TECHNICAL FOCUS PAPER

Integrated water resources management in the Caribbean:

The challenges facing Small Island Developing States

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Global Water Partnership

Global Water Partnership (GWP), established in 1996, is an international network open to all organisations involved in water resources management: developed and developing country government institutions, agencies of the United Nations, bi- and multilateral development banks, professional associations, research institutions, non-governmental organisations, and the private sector. GWP was created to foster Integrated Water Resources Management (IWRM), which aims to ensure the co-ordinated development and management of water, land, and related resources by maximising economic and social welfare without compromising the sustainability of vital environmental systems.

GWP promotes IWRM by creating fora at global, regional and national levels, designed to support stakeholders in the practical implementation of IWRM. The Partnership's governance includes the Technical Committee (TEC), a group of internationally recognised professionals and scientists skilled in the different aspects of water management. This committee, whose members come from different regions of the world, provides technical support and advice to the other governance arms and to the Partnership as a whole. The Technical Committee has been charged with developing an analytical framework of the water sector and proposing actions that will promote sustainable water resources management. The Technical Committee maintains an open channel with the GWP Regional Water Partnerships (RWPs) around the world to facilitate application of IWRM regionally and nationally.

Worldwide adoption and application of IWRM requires changing the way business is conducted by the international water resources community, particularly the way investments are made. To effect changes of this nature and scope, new ways to address the global, regional and conceptual aspects and agendas of implementing actions are required.

A **Technical Focus Paper** is a publication of the GWP Technical Committee aimed at harnessing and sharing knowledge and experiences generated by Knowledge Partners and Regional/Country Water Partnerships through the GWP Knowledge Chain.

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Acronyms

ACS	Association of Caribbean States
APUA	Antigua Public Utilities Authority
BPOA	Barbados Programme of Action
BWA	Barbados Water Authority
Cap-Net	Capacity Development in Sustainable Water Management
CAR/RCU	Caribbean Regional Coordinating Unit
CARDI	Caribbean Agricultural Research and Development Institute
CARICOM	Caribbean Community
CARIWIN	Caribbean Water Initiative
CAWASA	Caribbean Water and Sewerage Association Inc.
CBO	Community-based organisation
CDB	Caribbean Development Bank
CEHI	Caribbean Environmental Health Institute
CIMH	Caribbean Institute for Meteorology and Hydrology
COTED	Council for Trade and Economic Development
CWSA	Central Water and Sewerage Authority
CWWA	Caribbean Water and Wastewater Association
DOWASCO	Dominica Water and Sewerage Company
EC	European commission
ECLAC	Economic Commission for Latin American and the Caribbean
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
GoB	Government of Barbados
GoJ	Government of Jamaica
GoSL	Government of Saint Lucia
GoTT	Government of Trinidad and Tobago
GWI	Guyana Water Inc.
GWP	Global Water Partnership
GWP-C	Global Water Partnership Caribbean
IDB	Inter-American Development Bank
IPCC	Intergovernmental Panel on Climate Change
IWCAM	Integrating watersheds and coastal areas management
IWRM	Integrated water resources management
JpoI	Johannesburg Plan of Implementation
LBS	Land-based sources
MoH	Ministry of Health

NAWASA .... National Water and Sewerage Authority
NGO ..... Non-governmental organisation
NWC ..... National Water Commission
OECS ..... Organisation of Eastern Caribbean States
RIC ..... Regulated Industries Commission
SIDS ..... Small Island Developing States
SVG ..... Saint Vincent and the Grenadines
UNDP ..... United Nations Development Programme
UNEP ..... United Nations Environment Programme
UNEP-CEP ... UN Environment Programme-Caribbean Environment Programme
UNFCCC ..... United Nations Framework Convention on Climate Change
USACE ..... United States Army Corps of Engineers
WASA ..... Water and Sewerage Authority
WASCO ..... Water and Sewerage Company
WB ..... World Bank
WRA ..... Water resources agency
WSP ..... Water safety plan
WUE ..... Water use efficiency

Acknowledgments

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Foreword

Concerns about the reality of implementing integrated water resources management (IWRM) have been raised many times. Although IWRM has gained worldwide acceptance over the past two decades and is now included in national policies, strategies, and laws, there are still questions about how it is put into practice. So what is the current state of water resources planning and implementation?

Substantial evidence to support an integrated approach comes from the UN status report on Integrated Approaches to Water Resources Management (UN, 2012) published in time for the Rio+20 Conference. Some 134 nations across the world responded to the survey to determine progress towards sustainable water resources using integrated approaches. These approaches were measured against the practical elements of implementing integrated water resources management, namely, a strong enabling environment; sound investments in infrastructure; clear, robust, and comprehensive institutional roles; and effective use of available management and technical instruments. Encouragingly, 82 percent of countries have embarked on reforms to improve the enabling environment and integrated approaches to water resources management. The report rightly points out that there is no quick fix for sustainable water management and so national and international leaders must demonstrate their commitment for the long haul if it is to succeed.

Many changes have indeed taken place in the area of water management, and it is highly likely that the extent and timing of additional changes will accelerate even further in the coming decades. The need for an objective, non-dogmatic scrutiny of the IWRM paradigm has never been stronger. But the conceptual attractiveness of a paradigm is not enough: it must be applicable in the real world to improve the sustainable management of water resources.

This Technical Focus Paper is the first in a series of papers to present a critical review of progress made in planning and then putting plans into practice. They synthesise the challenges, the successes, the setbacks, and the direction for further integration. They provide valuable insights from which others can learn lessons and apply them to their particular and often unique circumstances.

This paper deals with the 15 English-speaking Caribbean States, which comprise some of the most fragile economies in the region, and explains the special circumstances of Small Island Developing States as they adopt and adapt to a 'source to sea' approach as their integrating framework. After 15 years' experience, the tangible results serve as a testament to the effectiveness and importance of taking an integrated approach. They reinforce the message that this works best when it addresses real issues that resonate with people's everyday experiences with water and their environment.

My thanks to the authors of this report, who are members of GWP-Caribbean, for their excellent analysis of water security challenges in what is a most diverse and complex region. We would particularly like to acknowledge Adrian Cashman, Christopher Cox, and Terrence Smith as lead authors and others within GWP-Caribbean for their invaluable comments and suggestions during the drafting stages.

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Executive summary

In 1998, the Forum of Ministers of the Environment of Latin America and the Caribbean agreed that integrating water and coastal resources management was a priority in the Caribbean region. In 2002, at the Johannesburg World Summit on Sustainable Development, the Caribbean States also committed to work towards developing integrated water resources management (IWRM) plans and water use efficiency (WUE) plans by 2005. Some 15 years have now passed and this paper asks: What measures have been taken and what progress has been made towards adopting an integrated approach to water management in the Caribbean?

For Small Island Developing States (SIDS), realising these ambitious commitments was always going to be challenging. These states are particularly vulnerable to increased stresses on their water resources through the limitations of land, population, and water resources and the need for economic development and social well-being. Hence in SIDS, IWRM has to adopt a 'source to sea' approach as an integrating framework. For the Caribbean, with a large geographical footprint, but small and dispersed populations and land mass, which face similar climatic conditions that influence the availability of water resources, it makes sense to combine national initiatives with a regional approach.

Much work has taken place in the region to push forward a process of integration, and examples of initiatives and an evaluation of their outcomes and relative successes are described. The focus is on the 15 States in the English-speaking Caribbean, the unifying effects of whose shared language and cultural and political similarities make this region a productive focus for the evaluation. This area has some of the region's most vulnerable states and territories in terms of fragile economies, impact of climate change, and constrained development opportunities.

A feature of water resources in the Caribbean is the diverse organisational arrangements governing management. Jamaica and Guyana have a ministry dedicated to water management, but in most states, water management forms just one part of a ministry portfolio, and often, responsibility is spread across more than one ministry. Responsibility for tariffs and economic regulation is rarely exercised independently of ministerial/cabinet control.

In most states, water service providers also undertake water resources management. Water supply and wastewater services are undertaken by a government-owned company or statutory authority, with little independent oversight and evaluation. Little distinction is made between responsibilities for water services and water resources management, as they are centralised within the same organisation. This reflects a predominant supply-side paradigm that sees water resources as an integral extension of water supply services. This centralising tendency is underpinned by the political dispensations that came into being after independence, which sought to address a legacy of neglect and marginalisation of large sections of the population on the grounds of colour and race. Programmes were implemented to greatly expand provision and access to basic services, such as health care, education, and water and sanitation. As a result, the region made significant progress in water supply, and most countries report over 95 percent access. Concomitantly, the public have come to expect that governments will provide services by guaranteeing financial support to ensure minimal cost to the public so that services are affordable. The problems now being encountered include quality of service, maintenance and operation of existing infrastructure, ageing infrastructure, high levels of unaccounted for water, and quality of potable water. This suggests difficulties with the management of water services and with securing the necessary levels of investment to address the supply–demand gap.

