



Grenada Integrated Water Resources Management Plan

February 2019



APPROVED BY THE CABINET OF THE GOVERNMENT OF GRENADA

“A water secure Grenada in which present and future generations have sustainable access to adequate, safe and affordable water, and sanitation, to maintain and enhance the quality of their lives and livelihoods and the integrity of natural ecosystems”

Grenada’s Water Vision
February, 2019

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Acronyms and Abbreviations

CBO	Community-based Organisation	MEA	Multilateral Environmental Agreement
C&PM	Carriacou and Petite Martinique	NAP	National Climate Change Adaptation Plan
DMP	Drought Management Plan	NASAP	National Adaptation Strategy & Action Plan for Water Sector
GCF	Green Climate Fund	NAWASA	National Water and Sewerage Authority
GCIC	Grenada Chamber of Industry & Commerce	NDC	Nationally Determined Contributions
G-CREWS	Climate-Resilient Water Sector in Grenada	NGO	Non-Governmental Organisation
GoG	Government of Grenada	NLP	National Land Policy
G-WaSP	Grenada Water Stakeholder Platform	NWP	National Water Policy
IWRM	Integrated Water Resources Management	OECS	Organisation of Eastern Caribbean States
M&E	Monitoring and Evaluation	PURC	Public Utilities Regulatory Commission
MC&PMA	Ministry of Carriacou & Petite Martinique Affairs	RWH	Rainwater harvesting
MoAL	Ministry of Agriculture & Lands	SDG	Sustainable Development Goals
MoF	Ministry of Finance	TNA	Technology Needs Assessment
MoH	Ministry of Health	WRMU	Water Resources Management Unit

1. Introduction

1.1 Background

The Government of Grenada has agreed on the need to reform the water sector in the country to provide a more efficient and equitable framework in order to maximize the contribution of the water sector to sustainable economic, social and environmental development. A Grenada National Water Policy was first developed and approved in 2007, and supporting legislation was drafted in 2008. These, however, were not implemented or promulgated.

This Grenada Integrated Water Resources Management Plan (IWRM Plan) represents the policy implementation component of a major review of the Grenada National Water Policy supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ). The IWRM Plan supports the Grenada National Water Policy, 2019 (NWP).

In the NWP the Government of Grenada has set out the Nation's vision for the water sector. The Policy also sets out a framework for the governance of the water sector and the allocation of duties, responsibilities and powers, as well as the respective roles of the public and private sectors and civil society. This document provides a road map for the realization of the objectives of the NWP, that is, to set out how the *intentions* can be turned into *actions*.

1.2 IWRM Plan

The IWRM Plan provides a detailed listing of priority actions, presented under 13 Policy Objectives, grouped under four main Policy Outcomes: (i) Enhanced enabling environment and improved, 'climate smart' water-related behavior; (ii) Increased water access, availability and quality; (iii) Increased water efficiency and conservation; and (iv) Strengthened preparedness for climate variability and extremes.

It is recognised that, given the current national fiscal conditions, all the desirable actions may not be possible in the short-term, hence the actions in the plan are categorized as high- medium- or low-priority, to enable a step-wise approach to implementation. For ease of reference, a brief summary of some key elements of the policy are included here: the rationale; vision; goal; outcomes; objectives; strategic responses; institutional arrangements; and key government agencies.

2. The Context

2.1 Challenges to Implementation of the National Water Policy 2007

The lack of implementation of the 2007 National Water Policy was explored in the various stakeholder consultations, and the main implementation obstacles were identified as follows:

- Lack of required financial resources;
- *Lack of adequate political will*; and
- Given the state of the national and global economy, implementation of water sector reform was not given priority.

2.2 National Water Policy 2019

Water Sector

For the purposes of the NWP, the water sector includes direct consumption and use of water (including harvested rainwater); land drainage; irrigation; industrial and other abstraction; in-stream use of water for recreation, amenity and ecology; environmental protection; treatment and disposal of sewage and industrial effluent; and associated infrastructure.

Policy Rationale

The need for the review and updating of the 2007 National Water Policy included the need to:

- Provide for a clear vision and holistic policy direction for the water sector;
- Take into consideration key developments in the local water sector and international best practices for water resources management;
- Re-align the Water Policy with Grenada's commitments under various Multilateral Environmental Agreements (MEAs) including the Organization of Eastern Caribbean States (OECS) Model Water Policy;
- Integrate cross-cutting issues such as gender and climate change;
- Incorporate current review of the institutional and legal framework; and
- Incorporate the traditional and place-based knowledge about water by the people of Carriacou and Petite Martinique (C&PM).

A comparison of the key elements of the 2007 and 2019 National Water Policies is shown at **Table 2.1**.

