

White Paper on Governance and Climate Resilience in the Water Sector in the Caribbean

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Introduction

The Caribbean, together with other Small Island Developing States in the Pacific, Africa, Indian Ocean, Mediterranean and South China Seas (AIMS), are among the countries most vulnerable to the impacts of climate change. In recognition of this vulnerability, the Heads of Government of the CARICOM region in July 2009 approved a '*Regional Framework for Achieving Development Resilient to a Changing Climate.*' An Implementation Plan for this Regional Framework, was approved three years later (2012) by CARICOM Heads in Suriname. This Implementation Plan identifies water as the most important cross-cutting issue for climate-compatible development in the region.

Existing water governance arrangements within Caribbean countries are weak and not capable of addressing the water challenges they are facing (Global Water Partnership, 2014). These challenges include water scarcity, deteriorating water quality, the impact of extreme events, and the provision and maintenance of water services (Cashman A. , 2012) (United Nations Environment Programme, 2012). Other critical issues have been highlighted, such as supply-driven management, fragmented and subsector approaches to water management, lack of information, inadequate technical competencies, and low levels of investment in the water sector (Global Environment Facility Integrating Watershed and Coastal Area Management (GEF-IWCAM), 2008) (United Nations Development Programme-DHI, 2007).

The issues related to water and climate change are many and varied. The increased sea surface temperatures that are associated with global warming are projected to lead to more intense hurricanes and heavier precipitation. Severe hurricanes have devastating impacts on national water infrastructure, as can be seen from the impacts of Hurricane Maria on the water infrastructure of countries like Dominica and Puerto during the 2017 Atlantic Hurricane season. Similarly, more intense flooding also renders water systems, particularly in rural areas in the Caribbean, inoperable. Climate change is also expected to result in more frequent droughts in the Caribbean, and this will also negatively affect Caribbean water systems. Sea level rise, which is already being experienced in the Caribbean, will lead to the salinization of aquifers, which will pose a serious problem for those Caribbean countries like Barbados and Antigua and Barbuda that depend on groundwater sources. Moreover, climate change, by causing an intensification of weather events, can increase the risk of pollution of water supplies from damage to wastewater treatment and/or collection systems, flooding of septic tanks and the consequential contamination of groundwater sources.

Over the last five years, several major international meetings have highlighted the critical need for action to safeguard the supply of water. The United Nations Conference on Sustainable Development - Rio+20, the Third International Conference on Small Island Developing States, the Sendai Framework on Disaster Risk Reduction, the Addis Ababa Action Agenda, and the 2030 Agenda for Sustainable Development all speak to the important role of water in sustainable development. These international conventions provide important avenues to leverage technical and financial support for the water sector in the Caribbean.

However, the issues confronting the water sector in the Caribbean are not all due to the impacts of climate change or extreme weather events. While climate change and natural disasters will continue to exacerbate the water situation in the region, there are several other challenges related to governance and the level of investment in the sector, both at the national policy level and at the level of the water utility. The state of Caribbean water utilities and water quality and accessibility in urban and rural populations also present serious challenges, which must be addressed.

This White Paper seeks to present the main issues surrounding the water sector in the Caribbean and articulate broad policy recommendations for consideration in the development of a strategy to address these issues.

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Governance

Ownership

In most of the countries in the English-speaking Caribbean, the water utility companies are owned by the governments. In some countries, particularly where desalination plants operate, there are also quasi-government type arrangements (Cole Engineering Group, 2015)¹.

Regulation

Regulation of the water sector is still in its early stages in the region. Because most of the utility companies are State-owned monopolies, regulation is usually left to the parent ministry with responsibility for the water sector. Most of the regulators, where they exist, serve primarily in an advisory capacity to the Minister. Their statutory mandate (Cole Engineering Group, 2015) can be described as:

- To promote or protect consumer interests;
- To publish information;
- To promote competition and promote the relevant Ministries on any applicable matters, as well as other duties and functions; and
- To promote tariffs based on standards for operation and good economic practice.

The water sector regulatory authorities operating in the region are: (i) the Public Utilities Commission in Guyana, (ii) the Office of Utility Regulation in Jamaica, (iii) the Public Utilities Commission in Belize, (iv) the Public Utilities Commission in the Bahamas, (v) the Regulated Industries Commission in Trinidad and Tobago, and (vi) the National Utilities Regulatory Commission in Saint Lucia.