Water resources management faces challenges that affect water availability and long-term freshwater security. An example is the increasing threat to streamflows caused when catchments are converted for development and agriculture. Overall water security is an emerging challenge, which the present institutional frameworks and enabling environments are increasingly ill-equipped to deal with. Although many governments acknowledge the need for change and to develop plans, existing efforts to put these plans into practice have not proved sufficient. Regional interventions have failed to get off the ground and national-level interventions have fared little better. The main challenge facing regional approaches is diversity, and so water resources management should focus on developing common frameworks and standards.

Over the past decade, most of the many interventions designed to improve integration have been initiated or promoted by international or regional actors. But a 'project approach' preferred by such agencies, and the associated implications for funding activities, does not fit well with the protracted process of transitioning and reforming national water sectors. Despite the fact that the Caribbean region shows considerable understanding of and sensitivity to the need for integration, so far efforts to embed integrated thinking have yielded few tangible benefits, particularly when these efforts have focused on institutional frameworks.

The administrative and professional classes in the water sector are very well acquainted with an integrated approach and actively include it, as far as they can, in the working environment. This is due in large part to ongoing training, capacity building, and networking of various advocacy organisations. However, the professionals have failed to capitalise on this, even when opportunities, such as the impact of natural hazards (e.g. droughts and hurricanes), have drawn attention to the need for change. It may have been the case that the urgent need for short-term crisis management obscured the longer-term commitment required for more far-reaching reforms.

Projects that address specific stakeholder concerns or issues at national and community levels were the most successful and visible aspects of interventions. The greatest impact can be seen in specific 'demonstration' projects, usually at the community or watershed level. These results reinforce the message that an integrated approach works best when it addresses real issues that resonate with people's everyday experiences with water and their environment.

In spite of failings in water service delivery, consumers and the public have shown very little appetite for change, and there is implicit support for continuing with existing arrangements. Customers have little influence over service providers and are unable to hold them to account. This lack of public interest in change is compounded by perceived political risks of change, such as raising water rates, improving collection of unpaid bills, and depoliticising investment decisions by which potential influence is reduced. The cabinet-based approach to political decision-making could potentially provide a mechanism for mobilising political support if ministers were to become champions of change. But this has seldom been the case.

Given the level of consensus among the various actors in the water sector and their commonly held beliefs about what constitutes good water governance, the necessary conditions for improving water management are in place. However, the slow pace of change suggests that these conditions and the presence of champions alone are not sufficient; that something else is necessary. Recent research suggests that advocacy needs to be complemented by so-called 'brokering' actions, which call for different approaches for different countries. Brokering is about recognising and reconciling the needs and aspirations of different stakeholders, particularly the politicians. This is achieved by ensuring a 'fit' between the problem perceived by politicians and decision-makers and the proposed solution. This suggests that approaches that seek wholesale water management reform will seldom 'fit'. What are required are more incremental approaches,

peculiar to each country, coupled with international financial contributions. Such approaches may be more successful, particularly if they have support at the very highest political level. The challenge for the Caribbean is how to secure that level of support, which to date is missing.

1 Water challenges on small islands

Small Island Developing States (SIDS) are particularly vulnerable to increased stresses on their water resources (Cashman et al., 2010; Falkland, 1999; Payet and Agricole, 2006). The limitations of land, population, and water resources and the need for economic development and social well-being place particular pressures on them. Furthermore, a particular feature of SIDS, which sets them apart from their continental neighbours, is the close interconnection between land and sea and the role of water as the medium of connection between them. Run-off generated by rainfall events can travel quickly through the terrestrial environment and enter the marine environment within a very short space of time. The use and management of land and water resources have a direct and immediate effect on the health and vitality of marine resources, so it is important to link water and watershed management with the management of coastal areas. This is necessary in order to support livelihoods and ecosystems services of both terrestrial and marine environments. Hence in SIDS, integrated water resources management must adopt a 'source to sea' approach as an integrating framework (UNEP, 2012a).

In 2002 at the Johannesburg World Summit on Sustainable Development, the Caribbean States, along with the rest of the global community, signed up to the Johannesburg Plan of Implementation (JPoI). One of the provisions under JPoI was a commitment to work towards the development of IWRM plans and water use efficiency (WUE) plans, to be in place by 2005. In large part this recognised that the limitations of existing water management arrangements were imposing obstacles to national development, as well as having an increasingly adverse impact on the integrity of ecosystems. For developing countries, and particularly for SIDS, the realisation of the ambitious commitments made in respect of water management was always going to be challenging. A regional approach to the problem, in conjunction with national initiatives, is an effective approach to the problem for a region such as the Caribbean with a large geographical footprint and small and dispersed populations and land mass. The countries face similar climatic conditions that influence the availability of water resources. This was recognised at a Caribbean Ministers of Environment meeting in April 2008 at the Caribbean Community's (CARICOM) Council for Trade and Economic Development (COTED) (CARICOM, 2011). It expressed the concern that the majority of Caribbean States had not been able to achieve the JPoI goals and that the need for policy and governance reform was not being met. Ministers recognised that in order to support this process there was a need to develop a common approach to water resources management in the Caribbean that would contribute to developing and strengthening national water policies, IWRM, and WUE plans.

Preceding, but overlapping these events, was another IWRM-related development. At the 11th Meeting of the Forum of Ministers of Environment of Latin America and the Caribbean in March 1998 (UNEP, 1998), it was agreed that there was a priority need to include a project in the Regional Programme of Action to address integrated management of water and coastal resources in the Caribbean region. Following this, CARICOM and the Secretariat of the Cartagena Convention, the Caribbean Environmental Health Institute (CEHI), the United Nations Environment Programme-Caribbean Regional Coordinating Unit (UNEP-CAR/RCU), and the United Nations Development Programme (UNDP) proceeded to develop a project to strengthen institutional capacities at national and regional levels, and assist countries in integrating their management of watersheds and coastal areas (Merla and Simmons, 2012). The project was funded through the Global Environment Facility (GEF) with co-funding from national governments and partner organisations and was referred to as the GEF-funded Integrating Watershed and Coastal Area Management (IWCAM) project. It was approved in May 2004 and became operational in 2006. One of the anticipated outcomes of the project was to implement

overall national and regional reforms in support of the GEF-IWCAM PROJECT approach. This would be primarily achieved through policy, legislation, and institutional reforms of the way in which water resources were managed.

A related development contributing to and supporting improvements in water resources management was the formation of a regional Global Water Partnership network of partners. Global Water Partnership Caribbean (GWP-C) was established in 2004 at a meeting attended by 67 representatives from 14 countries and 36 organisations in the Caribbean region. As of December 2013, GWP-C has 80 partners in over 20 Caribbean territories (GWP-C, 2014a). One of the goals of the partnership is to promote and facilitate better water resources management through the adoption of IWRM. To this end it supports the development of IWRM road maps and undertakes awareness-raising activities. GWP-C co-hosts the annual High Level Forum for Ministers with responsibility for water (GWP-C, 2014b), which provides a platform for them to meet with other decision-makers, water experts and professionals, and representatives of regional organisations active in the water sector to discuss policy and water-related matters, under the umbrella of IWRM.

The 2012 Ministerial Forum recognised the importance of ensuring long-term water security as a driver for economic and social development and the urgent need to address water scarcity in the region. From this (GWP-C, 2014c) came a clear understanding that more political attention was needed to promote measures that increase water security. The prominence of the issue indicated the growing concern over the ability of the governments to ensure good management and provision of water without jeopardising economic growth and the maintenance of social well-being. Of concern were the impacts of climate change, tariffs and the financial sustainability of service provision, the need to upgrade existing water infrastructure and improve resource use efficiency, the prevention of pollution of water sources, and the management of resources and services in the face of natural hazards. While IWRM seeks to address all of these issues, there appears to be a long way to go and governments are struggling to mainstream IWRM.

The shared and multifaceted nature of water presents special challenges for its management and the problems faced. The professional and institutional stakeholders in the region clearly show no shortage of interest in water management and the potential threats to water security. But this interest is not, on the whole, reflected by the general public, whose interests are often more immediate. The vulnerabilities of, in particular, tropical island states and territories have long been recognised. For example, the 1994 Barbados Programme of Action (BPOA) for the Sustainable Development of SIDS, identified priority areas and specific actions necessary for addressing the special challenges faced by SIDS. Priorities included coastal and marine freshwater and land resources, as well as strengthening national and regional institutions (UN, 1994). This was followed by the Mauritius Strategy of Implementation in 2005 which recognised that there were still constraints in fulfilling the activities of the BPOA. So, some 15 years after the 1998 agreement that recognised the need for an integrated approach to water and coastal areas management, and nearly 20 years after the BPOA, what measures have been taken and what progress has been made in the Caribbean to adopt IWRM?

