

Synthesis of policy interventions responding to integrated water resources management challenges in the Caribbean SIDS

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Abbreviations

ACTO	Amazon Cooperation Treaty Organization
CCCCC	Caribbean Community Climate Change Centre
CARICOM	Caribbean Community
COTED	Council for Trade and Economic Development
EM	Environmental Management
EMA	Environmental Management Authority
DEHS	Department of Environmental Health Services
GCF	Green Climate Fund
GSDS	Guyana Green State Development Strategy
GWP	Global Water Partnership
HLF	High Level Forum
HLPF	High Level Political Forum
ICT	Information and Communications Technology
IWRM	Integrated Water Resources Management
JWRA	Jamaica Water Resources Authority
NHS	National Hydrological Service
NIWRA	National Integrated Water Resources

NWC	National Water Council of Guyana
RSAP	Regional Strategic Action Plan for the Water Sector in the Caribbean
SAMOA Pathway	SIDS Accelerated Modalities of Action SAMOA Pathway
SDG	Sustainable Development Goals
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VBF	Water Abstraction Charges or Volume-Based Fees
WASA	Water and Sewerage Authority
WASH	Water, Sanitation, Hygiene
WET	Water Conservation Education Programme for Teachers
WRA	Water Resources Agency
WRM	Water Resources Management
WSRN	Water Sector Resilience Nexus for Sustainability in Barbados
WHO	World Health Organization
WUE	Water Use Efficiency

Abstract

In the Caribbean, high water demand, changes in land use, climate variabilities impacts, deforestation, soil erosion, pollution, inadequate wastewater treatment, and the overexploitation of water sources¹, impact on the quantity and quality of available freshwater resources. The management of freshwater resources through an integrated approach is internationally recognised as a best practice for supporting the sustainability of this finite resource.

The recent United Nations - 2030 Agenda for Sustainable Development report noted the low to medium-low levels of implementation of the integrated water resources management (IWRM) indicator 6.5.1 in the Caribbean SIDS. This low implementation rate can negatively impact attaining the SDG 6 targets of Agenda 2030. This study examines the IWRM implementation in the Bahamas, Barbados, Belize, Guyana, Jamaica, Suriname and Trinidad and Tobago. Among the areas assessed within the IWRM framework in each country were, an enabling environment, the institutional framework and management instruments.

The study provides policy recommendations for each of the IWRM components examined including recommendations for potable water management arising from the Covid-19 pandemic. In each of the countries considered in this study, the requirement for an effective IWRM organizational structure was identified as significant and the study lays out such a structure.

¹ This will include ground, surface, and coastal water sources.

Introduction

Water is a finite natural resource. It is a key driver of economic and social development, and it is also critical to maintaining the integrity of the natural environment and ecosystems.² Sustainable management of water resources, including access to safe, fresh water and sanitation, is indispensable for human health and well-being.³ The sustainable management of freshwater resources requires integrated and systematised structures across the social, economic, and environmental dimensions of development.

Optimal sustainable management of freshwater resources requires a coordinated multi-stakeholder and multisectoral approach. Integrated water resources management (IWRM) describes a holistic approach to the management of water, land, ecosystems and related natural resources, with a view to maximising economic and social welfare in an equitable manner. (GWP, 2006). IWRM typically embraces an enabling environment including financing, institutional framework and management instruments (UN Water, 2018). IWRM, to be effective, should also be systematically integrated into national sustainable development priorities (ECLAC, 2007).

A. Freshwater resources management in the Caribbean

Effective IWRM in the Caribbean should integrate a SIDS specific response to sustainable development challenges and a "whole-of-island" approach. This would include the integration of marine and coastal zone management plans (UNEP, 2016).⁴ These requirements are also recognised in the SIDS Accelerated Modalities of Action (SAMOA Pathway).⁵ Furthermore, the impact of the COVID-19

² International Decade for Action 'Water for Life' 2005-2015, <https://www.un.org/waterforlifedecade/iwrm.shtml>, cited September 3, 2021.

³ A/RES/75.212: United Nations Conference on the Midterm Comprehensive Review of the Implementation of the Objectives of the International Decade for Action, "Water for Sustainable Development", 2018–2028.

⁴ This is also in keeping with the United Nations Convention on the Law of the Sea requiring States to adopt laws and regulations to prevent, reduce and control pollution of the marine environment from land-based sources of pollution.

⁵ A/Res/69/15- SIDS Accelerated Modalities of Action (The SAMOA), under Paragraphs 64-65 further recognised that SIDS face numerous challenges in achieving sustainable freshwater resources management.

Pandemic has emphasised the necessity for providing safe and adequate potable water supplies to meet health (including public health), sanitation and other recovery measures and requirements.


This mandate for sustainable water resources management (WRM) is also contained in Articles 58 (2) and 60(3) of the Revised Treaty of Chaguaramas.^{6,7} At the Caribbean Community's Twenty-Fifth Special Meeting of the Council for Trade and Economic Development (COTED) – Member States encouraged that attention be given to the Environment, the development of IWRM Plans, and Water Use Efficiency (WUE) Plans (CARICOM, 2008). In pursuance of development of IWRM plans, a proposal to establish an intergovernmental Caribbean Regional Policy Road Map for WRM was tabled at the 14th Caribbean High-Level Forum for Ministers with Responsibility for Water (HLF)⁸ held in Montego Bay, Jamaica, in 2018. At the 15th HLF (October 2019), the Declaration of Basseterre was endorsed as a Regional Strategic Action Plan for the Water Sector in the Caribbean (RSAP). This Caribbean RSAP identified a need to develop effective national coordination mechanisms through the evaluation of current cross-sector coordination (mechanisms), the identification of successful institutional arrangements and development of lessons learned or the identification of success factors that could be replicated in other countries (CWWA, 2021).

B. Agenda 2030 on Sustainable Development and IWRM

The 2030 Agenda for Sustainable Development through Sustainable Development Goal 6 (SDG 6) makes clear that water and sanitation are at the core of sustainable development and are linked to all SDGs (UN DESA, 2021). SDG-6 addresses water availability, water quality, use, access, affordability, ecosystem and anthropogenic influencers, and their sustainable development linkages.⁹ Box 1 lists the eight (8) targets of SDG 6. IWRM is considered under the SDG 6.5 target.

Box 1

SDG 6: Ensure availability and sustainable management of water and sanitation for all



SDG 6- Targets

6.1- By 2030, achieve universal and equitable access to safe and affordable drinking water for all.

6.2- By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

6.3- By 2030, improve water quality by reducing pollution, eliminating dumping, and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and substantially increasing recycling and safe reuse globally.

⁶ Revised Treaty of Chaguaramas, Article 58(2) (a) of this treaty lists that Parties have the responsibility for, inter alia, the effective management of "all water resources, the exclusive economic zone and all maritime areas within the jurisdiction of Member states" and Article 60 (3) refers that "that forest resources "are those natural assets of forest lands, including timber and other forest products, biological diversity, recreation, fish and wildlife habitat, wilderness, flora and fauna, air, water and soil" (CARICOM, 2001). available at: <https://treaty.caricom.org/>, cited May 15, 2021.

⁷ Regional bodies of the Caribbean Community (CARICOM) through their respective mandates do also have IWRM responsibilities. These will include for example the Caribbean Agricultural Research & Development Institute Caribbean Community Climate Change Centre, Caribbean Disaster Emergency Management Agency, Caribbean Meteorological Organization, Public Health Agency and The Caribbean's Renewable Energy and Energy Efficiency Hub.

⁸ The High Level (Ministerial) Forum engages Ministers and policy makers on IWRM matters. The outcomes of these events are aimed to support water sector management in the Caribbean region. This Ministerial body is a joint initiative of the Caribbean Water and Wastewater Association and Global Water Partnership-Caribbean, see link at: <https://www.gwp.org/en/GWP-Caribbean/WE-LEARN/knowledge-resources/regional-resources/High-Level-Session-Ministerial-Forum-on-Water-/>, cited December 22, 2021.

