled.

9. **Equality and non-discrimination**

The Government will ensure equality and non-discrimination in its efforts to address climate change. A gender perspective, including efforts to ensure gender equity and addressing inter-sectionalities, will be considered in all planning for climate change mitigation and adaptation and care will be taken to protect the rights of children, older persons, persons with disabilities, and others in vulnerable situations.

10. Access to information

The Government of Jamaica promulgated Access to Information legislation in June 2002 which grants "… to the public a general right of access to official documents held by public authorities, subject to exemptions which balance that right against the public interest in exempting from disclosure government, commercial or personal information of a sensitive nature". The legislation reinforces several key principles including:

(a) government accountability;
(b) transparency; and
(c) public participation in national decision-making.

Additionally, Jamaica signed the Regional Agreement on Access to Information, Public Participation and Justice in Environmental Matters in Latin America and the Caribbean in September 2019.

3.5 Policy Objectives

3.5.1. Governance

The Ministry responsible for climate change will collaborate with relevant stakeholders at the local, national, regional and international levels to improve the governance framework related to climate action to ensure transparency and accountability.

OBJECTIVE 1.1	STRATEGIES	ACTIONS
GOVERNANCE Improve the governance framework for climate action and ensure transparency and accountability	Strengthen Jamaica's active participation in regional and international climate activities	Ensure Jamaica's participation in regional and international climate change processes, particularly the UNFCCC and Paris Agreement -related activities.
		Conduct national public and stakeholder consultations to inform Jamaica's positions articulated at international and regional climate change negotiations and other fora.
		Utilize and develop, as appropriate, tools and mechanisms to ensure that relevant decisions taken at regional and international levels are mainstreamed into national actions.
	Improve the legal framework for coordinating climate change action	Promote effective synergies between the national climate agenda and those of the economic, social and environmental sectors.
		Enact legislation to, *inter alia,* institutionalize the role and functions of the responsible authorities for coordinating action on climate change (e.g., Climate Change Division and Climate Change Advisory Board), establish emission reduction targets for key economic sectors which will be reviewed every 5 years and to promote engagement of public participation in relation to climate action.

OBJECTIVE 1.1	STRATEGIES	ACTIONS
	Strengthen multistakeholder coordination, networking, information exchange and expertise in climate action across MDAs, private sector and civil society	Strengthen the Climate Change Focal Point Network through, *inter alia,* increasing its capacity and expertise at the national and parish levels.
		Develop mechanisms and tools for the mainstreaming of climate considerations into plans and programmes to inform decision making at the level of Cabinet, Parliament and local government.
		Mainstream gender in climate action at all levels through implementation of inter alia Climate Change Gender Strategy and Action Plan.

3.5.2. Adaptation

The Government of Jamaica recognizes the need for climate change considerations to be reflected in key policy measures, regulations and laws across all sectors to ensure adaptive capacity to address climate change. Jamaica has already developed various policies, plans and programmes which address climate change, and some of the sector plans developed under Vision 2030 Jamaica – National Development Plan include climate change considerations. The CCD works with the Climate Change Focal Point Network and the Policy Analysts' Network (PAN) to mainstream climate change considerations into the policy development process.[56]

OBJECTIVE 1.2	STRATEGIES	ACTION
ADAPTATION Reduce Jamaica's vulnerability and increase Jamaica's capacity to respond to the harmful impacts of climate change	Develop a framework for mainstreaming climate change into sectoral plans, processes, programmes, projects and policies.	Utilize climate change risk assessment tools and methodologies in the decision-making processes at all levels.

[56] The Policy Analysts' Network (PAN) is a group of approximately 30 to 40 officials in the various Ministries, Departments and Agencies of the Government of Jamaica dedicated to sharing best practises in policy analysis. The PAN was formally launched by the Prime Minister of Jamaica on June 13, 2001 at Jamaica House, Kingston, Jamaica

OBJECTIVE 1.2	STRATEGIES	ACTION
		Formulate and implement a national adaptation plan (NAP), including an adaptation communication, strategy with due consideration to key sectors.
		Conduct and periodically update vulnerability assessments for key sectors and a national assessment of climate vulnerable groups, areas and ecosystems.
		Increase the number and improve the management of marine and terrestrial protected areas to, *inter alia,* prohibit destructive practices and enhance the resilience of ecosystems.
		Finalize and implement plans and policies, incorporating climate change considerations, related to land use, spatial planning and disaster risk reduction such as the National Land Policy[1], Agricultural Land Use Policy, Comprehensive Disaster Risk Management Policy and the National Hazard Risk Reduction Policy, Oceans and Coastal Zone Management Policy, Watersheds Policy and the Protected Areas Policy.
		Develop and implement a National Environment Policy to take into account, *inter alia*, issues related to enhancing the resilience of species and ecosystems in adapting to climate change.

OBJECTIVE 1.2	STRATEGIES	ACTION
		Periodically update Development Orders, Local Sustainable Development Plans, the National Building Code, setback limits, standards and guidelines for developments and enforce no-build zones to assist in addressing adaptation challenges.
		Strengthen early warning systems and emergency preparedness to inform climate services and support decision making at all levels.
		Strengthen existing partnerships and create new partnerships to address loss and damage at all levels.
	Build capacities at the national and local levels to coordinate and enhance mainstreaming and implementation of climate action.	Prepare and implement capacity building programmes that address the adaptation needs of various sectors.
		Build the capacity of the Climate Change Focal Point Network to support the development of National Adaptation Plans that incorporate climate change considerations for priority sectors including incorporating local government representatives in the network.
		Promote and facilitate capacity building for local government authorities and communities to support vulnerability assessments and local adaptation planning and implementation
	Adapt to the impacts of climate	Continue the implementation of

OBJECTIVE 1.2	STRATEGIES	ACTION
	change through the application of a nature-based approach[57].	the National Forest Conservation and Management Plan.
		Update and implement national policies and legislation to protect and conserve coastal ecosystems, such as seagrass meadows, mangroves and coral reefs.
		Implement the National Mangrove & Swamp Forest Management Plan as well as develop and implement a national ecosystem restoration plan for the restoration of priority ecosystems including coral reefs.

3.5.3 Mitigation

The Government of Jamaica will ensure that key policy measures, regulations and laws are adopted across all sectors to ensure Jamaica reduces its GHG emissions by pursuing low carbon development. The

Government is committed to implementing 'no-regrets' mitigation measures such as demand side management in electricity production, using alternative energy sources such as solar, wind, hydropower, and biofuels to produce energy, controlling water pipe leakages, sustainable forest management and enforcing no build zones in ecologically sensitive areas. [58]

OBJECTIVE 2.1	STRATEGIES	ACTIONS
MITIGATION Reduce Jamaica's overall GHG emissions in support of low	Provide an enabling environment for low carbon and climate-resilient development	Assess the most appropriate mitigation actions taking into account mitigation potential, cost, sector "buy-in", co-benefits

[57] Nature-based solutions are actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services, resilience and biodiversity benefits. (Resolution adopted by the United Nations Environment Assembly on 2 March 2022 accessed at https://www.unep.org/environmentassembly/unea-5.2/proceedings-report-ministerial-declaration-resolutions-and-decisions-unea-5.2)

[58] "No regrets" measures are those whose benefits, such as reduced energy costs and reduced emissions of local/regional pollutants equal or exceed their cost to society, excluding the benefits of climate change mitigation. They are sometimes knows as "measures worth doing anyway".(IPCC Second Assessment Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UN Framework Convention on Climate Change).