This paper attempts to answer this question. It takes stock of how much progress the Caribbean has made in improving water resources management and builds on this experience to better inform the future direction of movement. Future actions must be informed by past lessons and achievements in order to formulate answers to the question: *Should things be done differently or should different things be done?* The extent to which the management of water resources will be mainstreamed in the future will be determined by how well it resonates with Caribbean

realities and circumstances. This means that it will have to incorporate changing conceptual frameworks, such as the green economy, the land–water–energy nexus, and the successors to the UN Millennium Development Goals on sustainability, as well as building upon the lessons of the past.

"In the series of things those which follow are always aptly fitted to those which have gone before; for this series is not like a mere enumeration of disjointed things, which has only a necessary sequence, but it is a rational connection."

The Meditations, Book 4. Marcus Aurelius (121–180 AD)

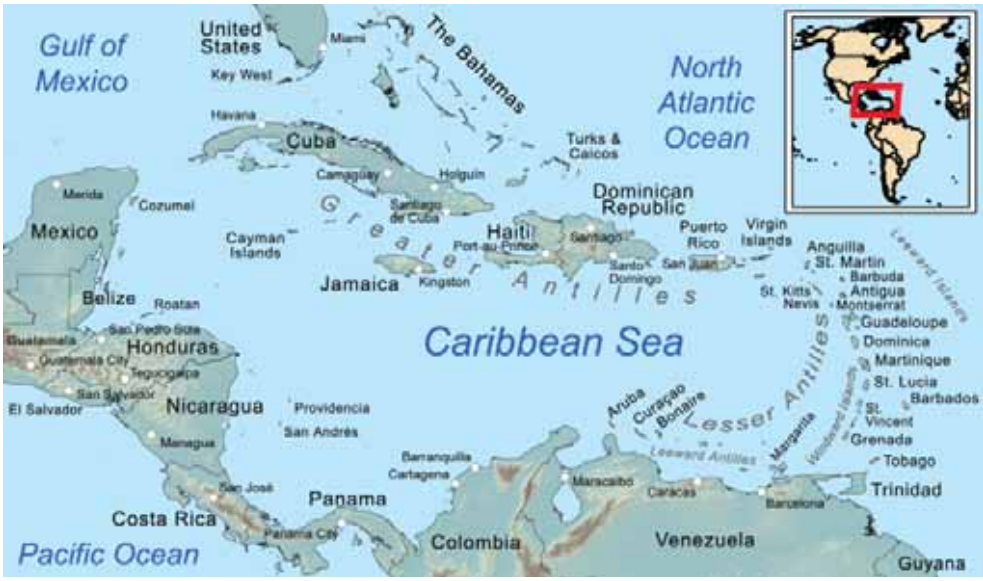
Firstly, the paper presents an overview of the waterscape of the Caribbean region, in order to set the context within which the water affairs of the region are located and managed. This includes the social, economic, and cultural factors which modulate the interaction between society and water and which shape water use and management. A number of challenges and concerns arise from this that have a direct bearing on policy development. These include questions of how climate change and wastewater management might be addressed through policy and programme interventions. Much work has taken place and examples of initiatives and an evaluation of their outcomes and relative successes are described. The paper then describes the significance of adopting an integrated approach to water resources management within a Caribbean context, the extent to which it may be influencing the development of the enabling regional and national environment, and the prospects for the more widespread adoption of appropriate management instruments to underpin equitable, efficient, and sustainable practices.

The geographic area of interest of this paper is confined to the 15 States in English-speaking Caribbean.[1] The choice of the Caribbean region as the focus of interest of this paper is outlined, and the region described. This area has some of the most vulnerable states and territories, in terms of the fragility of the respective economies, the impact of climate change, and constrained development opportunities. While these factors, along with the unifying effects of the shared language, and cultural and political similarities, make this region a productive focus for this evaluation, this in no way diminishes the importance of, or interest in, other parts of the Caribbean. Indeed Cuba, Dominican Republic, and Haiti together account for the overwhelming bulk of the region's population – some 31 million people out of a total of 40 million. It does, however, highlight the sometimes problematic concept of what constitutes the Caribbean.

[1] Anguilla, Antigua and Barbuda, Bahamas, Barbados, Belize, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, and Trinidad and Tobago.

2 The Caribbean

Figure 1. The Caribbean region



Source: Adapted from CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/)

The waterscape of the Caribbean is rich and diverse; it is home to some of the most water-scarce nations on the planet, such as Barbados and the Bahamas. Yet in close proximity there are countries with abundant freshwater resources, such as Guyana and Belize.

The term 'Caribbean region' provides a unifying idea, yet it has multiple uses and masks many differences among the sovereign states, overseas departments, and dependent territories that exist within the region (see Table 1). Some of the former colonial powers still hold sway. Guadalupe, Martinique, Saint Martin, and Saint Barthélemy are part of metropolitan France. Puerto Rico and the US Virgin Islands are unincorporated parts of the USA. The United Kingdom's Overseas Territories consist of Anguilla, British Virgin Islands, Cayman Islands, Montserrat, and Turks and Caicos Islands. The Netherlands Antilles include Aruba, Curaçao, and Sint Maarten as autonomous countries and Bonaire, Sint Eustatius, and Saba as municipalities of the Netherlands. The remainder of the countries became independent during the period of decolonisation that lasted from the early 19th century, in the case of Haiti, to the 1980s.

Geographically the Caribbean is diverse, and, given its different geologic histories, it displays a marked variety of different landforms, from small inhabited islands with populations of a few thousand people to large islands, such as Cuba, with populations in the millions. It ranges from flat low-lying islands a few metres above sea level, such as the Bahamas, to those with mountains up to 3,000 metres in height. It includes, according to some classifications, countries on the mainland of Central and South America – Belize, Guyana, and Suriname. The various population mixes, languages, and cultures reflect the colonial and political histories of the various states and territories. In terms of political economy, regionalism and collective coalitions have provided a means for the Caribbean States to play an important role in

Table 1. Islands of the Caribbean

Independent nations	French Departments and Overseas Territories	Netherlands Antilles	United Kingdom Overseas Territories	United States	Central and South American countries
Antigua and Barbuda	Guadaloupe	Aruba	Anguilla	Puerto Rico	Belize
The Bahamas	Martinique	Bonaire	British Virgin Islands	US Virgin Islands	Guyana Islands
Barbados	Saint Barthélemy	Curaçao	Cayman Islands		Suriname
Cuba	Saint Martin	Saba	Montserrat		
Dominica		Sint Eustatius	Turks and Caicos Islands		
Grenada		Sint Maarten			
Haiti					
Jamaica					
Saint Kitts and Nevis					
Saint Lucia					
Saint Vincent and the Grenadines					
Trinidad and Tobago					

international politics that their individual small size might otherwise have prevented. This is facilitated through a number of institutions, such as the Caribbean Community (CARICOM), the Association of Caribbean States (ACS), the Organisation of Eastern Caribbean States (OECS), and others. Thus the term Caribbean region can be interpreted in differing ways and as a result is often deliberately used loosely.

The GWP-C has partners from almost every country and territory in the Caribbean with the exception of Belize, Bonaire, Cayman Islands, Curaçao, Saba, Saint Barthélemy, Sint Eustatius, Saint Martin, and Turks and Caicos Islands. The majority of the partners are located in English-speaking countries (GWP-C, 2014a) and most of the work of GWP-C is carried out in the English-speaking Caribbean, with the exception of Suriname. Similarly, many of the efforts to promote IWRM by other organisations apart from GWP-C have taken place in the English-speaking Caribbean. In the case of both US and French West Indies, given their political status, approaches to water resources management are largely governed by sets of laws, policies, and regulations that are, for the most part, exogenously determined. For the large Spanish-speaking countries, shared cultural affiliations, traditions, and language predispose them to identify more closely with Latin America.

2.1 Climate

The Caribbean is a humid tropical region in which the climate is determined by the Trade Winds as well as the inter-tropical convergence, and it varies with both elevation and the size of the land mass. Temperatures are strongly elevation dependent. In coastal areas they vary between 32°C and 24°C, but with increasing elevation temperatures can drop to 10°C. Temperatures tend to vary little throughout the year, particularly at sea level, so that for a significant part of the year evaporation rates exceed precipitation. There are two distinct seasons during the year: a dry season (January to April) and a wet summer hurricane season. While hurricanes are a feature of the region, with tracks that pass from south-east to north-west, the southern Caribbean rarely experiences their effects. Precipitation varies greatly, with the windward sides of the islands receiving much more rain (sometimes up to 5,000 mm per year) than the rain-shadowed leeward sides (sometimes less than 600 mm per year) (Cashman, 2013; FRD, 1988–1999). In the southern Caribbean there can be a second mini dry season between July and September. Rain often occurs in short and heavy downpours.

2.2 Geography

A broad geographical grouping of the principal islands may be taken as: the Bahamas, the Greater Antilles, the Leeward Islands, the Windward Islands, and the Southern Offshore Islands (FRD, 1988–1999). The Bahamas are a low-lying archipelago of coral islands, being no more than 60 metres above sea level. Weathering of the coralline deposits has resulted in karstic formations, with many solution conduits. The result is that rainfall run-off infiltrates quickly so that there are no freshwater rivers, but instead, lenses of freshwater that 'sit' on top of more saline waters.