⁹ A/RES/75.212: United Nations Conference on the Midterm Comprehensive Review of the Implementation of the Objectives of the International Decade for Action, "Water for Sustainable Development", 2018–2028.

6.4- By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

6.5- By 2030, implementation of integrated water resources management at all levels, including through transboundary cooperation as appropriate.

6.6- By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes.

6.a- By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling, and reuse technologies.

6.b- Support and strengthen the participation of local communities in improving water and sanitation management.

Source: UN DESA, 2021.

The implementation of IWRM should encompass all sources of freshwater resources, as well as relevant sectors and stakeholders. SDG indicator 6.5.1 tracks the degree of IWRM implementation.¹⁰

The 2019 UN High-Level Political Forum (HLPF), reviewed progress on the implementation of SDG 6. With specific reference to SDG indicator 6.5.1, this 2019 HLPF noted that of 172 countries surveyed, 80 per cent have a medium-to-low implementation of IWRM and noted that 60 per cent of countries are unlikely to reach the target of full implementation by 2030.¹¹ The 2020 and 2017 UN SDG 6.5.1 data report¹² on the implementation of SDG indicator 6.5.1 for the Caribbean is provided in table 1 following.

Table 1
Caribbean SIDS implementation of SDG indicator 6.5.1 for reporting years 2017 and 2020

Caribbean SIDS	SDG 6.5.1 Status of implementation 2020	SDG 6.5.1 Status of implementation 2017
Antigua and Barbuda	Medium-low	Low
The Bahamas	Medium-low	Medium-low
Barbados	Medium-low	Medium-low
Belize	Low	Low
Cuba	High	High
Dominica	Medium-low	Medium-low
Dominican Republic	Medium-low	Medium-low
Grenada	Medium-low	Low
Guyana	Low	Low
Haiti	Low	Low
Jamaica	Medium-low	Medium-low
Saint Kitts and Nevis	Low	Low
Saint Lucia	Medium-low	Medium-low
Saint Vincent and the Grenadines	Low	No data

¹⁰ Indicator 6.5.1 tracks the degree of IWRM implementation, by assessing the four components of IWRM, these are: Enabling environment, Institutions and participation, Management instruments and Financing. Reference UN Water: available at: <https://www.sdg6monitoring.org/indicator-651/>, cited, July 25, 2021.

¹¹ High-level political forum on sustainable development, convened under the auspices of the Economic and Social Council Special edition: progress towards the Sustainable Development Goals; available at: <https://undocs.org/E/2019/68> pp 13.

¹² The data for the preparation of Table 1 is extracted from the UNEP-IWRM data portal, see link at <http://iwrmdataportal.unepdhi.org/>, cited July 25, 2021.

Caribbean SIDS	SDG 6.5.1 Status of implementation 2020	SDG 6.5.1 Status of implementation 2017
Suriname	Low	Low
Trinidad and Tobago	Medium-low	Low

Source: IWRM data portal: <http://iwrmdataportal.unepdhi.org/>, 2021.

Note: Table 1 guide: A grade of high indicates that this country is achieving IWRM policy objectives and is likely to reach the 2030 target for this indicator. Medium-low indicate that there exist most of the institutionalised elements for IWRM. Low indicates that countries have started developing elements of IWRM. In medium-low and low grades, countries are unlikely to meet the global targets unless progress significantly accelerates.

The 2021 review of implementation of SDG target 6.5.1 urged that the current rate of progress needs to be doubled, as 129 countries are not on track to achieve sustainable management of water resources by 2030 (UNSTATS, 2021).¹³ Concern was also expressed that the impact of COVID-19 could further retard progress in implementation of SDG target 6.5.1.

¹³ According to the UN-Water, 2021 report in SDG 6.5.1, that despite some progress, three quarters of countries are not on track to meet this global target. Priority needs to be given to the 46% of countries with low and medium low implementation of IWRM; reference, SDG-6-Summary-Progress-Update-2021_Version-2021-03-03 (1).pdf, cited July 25, 2021, pp 13.

I. Methodology and structure of the study

To assess the approaches and the challenges affecting the implementation of IWRM in the Caribbean, a questionnaire was administered in seven countries: the Bahamas, Barbados, Belize, Guyana, Jamaica, Suriname and Trinidad and Tobago (see annex 1).¹⁴

The field data and information were obtained through desktop reviews and interviews. The survey group included representatives from government agencies, civil society and other non-governmental organizations having designated roles and functions in WRM.

The research and data collected were analysed in the context of the IWRM framework components identified below. These will be discussed in the following sequence:

- An enabling environment
- The Institutional Framework
- Management Instruments
- The COVID-19 Pandemic and IWRM

¹⁴ To note that there is no internationally agreed methodology for the assessment of implementation of SDG 6.5.1, the methodology used for preparation of the 2030 Agenda reports for SDG 6.5.1 implementation is available at: <http://iwrmdataportal.unepdhi.org/currentdatacollection>, cited October 20, 2021.

II. Enabling environment

The IWRM enabling environment establishes and defines all stakeholders' roles and includes public, private, and other civil society groups (ECLAC, 1998). The enabling environment for IWRM also serves as an integral component of national sustainable development plans and policy frameworks.¹⁵ An IWRM enabling system includes, *inter alia*, a national water policy, legal frameworks, investments, and financing structures (GWP, 2021).

The approaches employed by the seven surveyed countries to promote a more effective IWRM enabling environment are described below.

A. National IWRM policies and plans

All countries surveyed have IWRM policy frameworks and plans for WRM. Examination of these, are detailed as follows:

- (i) Vision: All have respective national visions and goals for IWRM. Guyana's IWRM vision document is at the drafting stage. These national visions can be IWRM specific - as in the cases of Jamaica and Trinidad and Tobago - or form part of other related national visions, as is the case in the 2006-2025-National Strategic Plan for Barbados.¹⁶
- (ii) Strategies and Policies: IWRM policies and strategies have been developed in the Bahamas, Barbados, Belize, Jamaica, Suriname and Trinidad and Tobago. Belize and Jamaica have approved IWRM policies. The Bahamas has a common IWRM policy for 15 of its islands. Jamaica has approved a National Water Sector Policy that is underpinned by the IWRM

¹⁵ In this case where there exist shared freshwater resources, the enabling environment can also include arrangements with neighbouring States and other regional and international actors.

¹⁶ See for example the National Development Plan of Barbados (2005-2025), available at: <https://www.commonwealthgovernance.org/countries/americas/barbados/national-development-plan/>, cited July 1, 2021.

approach. Trinidad and Tobago has a revised draft (2018) IWRM policy and is pending Cabinet's approval. Strategically, countries have included IWRM within their national sustainable development policies and with policy linkages to such sectors as health, land use management, coastal zone planning, disaster management, climate change, agriculture and food production. Guyana for example in its draft Strategy 2030 - A New Low-Carbon Economy, recognised the requirements of IWRM across all related water-using sectors (Guyana, 2021).

- (iii) IWRM Plans: All countries surveyed have national IWRM Plans, be they IWRM overarching water sector plans as in the case of Jamaica, or whether they form part of other national plans. In the cases of The Bahamas, Barbados, Belize, Guyana and Trinidad and Tobago, IWRM plans are components of their respective national water services frameworks. In the case of Suriname, the IWRM plan is a component of its National Development Plan.

B. Legislative framework

In analysis of IWRM legislation, the data obtained suggest that there are several legislative, Ministerial portfolios, government departments and agencies having responsibilities for WRM (see annex 2). In each country examined there exists multiple legislations and institutions with legal responsibilities having WRM function. These legislative functions can include water management, water abstraction, conservation of watersheds, protection of water resources for as potable water supply, and wastewater management.

In addition there are other public sector agencies and other stakeholders having IWRM functions that are not legislatively mandated. This was observed for example in the case of watershed management where there are agencies and other actors having non-legislative functions on forestry, land-use planning, conservation, pollution controls and community participation. These array of legislative and administrative arrangements result in overlapping laws, challenges in determination and implementation of national WRM priorities, conflicts in decision-making and reduced effectiveness in stakeholder participation.¹⁷

This complexity of legislative, administrative and participatory arrangements is illustrated in table 2- Belize: Institutional, water services and legislative roles for water resources management.