OBJECTIVE 2.1	STRATEGIES	ACTIONS
carbon development		and alignment with sectoral and national development priorities.
		Promote measures to support renewable energy, energy efficiency, energy conservation and REDD+ activities, including legislative and administrative measures.
		Facilitate methods for the sharing and utilization of GHG emissions data among MDAs, private sector and academia in priority sectors.
		Establish and maintain a national Measuring, Reporting and Verification (MRV) system for the effective implementation of the country's Nationally Determined Contributions (NDC's) and other transparency-related activities.
		Develop and disseminate tools and methodologies for the implementation of capacity building activities at all levels to support the reduction of GHG emissions.
		Develop and implement a 2050 Long-term Emissions Reduction and Climate Resilient Strategy for Jamaica.
		Prepare, communicate and implement successive/progressive NDCs to reflect the country's ambitions with respect to the reduction of its GHG emissions.
		Explore pathways and implement measures to facilitate the decarbonization of the

OBJECTIVE 2.1	STRATEGIES	ACTIONS
		national grid.
		Promote an increase in the government's electric vehicle fleet.
		Promote the use of cleaner fuels in the transportation sector.
		Implement enabling activities to facilitate the transition towards electric mobility.
	Promotion and use of nature-based solutions to mitigate the impacts of climate change through direct carbon capture	Develop and implement a National Ecosystem Restoration Plan for critical ecosystems, including mangroves.
		Promote and implement urban forestry, afforestation and reforestation activities, restorative agriculture and improved livestock management.

3.5.4 Finance

The Government of Jamaica seeks to facilitate access to climate financing for adaptation and mitigation initiatives through the development and implementation of a Climate Change Finance Strategy to promote low carbon development and climate resilience.

OBJECTIVE 2.2	STRATEGIES	ACTIONS
FINANCE Facilitate access to and mobilization of climate financing for climate action	Develop a National Climate Change Financing Strategy to promote low carbon development and climate resilience.	Undertake on an ongoing basis, assessments of financing requirements for key sectors.
		Facilitate climate financing for private and public sectors, research institutions, community-based organizations and non-governmental organizations for research and technological innovation, disaster response and risk reduction and for climate

OBJECTIVE 2.2	STRATEGIES	ACTIONS
		information gathering and modelling equipment and systems, where possible.
		Build the capacity of the public and private sectors, community-based organizations and non-governmental organizations to access climate change financing for adaptation and mitigation activities through training and technical support.
		Develop monitoring tools for tracking climate financing across sectors.
		Promote the use of methodologies for climate proofing national budgets and procurement procedures for MDAs through training and capacity building.
		Create financial incentives and disincentives related to the reduction of GHG emissions in public and private sectors.
		Develop a national finance mobilization strategy as well as tools to leverage climate finance for, *inter alia,* the NDC's and NAP implementation.
		Providing an enabling environment for the mobilization of private finance to support low carbon and climate resilient development including leveraging of green investments, as outlined in the Green Investment Strategy for Jamaica, and promotion of

OBJECTIVE 2.2	STRATEGIES	ACTIONS
		green infrastructure and improved environmental performance.
		Listing of green or climate bonds on the Jamaica Stock Exchange to support the mobilization of finance from domestic and regional debt capital markets for implementation of climate action.
		Explore and where feasible and as appropriate negotiate debt-for-climate swap agreements to allow investment in domestic climate adaptation and mitigation projects and programmes.
		Provide an enabling framework to facilitate the participation of government and private sector in the trading of carbon credits.
		Promote the utilization of risk insurance to limit the financial impact of natural hazards as a result of climate change.
		Increase advocacy to scale up access to adaption finance and innovative finance for Jamaica to respond to national needs and priorities.

3.5.5 Public awareness and education

The Ministry responsible for climate change, shall promote consultative processes to enhance public participation in climate action.

OBJECTIVE 3.1	STRATEGIES	ACTIONS
PUBLIC AWARENESS EDUCATION	Develop and implement a national communication, public education and	Establish and regularly update databases with climate change relevant data and information

OBJECTIVE 3.1	STRATEGIES	ACTIONS
Increase public awareness of climate change impacts, climate actions and responses at the national and local levels and promote behaviour	behaviour change strategy	including the sharing of good practices, lessons learned, experiences and expertise.
		Engage and sensitize the media and institutions of learning on climate change issues on an ongoing basis.
		Establish a platform for communication and utilize mechanisms to allow for access to and sharing of climate-related information and data to facilitate the effective engagement of the public in decision-making.
		Utilize the best available media and formats to communicate with the public on climate action placing special emphasis on providing information geared towards children, youth, persons with disabilities and other vulnerable groups.
		Integrate climate change issues in the academic curricula at all levels.
		Support the participation and active engagement of civil society and the youth in climate change-related activities to foster greater advocacy and awareness of climate action and engender behaviour change.
		Facilitate private sector engagement to support climate action in key economic sectors, including, energy, transport, tourism, agriculture and fisheries and construction.
		Develop and disseminate knowledge products and tools to advance climate action.

OBJECTIVE 3.1	STRATEGIES	ACTIONS
	Improve the collection and dissemination of information on climate change impacts and resilience building measures	Prepare, regularly publish and make publicly accessible, climate change related national reports and assessments including National Communications, Adaptation Communications, Vulnerability Assessments, BURs, BTRs, NDCs and State of the Jamaican Climate Reports.
		Establish a mechanism to collect, record, regularly update and make publicly accessible, emissions data for Jamaica's greenhouse gas emissions inventory.
		Improve, as necessary and appropriate, and support the use of assessment tools for observing and researching the impacts of climate change at the sectoral and community levels including the national systems for climate change impact modelling.
		Develop protocols for the collection and analysis of disaggregated data in climate action initiatives.

3.5.6 Research

The Ministry with responsibility for climate change will work with national agencies and academia to seek financing to support capacity building as well as the development of research, data collection and analyses, technology and training. Considering Jamaica's vulnerability to natural hazards, there is a need for greater availability and timeliness of accurate scientific data, such as expanded coverage of hazard mapping for flood risks, to inform land use policy and building practices. The establishment of a central coordinating repository for information such as a clearinghouse of climate change related data and information would create great understanding of climate change impacts for researchers, policymakers and the general public.

OBJECTIVE 3.2	STRATEGIES	ACTIONS
RESEARCH	Improve the collection and	Continuously review and

OBJECTIVE 3.2	STRATEGIES	ACTIONS
Promote research, innovation, data collection, analysis and facilitate projections at the national level on climate change, its impacts, and appropriate adaptation and mitigation measures, to inform decision-making and strategic actions at all levels	dissemination of information on climate change impacts and resilience building measures.	implement a national scientific research agenda to support, *inter alia,* the preparation of publicly accessible climate change related national reports including National Communications, Adaptation Communications, Vulnerability Assessments, BURs, BTRs, NDCs and State of the Jamaican Climate Reports
	Build capacities at the national and local levels to coordinate and enhance mainstreaming of climate action.	Improve the assessment tools for observing and researching the impacts of climate change at the sectoral and community levels including the national systems for climate change impact modelling.
	Facilitate and support increased climate change research in academia, private sector, civil society and government.	Implement the national research agenda to support low carbon development and climate resilience.
		Identify and support training opportunities in climate change for academia and scientific, technical and managerial personnel within public, private and research institutions.
		Provide incentives for innovation and an enabling environment for innovation, research and technology development.

3.5.7 Technology Transfer

The Ministry responsible for climate change will encourage the private sector to embrace climate change imperatives and promote the development and implementation of technologies and processes that contribute to climate change adaptation and mitigation initiatives.

OBJECTIVE 3.3	STRATEGIES	ACTIONS

TECHNOLOGY TRANSFER Promote the transfer of environmentally sound technologies for mitigating and adapting to climate change with other countries and international organizations and among the public sector, private sector entities, financial institutions, nongovernmental organizations (NGOs) and research/education institutions	To encourage the use of environmentally sound technologies across sectors and groups including the private sector to contribute to climate change adaptation and mitigation initiatives.	Conduct periodic technological needs assessments (TNAs) to prioritize technologies for adaptation and mitigation in select sectors and develop a technology action plan (TAP).
		Promote and facilitate technology development, transfer and deployment, including via south-south cooperation.
		Promote financing for priority technology projects linked to the TNA.
		Disseminate available information on the costs, uses, and markets for environmentally sound technologies
		Increase and deployment across the island and maintenance of meteorological monitoring equipment to provide real time data and information to inform climate action.

3.6 Institutional Arrangements

An effective response to climate change requires effective institutional arrangements to ensure coordination, integration, monitoring and knowledge sharing across sectors and to avoid duplication of efforts. This Policy Framework outlines the institutional arrangements to respond to climate change.