The islands of the Greater Antilles are geologically more complex, with sedimentary, metamorphic, and igneous rocks, the weathering of which had been affected by tectonic movements as well as other changes over geologic time. These islands are more mountainous and with varied topography. All have significant rivers and groundwater sources. The Lesser Antillean islands (Leeward and Windward) are predominantly of volcanic and sedimentary origin and are characterised by steep and sometimes mountainous terrain. They too have an abundance of rivers and streams, but no significant groundwater, except where these might be alluvial aquifers associated with river systems. The rivers in general are short in length, drain relatively small catchments, and thus have lower volumes of water that are more susceptible to seasonal and climatic variations. This is particularly true in those Greater Antillean islands which have karstic limestone formations which serve to modify surface water flow characteristics.

The islands of the outer Lesser Antilles, such as Antigua, Barbuda, and Barbados, do not fit this pattern. These are coralline islands formed as a result of tectonic uplift at the edge of the Caribbean plate. As such, they exhibit many of the same geological features as the Bahamas, but with more pronounced topography and a lack of fresh surface waters. The most significant of the Southern Offshore Islands are Trinidad and Tobago, which geologically are part of South America. The mountain ranges consist of metamorphic rocks, with the lower lying areas formed from erosional and sedimentary deposits. There are rivers associated with the mountainous areas, but a feature is that once they reach the lower areas they form wetland areas, many of which have been drained for development purposes. For completeness Belize, Guyana, and Suriname are included, though they are not part of the insular Caribbean. All are continental

countries and all host major transboundary river systems as well as significant groundwater resources.

2.3 Demographics

The Caribbean region is one of the most demographically diverse regions in the world. Historically, population growth in the region has largely been via migration, but has slowed markedly since the mid-20th century. This Technical Paper focuses specifically on the English-speaking Caribbean (Table 2).

Table 2. Demographics for English-speaking Caribbean countries

Country	Total population (thousands)	Population density (persons/km²)	Annual population growth (%)
Bahamas	343	25	1.4
Barbados	273	636	0.2
Belize	312	14	2.1
Grenada	104	304	0.3
Guyana	754	4	0.2
Haiti	9,993	360	1.3
Jamaica	2741	249	0.4
Saint Lucia	174	323	1.1
Saint Vincent and the Grenadines	109	282	0.1
Trinidad and Tobago	1,341	261	0.4
US Virgin Islands	109	314	-0.1

Source: UNDESA Population Division (2013)

According to UN data, the Caribbean population has more than doubled from 17 million in 1950 to 41 million in 2010, and population density has increased by more than 100 percent during the same period (UNDESA, 2013). However, as a general rule, water distribution infrastructure built in the 19th and early 20th century did not anticipate this growth. This has led to many cases of water stress and scarcity, particularly in Antigua and Barbuda, Barbados, and Saint Kitts and Nevis (UNEP, 2008). Since a high proportion of the population in many Caribbean States and territories live in urban areas, there is a two-fold challenge to delivering potable water to densely populated communities, while addressing the stormwater and wastewater challenges typical of urban environments. All English-speaking Caribbean islands and territories show a consistent trend of migration from rural to urban areas (UNEP, 2008).

Table 3. Urban population

Country	Urban population (%)	Country	Urban population (%)
Anguilla	100	Haiti	52
Antigua and Barbuda	30	Jamaica	52
Aruba	47	Martinique	89
The Bahamas	84	Montserrat	14
Barbados	44	Netherlands Antilles	93
British Virgin Islands	41	Puerto Rico	99
Cayman Islands	100	Saint Kitts and Nevis	32
Cuba	75	Saint Lucia	28
Dominica	67	Saint Vincent and the Grenadines	49
Dominican Republic	69	Trinidad and Tobago	14
Grenada	39	Turks and Caicos Islands	93
Guadeloupe	98	United States Virgin Islands	95

Source: UNDESA Population Division (2013); 'Urban Population, Development and the Environment 2011'

2.4 Water resources and water services

A feature of the water resources of the Caribbean is the diversity, from country to country, of the organisational arrangements which govern them. In Jamaica and Guyana, there is a ministry dedicated to the oversight of water, but in most states, water management forms just one part of a ministry portfolio, and rarely enjoys a high degree of prominence. Furthermore, responsibility for different aspects of water management is dispersed across more than one ministry, which often results in water quality and environmental management being shared between ministries of health and environment and governed separately from water management (Cashman, 2012; McIntosh and Leotaud, 2007).

In most states, water resources management is a function performed by the water service provider. Only in Jamaica, Saint Lucia, and Trinidad and Tobago is the responsibility separated from that of water service delivery. Water services, whether water supply or wastewater, are undertaken by government-owned agencies, usually a government-owned company or statutory authority, and it is only in a few cases that there is more than one body responsible for water services within a country. In Jamaica there is a National Water Commission and a Rural Water Supply company, but parish councils and a small number of independent water service providers hold time-limited licences. In Belize, urban areas are supplied by the Belize Water Services, while rural areas are handled by the Department of Local Government and Rural Development. In contrast, Guyana provides water to both urban and rural areas through Guyana Water Inc., with the company providing support to community-based organisations (CBOs) which provide services in those areas.

Table 4. Water resources for the English-speaking Caribbean islands

Country	Land area (km²)	Total average annual rainfall (mm)	Total renewable water resources (mm³/year)	Municipal water withdrawal (mm³/year)	Total water withdrawal per capita (m³/capita/year)	Total renewable water per capita (m³/capita/year)
Anguilla	91	890	Not given	Not given	Not given	
Antigua and Barbuda	443	1,030	52	5.3	97.67	571.40
The Bahamas	13,880	1,292	20	Not stated	Not stated	57.00
Barbados	430	1,422	80	19.8	371.30	291.00
Belize	22,966	1,705	16,000	10.0	Not stated	51,779.00
British Virgin Islands	153	1,117	Not stated	Not stated	Not stated	Not stated
Cayman Islands	263	135	Not stated	Not stated	Not stated	Not stated
Dominica	751	2,083	Not stated	Not stated	244.10	Not stated
Grenada	344	2,350	Not stated	Not stated	97.09	Not stated
Guyana	214,970	2,387	241,000	61.3	2,222.00	317,942.00
Jamaica	10,991	2,051	9,404	274.9	370.00	3,406.00
Montserrat	102	1,143	Not stated	Not stated	Not stated	Not stated
Puerto Rico	9,104	2,054	71	904.0	264.00	1,897.00
Saint Kitts and Nevis	261	1,427	24	Not stated	Not stated	444.00
Saint Lucia	616	2,301	Not stated	9.8	98.22	Not stated
Saint Vincent and the Grenadines	389	1,583	Not stated	Not stated	Not stated	Not stated
Trinidad and Tobago	5,128	2,200	3,840	173.6	177.90	2,842.00
Turks and Caicos	616	559	Not stated	Not stated	Not stated	Not stated
United States Virgin Islands	346	998	Not stated	Not stated	Not stated	Not stated

Source: CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/); FAO Aquastat database (http://www.fao.org/nr/water/aquastat/main/index.stm)

Responsibility for tariffs and economic regulation is rarely exercised independently of ministerial/cabinet control, with possibly five exceptions – Belize, Guyana, Jamaica, Saint Lucia, and Trinidad and Tobago. In each case there is a degree of independent oversight and evaluation of tariff adjustments, although the responsible minister does have the final say when it comes to approving any tariff adjustments. With respect to environmental regulation, each

country has an established system of oversight of potable water quality, usually overseen by the Ministry of Health, which also handles pollution control. However, in all cases the existing Water Acts do vest some responsibility for pollution control, which is seldom if at all exercised, in the utilities. These remain government functions, and, as a result, the activities of other government agencies are not rigorously held to account. Failures are also evident in the oversight of discharge and effluent standards in the private sector, though this is primarily because of low penalties and enforcement rather than a lack of legislation. The use of management instruments in water management are limited to the use of volumetric charges and block tariffs for increasing levels of consumption, differentiated water rates between domestic and commercial users, and irrigators. Abstraction licences are required, as are discharge permits. These are reliant on the use of command and control approaches rather than economic incentives. However, practices around monitoring, reporting, and enforcement of permit conditions are loose and reflect the difficulties experienced in enforcement.

The general situation with respect to the management of water, including the collection of data and regulation within the water sector, is summarised in Table 5 below. The exceptions to this generalisation are noted above.