Table 2
Belize: Institutional, water services and legislative roles for water resources management

	Water Supply	Sewage Services	Protection and Conservation	Water Safety	Water Abstractions	Laws
Institutions with legislative responsibilities for WRM						
Belize Water Services	X	X	-	X	X	Water Industry Act.
Public Health Bureau	X	X	-	X	-	Public Health Act.
Public Utilities Commission	X	X	-	X	X	Public Utilities Commission Act and Water Industry Act.

¹⁷ This will include public and private sector participation.

	Water Supply	Sewage Services	Protection and Conservation	Water Safety	Water Abstractions	Laws
City and Town Councils	X	-	X	-	-	City and Town Councils Act
Village Councils	X	-	X	-	-	Village Council Act.
Forests Department	-	-	X	-	-	Forest Act, National Parks.
Coastal Zone Institute and Management Authority	-	-	X	-	-	Coastal Zone Management Authority Act.
Department of the Environment	-	-	X	-	-	Environmental Protection Act.
Land Utilization Authority	-	-	X	-	-	Land Utilization Authority.
Department of Lands	-	-	X	-	-	National Lands Act.
Solid Waste Management Authority	-	-	X	X	-	Solid Waste Management Authority Act.
Geology and Petroleum Department	-	-	X	X	X	Petroleum Act.
Mining Unit	-	-	X	X	X	Mines and Minerals Act.
National Hydrological Service	X	-	X	-	-	National Integrated Water Resources Act.
Belize Port Authority	-	-	X	-	-	Ports and Harbours Act.
Forests Department	-	-	X	-	-	Fisheries Act.
Institutions (public and private) operating in water resources sector without legal responsibilities						
Ministry of Works	-	-	X	-	-	No expressed legal authority for water
Department of Agriculture	-	-	X	-	-	No expressed legal authority for water
National Meteorological Service	X	-	X	X	-	No expressed legal authority for water
Bottled Water Companies	X	-	X	X	X	No expressed legal authority for water
Well Drilling Operators	-	-	-	-	X	No expressed legal authority for water
Aquaculture Companies	-	-	-	-	X	No expressed legal authority for water
Farmers	X	-	-	-	X	No expressed legal authority for water
Hotels	X	-	X	-	X	No expressed legal authority for water
Ministry of Local Government and Rural Development	X	X	X	-	X	No expressed legal authority for water
Social Investment Fund	-	X	X	-	X	No expressed legal authority for water
Citrus Products of Belize	-	-	-	-	X	No expressed legal authority for water
Belize Sugar Industries	-	-	-	-	X	No expressed legal authority for water
Banana Growers Association	-	-	-	-	X	No expressed legal authority for water

Source: Authors' interpretation and based on data from the survey conducted for this study, November 2020.

Note: Figure (3) guide: X indicates where there is a WRM institutional role and – no indicated WRM institutional role.

Drawing from table 2 above, for Belize WRM legislative and non-legislative arrangement includes:

- (i) Sixteen (16) public sector agencies have WRM functions and operate under legislative and established institutional structures. The lead agency for IWRM in Belize is the National Hydrological Service (NHS). The NHS was established under the National Integrated Water Resources Act (2010) under the Ministry of Natural Resources. The NHS functions as the Secretariat for the National Integrated Water Resources Authority (NIWRA). The composition of the Board of the NIWRA provides a platform for cross-sector coordination in water resources planning and management. The Authority is legally mandated to develop mechanisms for Inter-Ministries/Department coordination between relevant Agencies. Its members are drawn from the public, private, business, community and non-government sectors of society. Under this system, the technical coordination at the Government Department levels has improved but remains constrained due to limited resources and other administrative restructuring.
- (ii) The Ministry of Works, Department of Agriculture and the National Meteorological Services, Ministry of Local Government and Rural Development are public agencies having water resources functions that are not defined through legislation.
- (iii) Private sector companies whose operations are dependent on safe and reliable fresh water and which are not defined in existing WRM legislation include, for example, the bottled water companies, well-drilling operators, aquaculture industries, farmers (including those in aquaculture) and hotel operators.
- (iv) Cooperations and Associations whose functions will require safe and reliable fresh water and are not defined in existing WRM legislation include Social Investment Fund, Citrus Products of Belize, Belize Sugar Industries and the Banana Growers Association.

C. Transboundary water resources

Transboundary fresh watercourses management arrangements are recognised in the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention).¹⁸ This Convention is a legally binding instrument promoting the sustainable management of shared water resources, the implementation of Agenda 2030 and its SDGs, the prevention of conflicts, and the promotion of peace and regional integration. Effective management of transboundary water resources is required to address the administration of shared watershed, aquifers, and pollution control among other requirements.

In the Caribbean, Belize, Guyana and Suriname have shared transboundary watercourses with their neighbours. Belize, for example, shares five of its watersheds and aquifers with its border neighbours of Guatemala and Mexico. Belize and Mexico have an Agreement through the International Commission of Boundaries and Water¹⁹ to continue diagnostic studies to determine the state and proposed plan for the sustainable management of the Mexico-Belize Rio Hondo transboundary watershed (FAO, 2015). Guyana and Suriname together with Bolivia, Brazil, Colombia, Ecuador, Perú and Venezuela are members of the Amazon Cooperation Treaty Organization (ACTO).²⁰

¹⁸ The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) was adopted in Helsinki in 1992 and entered into force in 1996, see link at: <https://unece.org/environment-policy/water/about-the-convention/introduction>, cited July 10, 2021.

¹⁹ This is between Belize and Mexico.

²⁰ The ACTO enlists that water resources are strategic for the balanced and sustainable development of the peoples of the Amazon River Basin. These resources are subject to protection and conservation for their multiple uses with the purpose of improving quality of life of present and future generations, respecting the ethnic and cultural diversity and the sovereignty of the Member Countries.

The management plans including monitoring and reporting of these transboundary freshwater resources agreements in the countries of Belize, Guyana and Suriname are at early stages of development. Suriname for example is working towards the establishment of national coordination committees having the function of defining management approaches of shared freshwater resources. Countries have listed that achieving common sustainable development objectives in the management of shared transboundary freshwater resources will require financial provisions and investments in capacity building, strengthening of intergovernmental coordination mechanisms, legislative, technological and institutional systems.

D. Investments and financing structures

Public sector budgeting for IWRM is limited to the allocations assigned to the governing organization and agencies having water resources legislative, regulatory and management responsibilities.²¹ These allocations are typically allocated for physical infrastructure developments such as dams, canals, pumping stations, and flood control; operational activities such as water treatment, watershed and flood management, land-management practices for water resources, and monitoring and reporting. However, generally insufficient financing is provided and allocated to support all required water resources management, research, monitoring, data collection and reporting.

Countries are also recipients of multilateral loans and projects to assist in WRM and address nexuses such as climate change impacts and climate variability. An example of a multilateral funded project supporting a water sector and climate-change nexus is illustrated in box 2.

Box 2

Water Sector Resilience Nexus for Sustainability in Barbados Project

The Water Sector Resilience Nexus for Sustainability in Barbados (WSRN S-Barbados) is a \$45.2-million investment project that is being implemented by the Caribbean Community Climate Change Centre (CCCCC) in collaboration with the Green Climate Fund (GCF), the Government of Barbados and the Barbados Water Authority (BWA). Funding includes US\$27.6 million in grants from the GCF and counterpart funding of US\$17.6 from the Barbadian government. The WSRN S-Barbados project is the GCF's first single-country investment in the Caribbean. When complete, it should improve access to potable water, increase the Barbados water sector's resilience to extreme climatic events; reduce water disruptions, introduce adaptation and mitigation initiatives through a revolving fund; improve resilience to climate change while building Capacity and increasing public-private-partnerships and innovation for climate resilience in the sector.