Efforts to coordinate a multi-sectoral approach to responding to climate change include various initiatives by the Planning Institute of Jamaica (PIOJ), namely mainstreaming of climate change considerations into national development planning, and the facilitation of collaboration with international development partners. Other approaches include the creation of the Thematic Working Group on Hazard Risk Reduction and Adaptation to Climate Change (HRRACC) under Vision 2030 Jamaica - National Development Plan, the appointment of the Climate Change Advisory Board, establishment of the Climate Change Focal Point Network (CCFN). A local government network will also be developed to strengthen coordination of the climate action at the Parish level.

There is need for greater coordination among sectors in the development and implementation of climate change - related activities. Legislation will be promulgated and implemented to strengthen institutional

arrangements to coordinate the response to climate change. The legislation will include provisions for evaluation and an accountability mechanism.

i) The Environment and Risk Management Branch

The Environment and Risk Management Branch (ERMB) is the policy unit within the Ministry with responsibility for the environment and climate change which undertakes the formulation of the policy and legislative frameworks for climate change. The ERMB will undertake the periodic monitoring, review and subsequent revision of this Policy Framework, as appropriate.

ii) The Climate Change Division

The Ministry with portfolio responsibility for climate change will have responsibility to oversee and support the implementation of this Climate Change Policy Framework. The Climate Change Division (CCD) was established under this Ministry as the focal institution to coordinate existing and proposed initiatives in addressing climate change.

The CCD ensures that systems, institutions, and monitoring and evaluation mechanisms are in place to address climate change as an inclusive development priority that empowers local communities and strengthen resilience, especially in the most vulnerable populations. In this regard, the CCD will, inter alia:

(i) coordinate and monitor climate related activities of the ministries, departments, agencies involved in climate change resilience building as appropriate;

(ii) facilitate the provision of technical support and guidance for the development of climate change sectoral strategies and actions plans and the mainstreaming of climate change considerations into development plans, policies, projects and programmes;

(iii) facilitate and support the effective communication and dissemination of information among ministries, agencies and departments as well as the general public on the current and anticipated impacts of climate change and the appropriate adaptation and mitigations measures;

(iv) coordinate the development of climate finance and resource mobilization strategies, in collaboration with the Planning Institute of Jamaica, the Ministry of Finance and the Public Service and other relevant institutions;

(v) coordinate Jamaica's representation at regional and international climate change negotiations and other fora to advance the country concerns and interests and articulate Jamaica's position (including at the national level);

(vi) report on Jamaica's compliance with UNFCCC and the Paris Agreement including Measurement, Reporting, and Verification (MRV) of Jamaica's climate change mitigation under its NDCs; setting targets for Jamaica's GHG reduction targets, reporting on adaptation communications, National Communications, and ensuring the maintenance and updating of Jamaica's GHG inventory system;

(vii) act as the national focal point for climate change programmes and activities spearheaded by regional and inter-national bodies; and

(viii) establish a national climate change database and information system to facilitate data sharing, research and inform development planning and decision-making.

The CCD is the National Designated Authority (NDA) and focal point for the Green Climate Fund (GCF). As an NDA the CCD has the additional following responsibilities:

(i) Provide broad strategic oversight of the Fund's activities in Jamaica;

(ii) Convene relevant public, private and civil society stakeholders to identify priority sectors to be financed by the Fund;

(iii) Communicate nominations / no objection of entities (sub-national, national or regional, public and private) seeking accreditation to the Fund under the 'direct access' track;

(iv) Implement the no-objection procedure on funding proposals submitted to the Fund, to ensure consistency of funding proposals with national climate change plans and priorities; and

(v) Provide leadership on the deployment of readiness and preparatory support funding in the country.

iii) **Climate Change Focal Point Network (CCFPN)**

Climate change focal points are drawn from MDAs having been appointed as appropriate. Representation will be invited from civil society groups and the private sector. The focal points are responsible for the mainstreaming of climate change considerations into their respective policies, plans and programmes of the MDA's. Also, the focal points will ensure the preparation of periodic monitoring reports on these strategies and action plans to the CCD. The Municipal Corporations and members of Parish Disaster Committees will be incorporated into the CCFPN.[53]

iv) The Climate Change Advisory Board (CCAB)

The Climate Change Advisory Board (CCAB)[59] was established by a Decision of Cabinet in 2012 and comprises representatives of the public and private sectors, academia and non-governmental organizations appointed by the Minister with portfolio responsibility for climate change. This Board provides a platform for the exchange of scientific and technical information on climate change and related issues of importance to Jamaica and advise the Minister and the CCD, accordingly. The CCAB provides recommendations to Ministry with responsibility for climate change on the possible elements of a national climate change research agenda as well as potential implementation partners.

[59] Establishing a Climate Change Department in Jamaica https://www.jm.undp.org/content/dam/jamaica/docs/researchpublications/crisisprevention/EstablishingAClimateChangeDeptInJamaica2012.pdf

[53] CCFPN newsletter page, https://mailchi.mp/38ca3e397ad3/newsletter-on-the-activities-of-the-jamaica-climatechange-focal-point-network

The CCAB meets periodically, as determined by their terms of reference. Secretariat support to the CCAB is provided by the Ministry with responsibility for climate change. In addition, the membership of the Board includes *ex officio* officers, namely officers of the Ministry with responsibility for climate change. Ad-hoc Committees of the CCAB will be established as required to address specific issues.

3.7 Policy Application

This Framework will provide guidance to all MDA's, civil society, the private sector as well as the general public in addressing climate change.

3.8 Implementation

The Government in partnership with key stakeholders will ensure that the necessary steps are taken to achieve the fulfilment of the objectives, principles and directives of this policy framework. The Government will play a lead role in facilitating access to the necessary financial and technical support for the implementation of this policy framework, as appropriate. In addition, the CCD shall provide technical support for the development of sector action plans and will collaborate with stakeholders in the implementation of these plans. These activities may be enabled by grants and other forms of financing from domestic sources, development partners and through bilateral and multilateral cooperation. The respective sector action plans will detail specific activities to be undertaken by relevant stakeholders within given timelines and will identify sources of financing for their implementation.

As part of the implementation activities, training and sensitization programmes for parliamentarians and senior public sector officers will be developed and implemented.

a) Accountability

The Ministry with portfolio responsibility for climate change will be rquired to monitor and evaluate climate change related activities, projects and programmes, with annual reporting to the Cabinet and Parliament. The CCD will have administrative oversight and responsibility for climate change initiatives, including public education and awareness. All MDA's with responsibility for implementing specific activities or programmes to address climate change shall share with the CCD all relevant information and reports necessary for the proper collaboration, coordination, integration, monitoring and evaluation of climate change initiatives, as required.

b) Monitoring and Evaluation

The Ministry with responsibility for climate change (MRCC) will coordinate the verall implementation of this *Climate Change Policy Framework for Jamaica*, including the coordination of the relevant MDA's in the development and execution of their respective sector action plans.

The MRCC and CCD will develop a monitoring and evaluation strategy to ensure accountability in the implementation of the Policy. This includes the development of monitoring and evaluation indicators to

guide the progress towards mainstreaming climate change considerations into priority areas — water, health, tourism agriculture, transport and coastal resources and human settlement, among others.

The ERMB will conduct public reviews on a periodic basis of this policy framework to evaluate its effectiveness in achieving its goals and objectives as well as ensuring its continued relevance.