Table 5. Water management responsibilities

Activity	Principal responsible agency
Climatic data gathering	Meteorological service
Water resources monitoring and evaluation	Water service provider
Water resource quality monitoring	Ministry of Environment
Abstraction and withdrawal licences	Water service provider
Water production and consumption data	Water service provider
Drinking water quality monitoring	Ministry of Health
Discharge licences and environmental regulation	Ministry of Environment
Economic regulation	Minister with responsibility for water
Service regulation	Unclear

2.5 Politics of water management

The varied history of European colonisation in the Caribbean gave rise to differing legal arrangements with respect to water management. The growth of urban centres and the diffusion of ideas about providing water services in the middle to late 19th century influenced the institutional and legal arrangements governing those services. The predominant arrangement was for island administrations to provide water services as a municipal or government responsibility. Such arrangements survived well into the post-colonial period (Cashman, 2012). In Barbados, which became independent in 1966, it was not until 1980 that the Barbados Water Authority took over from the Waterworks Department. This is not untypical for the region. In Jamaica the National Water Commission, responsible for water service provision, also came into

being in 1980. Little distinction was made between responsibilities for water services and water resources management as these were centralised within the same organisation, again reflecting a predominant supply-side paradigm that conceived of water resources narrowly as an integral extension of water supply services (Cashman, 2012). One of the features of this dispensation was the relatively high ratio of semi-skilled and skilled to professional staff, which has tended to privilege the day-to-day operation and maintenance activities. This provided governments with the means to provide employment opportunities. However, this focus on operation and maintenance has resulted in a relative deficiency of resources in the professional cadre, whose role is to develop the planned, strategic actions required to ensure the long-term sustainable management of the services and resources.

The centralising tendency within water sector management was underpinned by the political dispensations that came into being after independence. These sought to address a legacy of neglect and marginalisation of large sections of the population on the grounds of colour and race. Part of the measures implemented were programmes to greatly expand provision and access to basic services, such as health care, education, and water and sanitation. A strong social welfare stance characterised governments throughout the region, in which the state assumed an important role in the economy and acted as a provider or guarantor of essential services, water being the prime example of this (Portes et al., 1997). Evidence of this can be seen in the development of varying forms of social partnerships between government, trade unions, and the private sector that sought to improve the conditions of the workforce and provide a way to mitigate fluctuations in the economy, particularly economic downturns, through a collective shouldering of the burden by each actor (Springer, 2010).

Consequently, the public have come to expect that governments will provide services by guaranteeing financial support to ensure that services are affordable. Almost inevitably, water services have become politicised (Batley, 2004). For example, with the possible exceptions of Jamaica and Saint Lucia, any changes in water tariffs have to be approved by the responsible minister. Hence, it is political rather than financial considerations that play a significant role in any decision about price rises. Many water service providers were constituted as government agencies and, as such, are governed by boards. The boards are appointed by ministers and are required to resign at a change of government. In effect, therefore, members of the board are political appointees whose positions depend on their acceptability to the incoming regime. Such a system of governance provides parties with opportunities to forward their particular interests and gain favour with their electorates. As one political commentator observed, "The Caribbean's political culture [is] based on authoritarian governance" (Hinds, 2001). It is characterised by a tendency to centralise executive power and decision-making within a cabinet rather than in parliament.

This is not to say that the role of politics or of politicians is a bad thing. On the contrary, they play a necessary and vital part in giving leadership, shaping policies, and ensuring that a balance is achieved between social, environmental, and economic concerns. Through their accountability to their electorate, politicians can ensure that public concerns and sensitivities are brought into the boardroom of water service providers, which in turn provide a necessary counterbalance to an otherwise technocratic approach.

In terms of governance of the water sector, a distinction can be made between the regional level and the national one. There are a number of disparate international bodies that have an interest in the regional water sector. They include the Caribbean Development Bank, Inter-American Development Bank (IDB), European Commission, Food and Agriculture Organization of the UN (FAO), US Agency for International Development and others. The majority are primarily funding

bodies operating on a bilateral basis and generally have had little specific interest in institutional reform or policy matters, though this may be changing. The exceptions to this are UNDP and the UN Environment Programme-Caribbean Environment Programme (UNEP-CEP), although the latter is not a 'donor agency', but acts to support sustainable development. While FAO operates on a bilateral basis UNEP-CEP does have a more regionally focused involvement in water governance through its programmes associated with promoting the Cartagena Convention. The Convention relates to water governance because it is a regional mechanism to assist in the adoption of laws and regulations to address pollution of the marine environment from land-based activities, such as wastewater discharges. Although this is a regional umbrella mechanism, implementation occurs at the national levels.

Regional level governance of the water sector is loose and peripheral. The key regional institution, CARICOM, has not been able to develop any overarching influence, though water matters are subsumed in the Sustainable Development Directorate. The initiative in 2008 to form the Consortium of CARICOM Institutions on Water, whose terms of reference were approved in 2010, had sought to develop a common water framework for the community for water resources management (CARICOM, 2011). However, failure to provide the necessary resources has meant that it has had little if any impact on the region. Somewhat more successfully, other regional institutions have played a direct role in supporting initiatives at the national level. These have come about either through regional projects that include a portfolio of national-level interventions or through their involvement in national and local projects. Examples include the other CARICOM institutions such as the Caribbean Environmental Health Institute (CEHI), the Caribbean Institute for Meteorology and Hydrology (CIMH), and the Caribbean Agricultural Research and Development Institute (CARDI), as well as those outside of CARICOM, such as GWP-C, the Caribbean Water and Wastewater Association (CWWA), and Caribbean Water and Sewerage Association Inc. (CAWASA).

Regional bodies tend to focus their attention on operational level activities, working within the current set of governance arrangements. This is characterised as strengthening existing capacities, both human resources and operational infrastructure, with a view to strengthening their efficiency and effectiveness. Occasionally the focus has been on re-ordering the national-level institutional framework, and this was linked to financing infrastructure projects with a requirement for structural adjustment of the governance arrangements.

At the national level, water governance is rooted in a state-based model of management, with the majority of the salient stakeholders being located within the public sectors. Caribbean actors outside the public sector, such as the private sector, customers, non-governmental organisations (NGOs), and community-based organisations (CBOs), seldom achieve the level of influence that can be witnessed in other parts of the world. Furthermore, a feature of this general arrangement is a lack of a system of checks and balances which would allow a degree of accountability on the part of those responsible for the management and provision of water services. The system of water governance, which has evolved since the mid-20th century, has proved itself to be resilient to change, exhibiting not so much inertia but rather 'lock-in' (Neff, 2013). With the exception of Jamaica, Saint Lucia, and Trinidad and Tobago there has been little fundamental reform of the national institutional frameworks governing water. In Trinidad and Tobago, a process of change is presently being undertaken by the utility sector, with the intention of separating the service function from resource management. However, there are various emerging policy challenges that demand a number of reforms which have the potential to change the current state of affairs. One of the more important is the cross-cutting issue of land use and land use change, which contributes to land degradation, pollution from developments and activities, demand for services, and increased levels of flood risk.

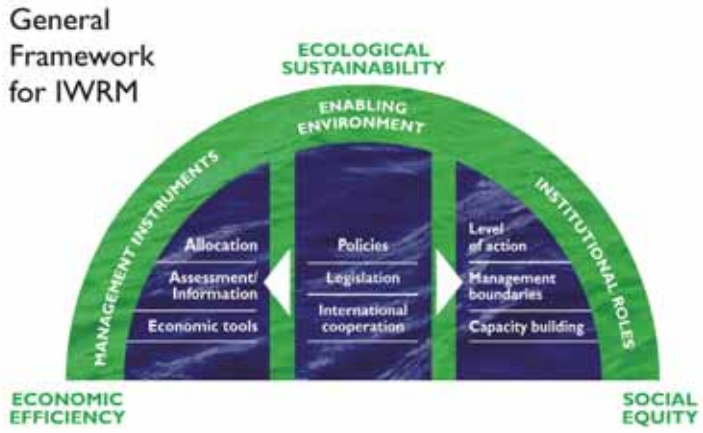
3 Policy challenges

3.1 Challenges for IWRM

The clear implication of Article 26 of the Plan of Implementation of the World Summit for Sustainable Development in 2002 was that IWRM, based on the four Dublin Principles, was seen at the international level as the framework within which countries should seek to organise and manage their water sectors. Part of the appeal is that 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. The impetus to embark on a process of integration is rooted in a recognition that existing water governance arrangements within countries are weak and not capable of addressing the water challenges that they are facing. These challenges include water scarcity, deteriorating water quality, the impact of extreme events, and the provision and maintenance of water services (Cashman, 2012; UNEP, 2012b). Critical issues identified include 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 (GEF-IWCAM, 2008; UNEP-DHI, 2007). The consequences are that poor management is impeding economic and social development and that these deficiencies are most acute in developing countries which can least afford them (Cashman et al., 2010).

The converse is that good water sector management makes an important contribution to the goals of poverty reduction, improved public health, and environmental sustainability. It provides infrastructure that underpins economic development (WHO, 2004). The implication is that IWRM is a political process in which societal, developmental, and ideological factors have to be reconciled, and one that will involve the resolution of conflicts of interests at many different levels. Implementation builds on three pillars: an enabling environment of appropriate policies, strategies, and legislation; an institutional framework that allows the enabling environment to be operationalised; and the establishment of management instruments that allow institutions to do their job.