Source: Caribbean Community Climate Change Centre, 2021.²²

In all countries surveyed, recommendations were made for having established water valuation and pricing procedures. The data for each country suggest that financing for WRM was assigned primarily to provide the basic service of access to water for domestic and commercial use. Gaps were identified for the valuation of freshwater as an input, for example, in the production of bottled drinking water,

The integrated management of water resources is made feasible by means of participatory management, exchange of information, research, implementation of actions to adapt to variability and climate change, through regional cooperation and the support of adequate institutions. Under Article V of the ACTO treaty, the Member States commit to make efforts towards the rational use of shared water resources. This included the establishment of a hydro-meteorological database of the Amazon region, strengthening technical cooperation between countries in hydrology and climatology, and encouraging the use of remote sensing. See link at: <http://otca.org/en/project/amazon-cooperation-treaty/>, cited July 10, 2021.

²¹ For example, in the case of Barbados the public sector agency is the Barbados Water Authority and for Trinidad and Tobago, this will be the Ministry of Public Utilities. For Trinidad and Tobago the Water Resources Agency (WRA) is a department under the Water and Sewerage Authority (WASA). WASA is also the provider of potable water and wastewater services.

²² Caribbean Community climate change Centre, CCCCC to Launch US\$45-M Water Improvement Project in Barbados, available at: <https://www.caribbeanclimate.bz/blog/2019/05/09/cccc-to-launch-us45-m-water-improvement-project-in-barbados/>, cited July 24, 2021.

agriculture, manufacturing, hotels and tourism sectors. This valuation should be conducted using accepted water valuation methodologies. This approach can yield data that can further support countries in negotiations with investors, especially those interested in expanding their operations and using water resources in their production process. This could also contribute to the reduction of uncontrolled and disproportionate use of freshwater.

E. Policy recommendations for an enabling environment

- (i) Mainstream and align IWRM into the national sustainable development priorities. In consideration to the Caribbean region high vulnerabilities to natural disasters, this will also require building resilience in WRM and in integration with climate variabilities, climate change impacts and disaster management.
- (ii) Establish and or update legislation, regulations, institutional arrangements including monitoring and reporting to provide for an effective IWRM system and reduce the high level of disaggregated structures and institutions and overlapping responsibilities of organizations and sectors having IWRM functions and including regularisation of unlicensed abstraction.
- (iii) Review, assess and implement Water Abstraction Charges²³ or Volume-Based Fees (VBF) for both surface water and groundwater sources based on the abstraction volumes and apply for all users, public and private. These water abstraction charges can be further examined as a source of IWRM financing and encourage more efficient water use. These water abstraction charges should also be applied to the potable water service providers.
- (iv) Assess and implement water resources demand management systems. The allocation of available water to different users or types of use should be based on assessing and implementing water demand management. Implementation of incentives for conservation, management of infrastructure, pollution control, water recovery, water recycling and water reuse should be considered for the optimisation of water use.
- (v) Strengthen bilateral and multilateral plans for improved water management of Caribbean SIDS with Transboundary Water Agreements. These plans should also include agreed procedures for managing the impacts of climate change and climate variabilities.

²³ Noting that water abstraction free is separate from the licensed fee for water use.

III. Institutional arrangements for IWRM

Institutional arrangements address the roles of all stakeholders in IWRM. An effective national institutional framework is fundamental to implementing policies and plans for sustainable IWRM. WRM requires the involvement of all citizens. To effectively undertake the broad scope of functions and multi-stakeholder responsibilities in the water sector, the institutional framework and organizational structures, roles, and responsibilities at the national, sectoral and community watershed levels must be clearly defined and coordinated.

A. Administrative structures

All countries surveyed reported the existence of several pieces of legislation and institutional arrangements addressing WRM. Several organizations and agencies have WRM roles and responsibilities. In the context of the specific functions and tasks inherent in IWRM, the institutional framework concerning structure, planning, management, and regulatory functions of water resources are at varying levels of development and effectiveness.

A consistent and common challenge observed in each IWRM component is the high level of legislative and institutional fragmentation (see Annex 2). Public sector agencies responsible for water and sewerage services are also responsible for WRM in The Bahamas, Barbados, Belize, Guyana, Suriname and Trinidad and Tobago. Under these arrangements, the WRM services and IWRM functions are administered as subordinate functions to the water and sewerage agencies and service providers.²⁴ The impacts of these disaggregated arrangements can result in unsustainable WRM and including:

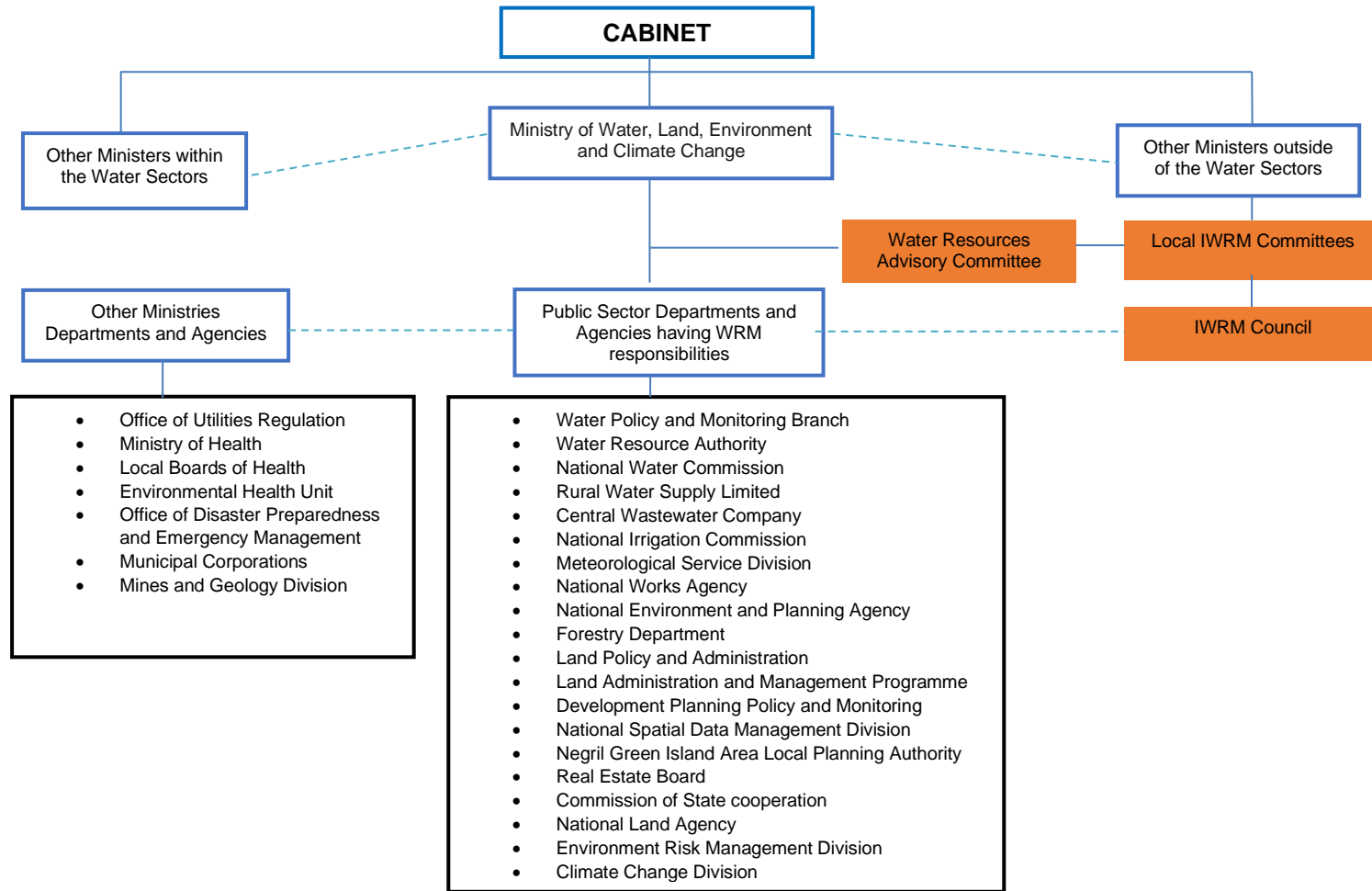
- The potable water and wastewater service providers as the largest users of water resources have deciding decision making and control on WRM. Under this arrangement the WRM agency does not have the required legislative nor administrative autonomy to sustainable manage water as a finite resource.