Regional Institutions

There are several institutions within the Caribbean region that are associated with the water sector. These are:

- The Caribbean Water & Sewerage Association (CAWASA)
- The Caribbean Public Health Agency (CARPHA)
- The Caribbean Community Climate Change Centre (CCCCC)
- The Global Water Partnership Caribbean (GWP-C)
- The Caribbean Institute of Meteorology and Hydrology (CIMH)
- The Caribbean Water and Wastewater Association (CWWA)
- Caribbean Agricultural Research and Development Institute (CARDI)
- The Organisation of Eastern Caribbean States (OECS)
- The Caribbean Community (CARICOM) Secretariat
- Centre for Resource Management and Environment Studies (CERMES) of the University of the West Indies.
- The Caribbean Development Bank (CDB)
- The United Nations Development Programme (UNDP)

- The United Nations Environment Programme: Caribbean Environment Programme (UN Environment CEP) and the Caribbean Sub-Regional Office (UN Environment CSRO)
- The Inter-American Development Bank (IDB)
- The Food and Agriculture Organization of the United Nations (FAO)
- The Pan American Health Organization (PAHO)/World Health Organization (WHO)

Unfortunately, however, the governance of the water sector at the regional level is not well organised or coordinated. The Organisation of Eastern Caribbean States (OECS) has sought to develop a common water policy and legislation for the Member States of the OECS. The Caribbean Community (CARICOM) has not managed to coordinate a regional water sector development agenda through its Sustainable Development Directorate, which has responsibility for the water portfolio. An initiative to form the Consortium of CARICOM Institutions on Water, which was approved by CARICOM and which sought to develop a common regional water framework for water resources management, has not progressed (Cashman, Cox, Daniel, & Smith, 2014).

In recent years, the Caribbean Water and Wastewater Association (CWWA) has attempted, through its annual High-Level Forum, to provide a mechanism for discussion of the critical issues confronting the water sector at the highest political and policy levels. As commendable and necessary as this initiative by the CWWA has been, it lacks the requisite anchor within the official CARICOM legal and institutional infrastructure. To ensure the appropriate political commitment and follow-through of the important, often cross-sectoral issues presented at the CWWA High Level Forum, there is a need for the outputs and recommendations of this Forum to feed into an annual meeting of the CARICOM Council for Trade and Economic Development (COTED) on the Environment, where binding policy decisions can be taken.

Challenges

Institutional Arrangements

A study on the Governance of the Caribbean Water and Wastewater Sector (Castalia, 2017) identified the multiplicity of agencies charged with responsibility for the sector as the most obvious institutional deficiency. The Study found that unfortunately, in some instances, responsibilities between bodies are not clearly established, which makes it difficult to create policies, regulate, and fund the sector. Additionally, there is no coordination at the national level of the closely inter-related issues of finance, agriculture, tourism, health, water and wastewater.

National Policy

At the national policy level, the following institutional deficiencies exist (Castalia, 2017):

- Multiple ministries are generally involved in making policies for the water and sanitation sector.
- In several countries, the regulatory authority does not have full regulatory responsibilities over the water and sanitation sector. The Ministry with responsibility for water is often the agency where the final decision-making authority resides.
- All countries have a ministry of finance that allocates funding to the public water utility. Nevertheless, some countries also grant responsibility for approving finances to other ministries.

Governance Arrangements

At the overall governance level, the following deficiencies were observed (Castalia, 2017):

- Long-term financial plans are seldom included in sector policies.
- Many countries do not have established measurable targets for meeting their policy objectives in the water and sanitation sector.
- Legal and institutional frameworks are often poorly developed and outdated.
- Tariffs regimes are often not well developed.
- Managerial autonomy is limited in some water utilities.
- Responsibilities and procedures are not well defined.
- There is a lack of transparency and consumer involvement.
- Financial planning does not consider the costs for expanding and improving services.
- There are weak incentives for operating efficiency.
- There is limited competence, resources, and credibility for effective utility supervision.

Also, there is seldom coherence between water sector plans and national physical development plans.