Figure 2. The three pillars of IWRM



Source: GWP (http://www.gwp.org/The-Challenge/What-is-IWRM/IWRM-pillars/)

Although countries signalled their intentions to develop IWRM plans through the 2002 JPoI, in many cases, actually turning intentions into actions required an additional set of dynamics, which might broadly be characterised as the realisation that the cost of not doing something is greater than the cost of taking action. In this context, cost is understood to mean more than just a financial cost; it includes social, environmental, and political costs as well. The exact nature of some of those driving forces in the Caribbean context is addressed in subsequent sections.

3.2 Challenges for water security

The long-term availability of freshwater has been of concern in the region for at least the last 30 years (CEHI, 2002). Given increasing levels of demand and expected changes in rainfall patterns brought on by climate change, even a slight reduction in rainfall would have serious consequences (IPCC, 2007; UNEP, 2003). There is already a gap between the ability to supply and the level of demand in many Caribbean countries. Barbados is using close to 100 percent of its available water resources, Saint Lucia has a 35 percent water supply deficit, Nevis 40 percent, and Trinidad and Tobago has had a deficit since 2000 (WASA, 2005). Jamaica is projected to experience deficits in areas of important economic activity by 2015 (GoJ, 2011), Antigua and Barbuda is reliant on desalination to meet demands, while in Dominica, Grenada, and Saint Vincent and the Grenadines demand can exceed supply during the dry season as a result of reduced stream flows (USACE, 2004). The situation is compounded by high levels of unaccounted for water (for example, 67 percent in Jamaica, 40 percent in Trinidad and Tobago, and 50 percent in Barbados). The paradox is that many of these countries have sufficient water resources to meet demand, but do not have the infrastructure or institutional frameworks to close the supply–demand gap. It is only in some of the drier islands, such as Antigua and Barbuda, Barbados, and the Bahamas, that the water resources can be considered scarce.

The region as a whole has made significant progress in water supply and most countries report over 95 percent access to improved water supplies. Problems are primarily associated with the quality of service, maintenance and operation of existing infrastructure, ageing infrastructure, and high levels of unaccounted for water, together with concerns over potable water quality. This suggests difficulties with the management of water services and with securing the necessary levels of investment to address the supply–demand gap.

The availability and security of water is another challenge for the effective management of water resources. An increasing threat to streamflows is the conversion of catchments for development and agriculture. The urbanisation of the upper watershed areas around Port of Spain, Trinidad and Castries, and Saint Lucia has resulted in higher peak flows, downstream flooding, an overall decrease in base streamflows (Edwards, 2011; Williams, 2010), and higher sediment loads. The consequences are most keenly felt during the dry season and often lead to significant reduction in water availability. In Dominica, this may be as much as 50 percent. Many catchments and watersheds used for water supply are essentially without gauges, and rainfall measurements are sparse.

Groundwater aquifer yields are threatened by prolonged periods of low rainfall and abstraction levels that exceed the sustainable long-term aquifer recharge. This is especially the case for coastal aquifers where abstractions have resulted in 'up-coning' and increased levels of salinity as the fresh–saline water interface has migrated inland. In Saint Kitts and Nevis, such concerns provided the catalyst for government action and intervention in the Basseterre aquifer. High concentrations of nitrates observed in abstractions from the Liguanea aquifer in Kingston and

St Andrew, Jamaica and the Belle area, Barbados have been attributed to inappropriate sewage disposal in urban areas (Mandal and Haiduk, 2011). Such contamination of groundwater makes it unusable unless expensive treatment is provided. A major challenge facing water resources managers is the difficulty of determining safe yields and undertaking assessments of the yield-demand balance. Often, the required data, the models, and the skilled personnel are all in short supply.

One of the reasons for this state of affairs is that responsibility for water resources management is vested in the water service provider. Only in Jamaica and Saint Lucia, and to some extent in Trinidad and Tobago, has it been constituted as a separate managing body. Another reason is the lack of formal mechanisms for cross-sector collaboration, which would allow water, land, and development issues to be coordinated.

Overall water security is an emerging challenge which the present institutional frameworks and enabling environments are increasingly ill-equipped to deal with. In particular, access to and investment in acceptable sanitation is limited in lower income communities (WHO/UNICEF, 2013). Those in coastal areas underlain by high water tables have issues operating on-site septic systems and hence there is an increased risk of contamination of local areas. This becomes particularly acute and a public health threat during severe flood events.

3.3 The Cartagena Convention

The Cartagena Convention is a protocol concerning pollution of the Caribbean Sea from land-based sources and activities (LBS Protocol). This Protocol came into force in 2010 with the objective of protecting the natural resources of the Caribbean Sea (fish stocks, coral reefs, fragile ecosystems, and recreational waters) from harm arising out of activities taking place on land. These activities include pollution from the disposal of domestic sewage, oil refineries, chemical industries, mining, and agro-industries. However, the biggest threats identified were from domestic sewage and run-off from land as a diffuse source of pollution. The objective of the Protocol is to deal with the sources of pollution through the use of appropriate technologies and by setting pollution standards and water quality objectives. By 2020 all existing domestic wastewater systems (other than community wastewater systems) must comply with the provisions of the Protocol, and all community systems other than individual household systems must comply by 2030.

In order to achieve this, all countries of the wider Caribbean region will have to establish the appropriate policies, legislation, and regulations to support the implementation of the Protocol, create the necessary institutional framework and capacities, and make available the finances to put in place the sewerage infrastructure. The Protocol provides a legal framework for regional cooperation to achieve the objectives of the agreement, establishing regional effluent limitations for domestic sewage and mandating specific plans to address agricultural non-point sources of pollution. It also provides for the future inclusion of other priority sources of pollution and activities.

The provision of centralised wastewater services throughout the Caribbean falls to the water service providers and, as such, the requirements of the LBS Protocol will have a major impact on them up to and beyond 2020. The numbers of people with access to improved sanitation in the Caribbean exceeds 90 percent, in most cases. However, the numbers with access to centralised wastewater service systems which collect and treat wastewater are low, ranging from 3 percent

in Saint Vincent to 30 percent in Trinidad and Tobago. In a situational analysis, wastewater treatment was considered a low priority by water utility managers and stakeholders. Countries were shown to be failing to take an integrated approach to wastewater management and there was inadequate provision for infrastructure investment, policy reform, and public education. All these elements present challenges to water managers. But they are also directly relevant to the development of IWRM strategies and plans at the national level.

3.4 Challenges related to climate change

Caribbean islands are especially vulnerable to the effects of climate change (IPCC, 2007) and as a result are likely to experience increased water stress. The Caribbean may experience sea level rise, temperature rise (2.5 to 3°C rise for the northern and southern Caribbean and 2 to 2.5°C for the eastern Caribbean from 2075 to 2099), and changes in rainfall patterns. An increase in the number of days and nights with very high temperatures (in excess of 35°C during the day and 25°C at night) is expected. Such changes will have a significant impact on soil moisture and evapotranspiration.

Rainfall is generally expected to decrease by between 25 and 50 percent by 2080 (Campbell et al., 2010), but in the Bahamas and Cuba increases are projected. The seasonal rainfall distribution shows significant decreases in the wet season across the region (UN ECLAC, 2010). The northern Caribbean will experience more intense rainfall and fewer rainy days, while the southern part will experience the opposite effect (Campbell et al., 2010). The reduced wet season rainfall, especially when coupled with the projected higher temperatures, is problematic, and the likely outcome is significantly reduced water availability.

A basic interpretation of the climate change projections suggests that surface water flows will be reduced and, potentially, water quality will be affected, and less water will be available for recharge. But these potential impacts require much more investigation. With water availability already a challenge, the prospect of further reductions in water availability because of climate change only increases the need for improved management of water resources and mechanisms to ensure that scarce resources are allocated and used in the most efficient and effective manner. Current institutional arrangements are struggling to cope with the existing situation, so they are not as fit for purpose as would be desired. The impact of recent extreme events, such as Hurricanes Tomas (UN ECLAC, 2011) and the regional drought of 2009 to 2010 (Farrell et al., 2010), have highlighted the vulnerability of the current infrastructure and the challenges to design standards and codes of practice in providing robust and resilient infrastructure that can cope with such events.

3.5 The challenges for regional approaches

The main challenge for regional approaches is diversity. The English-speaking Caribbean is home to some 5 million people, spread across 15 island states and territories. Populations range from a few thousand to over 3 million in Jamaica. Land areas range from 11,000 km^2 to under 10 km^2. Such diversity, along with the composition and size of the economies and the pressure on limited human and financial resources, presents challenges in undertaking adequate management of water resources and services. Politicians have long recognised this, and one of the main reasons for forming CARICOM was to enable the region to engage with the

global community on a more equal footing. Regional approaches to water resources management suggest that the focus should be placed on developing common frameworks and standards. Given the development of strong national identities since independence there would be difficulties in developing mutually acceptable funding arrangements, especially if cooperation required more than the development of common frameworks. Sharing jurisdictions has been problematic in the past, and there is no tradition of formal government-level cooperation in the water sector.