APPENDIX A – IMPLEMENTATION PLAN

GOAL	POLICY OBJECTIVE	STRATEGY	KEY ACTIVITIES	INDICATORS	TIMELINE (YEAR)					LEADING INSTITUTIONS	SUPPORTING INSTITUTIONS	COST J$
					1	2	3	4	5			
GOAL 1: Strengthening of Jamaica's adaptive capacity and resilience to reduce its vulnerability to climate change	1.1 GOVERNANCE Improve the governance framework for climate action and ensure transparency and accountability	Strengthen Jamaica's active participation in regional and international climate activities Improve the legal framework for coordinating climate change action	Ensure Jamaica's participation in regional and international climate change processes, particularly the UNFCCC and Paris Agreement - related activities.	Number of regional and international climate change processes in which the country, including civil society and the youth, is engaged and makes a contribution in advancing the global climate agenda.	X	X	X	X	X	MRECC, CCD (information clearing house), Ministry of Foreign Affairs and Foreign Trade (MFAFT)		Staff time
			Conduct national public and stakeholder consultations to inform Jamaica's positions articulated at international and regional climate change negotiations and other fora.	At least one yearly national consultation held	X	X	X	X	X	MRECC, CCD, MFAFT	MDAs, private sector, civil society and academia	5,000,000
			Utilize and develop, as appropriate, tools and mechanisms to ensure that relevant decisions taken at regional and international levels are mainstreamed into national actions.	National climate actions aligned with regional and international commitments	X	X	X	X	X	MRECC, CCD	PIOJ	Staff time
			Promote effective synergies between the national climate	Review of climate change agenda in keeping with the	X	X	X	X	X	MRECC (CCD)	PIOJ, MOJ	Staff time

			agenda and those of the economic, social and environmental sectors	country's economic, social and environmental priorities to ensure synergies								
			Enact legislation to, *inter alia*, institutionalize the role and functions of the responsible authorities for coordinating action on climate change (e.g. Climate Change Division and Climate Change Advisory Board), establish emission reduction targets for key economic sectors which will be reviewed every 5 years and to incorporate public participation in relation to climate action	Drafting instructions prepared and climate change legislation enacted	X	X	X			MRECC (ERMB, CCD)	MOJ, AGC, CPC, NEPA, CCFPN	Staff time
		Strengthen multistakeholder coordination, networking, information exchange and expertise in climate action	Strengthen the Climate Change Focal Point network through, *inter alia,* increasing its capacity and expertise at the national and parish levels	At least 15 focal points trained, and training workshops held		X	X			MRECC (CCD)	MDAs in key sectors	25,000,000
			Develop mechanisms	Sensitization	X	X	X	X	X	MRECC (CCD),	Cabinet Office,	5,000,000

		across MDAs, private sector and civil society	and tools for the inclusion of climate change considerations into policies, plans and programmes to inform decision making at the level of, Cabinet, Parliament and local government	sessions held with Cabinet, Parliament and local government officials on climate change						MLGCD	The Houses Parliament, Municipal Corporations	
			Mainstream gender in climate action at all levels through implementation of the Climate Change Gender Strategy and Action Plan	Policies, plans and programmes give consideration to climate change issues and gender	X	X	X	X	X	MRECC (CCD)		Staff time
	1.2 ADAPTATION **Reduce Jamaica's vulnerability and increase Jamaica's capacity to adapt to the harmful impacts of climate change**	Develop a framework for mainstreaming climate change into ecosystem protection, spatial planning and budget processes.	Utilize climate change risk assessment tools and methodologies in the decision-making processes at all levels.	Finalization of drafting instructions for EIA Regulations under the NRCA Act.		X				MRECC (ERMB), NEPA		Staff time
				Promulgation of EIA Regulations under the NRCA Act			X			MRECC (ERMB),		Staff time
			Formulate and implement a national adaptation plan (NAP) including an adaptation communication, with due consideration to key sectors.	National Adaptation plan completed	X	X	X			MRECC (CCD)		Staff time
			Conduct and periodically update	National vulnerability assessments	X	X	X	X	X	MRECC (CCD)	Municipal Corporations,	50,000,000

			vulnerability assessments for key sectors and a national assessment of vulnerable areas and natural resources at risk	completed							PIOJ, key sectoral MDAs	
			Utilize natural resource valuation tools and methodologies in the decision-making process for planning approval at all levels.	Natural resource valuation incorporated into the national planning and budgeting processes		X	X	X	X	MRECC (ERMB), NEPA	MOF	Staff time
			Increase the number and improve the management of marine and terrestrial protected areas to, *inter alia,* prohibit destructive practices and enhance the resilience of ecosystems.	Protected area regulations enacted. Management plans developed for all protected areas	X	X	X			MRECC (ERMB)	NEPA, Forestry Department, National Fisheries Authority	70,000,000
			Finalize and implement policies related to land use such as the National Spatial Plan, National Land Policy, Agricultural Land Use Policy, Comprehensive Disaster Risk Management Policy and the National	National Land Policy, Agricultural Land Use Policy Comprehensive Disaster Risk Management Policy and National Hazard Risk Reduction Policy adopted with climate change considerations.		X	X			Ministries with responsibility for physical planning and land administration, MoF	MRECC (CCD), PIOJ	20,000,000

			Hazard Risk Reduction Policy to incorporate climate change considerations, among other things									
			Develop and implement a National Environment Policy to take into account, *inter alia*, issues related to enhancing the resilience of species and ecosystems in adapting to climate change	National Environment Policy developed		X	X	X	X	MRECC (ERMB)	NEPA, Forestry Department, National Fisheries Authority	15,000,000
			Periodically Development Orders, Local Sustainable Development Plans, the National Building Code, setback limits, standards and guidelines for developments and enforce no build zones to assist in addressing adaptation challenges	New Building Code adopted. Revised Development and Investment Manual adopted. Development Orders and Local Sustainable Development Plans are not older than five years		X	X	X	X	Ministries with responsibility for physical planning and local government, NEPA	Municipal Corporations	90,000,000
			Strengthen early warning systems and emergency preparedness	Assess existing early warning systems an emergency preparedness based on international and regional standards.		X			X	Ministry with responsibility for local government, ODPEM	National Disaster Committee, Parish Disaster Committees, MRECC (CCD)	25,000,000

				Update and strengthen early warning systems and emergency preparedness protocols and guidelines based on assessments			X	X				25,000,000
			Strengthen existing partnerships and create new partnerships to address loss and damage at all levels.	Number of partnership agreements signed	X	X	X	X	X			Staff time
		Build capacities at the national and local levels to coordinate and enhance mainstreaming and implementation of climate action.	Prepare and implement capacity building programmes that address the adaptation needs of various sectors	Capacity building programmes prepared		X	X			MRECC (CCD), PIOJ	MDAs for key sectors	10,000,000
			Prepare and implement capacity building plans and strategies that address the adaptation needs of various sectors.	Capacity building needs identified and plans and strategies developed and implemented		X	X	X	X	MRECC (CCD)	MDAs for key sectors	5,000,000
			Build the capacity of the Climate Change Focal Point Networks to support the development of NAPs that incorporate climate change considerations for priority sectors including incorporating local government representatives in the network.	At least 15 focal points trained, and training workshops held		X	X			MRECC (CCD)	MDAs in key sectors	Incorporated above

			Promote and facilitate capacity building measures for communities to support vulnerability assessments and local adaptation plans.	Community level vulnerability assessments and plans developed and trainings conducted	X	X	X	X	X	MRECC(CCD)	MLGCD, ODPEM, Parish Disaster Committees, PIOJ	Staff time
		Adapt to the impacts of climate change through the application of a nature-based approach	Continue the implementation of the National Forest Conservation and Management Plan	Plan implemented	X	X	X	X	X	Forestry Department		5,000,000
			Update and implement national policies and legislation to protect and conserve coastal ecosystems, such as seagrass meadows and mangroves as well as forests	Policies and legislation updated	X	X	X	X	X	MRECC (ERMB)	NEPA, Forestry Department, National Fisheries Authority	Staff time
			Implement the National Mangrove & Swamp Forest Management Plan as well as develop and implement a national ecosystem restoration plan for the restoration of priority ecosystems including coral reefs.	National Swamp and Mangrove Forests Management Plan implemented National ecosystem restoration plan developed and implemented	X	X	X	X	X	Forestry Department, NEPA		5,000,000
GOAL 2: Pursuit of low carbon	2.1 MITIGATION	Provide an enabling	Assess the most appropriate mitigation actions per sector	Assessment of sectors to identify mitigation actions completed	X	X	X	X	X	MRECC (CCD)	Forestry Department, MSET, PIOJ	Staff time