²⁴ See for example table 2: Belize - institutional, water services and legislative roles for water resources management.

- Transparency in decision making with respect to the determination of priorities and allocation of water to other users for example for agriculture and food production, private and other commercial sectors and in the issuance of water abstraction licences. In the case of Trinidad and Tobago, the Water and Sewerage Authority (WASA) as this country largest public sector potable water and wastewater service provider is not required to have water abstraction licences.
- There is the risk of the service providers overriding rules on recommendations of the quantity of freshwater to be abstracted and resulting in over abstraction.

As a best practice, Jamaica, in its 2018 National Water Sector Policy and Implementation Plan, established and implemented an IWRM organizational structure under the then Ministry of Water, Land, Ministry of Water, Land, Environment and Climate Change. This Ministry had the portfolio responsibilities to oversee the implementation and operation of the IWRM processes. The IWRM is to be a multi-disciplinary, multi-sectoral group of public and private sector representatives, non-governmental organizations (NGO) and educational institutions that provide leadership in planning, co-ordination, implementation and monitoring of watershed projects, programmes and activities and liaising with local and international agencies regarding funding support for watershed management in Jamaica. Towards addressing this requirement, the proposed IWRM institutional structure for Jamaica is illustrated in figure 1 below.

Figure 1
Jamaica proposed IWRM institutional structure



Source: Jamaica, proposed IWRM Institutional Structure, Authors' interpretation, November 2020.

B. Human resources capacity requirements

Gaps in human resources capacity and human resources capabilities were identified in each of the seven countries examined. IWRM human and institutional capacity gaps were identified in hydrometeorological and climatological monitoring and reporting, disaster management, land use and controls of the freshwater extraction rates, pollution prevention, public-private sector partnerships and community engagements. The study also indicated the high rate of attrition of skilled personnel from the WRM public sector agencies.

There was demonstrated need for an increase in expenditures and incentives to support IWRM research and development. Research and development are also required on IWRM policies, water resources modelling,²⁵ data management, and operative linkages with resilience building, particularly addressing the economic, social, and environmental vulnerabilities of Caribbean countries. This also includes the management of COVID-19 and other public health requirements.

C. Coordination mechanisms

This study demonstrated that several sectors and agencies have IWRM functions and responsibilities. The main actors are ministries and other public-sector agencies, private sector entities, community groups, non-governmental organizations, academia, and bilateral and multilateral development and financing bodies. In all countries surveyed, IWRM coordination functions are often dispersed and assigned to various public sector agencies. Additionally, IWRM activities such as landuse, disaster and watershed management are often project-driven versus being institutionally led.

The IWRM coordination arrangements vary from country to country. These are, for example:

- The Bahamas: The IWRM coordination requirements for The Bahamas have to be managed across several islands. Freshwater availability decreases in groundwater resources as one moves from northern islands to southern islands. The primary public sector agencies having responsibilities for IWRM are the: Water and Sewerage Corporation (WSC), with its WRM Unit (WRMU), which has responsibility for optimal development of the country's water resources and the control of water quality. WRM by WSC includes the management of wellfields on the islands of New Providence and Eleuthera. The WSC has shared responsibilities with the Department of Environmental Health Services (DEHS) for water quality monitoring.
- Guyana: The WRM functions in Guyana are elaborated in various laws, national policy documents, strategic agendas and agencies.²⁶ With respect to agency assignments the Guyana Water Incorporated has the responsibility for water, sanitation and sewerage services. Other public sector agencies having WRM functions are the Ministry of Housing and Water, Municipalities, Ministry of Agriculture-Local Democratic Organs, the Hydrometeorological Department (Hydromet) - hydrology infrastructure and monitoring, National Drainage and Irrigation Authority. The Environmental Protection agency is responsible for regulating water pollution. Under this WRM arrangement, each agency interprets and implements assigned responsibilities in accordance to their respective mandates. This approach can result in an overlap and duplication of responsibilities.

²⁵ This includes having required human resources capacities to address surface water (including flooding) and groundwater quality and quality modelling.

²⁶ In November of 2021, the Government of Guyana issued for public consultation its Low Carbon Development Strategy (LDCS). This Guyana- LDCS includes specific IWRM elements, see document at: <https://lcds.gov.gy/>, cited December 21, 2021.

Towards addressing the need for a more coordinated IWRM approach across agencies, in 2008 Guyana established a National Water Council (NWC). The NWC is assigned the responsibility for management of Guyana's freshwater resources, formulation of a National Water Policy and IWRM implementation.

- The Jamaica Water Resources Authority (WRA) was established by the Water Resources Act of 1995 and with a mandate to regulate, allocate, conserve, and otherwise manage the water resources of Jamaica. Jamaica-WRA has the function of obtaining, compiling, storing, and disseminating data on water resources; prepares and updates Jamaica's Water Resources Master Plan, water quality control plans, regulates, and allocates the use of all freshwater resources and provides technical assistance to any department or agency of government, in respect of any projects, programmes or activities which relate to the development, conservation and use of water resources. However, the current institutional arrangement for administering the WRA functions is not legally binding and therefore risk being subjected to change.
- Suriname: The development of an IWRM system is listed in Suriname's National Development Plan 2017-2021.²⁷ For this country, its Ministry of Natural Resources is responsible for the water management and including the monitoring of compliance with rules and regulations with regards to WRM. However, the implementation of the various WRM tasks is spread over several ministries and departments. These departments, together with other agencies, form part of the institutional framework for water management. For example, the main supplier of potable water in the coastal region is the Suriname Water Company, the Ministry of Trade and Industry is charged with issuing company permits to the water bottling and soft drinks companies. The Maritime Authority of Suriname, under the Ministry of Transport Communication and Tourism, monitors the river water levels as related to water transportation. An effective IWRM for Suriname can provide for the identification of coordination gaps including a reduction in the overlap of responsibilities.

D. Communication and raising awareness

Communication and awareness-raising activities are conducted by each of the public sector agencies having WRM functions. These activities addressed potable water consumer use, non-revenue water loss,²⁸ conservation advices, water pollution and rainwater harvesting. Examples of these activities are:

- Non-revenue water loss: As part of a national campaign to respond in a more timely manner to water loss through leaks, Trinidad and Tobago-WASA has an app through which citizens can make reports on the location and descriptions of the leakages.²⁹
- Water Conservation: Through its WRA, Jamaica partnered with United Nations Educational, Scientific and Cultural Organization (UNESCO) to implement a water conservation education programme for teachers (WET).^{30,31}

²⁷ Republic of Suriname (2017). National Development Plan 2017-2021. Paramaribo: Suriname Planning Bureau Foundation. January 2017.

²⁸ Non-revenue water can be defined as water that has been produced and is "lost" before it reaches the customer. This loss can be through leaks, unauthorized connections or through legal usage for which no payment is made, reference <https://www.ib-net.org/toolkit/ibnet-indicators/non-revenue-water/>, cited September 03, 2021.

²⁹ Trinidad and Tobago Water and Sewerage Authority, see link at: https://www.wasa.gov.tt/WASA_ContactUs.html, cited December 15, 2021.

³⁰ The programme "Project Wet" was discontinued in 2014. However there are plans to revive this education programme.

³¹ Jamaica WRA launches education programme on water resources, see link at <https://jis.gov.jm/wra-launches-education-programme-on-water-resources-2/>, cited September 02, 2021.