Land Use and Water Resource Management

In several Caribbean countries, the absence of effective land use policies and robust, empowered water resource management authorities, have resulted in degradation of watersheds and the compromising of the integrity of water sources. Also, contamination of water sources from upstream agricultural activity has impacted negatively on the quality of water available for use. The conversion of catchments for development and agriculture poses an increasing threat to stream flows (Cashman, Cox, Daniel, & Smith, 2014). There is increasing evidence of solid wastes, including plastics, in drinking water resources, and worryingly, the emergence of contaminants such as hormones, endocrine disruptors and drugs in the water supply. Industrial activity, such as mining, and inappropriate sewage disposal have caused contamination of groundwater supplies in countries such as Jamaica and Barbados (Cashman A. , 2013). It is clear, therefore, that countries need to adopt integrated water resources management (IWRM) for a more comprehensive and sustainable approach to the management of land use and water resources.

Integrated Water Resources Management

Article 26 of the Plan of Implementation of the 2002 World Summit for Sustainable Development established a clear role for Integrated Water Resources Management (IWRM), based on the four Dublin Principles, as the framework at the international level through which countries should seek to organize and manage their water sectors (Global Water Partnership, 2014). The Dublin Principles are:

1. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment.
2. Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.
3. Women play a central role in the provision, management and safeguarding of water.
4. Water has an economic value in all its competing uses and should be recognized as an economic good.

Integrated water resources management is a political process in which societal, developmental and ideological factors must be reconciled, and one that will involve the resolution of conflicts of interests at many different levels (Global Water Partnership, 2014).

IWRM stresses cross-sector integration, not only as a support to development, but as a process and framework that is sensitive to country-specific geographic, historical, cultural, social, and economic conditions (Global Water Partnership, 2014).

Wastewater Management

The management of wastewater has, for a long time, been an issue of serious concern in the Caribbean region. Untreated sewage is one of the major threats to public health and biodiversity in the Caribbean. It has been observed that 85% of the wastewater entering the Caribbean Sea remained untreated (GEF Caribbean Regional Fund for Wastewater Management (CReW), 2016). Additionally, 51.5% of households lacked sewer connections, and only 17% of households were connected to acceptable wastewater collection and treatment systems (Pan American Health Organization (PAHO), 2001).

Freshwater and Coastal Zone Management

Because of the nature of Small Island Developing States like the Caribbean Member countries, there is a very close relationship between the management of fresh water and the management of the coastal zone. This 'continuum' of freshwater and coastal waters (Global Water Partnership, 2000) requires that the managers of water resources pay close attention to the impacts of their actions on the coastal resources. Again, as with land and water resources management, there needs to be an integration of freshwater resources management and coastal zone management.

Data Management

The collection and analysis of empirical data on the water sector has been identified as a major deficiency. There is very little certainty, in any of the Member States of the region, of the volume of the available water resource. The paucity of evidence and the lack of an evidence-based culture for decision making in the region have often resulted in sub-optimal use of existing resources and the prolonged execution of ineffective policies. When this is combined with the absence of a national water plan that takes into account the needs of other sectors, the result is decision making and policy formulation that appears arbitrary and improperly focused.

Therefore, there is need for 'robust data management tools to enable the preparation of accurate information for modelling and projections, and to support planning and development'. Also, consideration should be given to introducing a statutory requirement for plans to be produced and updated regularly as part of the regulatory process.

The following specific water information needs have been identified:

- Setting up of one central repository for water-related data to support implementation of a National Water Information System (NWIS).
- Improving quantity, type, placement and maintenance of instrumentation for data collection for sea level rise (SLR), groundwater aquifers, river flows, flood mapping and renewable water.
- Assessment of impact on water resources from changing distribution patterns due to land use.
- A water census to value the resource.
- Planning, including flooding and drought management.
- Establishment of a fully functioning water resources management unit.
- Expansion of existing water information systems to include forecasting and early warnings.
- Training and capacity building in data entry, analysis and dissemination.
- Regular reporting on the State of the Water Sector.

Community Engagement

It is not possible for any government to manage the national water resources effectively without the engagement and participation of the public, individually and through community-based and other civil society organisations. Therefore, local communities should be enlisted as essential allies in protecting water resources, and they should be given meaningful roles in helping to shape the decisions that are made concerning the management of the resource. Every effort must be made to educate consumers and communities and involve them in managing their water resources. Creative communications and messaging is necessary, encouraging school children and communities to learn and act, including advocating with politicians on this issue (Moss, 2015).