development and enhancement of access to and mobilization of climate finance	Reduce Jamaica's overall GHG emissions in support of low carbon development	environment for low carbon development	taking into account mitigation potential, cost, sector "buy-in", co-benefits and alignment with sectoral and national development priorities.									
			Promote measures to support renewable energy, energy efficiency, energy conservation and REDD+ activities, including legislative and administrative measures.	Legislation enacted and administrative measures adopted to support REDD+, renewable energy, energy efficiency and energy conservation.				X		Ministry responsible for energy, MRECC (CCD)	MOJ, AGC, CPC, Forestry Department	Staff time
			Facilitate methods for the sharing and utilization of GHG emissions data among MDAs, private sector and academia in priority sectors.	GHG emissions inventory mechanism operational			X			MRECC (CCD), NEPA	PIOJ, Ministry responsible for energy	Staff time
			Establish and maintain a national Measuring, Reporting and Verification (MRV) system for the effective implementation of the country's Nationally Determined Contributions (NDCs) and other transparency-related activities	MRV system operational		X				MRECC (CCD)	PIOJ, relevant MDAs	5,000,000
			Develop and disseminate tools and	Assess capacity building needs in relation to GHG		X				NEPA,MRECC (CCD), MSET,	Relevant MDAs	Staff time

			methodologies for the implementation of capacity building activities at all levels to support the reduction of GHG emissions.	emissions reduction.						Ministry with responsibility for transport		
				Tools and methodologies developed and utilized for implementation of capacity building activities			X	X	X	NEPA, MRECC (CCD),	MSET, Ministry with responsibility for transport and other relevant MDAs	3,000,000
			Develop and implement a 2050 Long-term Emissions Reduction and Climate Resilient Strategy for Jamaica	Long-term Emissions Reduction and Climate Resilient Strategy for Jamaica developed	X	X	X	X	X	MRECC (CCD)		Staff time
			Prepare, communicate and implement successive/progressive NDCs to reflect the country's ambitions with respect to the reduction of its GHG emissions	NDCs prepared	X	X	X	X	X	MRECC (CCD)		Staff time
			Explore pathways and implement measures to facilitate the decarbonization of the national grid	Recommendations developed and disseminated	X	X				MRECC (CCD)		Staff time
			Promote an increase in the government's electric vehicle fleet	Recommendations developed and disseminated	X	X				MRECC (CCD)		Staff time

			Promote the use of cleaner fuels in the transportation sector.	Recommendations developed and disseminated	X	X				MRECC (CCD)		Staff time
			Implement enabling activities to facilitate the transition towards electric mobility.	Activities implemented	X	X	X	X	X	MRECC, MSET		2,000,000
		Promotion and use of nature-based solutions to mitigate the impacts of climate change through direct carbon capture.	Develop and implement a National Ecosystem Restoration Plan for critical ecosystems, including mangroves	Ecosystem Restoration Plan developed	X	X				NEPA, Forestry Department		To be determined
			Promote and implement urban forestry, afforestation and reforestation activities, restorative agriculture and improved livestock management	Activities implemented	X	X	X	X	X	Forestry Department	MoAF	To be determined
	2.2 FINANCE Facilitate access to and mobilization of climate financing for adaptation and mitigation	Develop a National Climate Change Financing Strategy to promote low carbon development and climate resilience	Undertake on an ongoing basis assessment of key sectors	Report of analyses	X	X	X	X	X	MRECC (CCD)		Staff time
			Facilitate climate financing for private and public sectors, research institutions, community-based organizations and non-governmental organizations for research and technological innovation, disaster response and risk		X	X	X	X	X	MRECC (CCD)	PIOJ, relevant MDAs	Staff time

			reduction and for climate information gathering and modelling equipment and systems, where possible									
			Build the capacity of the public and private sectors, community-based organizations and non-governmental organizations to access climate change financing for adaptation and mitigation activities through training and technical support.	Training sessions held	X	X	X	X	X	MRECC (CCD)	PIOJ, relevant MDAs	Staff time
			Develop monitoring tools for tracking climate financing across sectors	Tools developed	X	X				MRECC (CCD)		Staff time
			Promote the use of methodologies for climate proofing national budgets and procurement procedures for MDAs through training and capacity building.	Tools and methodologies developed and utilized for implementation of capacity building activities.			X	X	X	NEPA, MRECC (CCD),	MSET, Ministry with responsibility for transport and other relevant MDAs	Staff time
			Create financial incentives and disincentives related to the reduction of GHG emissions in public and	Financial incentives and disincentives adopted				X		MOFPS	MRECC, (CCD), NEPA, Ministry with responsibility for energy and transport	Staff time

			private sector									
			Develop a national finance mobilization strategy as well as tools to leverage private climate finance	National finance mobilization strategy developed		X	X	X		MRECC (CCD)	MOFPS	10,000,000
			Providing an enabling environment for the mobilization of private finance to support low carbon and climate resilient development including leveraging of green investments, as outlined in the Green Economy Investment Strategy for Jamaica, and promotion of green infrastructure and improved environmental performance	Guidelines developed	X	X				MRECC (CCD)		Staff time
			Listing of green or climate bonds on the Jamaica Stock Exchange to support the mobilization of finance from domestic and regional debt capital markets for implementation of climate action.	Green or climate bonds listed on the Jamaica Stock Exchange	X	X	X	X	X	MRECC (CCD), JSE		Staff time
			Explore and where feasible and as appropriate negotiate debt-for climate swap agreements to allow	At least one debt-for climate swap agreement signed	X	X	X	X	X			Staff time

			investment in domestic climate adaptation and mitigation project and programmes.									
			Provide an enabling framework to facilitate the participation of government and private sector in the trading of carbon credits.	Guidelines developed	X	X				MRECC (CCD), Ministry with responsibility for science and energy	Forestry Department, NEPA	Staff time
			Promote the utilization of risk insurance to limit the financial impact of natural hazards as a result of climate change	Public awareness campaign implemented	X	X	X	X	X	MRECC (CCD)		Staff time
GOAL 3: Promotion of public education and awareness raising, research and technology transfer towards ambitious climate action	3.1 PUBLIC AWARENESS AND EDUCATION Increase public awareness of climate change impacts, climate actions and responses at the national and local levels and promote behaviour change	Develop and implement a national communication, public education and behavioural change strategy at all levels	Establish and regularly update databases with climate change relevant data and information including the sharing of good practices, expertise and experiences.	Databases operational		X				MRECC (CCD)	National Spatial Data Management Branch, MDAs in key sectors	Staff time
			Engage and sensitize the media and institutions of learning on climate change issues on an ongoing basis	At least one sensitization meeting held per quarter with the media and/or institutions of learning	X	X	X	X	X	MRECC (CCD)	MOEY, Press Association of Jamaica, Jamaica Teachers Association and related bodies	4,000,000
			Establish and implement methodologies to allow for access to and sharing of information	Methodologies established and implemented		X	X	X	X	MRECC (CCD)	JIS	Staff time

			and data on climate action to facilitate the effective engagement of the public in decision-making									
			Utilize the best available media and formats to communicate with the public on climate action placing special emphasis on providing information geared towards youth, persons with disabilities and other vulnerable groups	At least 1 public education and awareness raising session held annually	X	X	X	X	X	MRECC (CCD)	PIOJ, MOEYI, Jamaica Council for Persons with Disabilities	Staff time
			Establish a platform for communication and utilize mechanisms to allow for access to and sharing of climate-related information and data to facilitate the effective engagement to the public in decision-making.	Platform established and utilized by stakeholders	X	X	X	X	X	MRECC (CCD)	E-GOV, Main private sector groupings	2,000,000
			Integrate climate change issues in the academic curriculum at all levels	Curricula revised with additional climate change content	X		X		X	MOEYI	MEGJC, CCD	Staff time
			Support the participation and engagement of youth in climate change-related activities to	At least two youth events organized on climate action Designate and convene		X		X		MRECC (CCD)	MOEYI, Youth groupings	15,000,000

			foster greater awareness of climate action and engender behaviour change	at least 1 training session for climate youth ambassadors								
			Develop and disseminate knowledge products and tools to advance climate action	Communications materials developed and published, including those for target audiences (youth, persons with disabilities and other vulnerable groups)	X	X	X	X	X	MRECC (CCD)	MOEYI	10,000,000
			Facilitate private sector engagement to support climate action in key economic sectors, including, energy, transport, tourism, agriculture and fisheries and construction.	Sensitization sessions held		X	X	X	X	MRECC (CCD)		25,000,000
		Improve the collection and dissemination of information on climate change impacts, adaptation and mitigation related opportunities at all levels so that decision makers and the general public will be better informed	Prepare and regularly publish national reports on the assessment of climate change impacts, strategies, projected climate change impacts, observations, projects, programmes and activities including National Communications, Adaptation Communications, BURs, BTRs, NDCs and State of the	Reports completed and published		X		X	X	MRECC (CCD)	MDAs, UWI Climate Studies Group	20,000,000