There are, however, precedents in the electricity sector, notably in the Organisation of Eastern Caribbean States (Grenada, Saint Vincent and the Grenadines, Saint Lucia, Dominica, Antigua, and Barbuda, and Saint Kitts and Nevis). Nevertheless, the difficulties in securing sufficient expertise and the financial cost of providing the organisational infrastructure at the national level are being increasingly recognised. This has led some opinion formers to seriously propose a greater level of regional cooperation between governments on water matters (Farrell et al., 2007). This change in thinking is being reflected in the level of informal cooperation between practitioners, as well as that by NGOs involved in the water sector.

4 Policy developments

A number of policy initiatives which support IWRM have taken place over the past six years at regional and national levels.

4.1 Regional and sub-regional IWRM developments

In 2008 a CARICOM resolution to institute a consortium of water institutions was meant to lead to the development of a Common Water Framework for the Community to assist member states with developing and implementing their IWRM plans. It was only in 2010 that the terms of reference of the consortium, which included representation from regional non-CARICOM institutional partners, were approved. The immediate aims were to develop a consolidated work programme and to set up a clearing house and library of water resource projects and a skills database. In the longer term the consortium was to facilitate the assessment of national water resources, identify priority issues, building up capacity, and updating water legislation as a means of moving forward with the development of a common water framework. However, the lack of any available funds and the voluntary nature of the consortium have severely hampered its ability to address any of the objectives set out in the terms of reference. In 2014 this may change as GWP-C (one of the regional non-CARICOM institutional partners of the consortium) has committed to provide at least one year's funding for a person to work for the consortium. Further funding for the consortium's activities may be forthcoming as part of other regional initiatives under development by CARICOM consortium partners.

The GEF-IWCAM project, up to its completion in 2011, provided support in developing national IWRM plans and also reviewed policy, legislation, and institutional structures in the participating countries (GEF-IWCAM, 2014). The outcome was the publication of a *Toolkit for institutional, policy, and legislative improvements in support of the GEF-IWCAM project approach in Caribbean SIDS*, which provided a platform to aid IWRM implementation and specifically the LBS Protocol of the Cartagena Convention. The Toolkit was designed for technocrats, policy-makers, planners, developers, and legislators and provided model examples and laws, including legislative drafting guidelines for the GEF-IWCAM project. In addition, national and sub-national IWRM road maps were prepared in Antigua and Barbuda, Barbados, Grenada, Saint Lucia, and Union Island in Saint Vincent and the Grenadines. Draft policy statements were developed in Antigua and Barbuda and Dominica, and support to dialogue and issue papers in Cuba, Jamaica, Saint Kitts and Nevis, and Trinidad.

Concurrently with the GEF-IWCAM project, GWP-C has commissioned IWRM road maps for individual countries that were not covered under the GEF-IWCAM project. Caribbean WaterNet, part of the UNDP Cap-Net international network for capacity building in sustainable water management, has collaborated with GWP-C in organising a range of training workshops for water sector professionals. The IWRM-related topics included economic and financial instruments, capacity needs assessments, IWRM training for utility managers, climate change, hydro-climatic disasters in water resources management, water legislation and legal reform, conflict resolution and negotiation skills, and gender (GWP-C, 2014d).

In 2007 the Caribbean Water Initiative (CARIWIN) was developed by McGill University, Canada, in partnership with CIMH to provide support for IWRM in Grenada, Guyana, and Jamaica. This included drought monitoring, the development of water information systems, training courses in

IWRM and hydrometeorology data collection, and the development of online IWRM courses (CARIWIN, 2012).

More recently, in 2012, the Secretariat of the Organisation of Eastern Caribbean States (OECS) commissioned the development of a model water policy and legislation on behalf of its member states. The two model documents are based on IWRM principles and incorporate climate change and the LBS Protocol. In addition, they promote the use of economic instruments as management tools, and provision is made for sub-regional collaboration in areas such as the economic regulation of water utilities (OECS, 2013).

4.2 National developments

A number of initiatives have taken place at the national level.

4.2.1 Anguilla

As a British Overseas Territory, Anguilla has not benefited from any external interventions and the developments that have taken place are essentially 'home grown'. In 2006 an Environment Department was established and an Environmental Protection Bill was drafted, covering water and regulatory issues, but there is no consensus regarding where responsibility for regulation would be vested. In 2008, the Anguilla Water Corporation was established. The impetus for the development of the environmental protection legislation was linked to the signing of the LBS Protocol by the British government, as prior to this there was no comprehensive environmental legislation. The management of water resources is governed under the 2007 Water and Wells Act, though the regulations have still to be drafted.

4.2.2 Antigua and Barbuda

At present water management is guided by the 1973 Public Utilities Act, under which responsibilities for water management are dispersed across a number of agencies within government, including the Water Division in the Antigua Public Utilities Authority (APUA). Regulatory measures are minimal to non-existent (UN ECLAC, 2007) and the primary concern of APUA is the high cost of the energy used in producing and distributing water. In 2011 Antigua and Barbuda completed the preparation of an IWRM road map, which included an IWRM Vision and Policy statement. The national IWRM policy was endorsed by the Permanent Secretaries as well as the members of the IWRM road map focus group. This consisted of representatives from various ministries and administrative agencies. The policy document focused on coordination, integration, inclusion, cost reduction, and increasing benefits across stakeholders. As a general policy statement rather than a water sector policy, it focuses on integrating strategies and activities to improve water, wastewater, land management, and disaster preparedness. The IWRM policy was submitted to the government for approval. The main drivers behind the development of the policy were technocrats within the various government agencies responding to issues of increasing water scarcity, competition from agriculture, and the increasing exploitation of groundwater.

In addition to the policy-related IWRM work, a demonstration project addressed the impact of sewage overflows from septic tanks on an important coastal wildlife area. The elements of the

intervention included a public education programme and household connections to a new sewage treatment plant that will use treated effluent to irrigate local farms (Merla and Simmons, 2012).

4.2.3 The Bahamas

There is no water policy for the Bahamas and no discussions of whether one is needed or not, though the requirement for a national water management plan is contained within the Bahamas' climate change policy. Water management broadly falls under the duties of the Water and Sewerage Corporation, which has a Water Resources Management Unit. It appears that many of the regulations governing the management of water resources were not enacted and that, rather than enacting new legislation, attention is focusing on activating existing regulatory provisions. There is a Public Utilities Commission, but this has so far not been able to consider the economic regulation of water services. Under the GEF-IWCAM project, and in collaboration with CWWA support, a national dialogue to identify key issues was initiated (Merla and Simmons, 2012).

4.2.4 Barbados

As one of the more water-scarce islands, because of both its physical size and population, Barbados has potentially much to gain from improving the way water is managed. However, the institutional arrangements in the water sector have not changed significantly since the 1980s when the Barbados Water Authority (BWA) was incorporated as a statutory body. The BWA, like a number of other water authorities in the region, combines water resources management functions with water services provision. The institutional challenges facing the water sector in Barbados are known and acknowledged:

- no clear demarcation of regulatory powers and a need to separate regulatory powers
- the need to facilitate consultation with stakeholders
- no dispute resolution mechanisms
- a lack of clarity over ownership of water
- the need to harmonise legislation (Brewster and Mwansa, 2001).

An attempt was made in 1997 to develop a National Water Resources and Development policy, which was taken to the cabinet in 2000, but was shelved, though the policy document was amended in 2002.

The National Strategic Plan (GoB, 2007) set out a vision that, by the end of 2007, an Integrated Water Resources Management Plan would be in place. The strategic plan also envisaged enhanced regulatory and enforcement mechanisms, and an attempt was made in 2008 to bring the economic regulation of BWA under the auspices of the Fair Trade Commission. In 2008, the BWA, with the assistance of the GEF-IWCAM project, embarked on preparing an IWRM road map which should ultimately lead to the formulation of a National Water Policy and a reorganisation of water sector governance. Although the formation of the Ministry of Environment, Water Resources, and Drainage at the end of 2008 demonstrated some promise of change, nothing came of the GEF-IWCAM project initiative. Indeed, it was never possible to get the minister responsible to accept the document, despite widespread national consultation and stakeholder buy-in.

Subsequently, the BWA embarked upon a re-evaluation of its groundwater zoning policy (Barbados is reliant on groundwater for its water supply) in response to the increasing level of pollution that was threatening the integrity of its groundwater resources. The re-evaluation recommended a revision of the protection zoning regulations. Interestingly, it also recommended changes to the institutional framework for the governance of water resources that mirrored, but did not duplicate, some of the proposals in the IWRM road map. The re-zoning proposals were accepted by the Barbados Cabinet in 2011, but subsequent reorganisation and reallocation of ministerial responsibilities for water management (water resources management is now subsumed as part of the Ministry of Agriculture and Fisheries) have fragmented responsibilities. It is unlikely, under the emerging government austerity measures, that any significant change in the enabling environment or institutional framework will emerge.