Water Availability

Water Resources

The primary water supply sources in the Caribbean are groundwater, surface water, springs and desalination. The abstraction of groundwater represents the largest proportion of water supply, accounting for approximately 52.5% of supply, while surface water accounts for 35.8%, desalination 11.6%, and rainwater harvesting less than 1% (Cole Engineering Group, 2015). Recently, there have been efforts to explore the potential for the use of wastewater and biosolids/sewage sludge as a resource, specifically for irrigation of agricultural land, small farms, hotel grounds and golf courses (Sustainability Managers, 2016)

There is a growing gap in several Caribbean countries between demand for freshwater and the ability to meet that demand. Barbados is using almost 100 percent of its available water resources, Saint Lucia has a 35 percent water deficit, in Nevis the deficit is 40 percent, and Trinidad and Tobago has been operating at a deficit since 2000 (Cashman, Cox, Daniel, & Smith, 2014).

Surface water accounts for the larger proportion of water supply in Dominica (100%), Grenada (100%), Saint Lucia (100%), St. Vincent and the Grenadines (89%), Belize (62%) and Trinidad and Tobago (59%), while desalination is the main source in Anguilla (100%), Bahamas (100%), British Virgin Islands (100%), Cayman Islands (100%), Turks and Caicos (100%) and Antigua and Barbuda (66%) (Cole Engineering Group, 2015).

Challenges

Among the challenges identified with respect to water availability and distribution are the following:

- There are seasonal shortages in some countries, resulting in piped water coverage in some countries being below the average coverage for Latin America and the Caribbean.
- Collection and treatment of wastewater in most jurisdictions in the Caribbean is noticeably lacking.
- The quality of service provided by State-owned utilities is not adequate.
- Information regarding quality of service and operating efficiency is poor in many of the water utilities.
- Non-revenue water levels are high.
- Some aquifers have become unusable because of over-abstraction, which in turn has hastened saline intrusion.
- Some groundwater sources have become too polluted because of contamination from mining activity, agricultural chemicals and sewage.
- Reductions in groundwater recharge and flows have reduced the availability of water in aquifers.
- Tariffs do not cover the cost of service.
- Many water utilities in the Caribbean are not investing enough in their assets.

Water and Health

Developing countries face significant health risks from water-borne infectious diseases. It has been determined that infectious diseases are the largest water-related mortality risks faced by households in these countries (Whittington, 2013). In countries with inadequate potable water distribution or poor sanitation services, the likelihood of increased mortality from water and sanitation-related diseases increases.

There is also the potential for contamination of water sources from agricultural and mining activity, which can have very significant negative health impacts.

Water for Agriculture

Due to the inconsistent performance of the agriculture sector in the Caribbean over the past decade or more, the demand for water for agriculture has declined. There are some countries, however, such as Guyana, Belize and Jamaica, where this need is still significant. Climate Change models for the Caribbean suggest that at a 2 °C global warming threshold, the total annual rainfall for CARICOM countries is expected to decrease by ten to twenty percent, compared to the present (Simpson, 2010). This will place significant constraints on the availability of water for agriculture.

In the Caribbean, food production systems are still based mainly on rain-fed agriculture. This has led to seasonality in the production of certain crops. As rainfall patterns become more variable and unpredictable, this will lead to a change in the yields of certain crops. Research will need to be conducted into cultivars that are more drought tolerant. Where irrigation is employed, the form of irrigation will have to be as water-efficient as possible.

It has been suggested that water-constrained countries will exacerbate their water security issues if they strive for food self-sufficiency, rather than achieving food security through trade. This has led to the concept of 'virtual water', where by importing food, water-constrained countries will in effect be importing water from more water-endowed countries (Global Water Partnership, 2000). It is clear, therefore, that considerations over water for agriculture will have significant impacts on agriculture policy and domestic and regional food security.

Water for Tourism

The tourism sector is an important driver of economic growth in almost every Caribbean island. It has been reported that tourists may consume up to three times as much water as the local population and the supply of water to hotels can account for between 10% and 15% of all water supplied by municipal distribution systems (Cashman A. , Water Security and Services in the Caribbean, 2013). As the tourism industry continues to grow in Caribbean jurisdictions, its demand for water will continue to pose a challenge for national authorities.

Treated Wastewater

Increasingly, treated wastewater and sewage sludge are viewed as a potential resource. It presents an opportunity to improve waste management, but even more importantly, a valuable medium to attract investment in sewage and wastewater management by the public

and private sectors (Sustainability Managers, 2016). The safe reuse of treated effluent, can make more water available for agriculture, aquifer recharge, aquaculture, firefighting, flushing of toilets, industrial cooling, park and golf course irrigation, formation of wetlands for wildlife habitats, and other non-potable needs. Additionally, wastewater sludge can be used as fertilizer, to manufacture construction materials and to generate biogas and biofuels (Sustainability Managers, 2016).