Table 2.1 Comparison of key issues in 2007 and 2019 Grenada National Water Policies

Key issues	2007 National Water Policy	2019 National Water Policy
Separation of functions of water services provision and water resources management	✓	✓
Establishment of a Water Resources Management Unit (WRMU)	✓	✓
Review of current Water Sector legislation	✓	✓
Setting up of a National Water Commission	✓	✗
Drought management	✗	✓
Focus on Climate Change Resilience	✗	✓
Mainstreaming gender	✗	✓
Public Utilities Regulatory Commission (PURC)	✗	✓
Non-potable water pollution control as responsibility of Min. of Health	✗	✓
Alignment to the OECS Model Water Policy	✗	✓
Emphasis on Carriacou and Petite Martinique	✗	✓

Policy Vision

“A water secure Grenada in which present and future generations have sustainable access to adequate, safe and affordable water, and sanitation, to maintain and enhance the quality of their lives and livelihoods and the integrity of natural ecosystems”

Guiding Principles

Freshwater and coastal resources are linked through the hydrological cycle from ridge to reef and thus have to be managed in a holistic manner for the benefit of people, society, the environment and the economy. Guiding principles include:

- Water and sanitation are a human right and the State shall endeavor to ensure its fulfilment re availability, accessibility, adequacy, safety and affordability;
- Water is public property and as such its ownership and stewardship is vested in the State;
- The State may delegate some, part or all of the exercising of its responsibilities to a designated body, paying regard to the setting out of the powers, duties, roles and responsibilities of such;
- Water is essential to sustain life, development and maintain ecological integrity. Its utilization shall be such as to ensure the provision of environmental goods and services that contribute to fresh and coastal water quality (quantity in case of freshwater);
- All water use should be sustainable;
- The Precautionary and User Pays Principles shall apply;
- Particular attention shall be paid in the participatory processes to ensuring social equity and equality in the incorporation of women, vulnerable, and disadvantaged groups;
- The private sector together with non-governmental and civil society organisations shall be recognised as partners, contributing to the sound functioning of the water sector and the State shall facilitate a greater role for their involvement in water resources management and water services provision; and
- The Policy shall apply to all geographic areas of the country; notwithstanding the small physical size of Grenada, there are geographic and climatic differences between the mainland and the dependencies of C&PM, which are semi-arid in nature.

Policy Goal

The Goal of Grenada’s National Water Policy is to provide sustainable management of the country’s water resources, through stakeholder participation and contribution to economic, social and environmental development in an efficient and equitable manner.

The Policy is based on the need for a holistic and coordinated approach to water management; the adoption of the concept of Integrated Water Resources Management (IWRM) which recognizes the essential, finite and vulnerable nature of water, the conservation and protection of ecosystems, participatory approaches in decision making, the role of women, and the economic value of water; the

need to urgently address the adverse impacts of climate change on water resources and enable social and economic well-being through improved water resources management.

Outcomes and Objectives of the Policy

To accelerate progress towards the achievement of the Policy Goal, the National Water Policy has defined 13 Policy Objectives, grouped under four main Outcomes, as follows:

Outcome 1. Enhanced enabling environment and improved, 'climate smart' water-related behavior

Policy Objectives

- 1.1 Improve the policy, legal, regulatory and institutional frameworks for the water sector.
- 1.2 Build national human capacity for the design and implementation of water-related climate adaptation projects.
- 1.3 Increase public awareness of integrated water resources management.

Outcome 2. Increased water access, availability and quality

Policy Objectives

- 2.1 Ensure that present and future generations have access to water of sufficient quality and quantity for their various uses and an acceptable standard of sanitation.
- 2.2 Promote the sustainable use of alternative water sources, such as rainwater harvesting (RWH) and water recycling and reuse, to ensure water availability under a changing climate.
- 2.3 Secure water for ecosystem services, recreation and aesthetics in order to ensure that vital ecosystems are maintained, restored and enhanced.
- 2.4 Promote sound stormwater management, as a measure which can contribute to the enhancement of limited available resources.
- 2.5 Promote the reduction of pollution of fresh and adjacent coastal waters through implementation of the obligations of the Cartagena Convention's LBS Protocol.

Outcome 3. Increased water use efficiency and conservation

Policy Objectives

- 3.1 Improve water infrastructure to build climate resilience.
- 3.2 Ensure water is used as efficiently as possible, including promotion of wise use and conservation, while recognizing the important role of women in household water management.
- 3.3 Promote 'climate smart' agriculture.

Outcome 4. Strengthened preparedness for climate variability and extremes

Policy Objectives

- 4.1 Improve hydrometeorological monitoring, emergency planning and decision making.
- 4.2 Minimize water-related climate change risks by adopting ecosystem-based adaptation solutions.

Strategic Response

The National Water Policy identifies four key areas that require a policy response, and that need to be addressed within an institutional framework. Broadly these relate to:

1. **Management of the country's water resources:**

- a. The monitoring, assessment, development and protection of the resources, and conditions governing wastewater re-use. This function would be carried out by the Water Resources Management Unit (WRMU);
- b. Determination of water use rights, the obligations and conditions of water use and the arbitration between competing uses;
- c. Inter-sectoral planning, coordinating and information functions;
- d. Improving the provision of water for 'climate smart agriculture;' and
- e. Improving the provision of water for Carriacou and Petite Martinique.

2. **The provision of water and wastewater services:** provision, maintenance and management of infrastructure that meets current and future needs of consumers.

3. **Water quality regulation as it relates to public and environmental health:** including setting, regulating and monitoring of quality standards for drinking water, wastewater, wastewater reuse, water bodies and water pollution control.

4. **Economic and service regulation:** public and customer interests; standards of service; and financial and economic measures.