			Jamaican Climate Reports									
			Establish a mechanism to collect, record and regularly update emissions data for Jamaica's greenhouse gas emissions inventory.	GHG emissions inventory mechanism operational	X	X	X	X	X	NEPA and MRECC (CCD)	NEPA Met Office, Ministries with responsibility for energy, transport and agriculture	10,000,000
			Improve as necessary and appropriate and support the use of assessment tools for observing and researching the impacts of climate change at the sectoral and community levels including the national systems for climate change impact modelling.	Assessment tools improved in line with approved international guidelines or specifications, including those of the IPCC, as appropriate		X	X	X	X	Tertiary institutions, Met Office, MRECC (CCD)	Relevant MDAs	10,000,000
			Develop protocols for the collection analysis of disaggregated data in climate action initiatives	Protocols developed	X	X				MRECC (CCD)		Staff time
	3.2 RESEARCH Promote research, innovation, data collection, analysis and facilitate projections at the	Improve the collection and dissemination of information on climate change impacts, adaptation and	Continuously review and implement a national scientific research agenda to support, *inter alia,* the preparation of publicly accessible climate	Reports completed and published		X		X	X	MRECC (CCD)	PIOJ	Staff time

	national level on climate change, its impacts, and appropriate adaptation and mitigation measures, to inform decision-making and strategic actions at all levels.	mitigation related opportunities at all levels so that decision makers and the public will be better informed and the general public will be better informed.	change related national reports including National Communications, Adaptation Communications, BURs, BTRs, NDCs and State of the Jamaican Climate Reports									
		Build capacities at the national and local level to coordinate and enhance mainstreaming of climate action	Improve the assessment tools for observing and researching the impacts of climate change at the sector and community levels including the national systems for climate change impact modelling.	Assessment tools developed, improved where necessary and utilized	X	X	X	X	X	MRECC (CCD)	MDAs, Tertiary institutions,	Staff time
		Facilitate and support increased climate change research in academia, private sector, civil society and government	Implement the national research agenda to support low carbon development and climate resilience resilience	Number of funding mechanisms to support research activities increased			X	X	X	MRECC (CCD)	Relevant MDAs (example finance, PIOJ), and research institutions	Staff time
			Identify and support training opportunities in climate change for academia and scientific, technical	Yearly training sessions to support research activities held	X	X	X	X	X	MRECC (CCD)	MSET, PIOJ	10,000,000

			and managerial personnel within public, private and research institutions									
			Provide incentives for innovation and an enabling environment for innovation, research and technology development.	At least one incentive designed		X	X			MRECC (CCD)	PIOJ, MSET, MICAF, MOFPS, DBJ	Staff time
	3.3 TECHNOLOGY TRANSFER Promote the transfer of environmentally sound technologies for mitigating and adapting to climate change with other countries and international organizations and among the public sector, private sector entities, financial institutions, governmental organizations (NGOs) and research/education institutions	To encourage the use of environmentally sound technologies across sectors and groups including the private sector to contribute to climate change adaptation and mitigation initiatives.	Conduct periodic technological needs assessments (TNAs) to prioritize the technologies for adaptation and mitigation in select sectors and develop a technology action plan (TAP).	TNA completed and disseminated to relevant stakeholder	X			X		MRECC (CCD)	PIOJ, MSET	Staff time
			Promote and facilitate technology development, transfer and deployment, including via south-south cooperation.	Engage at least 1 country in the Caribbean region to foster the sharing of good practices, experiences and expertise		X		X		MRECC (CCD)	PIOJ, MSET, MICAF, DBJ	Staff time
			Promote financing of pilot priority technology projects linked to the TNA	Pilot project developed and implemented			X		X	MRECC (CCD)	Relevant MDAs	Staff time
			Disseminate available information on the		X	X	X	X	X	MRECC (CCD)	PIOJ, MSET, MOEYI, JSIF	Staff time

			costs, uses, and markets for environmentally sound technologies									
			Increase deployment across the island and maintenance of meteorological monitoring equipment to provide real time data and information to inform climate action.		X	X	X	X	X	MRECC (Met Office)		5,000,000

APPENDIX B – Linkages with Vision 2030 and the SDGs

Vision 2030 Outcome	SDG Goal	SDG Target
#10 Energy Security and Efficiency		Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix Target 7.3: By 2030, double the global rate of improvement in energy efficiency Target 7.A By :2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology Target: 7.B By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support
#13 Sustainable Management and Use of Environmental and Natural Resources		Target 12.2: By 2030, achieve the sustainable management and efficient use of natural resources
#14 Hazard Risk Reduction and Adaptation to Climate Change		Target 13.1: strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries Target 13.2: Integrate climate change measures into national policies, strategies and planning Target 13.3: Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning Target 13.5: Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

#13 Sustainable Management and Use of Environmental and Natural Resources		Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans Target 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
Vision 2030 Outcome	**SDG Goal**	**SDG Target**
#13 Sustainable Management and Use of Environmental and Natural Resources		Target 15.1: By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements Target 15.2: By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation neutral world Target 15.9: By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts
# 15 Sustainable Urban and Rural Development		Target 11.4: Strengthen efforts to protect and safeguard the world's cultural and natural heritage Target 11.5: by 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations Target 11.6: By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management Target 11.B: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

APPENDIX C – Table of Related Policies and Legislation

SECTOR	POLICY / LEGISLATION	DESCRIPTION
FORESTS	The Forest Policy of Jamaica, 2017	The Forest Policy seeks to ensure the preservation of Jamaica's forest cover with a "no net loss" mandate. In recognizing the importance of forests as carbon sinks, the Policy includes targeted goals and actions to sustainable manage Jamaica's forests and to develop a REDD++ framework for Jamaica.
	The National Forest Management and Conservation Plan, 2016-2026	The National Forest Management and Conservation Plan 2016 – 2021 includes plans to build Jamaica's climate resilience and seeks to mainstream climate change into the national development process. The outputs from implementation of the Plan include implementing REDD+ and conducting a gap analysis identifying spatial data and other information to better map the risks and vulnerabilities of forests and communities to climate change and related hazards (e.g., fire, floods, landslides) and improving the knowledge of climate change impacts on forests.
	The National Mangrove and Swamp Forests Management Plan	The National Mangrove and Swamp Forests Management Plan has four objectives: 1. Reverse the loss and degradation of forested wetlands and conserve those that remain, through wise use and management, strengthening the legislative, policy and institutional frameworks and mainstreaming forested wetlands across government and society. 2. Improve the technological and technical staffing capacity, participatory planning, and knowledge management within the Forestry Department, NEPA, its partners and communities for implementation of forested wetland conservation best practices. 3. Increase public awareness, information dissemination, and formal education levels about forested wetlands to complement increased protection, conservation and restoration of these ecosystems. 4. Enhance the fair and equitable economic, social and environmental benefits to all from forested wetlands ecosystem services.