Climate Resilience and Disaster Risk Reduction

Background

Freshwater systems are among the systems that are most vulnerable to climate change (IPCC, 2007). According to the UNDP (Simpson, 2010), climate change will lead to increased water insecurity in most CARICOM nations. This will manifest as a decline in rainfall levels, less reliability of surface water reserves, sub-optimal groundwater recharge, and an increase in the frequency and severity of drought. Moreover, the increased variability in the hydrological cycle will necessitate a re-evaluation of assumptions on stream flows, aquifer recharge rates, sustainable levels of abstraction, and yields from surface and groundwater sources (Cashman A. , 2013).

Higher global temperatures will cause more rapid melting of Polar ice caps and thermal expansion of the oceans, which in turn will result in sea level rise. For countries in the Caribbean that depend primarily on aquifers or groundwater sources for their water supply, this saline water intrusion of aquifers from sea level rise, in some instances worsened by over-abstraction and lower rates of recharge, will have serious negative repercussions for the water supply.

Increases in average global temperatures higher than 1.5 degrees Celsius will result in stronger hurricanes, carrying greater levels of precipitation. Therefore, the damage to national water and wastewater/sanitation infrastructure that accompanies severe storms and the more frequent flooding and debris flows that are expected in the Caribbean because of climate change, will place water resources and water and wastewater infrastructure, which have not been designed or built to withstand these more extreme conditions, under severe stress.

Changes in the volume and quality of surface water and groundwater will impact on the reliability of safe water supplies, on exposure to damaging flood events, on the availability of water for industrial purposes, on water-borne transport, water-related diseases, and aquatic ecosystems and the services they provide (Kundzewicz, 2008).

Anticipated Climate Change Impacts

The effect of Climate Change on the water sector in the Caribbean is expected to range from impacts on water resources to damage to water and wastewater infrastructure (Global Water Partnership-Caribbean & Caribbean Community Climate Change Centre, 2014):

- Drought risk to surface water reservoirs, river flows and aquifers, leading to supply deficits for water services
- Drought leading to salinization of aquifers (compounded by over-abstraction)
- Drought reducing dilution of pollutants and wastes, causing water quality problems for service providers

- Drought causing a reliance on water trucking and desalination, increasing the cost of water provision to consumers
- Coastal, river and surface water flood risk to water infrastructure, causing water supply contamination, service outage and damage to assets
- Long term sea level rise and coastal erosion, presenting a risk to water infrastructure
- River flooding causing turbidity and sedimentation, damaging infrastructure and causing treatment problems
- Storm rainfall mobilising polluted runoff, leading to water treatment problems and public health risks.
- Intense rainfall causes overloading of wastewater systems and this may cause raw sewage to flow into receiving systems.

Broadly categorized, these climate-induced water security challenges may be identified as (Global Water Partnership-Caribbean and Caribbean Community Climate Change Centre, 2016):

1. Water sector infrastructure exposed to damage and disruption from water-related hazards
2. Effectiveness of community and urban water supply systems exposed to increasing climate vulnerability
3. Effective management of water resource quantity and quality threatened by a changing climate
4. Increasing demand and insufficient water use exacerbating the vulnerability of existing water supply systems and sources
5. Agricultural production vulnerable to seasonal rainfall and drought
6. Escalating costs of flood-related damage and losses

Vulnerability Issues

Climate-related vulnerability issues in specific Caribbean countries associated with the water supply include the following (Cole Engineering Group, 2015):

- **Water scheduling:** Anguilla, Guyana, Saint Lucia, and Trinidad and Tobago;
- **Drought events:** Anguilla, Antigua and Barbuda, Barbados, Dominica, Grenada, Jamaica, Saint Lucia, St. Vincent and the Grenadines, and Turks and Caicos;
- **Flooding:** Anguilla, Guyana, Saint Lucia, Trinidad and Tobago, British Virgin Islands, and St. Vincent and the Grenadines;
- **Contamination, saline intrusion:** Anguilla, Antigua and Barbuda, Cayman Islands, Barbados, Belize, Guyana, St. Kitts and Nevis, and Turks and Caicos;
- **Turbidity problems:** Dominica and Trinidad and Tobago; and,
- **Landslides and Debris Flows:** Dominica, Saint Lucia, St. Vincent and the Grenadines and British Virgin Islands.