Institutional Arrangements

Grenada's policy position is that the responsibility for management of water resources is to be separated from responsibility for the provision of water and wastewater services. In order to give effect to this restructuring, such changes of institutional arrangements will be implemented through supporting legislative measures. In view of the limited resources available, and the need to minimize the expected financial impact, any restructuring will as far as possible build on existing structures and current best practice. The new institutional framework will consist of three sets of inter-related functions: (A) Policy Direction and Coordination; (B) Regulation; and (C) Services Provision – illustrated in **Figures 2.1 and 2.2**.

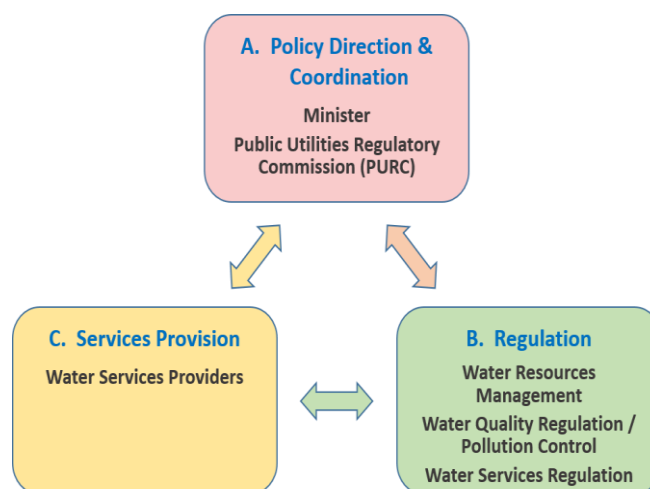


Figure 2.1 Water Sector Institutional Relationships

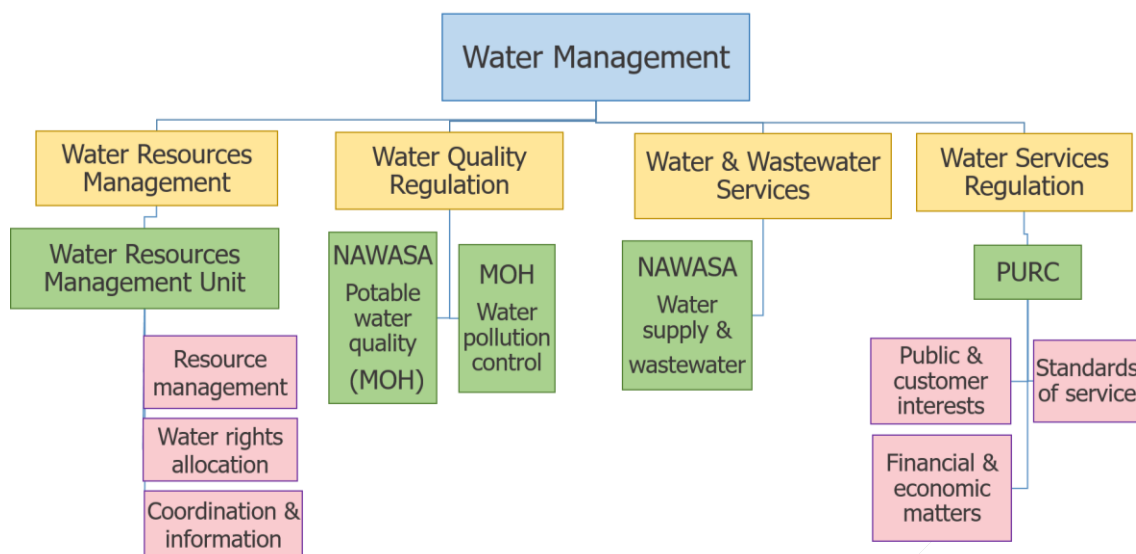


Figure 2.2 Water Sector Functional Chart

The specific institutional functions are summarized as follows:

Minister with responsibility for Water – the primary role of this minister will be to provide high-level national and regional policy support and direction, and have a steering role in the following broad areas:

- Ensuring the sufficient allocation of resources and taking a balanced view of competing needs and requirements;
- Ensuring that the necessary framework of policy, law and regulation are in place to guide the sector; and
- Providing oversight and responsibility for the functioning of the sector.

Public Utilities Regulatory Commission (PURC) – a statutory body established under the provisions of the Public Utilities Regulatory Commission Act, 2016, will:

- Provide coordinated, multi-sectoral, policy-level planning and decision-making for the water sector;
- Provide policy advisory support on policy-related matters;
- Provide policy-level and administrative oversight of the proposed Water Resources Management Unit;
- Set ‘License to Operate’ conditions, duties and requirements pertaining to service providers;
- Set, monitor and report annually on standards of service provided to customers;
- Ensure that water and wastewater tariffs and associated charges are set at a level that can be justified; and

- Delegate functions and duties to other regulatory agencies or refer matters to them where detailed or specialist evaluations and inputs for decision-making are required.