	Amendments to Forest Act	The Forest Act will be amended to incorporate relevant provisions to facilitate the effective implementation of the Protected Areas System Master Plan. The provisions in the Forest Management Plans for forest reserves and forest management areas will become binding on all Government Agencies. Other amendments include designating The Forestry Department with the power to issue Tree Preservation Orders and improving the Department's enforcement capabilities to combat illegal harvesting of timber and non-timber forest products in the areas managed by it
ENERGY	Jamaica's National Energy Policy 20092030	The goals of The National Energy Policy include the development of renewable energy sources such as solar, wind, hydropower and biofuels with the target of increasing the percentage of renewables in the energy mix to 20% by 2030 as well as to improve energy conservation and efficiency. The Policy has 5 supporting policies as follows:
	i) The National Renewable Energy Policy 2010-2030	The National Renewable Energy Policy focuses on the deployment of wind, the emerging potential and deployment of biomass and biofuels, exploratory work on ocean energy and the deployment of other technologies such as solar and hydro technologies
SECTOR	**POLICY / LEGISLATION**	**DESCRIPTION**
	ii)The National Energy-From-Waste Policy 2010 – 2030	The National Energy-from-Waste Policy focuses on the utilization of residual waste that cannot be absorbed through the institution of waste minimization, recycling or composting programmes and utilization into energy. These include management of municipal solid waste, capture of landfill gas, production of bio-diesel, cogeneration using bagasse, production of biogas using animal wastes and use of wastewater sludge.
	iii)The National Energy Conservation and Efficiency Policy 2010 - 2030	The National Energy Conservation and Efficiency Policy seeks to increase efficiency in the generation, transmission and distribution of electricity, in the use of energy in the transport sector, and in the consumption of electricity by industrial, commercial and residential consumers. This Sub-Policy also facilitates Jamaica's participation in the Clean Development Mechanism (CDM) by including a policy action to develop a framework to capitalize on the opportunities offered by the carbon market under the CDM for efficiency and conservation projects.

	iv)The Biofuels Policy 2010 - 2030	The Biofuels Policy provides a framework for the development of the biofuels sector with specific focus on bioethanol from sugar cane, electricity power cogeneration using bagasse and biodiesel primarily from crops.
	v)The National Policy for the Trading of Carbon Credits 2010 – 2030	The National Policy for the Trading of Carbon Credits seeks to establish the legal, financial and institutional framework for a carbon credits trading system. The Policy will enable Jamaica's participation in carbon trading regimes including CDM of the Kyoto Protocol and voluntary carbon schemes.
	The Emissions Policy Framework for Jamaica (Green Paper), 2021	The Policy will provide seek to address, inter alia, the management of emissions from the following sources: •Industrial processes e.g., Power generation; • Land, air and sea transportation; • Waste disposal and treatment; • Land-use and biomass burning; • Agricultural by-products; and • Residential and commercial sources.[60]

SECTOR	POLICY / LEGISLATION	DESCRIPTION
BIODIVERSITY	The National Strategy and Action Plan on Biological Diversity in Jamaica 2016 – 2021	The National Strategy and Action Plan for Biological Diversity in Jamaica 2016-2021 (NBSAP) is an update to the 2003 NBSAP. The document provides information on Jamaica's conservation efforts which are aligned to the Convention on Biological Diversity Achi Targets. The document also seeks to mainstream biodiversity is one of the main elements of the NBSAP.

[60] Government of Jamaica Policy Development Programme as at 31 March, 2018, available at https://cabinet.gov.jm/wp-content/uploads/2018/06/GOJ-Policy-Development-Programme-Update-at-March2018-web-version.pdf

	The Protected Areas System Master Plan 2013-2017	The Protected Areas System Master Plan (PASMP) sets out guidelines for establishing and managing a comprehensive network of protected areas that supports national development by contributing to long-term ecological viability; maintaining ecological processes and systems; and protecting the country's natural and cultural heritage. Goal 4 of the Master Plan is " identify and integrate climate change adaptation and mitigation measures in protected area planning and management strategies".
	Overarching Policy for Jamaica's Protected Areas System (draft)	This draft Overarching Policy for Jamaica's Protected Areas System Policy will update the existing Policy for Jamaica's System of Protected Areas, 1997, taking into consideration the changes in protected areas management since its development The aim of the draft Policy is to ensure that Jamaica has an effective protected areas system. One of the objectives of the Policy is to identify and integrate climate change adaptation and mitigation measures in protected area planning and management strategies.
	Overarching Protected Areas Legislation (proposed)	The proposed Overarching Protected Areas Legislation aims to is provide for comprehensive legislation to enable the creation and regulation of a National Protected Areas System (NPAS) that is representative of Jamaica's biological and cultural heritage. The legislation will include harmonized provisions for management of all protected areas under a new comprehensive statute while at the same time preserving specific statutory functions under other enactments.
	Watershed Policy (draft)	A draft Watershed Policy has been prepared. The draft Policy sets out the goals and principles that should guide decision-making by public sector agencies that have mandates relating to watershed management, taking into account Jamaica's commitments under various national plans and global agreements. The Policy addresses the challenges in watershed management, including outdated laws and policies as well as threats such as climate change.
DISASTER RISK MANAGEMENT	The Disaster Risk and Management Act 2015	This Act repeals the Disaster Preparedness and Emergency Risk Management Act and makes new provisions for the management and mitigation of disasters and reduction of risks associated with disasters.

SECTOR	POLICY / LEGISLATION	DESCRIPTION
		The Act allows the relevant authorities to evacuate persons from declared disaster areas.
	The Comprehensive Disaster Risk Management Policy (draft)	The Comprehensive Disaster Risk Manager Policy will replace the Natural Hazard risk Reduction Policy (also in draft) which seeks to integrate hazard risk reduction into planning and to ensure active public participation and mobilization of communities.
PHYSICAL PLANNING	The Building Act 2018	The Building Act of 2018 repeals the Kingston and St. Andrew Building Act and the Parish Councils Building Act and makes new provisions for the regulation of the building industry; to facilitate the adoption and application of international building standards through a National Building Code of Jamaica for ensuring safety in the built environment, to minimize damage cause by natural and man-made hazards, to prevent squatter settlements, to enhance amenities and promoting sustainable development.
	National Land Policy (draft)	The Policy seeks to establish a framework for the efficient planning, management, development and use of land to generate and sustain economic growth, while considering issues of sustainability and environmental preservation.[61]
WATER	The Revised Policy Guidelines on Rainwater Harvesting 2019 (draft)	The Policy Guidelines on Rainwater Harvesting will make provisions to facilitate water harvesting for housing and commercial developments.
	The National Water Sector Policy and Implementation Plan (2019)	the goal of the Policy is to ensure that Jamaica's water resources are effectively managed so as to provide for our nation's social, economic and environmental wellbeing, now and in the future. The policy aims to ensure universal access to potable water by 2030.

[61] Government of Jamaica Policy Development Programme as at 31 March, 2018, available at https://cabinet.gov.jm/wp-content/uploads/2018/06/GOJ-Policy-Development-Programme-Update-at-March2018-web-version.pdf

MARINE RESOURCES	The National Policy on Ocean and Coastal Zone Management 2002	The objective of the Policy is to provide a comprehensive framework for the management and development of resources in Jamaica's ocean and coastal zones. The National Council on Ocean and Coastal Zone Management, established in 1998, is responsible for the coordination of the policy.

SECTOR	POLICY / LEGISLATION	DESCRIPTION
FISHERIES	The Fisheries Act 2018	A new Fisheries Act has been enacted which repeals the Fishing Industry Act of 1975 to allow for the effective, efficient and sustainable management of Jamaica's fisheries and aquaculture. The Act allows the relevant Minister to establish fish sanctuaries for the protection of the ecosystem and fisheries resources.
	Draft Fisheries Policy	The Draft Fisheries Policy seeks, *inter alia*, to ensure the sustainable development of the fisheries industry, promote efficiency of the fishing industry and economic and social development of fisheries industry.
AGRICULTURE	The National Food and Nutrition Security Policy (2013) and National Food and Nutrition Security Action Plan (2016)	An objective of the National Food and Nutrition Security Policy is food stability geared towards improving the food and nutrition security resilience of the national community to natural and socio-economic shocks and climate change.
	The National Seed Policy and Action Plan (2018-2028)	An objective of the policy is to facilitate development, evaluation and maintenance of pest resistant/ tolerant, high yielding varieties that are adaptive to given local agro-ecological zones and challenges posed by climate change

	The Agricultural Land Utilization Policy (draft)	This policy has been developed in response to the national imperative to guide proper administration and management of land for sustainable use that will foster agricultural growth, encourage opportunities for investment and income generation, satisfy the demand for lands for agricultural production, re-generate livelihoods for farming communities, and promote overall economic development of the country.[62]
TRANSPORTATION	Road Traffic Act, 2018 and the Road Traffic Regulations, 2022	The 2018 Road Traffic Act repeals and replace the Road Traffic Act and seeks to improve road safety and transport efficiency and reduce the cost of administering road transport. The Act also empowers the relevant Minister to make regulations to control GHG emissions from vehicles. The Road Traffic Regulations, 2022 came into effect on 1 February 2023. These regulations include a provision for tailpipe testing of motor vehicles.