Treatment of Water in Major International Agreements

Background

Every major international development agreement that has been adopted by the global community over the past five years has recognized the important role that water must play in securing positive outcomes for citizens and ensuring the sustainability of development efforts. This acceptance of the role of water provides an avenue for developing States, such as ours in the Caribbean, to leverage technical and financial support for the water sector.

The Third United Nations Conference on Sustainable Development

The outcome document of the Third United Nations Conference on Sustainable Development, Rio+20, held in Rio de Janeiro in Brazil in 2012, entitled 'The Future We Want', stated "We recognize that water is at the core of sustainable development as it is closely linked to a number of key global challenges. We therefore reiterate the importance of integrating water in sustainable development and underline the critical importance of water and sanitation within the three dimensions of sustainable development."

The SAMOA Pathway

At the Third International Conference on Small Island Developing States (SIDS) in Samoa in 2014, the international community reflected, "that small island developing States face numerous challenges with respect to freshwater resources, including pollution, the overexploitation of surface, ground and coastal waters, saline intrusion, drought and water scarcity, soil erosion, water and wastewater treatment and the lack of access to sanitation and hygiene. Furthermore, changes in rainfall patterns related to climate change have regionally varying and potentially significant impacts on water supply."

The Sendai Framework for Disaster Risk Reduction

The important role of water in disaster risk reduction was noted in the Sendai Framework for Disaster Risk Reduction, which pledged, "To promote the mainstreaming of disaster risk assessment, mapping and management into rural development planning and management of, inter alia, mountains, rivers, coastal flood plain areas, drylands, wetlands and all other areas prone to droughts and flooding, including through the identification of areas that are safe for human settlement, and at the same time preserving ecosystem functions that help to reduce risks."

The 2030 Agenda for Sustainable Development

The importance of the water sector to the global development agenda was further amplified in Resolution 70/1 of the United Nations General Assembly on 25 September 2015, entitled 'Transforming our world: the 2030 Agenda for Sustainable Development'. This resolution articulated seventeen Sustainable Development Goals (SDGs) for a fifteen-year global development agenda. The sixth goal, SDG6, aims to "Ensure availability and sustainable management of water and sanitation for all".

SDG 6 is further broken down into eight targets, namely:

Target 6.1 – Drinking Water

Target 6.2 – Sanitation and Hygiene

Target 6.3 – Water Quality and Wastewater

Target 6.4 – Water Use and Scarcity

Target 6.5 – Water Resources Management

Target 6.6 – Water-Related Ecosystems

Target 6.a – International Cooperation and Capacity Building

Target 6.b – Stakeholder Participation

The importance of water in the achievement of the 2030 Agenda for Sustainable Development is not confined to SDG 6. Several of the other Sustainable Development Goals are impacted by water security and safety issues. Some of the goal indicators that specifically reference water in the 2030 Agenda are:

3.3: By 2030 end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases;

3.9: By 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination;

11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations;

12.4: By 2020 achieve environmentally sound management of chemicals and all wastes throughout their life cycle in accordance with agreed international frameworks and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment;

15.1: By 2020 ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements;

15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world;

15.8: By 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species.

The Addis Ababa Action Agenda

The Addis Ababa Action Agenda, which sets the framework for financing the 2030 Development Agenda, made several strong statements on the importance of investments in the water sector, including the following:

- It is also critical to reinforce national efforts in capacity-building in developing countries in such areas as public finance and administration, social and gender responsive budgeting, mortgage finance, financial regulation and supervision, agriculture productivity, fisheries, debt management, climate services, including planning and management for both adaptation and mitigation purposes, and water and sanitation-related activities and programmes.
- We will provide fiscally sustainable and nationally appropriate social protection systems and measures for all, including floors, with a focus on those furthest below the poverty line and the vulnerable, persons with disabilities, indigenous persons, children, youth and older persons. We also encourage countries to consider setting nationally appropriate spending targets for quality investments in essential public services for all, including health, education, energy, water and sanitation, consistent with national sustainable development strategies.
- Investing in sustainable and resilient infrastructure, including transport, energy, water and sanitation for all, is a pre-requisite for achieving many of our goals. To bridge the global infrastructure gap, including the \$1 trillion to \$1.5 trillion annual gap in developing countries, we will facilitate development of sustainable, accessible and resilient quality infrastructure in developing countries through enhanced financial and technical support.
- We will support cities and local authorities of developing countries, particularly in least developed countries and small island developing States, in implementing resilient and environmentally sound infrastructure, including energy, transport, water and sanitation, and sustainable and resilient buildings using local materials. We will strive to support local governments in their efforts to mobilize revenues as appropriate.