Water Resources Management Unit (WRMU) – will be responsible for the day-to-day management of Grenada’s water resources in their entirety: surface waters (streams, rivers, lakes, other natural reservoirs), ground waters (natural aquifers, wells), water stored as part of municipal/community supplies from rainwater harvesting or other sources, estuarine waters and waters along the coast that are subject to use (recreation, supply for desalination and receiving environment for effluent discharge). In order to fulfill these functions, the WRMU will, *inter alia*:

- Establish, analyse, assess and monitor the status of national water resources (quantity, quality, utilization, vulnerability) on a routine basis, and identify the available resources and their potential sustainable yields;
- Work with water service providers and other water users, including communities, to ensure the protection, efficient and sustainable use of water resources. The G-WASP will act as the major ‘sounding board’ for these actors in the discourse with the WRMU (and PURC) on WRM issues;
- Develop a permit system for the allocation of access rights to the use of water resources, which set out the terms, conditions and limitations on use;
- Develop standards, regulations and guidelines governing the management of water resources; and
- Design and deliver public education and awareness programmes on water resources management.

The Ministry of Health (MoH) – will continue to exercise oversight and audit functions of NAWASA to ensure compliance with drinking water quality standards. With respect to water quality regulation and the control of pollution to the freshwater and marine environment, MoH will, *inter alia*:

- Develop and implement water quality standards and regulations covering drinking water quality and effluent standards;
- Develop rules and standards governing wastewater reuse and augmentation, including RWH and desalination; and
- Enforce quality and effluent standards, the requirement for the submission of remedial action and implementation plans, and the imposition of penalties in the event of on-going breaches.

The National Water and Sewerage Authority (NAWASA) – under the provisions of the envisioned Water Resources, Supply and Sewerage Act of 2019, will continue, at least in the short term, to discharge its responsibility for:

- Testing of drinking water quality for compliance purposes and reporting to MoH; and
- Provision of water and wastewater services, while undertaking transparent monitoring and reporting of performance, and ensuring that there are effective and meaningful mechanisms for stakeholder participation and consultation.

3. Integrated Water Resources Management Plan 2019

This IWRM Plan is structured to guide implementation of, and track progress toward, the National Water Policy goal and vision. The NWP covers the period 2019-2035 – in alignment with the National Sustainable Development Plan 2035 – and identifies four policy outcomes and 13 policy objectives. The Plan, therefore presents priority actions to be taken, within the framework of the policy outcomes and defined objectives. These actions are categorized as high- medium- or low-priority, to enable a step-wise approach to implementation.

Further, to enable monitoring of the achievement of *results*, the proposed implementation timeframe and (where available) estimated cost for each action is given, along with the lead implementing agency and collaborators, and comments which link the action to a prior national policy document. As detailed in the NWP, there are over a dozen national policy documents and plans which have direct relevance for the water sector, the following which provided inputs to this IWRM Plan and need to be implemented to guarantee success of the NWP:

- **National Adaptation Strategy and Action Plan for the Water Sector in Grenada, Carriacou and Petit Martinique** (GoG, 2015a) – which addresses the anticipated adverse effects of climate change on the water sector;
- **Grenada National Agricultural Plan 2015-2030** (GoG, 2015b) – which identifies various Priority Actions to support Strategic Objectives including: irrigation; water storage; improved access to potable water and sanitation; RWH systems; and drainage;
- **Integrated Coastal Zone Management Policy for Grenada, Carriacou and Petite Martinique** (GoG, 2015c) – which highlights marine pollution from land-based sources and watershed runoff as key coastal zone management issues facing Grenada;
- **Final Draft Technology Needs Assessment (TNA)** (GoG, 2016a) – which identifies the water sector as the priority sector to be assessed, along with technology options which could be used to increase water availability for agriculture, tourism and domestic water supply;
- **National Biodiversity Strategy and Action Plan (NBSAP) 2016-2020** (GoG, 2016b) – which identifies the main threats to biodiversity in Grenada’s fresh water ecosystems as pollution through waste disposal, unsustainable consumption, unsustainable agricultural practices, saline intrusion, invasive ‘alien’ species and over exploitation of the resources;
- **National Climate Change Adaptation Plan (NAP) for Grenada, Carriacou and Petite Martinique** (GoG, 2017) – under its Programme of Action 3 (PoA 3) *Water Availability*;
- **(Draft) Grenada National Land Policy** (GoG, 2018) – prepared in 2018 and awaiting Government approval and adoption;
- **(Draft) Grenada Drought Management Plan** – recently completed in 2019, which focuses on the need to urgently address the adverse impacts of climate change on water resources and assuring social and economic well-being through improved water resources management; and

- **Funding Proposal: Climate-Resilient Water Sector in Grenada (G-CREWS)** (GCF, 2018) – approved in 2018, and scheduled for implementation from second quarter 2019-2025, this program presents an opportunity to comprehensively mainstream and implement climate resilience throughout Grenada’s entire national water sector.

An early draft of the IWRM Plan received inputs and was improved and validated at a National Consultation workshop.

As shown at **Figure 3.1**, the total estimated funding allocation for the IWRM Plan is EC\$135 million. Most of the priority actions, amounting to EC\$104 million or 77 percent of the total funding allocation, have been designated as ‘High Priority’ – of which about EC\$88 million or 65 percent of the total funding allocation is secured under the G-CREWS project.

Table 3.1 presents a matrix of integrated water resources management actions.