- Rainwater harvesting: Barbados has a public education activity encouraging the harvesting of rainwater and for use in non-potable water demand activities as cleaning and irrigation.³²

E. Policy recommendations for IWRM institutional arrangements

- (i) Establish an IWRM institutional framework and organizational structure that is legally defined, has permanence, is adequately financed, and has appropriate human resources. The functions can include water resources assessment, regulation, allocation of the water resources for its uses, conservation, development and maintenance of a national water resources data and information database/system, development and implementation of water resources master plans and cross-sector policy coordination.
- (ii) National and regional training and educational institutions to have curricula on specialised WRM fields such as water resources assessment, including valuation, hydrological engineering, hydrogeology, watershed and environmental management. Considering the particular WRM challenges of the SIDS, opportunities should be explored for sharing of best practices through, for example, SIDS-SIDS cooperation.
- (iii) Establish a WRM data information public access system and to have a more participatory approach including the adoption of local practices supporting WRM decision making. These activities should be designed towards achieving long term behavioural changes for the management of water as a finite natural resource.
- (iv) Strengthen the National Stakeholder Coordination Mechanism and organizational structures, including IWRM in transboundary water management and water transfer arrangements as in the cases of Belize, Guyana, and Suriname.

³² Rainwater harvesting the way to go, see link at The Barbados Advocate, <https://www.barbadosadvocate.com/columns/editorial-rainwater-harvesting-way-go>, June 26, 2018.

IV. Management instruments

Management instruments include the tools and methods that enable decision-makers and users to make rational and informed choices between alternative actions for IWRM. It provides water resources assessment, plans for IWRM, demand management, data and information management and exchange, water allocation and conflict resolution, regulatory instruments, economic instruments, and social change instruments. Water resources quantity and water resources quality data are the basis of decision making for water supply projects and infrastructures.

A. Water resources assessment and demands

Water resources assessment aims to have a holistic and comprehensive understanding of the water resources situation and the possible opportunities, security and threats associated with its development and uses in a country. The assessment should address the surface and groundwater levels and associated qualities in both space and time, as well as assess the water requirements for the assumed uses.³³

Water demand assessments are the basis of the reconciliation between supply and demand to identify surplus and deficits, which are crucial to the policy and planning process. To assess the water resources availability and quality, and their long-term changes through consumptive water use, climate change, climate variability and land-use changes, reliable data is necessary. This data and information are the pillar of the national water information database and, therefore, critical to the IWRM process. This IWRM data are required to be regularly updated.

From the data obtained in the countries examined, Belize and Guyana mainly use surface water while the Bahamas and Barbados depend on groundwater supplies. Jamaica, Suriname and Trinidad and Tobago abstract both ground and surface water resources. In the case of Suriname, groundwater is mainly used in the urban centres, while surface water is used in the coastal and interior areas.

³³ This will include service providers in both the public and private sectors.

Desalination plants are also commissioned to augment the public water supply in the event of a prolonged drought and meet additional demand arising from increased economic activity or deficit in water resources supply in the area.

Countries have also invested in providing incentives for increased rainwater harvesting. Rainwater harvesting collection, storage and distribution are increasingly being viewed as an alternative mechanism for ensuring the security of water supplies in the Caribbean, particularly for communities not served from the central supplies or are underserved. Rainwater harvesting provides additional options for non-potable uses, for example, to supplement agriculture and other industrial demands; box 3 provides an example of a water harvesting project in Jamaica.

Box 3

Water harvesting project in Jacob's Ladder, Jamaica

In 2015, the Jacob's Ladder water harvesting project was implemented by UNDP with funding from the GEF Small Grants Programme and Australia Aid. The project, which services the Mustard Seed Community in this area (1 of 13 residential care facilities for adults with physical and mental disabilities), has greatly improved water access in sanitation, cooking and agricultural activities. This refurbished water catchment system now irrigates 50 hectares of crops which provide revenue for the community. The agroforestry system provides more than just food for this growing community but also a natural land degradation reversal system. Tree roots stabilise the soil and improve its quality, reduce rainfall runoff and allow the water to replenish underground water reserves. The goal is to reverse the impacts of climate change, by mitigating drought and flooding while boosting access to underwater reserves.

Source: Jacob's Ladder-No longer left Behind, cited <https://undpjamaica.exposure.co/jacobs-ladder-no-longer-left-behind>, July 25, 2021.

B. Water quality management

The management of surface and ground water quality is an integral component in IWRM. This includes having IWRM elements in the policy, planning, legislative, regulatory, compliance, enforcement and other management frameworks at the local watershed, national, and transboundary levels.

Activities affecting the quality of freshwater supplies in the survey countries include inadequate waste and wastewater management, unregulated small-scale mining, quarrying, uncontrolled use and disposal of agrochemicals, sea-level rise, increased salination of surface and groundwater systems, unregulated land use, inefficient use of produced water and over-abstraction at sources.

Each of the countries has national systems for monitoring water quality for potable water use. Standards used are based on the World Health Organization (WHO) guidelines for potable water and wastewater.³⁴ Member countries as Parties to the Basel Convention on Controlling the transboundary movement of hazardous wastes and their disposal, Rotterdam Convention on the prior informed consent procedure for certain hazardous chemicals and pesticides in international trade, the Stockholm Convention on persistent organic pollutants, and the Minamata Convention on Mercury will also be required to conform with compliance procedures stipulated under these agreements. Many Caribbean countries have also established legislation and rules for the importation, use, and disposal of single-use plastics (UNEP, 2019).³⁵

³⁴ WHO: Water Sanitation and Health, Drinking-water quality guidelines, available at: <https://www.who.int/teams/environment-climate-change-and-health/water-sanitation-and-health/water-safety-and-quality/drinking-water-quality-guidelines>, cited July 25, 2021.

³⁵ Rivers are often the conduit of plastic litter entering into coastal and ocean systems. Plastic including micro-plastics can affect the productivity of freshwater ecosystems: available at: <https://internationalmarinedebrisconference.org/index.php/plastic-debris-pollution-in-freshwater-environments-of-the-world/>, cited December 15, 2021.

To meet the requirements for a more effective and integrated approach to water pollution management, watershed management and coastal zones protection, the countries such as Barbados, Jamaica, Suriname and Trinidad and Tobago have established Water Pollution Legislative Rules to manage and control both point and non-point sources of water pollution.³⁶

C. Data and information management

Fundamental to the management of water resources is accessibility to data and information. Data is required to make informed decisions on managing all sources of water resources (WMO, 2020). IWRM data must be collected, analysed, verified, stored, disseminated, and used for decision making, assessment and reporting requirements. For example, in the case of Jamaica, its IWRM database is used to issue water abstraction rights and for development and environmental planning. Data and information further enable policy dialogue on priority issues, implementation and reporting.

Water resources data information and reporting are dispersed amongst many agencies at varying degrees in the countries studied. Data generation is often project-based and not sufficient, continuous, or consistent to provide a comprehensive information base to support the decision making on WRM. There is no public mechanism to access IWRM data, for example, a single online platform to disseminate water resources data and other information.

The IWRM data gaps and time lags in official statistics highlighted the need for reliable water resources data, statistical capacity investments, and new approaches to monitor and report on countries' commitments and WRM progress.

D. Policy recommendations for IWRM management instruments

- (i) Establish an institutionalised monitoring and accountability system for IWRM. This system should include having updated data on the status of water sources, abstractable volumes of ground and surface freshwater resources and sectoral demands and uses.³⁷ This will support data review and updating of national plans on a scheduled basis. The use of water resources data in decision making will also result in more effective planning and savings in investment costs.
- (ii) Ensure national laboratories for water quality analysis are adequately resourced and equipped, and that there is effective and timely data reporting. The operations of these water laboratories must be certified through recognised certification bodies.
- (iii) Ensure that each country has a national IWRM Database and Information System with real-time access to all stakeholders, particularly for disaster planning and management. This will require investments in geospatial technologies, citizen science participation and open data portal access. It is recommended that a shared data platform on IWRM resources be developed. This data platform can give controlled access to key stakeholders and provide read-only access to other stakeholders. This data management and reporting system will also meet the reporting requirements of SDG 6 targets and indicators and other regional and international multilateral agreements.