The Paris Agreement

While the Paris Agreement does not speak specifically to the water sector, it is universally recognized that this sector is one that will be significantly impacted by climate change. Therefore, any efforts at helping developing countries adapt to the impacts of climate change must pay close attention to the water sector.

In the section under Adaptation, the Paris Agreement commits “to consider methodologies for assessing adaptation needs with a view to assisting developing countries, without placing an undue burden on them”. It further calls on its Finance Committee and other relevant institutions to take “the necessary steps to facilitate the mobilization of support for adaptation in developing countries in the context of the limit to global average temperature”, and further “requests the Green Climate Fund to expedite support for the least developed countries and developing country Parties for the formulation of national adaptation plans”

and “for the subsequent implementation of policies, projects and projects identified by them”.

The issue of Loss and Damage is one for which Small Island Developing States and other climate-vulnerable countries fought hard to be included and treated separately (from Adaptation) in the Paris Agreement. It speaks to the need for responses to the loss and damage associated with the adverse effects of climate change, from extreme events and slow onset impacts, such as sea level rise, salinization, land and forest degradation. The instrument that has been established under the United Nations Framework Convention on Climate Change and the Paris Agreement for addressing Loss and Damage is the Warsaw International Mechanism on Loss and Damage (WIM). Although the work of the Executive Committee of the WIM is ongoing, this mechanism may provide an avenue to mobilize technical and financial support for interventions in the water sector aimed at developing resilience, mitigating risk or responding to climate-related impacts.

The Caribbean Water Sector Development Agenda

A Water Agenda for the Caribbean should seek to address and resolve the issues raised in this White Paper. However, it should be clear from the inter-connectedness of these issues and the pivotal role they play in the economic, social and environmental development of the region, that the approach to their resolution cannot be piecemeal or disjointed. As explained by Cashman et al., good water sector management makes an important contribution to the goals of poverty reduction, improved public health, and environmental sustainability (Cashman, Cox, Daniel, & Smith, 2014). It also underpins economic development. Therefore, it must be addressed through a comprehensive, integrated programme. The concept of Integrated Water Resources Management (IWRM) addresses this imperative. IWRM is a politically-driven process that seeks to reconcile societal, developmental, ecological and ideological factors at several levels (Cashman, Cox, Daniel, & Smith, 2014).

Governance

Baseline Data

One of the first necessary steps identified for improving governance is to address the paucity of information on baseline data for water supply services. Therefore, each country needs to establish a mechanism to collect baseline information on service quality, operating efficiency, access to service and financial sustainability (Castalia, 2017). The development of data management and analysis tools for water resources, network operations, financial performance, asset management, network design and benchmarking can assist the water utilities through benchmarking support (Cole Engineering Group, 2015). Information is also required on water demand at the sector level. Given the pressures that will arise from a higher demand for potable water, data should be collected on wastewater generation and reuse potential.

Stabilizing Underperforming Utilities

In order to ensure the viability of any proposed infrastructure upgrades or network expansions, underperforming utilities must first be stabilized. This should be done through a series of simple actions (improving collection rates, reducing response times to complaints, obtaining and collecting data on operating and financial performance), empowering managers and giving them the autonomy to manage the utility and effect the necessary improvements, and increasing accountability. Governments should also assess the adequacy of tariff regimes and the need for subsidies that are linked to targets for performance improvement (Castalia, 2017).

There should also be clear operating standards of service against which water utilities are judged. The utilities should be mandated to publish data annually on performance indicators, such as frequency and duration of interruptions of service, responsiveness to customer complaints, drinking water quality, water production, water consumption, and new connections. Measuring the performance of the utilities is an important step in the quest to improve that performance.

Monitoring and Enforcement

Quality monitoring and enforcement mechanisms should be established to improve water sector governance. These mechanisms are important as they serve to hold utility managers accountable for progress against defined targets (Castalia, 2017).