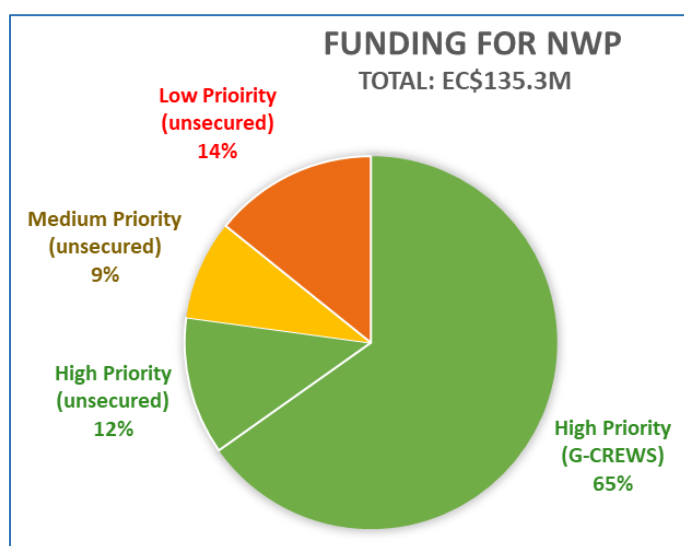


Figure 3.1 Funding for IWRM Plan by category

4. Monitoring and Evaluation of the IWRM Plan

The cross cutting issues in the Policy and IWRM Plan make monitoring and evaluation (M&E) a central tool to manage interventions, improve practice and ensure accountability. Every two years, the responsible institutions and entities will provide data and information through the existing NAP M&E framework for compilation and eventual Cabinet consideration, and public communication.

Table 3.1 Matrix of Integrated Water Resources Management Actions

<i>Colour key</i>	<i>High priority</i>	<i>Medium priority</i>	<i>Low priority</i>
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Outcome 1. Enhanced enabling environment and improved, 'climate smart' water-related behavior					
<i>Objective 1.1: Improve the policy, legal, regulatory and institutional frameworks for the water sector</i>					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
1	Approve and commence implementation of the Draft Grenada National Land Policy (NLP) .	MoAL/ PPU	6 months Q3-Q4, 2019	0.000	Ref. NASAP (GoG, 2015a), Outcome 1 . Draft Policy completed in Q1 2018. Progress toward NLP Vision of sustainable land management and ecosystem resilience will enable achievement of the NWP Vision.
2	Approve and implement the Draft Grenada Drought Management Plan (DMP) .	MoAL/ NAWASA	4 years 2020-2023	7.503	Expected Draft DMP completion Feb. 2019. This Draft Plan has informed the National Water Policy and IWRM Plan. Ref. NAP, PoA 3/3.11 . Ref. G-CREWS Act. 3.2 and 3.3 . Funding from GCF and GoG secured under G-CREWS.
3	Develop a climate-responsive water tariff which: provides incentives for water use efficiency; responds to water availability; and enables NAWASA to allocate adequate resources for maintenance and capital expansion.	NAWASA/ Min. Public Utilities; MCPMLG	1 ½ years Q2 2019- Q3 2020	2.132	Ref. NAP, PoA 3/3.21 . Ref. G-CREWS Act. 1.3 . Funding from GCF and GoG secured under G-CREWS.
4	Review, draft and promulgate legislation to establish and empower Water Resources Management Unit , including a comprehensive <i>Water Management Act</i> and amendments to existing supporting legislation.	Min. Public Utilities/ MLA; MoAL; MoH; Forestry; PURC	1 year Q3 2019- Q2 2020	0.150	Ref. G-CREWS Act. 1.1 . Funding from GCF and GoG secured under the G-CREWS. Water Management Act Regulations to include for: abstraction licenses; wastewater discharge permits; appeals; and dispute resolution procedures.

Objective 1.1 cont'd: Improve the policy, legal, regulatory and institutional frameworks for the water sector

No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
5	Create a Water Resources Management Unit , with responsibility for management of water resources in a holistic manner. Capacity building for WRMU to include a study on the 'Sustainable Financing of the WRMU'; elaboration of policies, duties, functions and responsibilities; and staffing/recruitment.	Min. Public Utilities/ MoAL; PURC	1 ½ years Q4 2019- Q1 2021	4.246	Ref. NAP, PoA 3/3.15 . Ref. G-CREWS Act. 1.1 . Funding from GCF and GoG secured under G-CREWS. Financing study to include consideration of 'user pays' and 'polluter pays' fees.
6	Build capacity within NAWASA in preparation for the transfer of its WRM duties, functions and responsibilities; and functioning within the new WRM regime.	NAWASA/ PURC	9 months Q1-Q3, 2020	0.000	Ref. G-CREWS Act. 1.1 . Funding from GCF and GoG secured under G-CREWS.
7	Achieve cross-sectoral mainstreaming of climate resilience into Policies, Plans and Regulations of Water-Related Sectors; improve enforcement of existing legislation through provision of the necessary support from relevant government agencies.	MoAL/ MoH; NAWASA; Environ. Div.; Min. Public Utilities	2 years 2021-2022	1.554	Ref. NAP, PoA 3/3.5-3.8 . Ref. NASAP, Outcome 1 . Ref. G-CREWS Act. 1.2 . Funding from GCF and GoG secured under G-CREWS.
8	Revise and expand GDS 79: 2006 "Specification for effluent from industrial processes discharged into the environment".	Environment Div./ GDBS	1 year 2021	0.014	Ref. NAP, PoA 3/3.4 .
9	Promote the efficient and effective operation of the WRMU to provide management of water resources in a holistic manner.	Min. Public Utilities/ PURC; WRMU	15 years 2021-2035	0.300	Ref. G-CREWS Act. 1.1 . Activities to include: training; equipment procurement to strengthen collection and management of WR data; and establishment/operation of Water Basin Committees.
10	Develop a Water Resources Master Plan , including an inventory of Grenada's surface water and groundwater resources in relation to supplying the present and future demand for water by all users.	Water Resources Management Unit/ MoAL; MoCREP; NAWASA	2 years Q3 2021- Q2 2023	0.200	Ref. NAP, PoA 3/3.3 . Ref. NASAP, Outcome 1 .