SECTOR	POLICY / LEGISLATION	DESCRIPTION
	Revised National Transport Policy (draft)	The National Transport Policy seeks to make Jamaica's transportation system more efficient and accessible. The Policy's proposed actions include encouraging the importation of high efficiency vehicles which will reduce the level of emissions and promoting the testing of motor vehicle emissions to meet stipulated standards as a licensing requirement.

[62] Government of Jamaica Policy Development Programme as at 31 March, 2018, available at https://cabinet.gov.jm/wp-content/uploads/2018/06/GOJ-Policy-Development-Programme-Update-at-March2018-web-version.pdf

FINANCE	National Disaster Risk Financing Policy (draft)	The goal of the National Disaster Risk Financing Policy is to facilitate the mobilization of public expenditure in disaster risk management to enable fiscal resilience to natural disasters. Measures in the policy include designating the Contingency Fund as the National Catastrophic Disaster Reserve Fund with a fiscal buffer; improve insurance of public assets and incorporate disaster risk analysis in public sector investments and planning.

GLOSSARY AND DEFINITIONS

Acidification (ocean)

A decrease in the pH of sea water due to the uptake of anthropogenic carbon dioxide, nitrous oxides and sulfur oxides.

Adaptation (to climate change) *IPCC 2007*

Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Agro-climatic conditions

The relation of growth rate and yields of agricultural crops to various climate conditions

Best Science

The most appropriate, adaptable and current technologies, processes and methodologies, which also include community knowledge and practice

Carbon abatement

Reduction of the amount of carbon dioxide that is produced when fossil fuels are burned

Carbon dioxide *IPCC 2007*

'A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1'

Carbon Market

A trading system through which countries may buy or sell units of greenhouse-gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union.

Clean development mechanism

A mechanism under the Kyoto Protocol to the United Nations Framework Convention on Climate Change to assist developing countries which are Parties to the Protocol in achieving sustainable development, and to assist developed countries which are Parties in achieving compliance with their quantified emission limitation and reduction commitments under the Protocol.

Climate

The long-term average weather of a region, including typical weather patterns, the frequency and intensity of storms, cold spells and heat waves.

Climate Action

Stepped up efforts to reduce greenhouse gas emissions and strengthen resilience and adaptive capacity to climate-induced impacts, including: climate-related hazards in all countries; integrating climate change measures into national policies, strategies and planning; and improving education, awareness raising and human and institutional capacity with respect to climate change mitigation, adaptation, impact reduction and early warning.

Climate change *UNFCCC*

A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and is in addition to natural climate variability observed over comparable time periods.

Climate departure *University of Hawaii Manoa 2013*

The year past which the annual (or monthly) average value for a climate variable, such as surface temperature, moves and stays outside of the range of historical annual (or monthly) means.

Climate variability *IPCC 2007*

Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events.

Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

Coastal erosion

A long-term trend of shoreline retreat and/or loss of beach sediment volume over several decades.

Coral bleaching *IPCC 2007*

The paling in colour which results if a coral loses its symbiotic, energy-providing organisms (micro algae –zooxanthellae).

El Nino

El Niño conditions refer to periods when the eastern Pacific Ocean off the coast of Peru and Ecuador is abnormally warm. (La Niña refers to the opposite conditions when the eastern Pacific Ocean is abnormally cold.) During an El Niño event, the Caribbean (and Jamaica by extension) tends to be drier than usual. There is also a tendency for reduced hurricane activity during El Niño events.

Emissions

The release of substances (e.g., greenhouse gases) into the atmosphere

Emissions trading *IPCC 2007*

A market-based approach to achieving environmental objectives. It allows those reducing greenhouse gas emissions below their emission cap to use or trade the excess reductions to offset emissions at another source inside or outside the country. In general, trading can occur at the intracompany, domestic, and international levels.

Energy efficiency

Reducing the amount of energy used for a given service or level of activity in order to produce the same level of end-use service.

Fossil fuels

Hydrocarbons such as coal, oil and gas, formed from the organic remains of prehistoric plants and animals

Greenhouse gases *IPCC 2007*

'Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the green-house effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N2O), methane (CH4) and ozone (O3) are the primary greenhouse gases in the earth's atmosphere. Moreover, there are a number of entirely manmade green-house gases in the atmosphere, such as the halocarbons and other chlorine and bromine-containing substances, dealt with under the Montreal Protocol. Besides carbon dioxide, nitrous oxide and methane, the Kyoto Protocol deals with the green-house gases sulphur hexafluoride, hydrofluorocarbons, and perfluorocarbons.'

Inter-generational equity

Resources and assets which do not 'belong' to any generation but are to be administered and preserved in trust for all future generations.

Inter-governmental Panel on Climate Change (IPCC)

The IPCC surveys world-wide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change. The IPCC also works on methodologies and responds to specific requests from the UNFCCC's subsidiary bodies. The IPCC is independent of the Convention.

Kyoto Protocol

The Kyoto Protocol is an international agreement linked to the United Nations Framework Convention on Climate Change, which commits its Parties by setting internationally binding emission reduction targets. 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."

Mitigation *IPCC 2007*

In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to solar energy or wind power, improving the insulation of buildings, and expanding forests and other 'sinks' to remove greater amounts of carbon dioxide from the atmosphere.

Natural disaster

Any event or force of nature that has catastrophic consequences, such as an earthquake, a flood, forest fire, hurricane, lightning, tornado, tsunami, or volcanic eruption.

No-regrets mitigation

Mitigation actions that reduce greenhouse gas emissions and generate direct or indirect benefits that are large enough to offset the costs of implementing the mitigation actions, resulting in negative net mitigation costs.

Ocean acidification

Ocean acidification is the process by which excess CO_2 is dissolved into the ocean and increases its acidity.

Polluter Pays Principle

An environmental policy principle that requires that the costs of pollution be borne by those who cause it and that the burden of proof in demonstrating that a particular technology, practice or product is safe will lie with the developer.

Precautionary approach

Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.
The Precautionary Principle is defined as follows:

When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. Morally unacceptable harm refers to harm to humans or the environment that is

- threatening to human life or health, or
- serious and effectively irreversible, or

- inequitable to present or future generations, or

- imposed without adequate consideration of the human rights of those affected.

The judgement of plausibility should be grounded in scientific analysis. Analysis should be ongoing so that chosen actions are subject to review. Uncertainty may apply to, but need not be limited to, causality or the bounds of the possible harm.

Actions are interventions that are undertaken before harm occurs that seek to avoid or diminish the harm. Actions should be chosen that are proportional to the seriousness of the potential harm, with consideration of their positive and negative consequences, and with an assessment of the moral implications of both action and inaction. The choice of action should be the result of a participatory process.

Reforestation

'The direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land.

Renewable energy

Is obtained from the continuing or repetitive currents of energy occurring in the natural environment and includes non-carbon technologies such as solar energy, hydropower, wind, tide and waves and geothermal heat, as well as carbon-neutral technologies such as biomass.

Resilience

The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.

Sea level rise *IPCC 2007*

Sea level can change, both globally and locally, due to (i) changes in the shape of the ocean basins, (ii) changes in the total mass of water and (iii) changes in water density. Factors leading to sea level rise under global warming include both increases in the total mass of water from the melting of land-based snow and ice, and changes in water density from an increase in ocean water temperatures and salinity changes. Relative sea level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence.

Sequestration

Carbon storage in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO_2 from the atmosphere through land-use change, afforestation, reforestation, carbon storage in landfills and practices that enhance soil carbon in agriculture.

Sink *IPCC 2007*

Any process, activity or mechanism that removes a green-house gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere.

Storm surge *IPCC 2007*

The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure and/or strong winds). The storm surge is defined as being the excess above the level expected from the tidal variation alone at that time and place.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Urban heat island

An urban area with significantly higher temperatures than surrounding areas due to anthropogenic activities.

Vector borne diseases

Diseases that result from an infection transmitted to humans and other animals by blood-feeding arthropods, such as mosquitoes, ticks, and fleas. Examples of vector-borne diseases are dengue fever, viral encephalitis, lyme disease and malaria.

Vulnerability *IPCC 2007*

The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

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