³⁶ See for example of the Trinidad and Tobago Water Pollution Rules, available at: <https://www.ema.co.tt/our-environment/water/> cited July 25, 2021.

³⁷ This will include having systems to address water resource allocation procedures, the assignment of charges for water resources abstraction by service providers and to reduce non-revenue water.

- (iv) Explore Rainwater Harvesting both for potable and non-potable uses. Training, capacity building, and infrastructure services can be further developed to collect, store, and treat harvested rainwaters as potable water for communities that are not served from a central water supply grid or are underserved. The harvesting and management of rainwater can reduce the dependencies on produced potable water or provide an alternative source where there are disruptions in supplies, for example, on the impacts of a disaster. Rainwater harvesting can also be directed for serving the agriculture and other non-potable water demand sectors.

V. IWRM and the COVID-19 pandemic management

Public health efforts to effectively control the spread of COVID-19 at the national level have revealed the complex interaction among human, economic and natural systems and the systemic nature of risk. Management measures to suppress the spread of the Covid-19 virus require that citizens have sustained access to acceptable amounts of potable water. The WHO guides that safe water, sanitation, hygiene (WASH), and waste management are essential for preventing and protecting human health during infectious disease outbreaks (WHO, Interim guidance, 2020). The impact of the pandemic underscored that the management of risk, including recovery policies, must be conducted through an integrated and systematic approach (ECLAC, 2021). Having resilient water security systems are essential for preventing and combatting current and future pandemics. This is also a requirement in the post-pandemic recovery and rebuilding phases. The strengthening of water security measures is essential for preventing and combatting future pandemics and other water-borne communicable diseases.

To support compliance with the COVID-19 public-health protocols, Governments took actions in providing nationwide access to potable water. All countries decided to address potable water distribution as an essential service. There was additional facilitation for online bill payments, arrangements to defer payments, and deferred disconnections to support these actions. Further, in the case of The Bahamas, customers who were disconnected before the Pandemic were reconnected as a measure to provide access to potable water. Additional services were provided to support communities with truck-borne potable water supplies. Targeted COVID-19 educational and awareness campaigns were delivered to communities served from communal WASH facilities.

With respect to the demands due to the COVID-19 pandemic control measures and impacts on IWRM operations, the following were identified:

- To have greater accessibility to WASH services for all citizens. Particular attention has to be provided for WASH services to women, girls, youth and persons with disabilities.

- Potential decrease of revenue through water tariffs from the commercial sectors. Closure of the services sectors, including restaurants, hotels, tourism, and cruise vessels, decreased the potable water and wastewater demand.
- COVID-19 lock-down measures delayed progress in water infrastructure development and maintenance.
- Increase in domestic water demands due to work and school from home COVID-19 control measures.
- The loss of jobs and income impacted many, including women, girls, youth, and other vulnerable communities. These consumers will require financial support and other incentives to meet their water charges.

A. Policy recommendations for IWRM and COVID-19 pandemic management

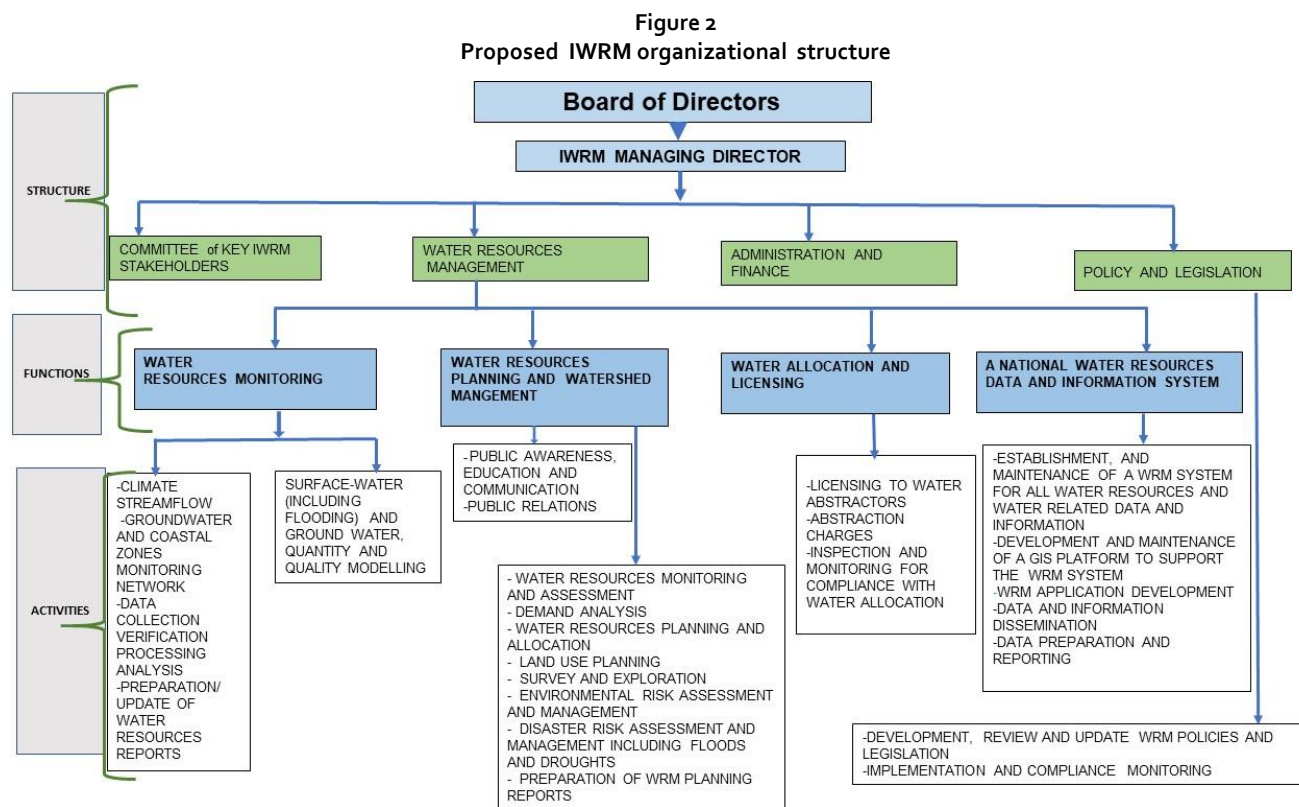
- (i) Establish that WRM is a component of the National COVID-19 Response and Recovery Plan. This arrangement should include having policies to support ministerial and inter-agency coordination, thereby providing timely and informed decision making.
- (ii) IWRM systems should include operational and recovery plans to address the COVID-19 Pandemic. This arrangement should aim to provide continuous monitoring, assessment, and reporting of the quantity and quality of freshwater resources.

VI. Proposed IWRM organizational structure

Effective WRM administered through an IWRM organizational structure is necessary for achieving the SDG 6.5 targets under the 2030 Agenda for sustainable development. The mainstreaming of IWRM into sustainable development decision-making processes will require significant shifts in the governance, policy setting, planning, institutional structures, financing, engagement of the relevant public and private sectors stakeholders,³⁸ assessment, monitoring and reporting. The strengthening of IWRM measures is also essential for preventing and combatting future pandemics and other water-borne infectious diseases.

The policies examined across the seven countries considered in this study, recommend that IWRM arrangements should be legally and institutionally independent of national water utility providers. In consideration of this recommendation, a proposed IWRM Organizational Structure includes major functions and activities is provided in figure 2.

³⁸ This will include the civil society sectors.



Source: Authors' interpretation, 2021 and based on 'Water Resources Management Strategy for Trinidad and Tobago- Final Report, DHV Consultants BV in association with Delft Hydraulics and Lee Young & Partners, 1999.

The proposed IWRM organizational structure, as provided in figure 2, outlines the major IWRM operational structures and their assigned functions. Under each function there are specialised and assigned WRM activities. The proposed structure has defined functions with corresponding activities for water resources monitoring, data and information system which can provide for the reporting obligations of the SDG 6 of 2030 Agenda. Member countries can further adapt and adjust this proposed structure to meet local conditions.