Objective 1.1 cont'd: Improve the policy, legal, regulatory and institutional frameworks for the water sector					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
11	Promulgate legislation/regulations to make rain water harvesting and storage (min. 6 days' supply), mandatory for all new buildings in Grenada, C&PM	PPU, Min. Infrastructure Development/ MLA; A&E Associations	1 year 2022	0.081	Ref. NAP, PoA 3/3.10. Ref. G-CREWS Act. 1.2. Funding from GCF and GoG secured under G-CREWS.
12	Develop a Watershed Master Plan for Grenada, Carriacou and Petite Martinique , including watershed soil mapping and land use classification; and incorporating satellite imagery.	Water Resources Management Unit/ MoAL; MoCREF; NAWASA	2 years Q3 2023- Q2 2025	0.527	Ref. NAP, PoA 3/3.2. Ref. NASAP, Outcome 1.
Objective 1.2: Build national human capacity for the design and implementation of water-related climate adaptation projects					
13	Upgrade the National Water Information System online data access platform.	MoAL/ WRMU; NAWASA/IT Unit	4 years 2021-2024	0.405	Ref. NAP, PoA 3/3.14.
14	Train community members and the staff of NAWASA and MoH in the acquisition and use of meteorological and hydrological data.	LUD/ Met. Office	2 years 2022-2023	0.150	Ref. NAP, PoA 3/3.12.
15	Develop and implement an education campaign focused on training farmers on improved farming practices to include water conservation measures and to increase the use of RWH systems.	MoAL/ MOE; CARDI; IICA; GCNA; MNIB	3 years 2022-2024	0.427	Ref. NASAP, Outcome 3.
16	Establish human resource and training expertise in NGOs and CBOs to support natural resource management and water quality monitoring.	Min. Environment/ MoH; SGU; NAWASA	3 years 2024-2027	0.200	Output of stakeholder focus group.
Objective 1.3: Increase public awareness of integrated water resources management					
17	Design and implement a communications strategy for raising awareness and promoting action on integrated water resource management under a changing climate at all levels of Grenadian society	MoAL/ Min. Environment; NAWASA; Min. Education/NGOs	2 years 2022-2024	5.684	Ref. NAP, PoA 3/3.24. Ref. NASAP, Outcome 3. Ref. G-CREWS Act. 2.2. Funding from GCF and GoG secured under G-CREWS.

Outcome 2. Increased water access, availability and quality					
Objective 2.1: Ensure that present and future generations have access to water of sufficient quality and quantity for various uses and an acceptable standard of sanitation					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
18	Strengthen the Pest Management Unit to ensure sustainable agricultural production systems including restricted use of inorganic fertilizers, insecticides and pesticides, genetically modified organisms, introduction of alien species, managing nutrient discharge and pollution, combating soil erosion and land degradation and safeguarding genetic diversity.	MoAL, Pest Management Unit/ MoF; Customs Dept.; RGPF	2 years 2021-2022	0.350	Ref. NBSAP 2016-2020 (GoG, 2016b). Strategic Priority 2/ Focus Area 6.
19	Extend and consolidate forest replanting, rehabilitation and restoration programme, and mangrove forest replanting programme.	MoAL, Forestry Div./ MoF	6 years 2021-2026	1.000	Ref. NBSAP 2016-2020 . Strategic Priority 2/ Focus Area 5.
20	Adopt forest management plans to reduce and control soil erosion, sedimentation of water sources and to minimize the risk of landslides.	MoAL, Forestry Div./ MoF	5 years 2021-2025	0.250	To include as part of Forestry Division programming.
21	Activate Community-based Organizations for integrated watershed / natural resource management.	MoAL, Forestry Div./ MoF	2 years 2022-2023	0.050	To include as part of Forestry Division programming.
22	Develop and implement a public education program to encourage phasing out of inappropriate activities (e.g. agricultural, commercial, industrial, and domestic) which compromise water quality and take place adjacent to water sources.	MoAL, Forestry Div./ MoF	3 years 2022-2024	0.075	To include as part of Forestry Division programming.
23	Implement engineering measures for river bank and channel protection , where necessary.	MoAL/ Min. Infrastructure Development; MoF	5 years 2023-2027	1.000	