Regulation

The regulatory regime for the water sector requires improvement across the region. As much as possible, regulatory authorities should be given the statutory authority to set standards and hold water utility companies accountable for the various elements of service delivery. Regulations must also be clear and unambiguous on the management and protection of water sources, with strict penalties for actions that negatively impact the integrity of the water source and the water supply.

Integrated Water Resources Management

Integrated Water Resources Management should be institutionalised to help resolve the inefficiencies and problems caused by a disjointed, piecemeal approach to water sector management. This will also assist with addressing the problems caused by inadequate land use and freshwater management-coastal zone management conflicts.

Water Availability

Information Management

Like governance, addressing the issues related to water supply, distribution and availability requires a robust management information system for water.

If not already in place, systems should be established to collect and analyse river flows, groundwater levels and rainfall data. One of the major shortcomings of many national water systems is a dearth of real-time information on the production of water at source. Policy makers and managers often do not the size of the water resource that they are managing. Therefore, a National Water Information System, which serves as an official repository for all hydrologic, climate, land, watershed, infrastructure and water-related data in the country, is necessary (Cole Engineering Group, 2015).

Non-Revenue Water

The issue of non-revenue water requires urgent attention because of the impact that it has on (i) the ability of the utility to meet the demands of its customers, and ii) the financial viability of the utility. Therefore, across the region, albeit to varying degrees, this problem must be addressed.

There are examples within the region where water utilities have been successful in reducing levels of non-revenue water. Belize Water Services, for example, has implemented a successful leakage reduction programme. Therefore, the sharing of best practice in this and other areas can greatly assist in addressing some of the critical issues confronting the sector.

Treated Wastewater

Significant opportunities exist for the use of treated wastewater in two of the most important economic drivers for the Caribbean, the agriculture and tourism sectors. There is also the possibility of using the biosolids in sewage sludge to provide energy, which is highly priced in most countries in the Caribbean, due to the dependence on imported fossil fuels (with the notable exception of Trinidad and Tobago). However, for this to be done effectively, the issue of wastewater management must be given more serious attention in the respective national jurisdictions, and the appropriate standards and regulations must be put in place to govern the use of treated wastewater (Sustainability Managers, 2016).

Climate Change and Disaster Risk Reduction

Six thematic programmes of action have been proposed to address the risks posed by climate change and weather-related disasters (Global Water Partnership-Caribbean and Caribbean Community Climate Change Centre, 2016). These are:

- Climate Resilient Water Infrastructure
- Water Efficiency, Re-Use and Augmentation
- Drought-Resilient Water Supplies
- Climate-Resilient Agricultural Water Management
- Resilient and Healthy Water Resources Systems
- Integrated Flood Management

These programmes require coordination and integration of actions in (i) evidence based planning, (ii) policy development, (iii) capacity development, (iv) financing investment, (v) awareness and outreach, and (vi) technology and innovation.

Alignment with International Agreements

The various international agreements provide important platforms for countries and the region to mobilize needed technical and financial support for the development of the water sector and for developing greater resilience in this sector to the impacts of weather-related events. This will require a clear articulation of water policies, the embedding of these policies in national development agendas, and the underpinning of these policies by a robust, dynamic evidence base. Most importantly, however, it will require much better and closer coordination of actions across agencies at the national and regional levels than has been witnessed thus far.

The water sector is influenced by the actions of myriad agencies, in much the same way that the water sector impacts almost every public and private sector. Therefore, in reaching out to development partners for support for the water sector under the various international agreements, the focus should be on presenting a comprehensive, integrated, multi-sector water development agenda, which touches on the economic, social and environmental imperatives.

Conclusion

Addressing the myriad challenges confronting the water sector in the Caribbean will require effective coordination at the regional level, strong political will and sense of urgency at the national level, concerted efforts to engage with the public at the community level, and strategic support at the development partner level.

The water issues are cross-cutting and impact on every element at the economic, social and environmental levels in the country. As such, there is need for robust inter-sectoral and inter-agency linkages at the national level.

The strategy that is developed for Water Governance and Climate Resilience must address these issues, but it must also be guided by a level of pragmatism with respect to the resources, human and financial, that exist in the Caribbean region. It must articulate a clear methodology for engaging the public and all stakeholders in a water systems development agenda. Without the ownership of this strategy by a wide-cross section of stakeholders, it will go the route of many other well-intentioned strategies - partially implemented or not implemented at all. The water sector is too important for the sustainable development of our CARICOM Member States and our region for this to happen.

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