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Annexes

Annex 1

Model Questionnaire on National Policy interventions responding to common IWRM Challenges in the Caribbean SIDS

Introduction: The information to be obtained will seek to identify **Policy interventions responding to common IWRM Challenges in the Caribbean SIDS**. The IWRM dimensions to be addressed in this survey include Enabling Environment, the Institutional Structures (roles and responsibilities), Management Instruments and the Financing.

Section 1: Enabling environment

1. What is the National Vision for Integrated Water Resources Management?
2. What are the goals for sustainable water management?
3. What are the Policies for Integrated Water Resources Management and including any policies with respect to water use, protection, and conservation?
4. What Water Management Strategy is in place and what is the extent of implementation?
5. Are there IWRM implementation Plans and what is the extent of implementation?
6. What are the National Legislation and Regulations to achieve the policies and goals?
7. What is the present status and extent of implementation for an enabling Environment for Integrated Water Resources Management (IWRM)?
8. What are the International water agreements that your country is party too?

Section 2: Institutional Structure:

This section will explore the Institutional Roles for IWRM. Focus areas include the status of the present IWRM situation, gaps, challenges, successes. Lessons learnt should also be indicated.

1. What is the Institutional Framework for IWRM in your country?
2. What is the organizational structure for the IWRM organization and or the Water Resources Agency?
3. What if any are the challenges in the current IWRM institutional structure?
4. What are the Relationships among Water management Institutions and how can they be improved?
5. What is the role of stakeholder institutions and their goals (including political, social, and economic) in supporting the implementation of IWRM?
6. Identify stakeholders normally involved and the extent of involvement (whether from planning to implementation phase).
7. What is the Capacity of stakeholder organizations to undertake their roles and responsibilities in the context of Integrated Water Resources Management?
8. Identify Effectiveness, Gaps and Lessons learned from stakeholder engagement including engagement with academia, private sectors, community groups and civil society.

Section 3: Cross Sector Coordination Mechanisms: Describe what are the National cross-sector coordination mechanisms in Integrated Water Resources Management.

Section 4: Communication and Outreach strategies. Identify what are the current communication and outreach strategies for IWRM in your organization. Please include the input from appropriate stakeholders, identify what is effective, what are the gaps and what can be established to make it effective. Is there public education on water resources?

Section 4: Management Structure: This section will explore the Management Instruments for IWRM. It should provide an indication whether the instruments/issues are undertaken, how, by which stakeholder in IWRM, whether they are effective, the gaps, challenges, successes, lessons learnt and recommendations to advance the process and fill the gaps.

1. What Water Resources Assessment including climatic, surface water and groundwater monitoring, and research and development is undertaken?
2. Is Master Planning and water resources allocation undertaken?
3. Is Water Demand analysis undertaken?
4. Have water conservation plans been developed and implemented?
5. What Water Conservation (for water resources sustainability) including Treatment /Reuse of water /wastewater, and Watershed management actions are undertaken?
6. Is Demand management (efficient use) undertaken? How effective is it?
7. Are there sources protection zones?
8. Are there water resources abstraction licenses and fees? How is this implemented?
9. Has a water quality control plan been established and implemented?
10. Has flood management plans and guidelines been developed and implemented?
11. How is Water Resource Development and Distribution undertaken for Domestic water, Industrial water, Agricultural water, water for energy, water for the multi-purpose dam/reservoirs, drainage/flood control, sewerage/conveyance, and water treatment?
12. Does a Database management and National Integrated Water Resources Management Information System and exchange exist? How is it implemented and is it effective? What is in the databases information system?

Section 5: Financing:

1. Please review the public sector budgeting for integrated water resources management implementation for the period 2015-2019.
 - a) Was this budget adequate and effective to undertake the actions planned?
 - b) What are the challenges and recommendations for effectiveness for utilisation of the budget?
2. What were the sources of revenue such as taxes, tariffs and charges from abstraction, pollution, and licenses for this period?
 - a) Was the revenue adequate?
 - b) What are the challenges and successes achieved in revenue collection? Also state the recommendations for improvement of revenue collection.

Annex 2

Summary of IWRM legislations in seven Caribbean countries

The Bahamas	Barbados	Belize	Guyana	Jamaica	Suriname	Trinidad and Tobago
Environmental Planning and Protection Act (2019)	Planning and Development Act (2018)	Belize's National Integrated Water Resources Act (2010)	Disaster Risk Management Bill (2019)	Office of Utilities Regulation Act (1995) as amended by the Office of Utilities Regulation (amendment) Act (2015)	The Environmental Framework Act (2020)	The Water and Sewerage Act (1965)
Water and Sanitation Regulation Bill (2016)	Income Tax Act (2009)	Water Industry Act (2001) Public Utilities Commission Act (1999)	<i>Amerindian Act (2006)</i>	Public Bodies Management and Accountability Act (2001)	The Drilling Act (1952)	Waterworks and Water Conservation Act (1944)
Forestry Act. (2010)	Tourism Development Act, 341 (2002)	Coastal Zone Management Authority Act (1998)	<i>The Mining Amendment Regulations (2005)</i>	Forestry Act (1996)	The Nature Conservation Act (1992)	Environmental Management Act (2000)
Environmental Health Services Act (1987)	Utilities Regulation Act (2001)	Effluent Discharge Limitations Regulations (1996)	The Drainage and Irrigation Act (2004)	Disaster Preparedness Act (2015)	Water board Act of (2005)	Regulated Industries Commission Act (1945)
Water and Sewerage Corporation Act(1976)	Marine Pollution Control Act (MPA) Cap 392A Coastal Zone Management Act Cap.391 (1998)	Environmental Protection Act (1992)	The Water and Sewerage Act (2002)	Water Resources Act (1995)	The Act on Territorial Sea and the Contiguous Economic Zone (1978)	Tobago House of Assembly Act (1996)
Environmental Health Services Act (1987)	Highways Act Cap 289 (1998)	Petroleum Act (1991)	Environmental Protection (Water Quality) Regulations (2000)	Natural Resources Conservation Authority (NRCA) Act (1991)	The Forest Management Act. (1992)	Town and Country Planning Act (1969)
	The Factories Act (1984)	Solid Waste Management Authority Act (1991)	Environmental Protection Act (1996)		Protection of water resources for drinking water supply	Municipal Corporation Act (1990)
	Water Services Regulations (SI No. 150) (1982)	Mines and Minerals Act (1989)	East Demerara Water Conservancy Act (1980)	Public Health Act (1985)	The Water Supply Act (1938)	Public Health Ordinance Chap 12:04
	Sewerage Regulations (SI No. 151) (1980)	Belize Fisheries Act (1948)	The Creeks Act (1998)	Irrigation Act (1949, and amendments)	The Price-fixing and Price-control act (1957)	
	The Town and Country Planning Development Order (1972)	Belize Public Health Act (1943)	The Mahaica-Mahaicony-Abary Agricultural Development Authority Act, (1977)	Watershed Protection Act (1963)	The Anchylostomiasis act (1937)	
	The Health Services Act (1969)		Water Commissioners Act (1886)	Flood-Water Control Act (1958)	The Mosquito's Act (1952)	

The Bahamas	Barbados	Belize	Guyana	Jamaica	Suriname	Trinidad and Tobago
	Disposal of Offensive Matter (1969)			Town and Country Planning Act (1958)	Wastewater management	
	Nuisance Regulation (1969)			Parishes Water Supply Act (1889)	The Building State Order (2002)	
	Irrigation Act (1967)				The Nuisance Act (1930)	
	Soil Conservation (Scotland District) Act (1951)				The Harbor Decree (1981)	
	Underground Water Control Act (1953)				The Nuisance Act (2011)	
	Porey Spring Act (1864)				The Harbor Decree (1981)	
	Three Houses Spring Act (1713)					

Source: Authors' interpretation, 2021.



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