Objective 2.2: Promote the sustainable use of alternative water sources, such as RWH and water recycling and reuse, to ensure water availability under a changing climate					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
24	Promote the use of communal rain water harvesting (RWH) and storage systems for non-potable uses and the retrofitting of private homes and commercial/ industrial buildings to include RWH and storage.	Min. Environment/ Min. Public Utilities; NAWASA; Min. Tourism/CBOs	4 years 2020-2023	1.000	Output of stakeholder focus group.
25	Promote water reclamation and re-use technologies , specifically in tourism and industry sector.	Min. Environment/ Min. Public Utilities; NAWASA; Min. Tourism	4 years 2020-2023	0.135	Ref. NAP, PoA 3/3.25.
26	Raise awareness, and develop/implement training on the correct operation and maintenance of RWH and private water storage systems.	Min. Environment/ GCIC; NAWASA/CBOs	2 years 2021-2023	0.270	Output of stakeholder focus group. Focus on building NGO/CBO capacity, and small business development.
Objective 2.3: Secure water for ecosystem services, recreation and aesthetics in order to ensure that vital ecosystems are maintained, restored and enhanced					
27	Establish, implement and monitor protocols for nutrient discharge and pollution, introduction of alien species, water extraction, unsustainable agricultural practices, saline intrusion and over exploitation of freshwater species.	MoAL/ MoF, Customs Dept.,	5 years 2022-2026	0.300	Ref. NBSAP 2016-2020. Strategic Priority 2/ Focus Area 7.
28	Elaborate and implement a comprehensive watershed management plan and water harvesting distribution and utilization programme	MoAL, Forestry Div./ NAWASA; WRMU; MoF	4 years 2023-2026	0.300	Ref. NBSAP 2016-2020. Strategic Priority 2/ Focus Area 7.
29	Conduct a feasibility study to establish river usage zoning to reduce water use conflicts and secure the integrity of river water quality.	MoAL, Forestry Div./ WRMU; CBOs; MoF	2 years 2024-2025	0.060	Use local expertise.
30	Improve river bank management and water quality by introducing and maintaining riparian buffer zones/ strips and/or selectively re-introducing river reserves.	MoAL, Forestry Div./ WRMU; CBOs; MoF	5 years 2025-2029	0.250	Use local expertise.

Objective 2.4: Promote sound stormwater management, as a measure which can contribute to the enhancement of limited available resources					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
31	Re-engineer the stormwater drainage system across the tri-island state.	Min. Infrastructure Development/ MoF	3 years 2021-2023	3.240	Ref. NAP, PoA 3/3.18.
32	Test and implement stormwater management and re-use systems.	Min. Infrastructure Development/ MoF	5 years 2026-2030	1.000	Output of stakeholder focus group.
Objective 2.5: Promote the reduction of pollution of fresh and adjacent coastal waters through implementation of the obligations of the Cartagena Convention's LBS Protocol					
33	Extend Public Sanitation Programs and improve/ upgrade sanitation facilities in vulnerable communities/ poor households.	MoH/MoF	2 years 2021-2022	0.200	To include as part of MoH programming.
34	Revise and enforce current regulations to ensure that connections are made to the municipal sewer where possible, and that the construction and maintenance of private septic systems and other onsite wastewater treatment and disposal systems are appropriate.	Min. Public Utilities/ NAWASA; MoH; PPU	2 years 2021-2022	0.200	To include as part of NAWASA programming.
35	Build capacity for water quality monitoring and enforcement of pollution control by the Environmental Health Division, MoH, and develop the PCL Water Testing Laboratory.	MoH/ PCL; MoF	4 years 2021-2024	0.500	To include as part of MoH programming. Pursue assistance from CARPHA/ PAHO
36	Implement, on a phased basis, the infrastructural requirements for tertiary level municipal sewage treatment facilities , in accordance with previous Master Plan, Feasibility Study and Designs.	Min. Public Utilities/ NAWASA; MoF	10 years 2022-2031	15.000	GoG should seek financing from regional/international development partners.
37	Develop guidelines for the handling, transportation and storage of chemicals and chemical waste ; managing accidents and spills; and the use and disposal of chemicals in order to safeguard water resources.	MoH/ MoF	3 years 2023-2024	0.050	To include as part of MoH programming.

Outcome 3. Increased water use efficiency and conservation					
Objective 3.1: Improve water infrastructure to build climate resilience					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
38	Facilitate investment and invest in major water system infrastructural upgrades , including the construction of new pipelines to reduce water loss.	NAWASA/ MoF	3 ½ years 2020-2023	73.680	Ref. G-CREWS Act. 3.1 . Funding from GCF and GoG secured under G-CREWS. Sub-projects to include: storage; pipelines (including for the N part of Carriacou); and communal RWH systems
39	Implement distribution system water loss reduction strategy to comprehensively reduce NRW, including selected replacement of leaking pipes.	NAWASA/ MoF	4 Years Q4 2019- Q2 2023	4.000	Ref. G-CREWS Act. 4.1 . Funding from GCF and GoG secured under G-CREWS.
40	Conduct water audit of government buildings, government-occupied buildings and schools to determine where there are high leakages/wastage.	NAWASA/ MoF	2 Years 2020-2021	0.025	Each Ministry or Department utilizing the facilities should assign a person in charge of the building to lead process.
41	Install ' smart ' water meters for all consumers (bulk and low volume).	NAWASA/ MoF	4 years 2024-2027	6.000	To include as part of NAWASA programming.
42	Retrofit public and key community buildings for climate change resilience and for demonstration/replication of climate-appropriate design re: RWH.	Min. Infrastructure Development/ NAWASA; MoF	3 years 2021-2023	0.000	Ref. G-CREWS Act. 2.1 . Funding from GCF and GoG secured under G-CREWS.
43	Facilitate the development of renewable energy infrastructure to reduce water pumping costs.	NAWASA/ MoF	2 ½ years 2021-2023	1.069	Ref. G-CREWS Act. 4.1 . Funding from GCF and GoG secured under G-CREWS.
Objective 3.2: Ensure water is used as efficiently as possible, including promotion of wise use and conservation, while recognizing the important role of women in household water management					
44	Promote, and provide incentives for the procurement of low-volume/low energy faucets .	Min. Public Utilities/ MoF; NAWASA	15 years 2021-2035	11.758	Ref. NAP, PoA 3/3.9 . Ref. G-CREWS Act. 2.1 . Funding from GCF and GoG secured under G-CREWS.
45	Encourage the private sector to increase availability of domestic water conservation products for purchase by the public in Grenada	Min. Public Utilities/ MoF; NAWASA	3 years 2021-2023	0.000	Ref. G-CREWS Act. 2.1 . Funding from GCF and GoG secured under G-CREWS.

Objective 3.3: Promote 'climate smart' agriculture					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
46	Document best practices in dry land agriculture in Grenada.	MoAL/ MC&PMA	2 years 2021-2022	0.050	Should become part of routine tasks of Extension Officers.
47	Change management practices such as planting dates to compensate for crop/water cycle modifications.	MoAL	3 years 2021-2023	0.020	Should become part of routine tasks of Extension Officers.
48	Improve farm drainage infrastructure , cultivation and harvesting practices to reduce impacts of soil water stress during heavy precipitation periods.	MoAL/ SAEP	4 years 2021-2024	0.100	Should become part of routine tasks of Extension Officers.
49	Extend drip irrigation use and develop irrigation networks that allow for the recycling of waste water.	MoAL (Irrigation and Drainage Unit)	5 years 2021-2025	0.500	Should become routine activities through Extensions Services.
50	Extend the use of soil and water conservation measures (mulching, appropriate terracing, etc.) to reduce water losses and erosion.	MoAL	5 years 2021-2025	0.200	To include as part of MoAL/Land Use Div. programming.
51	Set up demonstration plots showcasing climate-smart farming techniques . Facilitate farmers' training on climate smart agriculture through farmer field schools.	MoAL/ MC&PMA	2 years 2023-2024	0.050	Engage the youth.
Outcome 4. Strengthened preparedness for climate variability and extremes					
Objective 4.1: Improve hydrometeorological monitoring, emergency planning and decision making					
52	Undertake country-wide hazard mapping (flooding, drought, wildfires, landslides, digital elevation modelling) to inform land use and infrastructure development planning.	MoAL/ WRMU	3 years 2019-2021	0.250	Start as soon as possible.
53	Continue expanding the network of automatic rainfall stations and stream gauges with data loggers to remotely transmit readings to a central office and improve early warning systems.	MoAL/ MOC&PMA; NAWASA; Met. Office	4 years 2019-2023	0.950	Continue work now, since a project is already in train (Land Use Division).

Objective 4.1 cont'd: Improve hydrometeorological monitoring, emergency planning and decision making					
No.	Priority Action	Lead Agency/Collaborators	Timeframe	Est. Costs (EC\$M)	Comments
54	Enhance existing monitoring/alert networks on sea level rise through effective training and outreach mechanisms.	MoAL/ Met Services; PPU; Met. Office	4 years 2022-2025	0.350	GoG should continue to support this initiative.
55	Identify and acquire appropriate predictive rainfall and flood (coastal and inland) models and provide in-depth training and capacity building on their use and analysis.	MoAL/ WRMU	3 years 2021-2024	0.350	Training complementary to, and beyond, the Hydromet Rehabilitation component of the Disaster Vulnerability Reduction Project (DVRP). Initial reports already done by CIMH/CSF.
56	Train staff in GIS, satellite image analysis, meteorological data analysis, predictive analysis, and use of satellite and remote sensed data and systems.	MoAL/ WRMU; TAMCC	4 years 2020-2024	0.400	Output of stakeholder focus group.
Objective 4.2: Minimize water-related climate change risks by adopting ecosystem-based adaptation solutions					
57	Maintain existing vegetative buffers – mangroves, coastal vegetation, river banks – through regulations, enforcement and public education.	MoAL/ WRMU; MoE; RGPF; CBOs	3 years 2019-2023	0.500	Should be included as routine activities of MoAL.
58	Protect wetland ecosystems , most of which are coastal and have been targeted as landfill sites or earmarked for development.	MoAL/ Fisheries Division; CBOs	3 years 2022-2024	0.250	Should be included as routine activities of MPA Unit, Fisheries Div.

5. References

- Government of Grenada (2015a).** *Draft Final National Adaptation Strategy and Action Plan for the Water Sector in Grenada, Carriacou and Petit Martinique*. Report prepared for the CCCCC, and Environment Unit, Ministry of Agriculture, Lands, Forestry, Fisheries and the Environment, Grenada.
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- Government of Grenada (2015c).** *Integrated Coastal Zone Management Policy for Grenada, Carriacou and Petite Martinique*.
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- Government of Grenada (2016b).** *National Biodiversity Strategy and Action Plan 2016-2020*.
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