However, with a US$ 50 million loan from the IDB to the BWA for a water and sanitation systems upgrade, part of the financing is earmarked for modernising the institutional setting, improving the efficiency of operations, and implementing a cost recovery mechanism. One objective of the project is to prepare the BWA for its activities to be regulated by the Fair Trade Commission. This includes the preparation of a long-term business plan, as well as a change management and improvement plan, which would modernise and improve the operation of the BWA. Although the award was made in 2009, it was only towards the end of 2013 that the majority of the significant work was expected to commence. Other outstanding issues that affect water management include the need to address climate change, and the LBS Protocol, with respect to legal provisions and regulations pertaining to environmental (pollution) management, particularly discharges to the environment.

4.2.5 Belize

Belize's geographical position on the edge of the Caribbean region within Central America has placed it very much on its own with respect to mainstream IWRM activities in the Caribbean. A process of water policy development and legislative change was commenced in 1993 with technical and financial assistance from the FAO. That process stalled, though there were several attempts to revive it, for example in 1998, 2003, and 2005. In 2007 a policy was presented, based on IWRM principles, accompanied by a draft Act. However, this again stalled because it was held that it did not address climate change issues and, although the document was redrafted, the policy was not accepted by the water stakeholders. In late 2008, floods in the country gave rise to concerns over the future availability of water for agriculture and helped to refocus interest in water. With support from water professionals, environmental organisations, and from the Caribbean Community Climate Change Centre, the process was reactivated, and it secured political support. Legislation governing water resources management was passed in 2010, and the country embarked upon the development of supporting regulations, management instruments, and organisations (Cashman, 2012). However, the country faces significant challenges, in terms of available human resources needed to improve water management. There is also an undercurrent of opposition to the changes, particularly from commercial agricultural interests. These relate in particular to perceptions of how their access and abstraction rights might be affected. The importance of satisfactorily addressing these issues can be seen in the parallel initiative, supported by FAO, to promote irrigated agriculture in the country through the development of an irrigation and drainage policy.

4.2.6 British Virgin Islands

The water sector is governed primarily by a Water and Sewerage Act, which has been in the process of revision and updating since 2007. Although the revisions were passed on to the responsible minister, before they could be adopted by the National Assembly there was a change of government (Cashman, 2012). To date this Bill has not been adopted.

4.2.7 Dominica

The Dominica Water and Sewerage Company (DOWASCO), a wholly owned government company, is responsible for both water service provision and water resources management, despite the focus on water resources being minimal, with poor monitoring and data collection (UN ECLAC, 2007). Towns and communities are supplied from the country's abundant streams and rivers, using, predominantly, run-of-the-river off-takes that have little storage capacity. During the dry season, water available from these sources can fall by as much as 50 percent. Given the mountainous nature of much of the island, pumping water is a major expense.

The water policy process was mobilised under two initiatives supported by the European Union (EU). In 2005 a policy statement was developed, but was never ratified. This was followed in 2008 by an extensive institutional review of DOWASCO to improve the management and operational framework of the organisation, the legislative setting, enhancements to infra-structure, and protection of the resource. The review and its recommendations were never formally ratified by government. Under the GEF-IWCAM project, the Roseau catchment (location of the capital and source of its water supply) was identified as a critical area in need of an integrated approach to water management. The problems identified included changing land use patterns, uncontrolled land-based activities giving rise to pollution, and inadequate legislation and policies for the management of water resources. In 2011, consultations were held which drew heavily on two prior sector reform studies sponsored by the EU around a national IWRM policy and guidance paper for ratification of the LBS Protocol by the Cabinet. Although this received support from technocrats in the water sector and from the minister responsible, the proposals have yet to be ratified by the cabinet (CEHI, 2013).

4.2.8 Grenada

Grenada in many ways typifies the institutional arrangements established in the years after independence. Water services are undertaken by the National Water and Sewerage Authority (NAWASA) as a statutory government agency. It has included in its mandate responsibility for water resources management, but, for a variety of reasons, did not choose to exercise that function. The focus of activities is on water service provision. There is almost no independent regulatory oversight other than for drinking water quality, and it is the minister and cabinet that have the real power over economic and financial matters.

Grenada's water resources policy development process was supported initially with contributions from the GEF-IWCAM project and from GWP-C, with the formulation of an IWRM road map in 2007. Caribbean WaterNet also assisted in developing the road map by producing a framework document modelled on the IWRM plan for Grenada. The road map laid out the priority management issues in the country with an assessment of the state of governance and capacity for IWRM. One of the goals was to implement an integrated coastal areas and watershed management approach to reduce land-based sources of pollution. The road map also outlined the range of priority management interventions that stakeholders identified, and, as part of the process, three projects were identified for implementation. They included a

Grenada's tariff reform 2008–2010

In April 2010, Grenada's National Water and Sewerage Authority (NAWASA) implemented its first tariff increase in 17 years. The Authority was facing a deteriorating financial position that meant that it was unable to allocate sufficient resources for the maintenance of its existing water and wastewater system or to capitalise expansion. The steps that led to this commenced in 2006 with a tariff study conducted by consultants PricewaterhouseCoopers and what was, at the time, the Caribbean Basin Water Management Programme (now CAWASA). The appointment of a new board of directors in September 2008, following a change of government, presented the NAWASA management team with the opportunity, at the start of 2009, to present to the government the case for tariff reform.

The board adopted the recommendations and not only submitted the case to the minister responsible, but actively lobbied the minister to convince him to support the recommendations. As a result, the minister agreed to champion the tariff reform case in cabinet and arranged for the general manager and board of NAWASA to make a face-to-face multimedia presentation to the prime minister and the cabinet. A pivotal point in the presentation came when it was shown that the monthly increase in water bills for the average customer would be the equivalent of US$ 4.

As a result, a 35 percent increase was approved in September 2009, subject to the formulation of a public relations (PR) plan and that a social security 'safety net' would be operational. The PR plan was implemented between December 2009 and February 2010, using various media and involving the minister responsible, board chair, general manager and others in NAWASA. In April 2010, the Water and Sewerage Rates and Charges Regulations 2010 came into effect.

wastewater wetland treatment system implemented at a commercial establishment, mapping the rainwater harvesting potential of the main island, and the need for a water information management system. The latter was implemented under the Caribbean Water Initiative (CARIWIN) project.

The work of the GEF-IWCAM project was built on, with assistance from the FAO, to develop a national policy for water resources, along with a legislative review in 2008. The policy development process was advanced in response to developmental assistance from the EU under the Southern Water Supply Development project designed to upgrade the water supply for communities in the south of the island. The adoption of a water policy was made a condition for Grenada to receive the water project funding. The potential loss of grant aid added political will to the already acknowledged need to restructure the water sector. The draft National Water Policy and Implementation plan was presented and accepted by the cabinet in 2007 (CEHI, 2013; Merla and Simmonds, 2012).

In 2008 there was a change of government and this could have derailed the take-up of the policy. But because of the persistence and engagement of those who had developed the policy, the new minister accepted the plan and it was subsequently endorsed by the new cabinet. However, to date implementation has not taken place. The only real achievement has been the successful revision of water tariffs by the cabinet.

4.2.9 Guyana

In 2000, with the assistance of foreign donors, the Guyanese water sector was reorganised, leading to the 2002 Water and Sewerage Act which set up Guyana Water Inc. (GWI). The purpose was to increase access to safe and affordable water. Guyana Water Inc. is responsible for urban water services and has a Rural Water Supply Department which oversees the activities of community water services operators. In 2003 a five-year management contract was awarded to

an international private operator, funded through a British government grant. Water services are regulated through the Public Utilities Commission and policy falls under the Ministry of Housing and Water. In 2007 the water services management contract was cancelled on the grounds of failure to meet specified performance criteria. Since the cancellation, GWI has taken back managerial responsibility and it has received project support from external agencies to improve supply coverage, operational efficiency, water and wastewater treatment, and to improve rural water supplies. Since 2010, interest in IWRM has increased, aided by the active support of the Minister of Housing and Water, and this has created some policy opportunities. The process was supported by the National Water Council and GWP-C through the commissioning of an IWRM road map for the country. This was presented to the minister responsible, but has yet to go the cabinet.

In addition to the road map, GWI has recently started to prepare a framework for the management of water resources through its Water Resources Department in order to advance and guide IWRM in the country. The work is being undertaken through the Water Resources Subcommittee and seeks to ensure coordination with the Ministry of Agriculture, which has responsibility for the National Drainage and Irrigation Authority, to integrate with national strategic development objectives, and promote the role of the private sector. Irrigated agriculture is an important part of Guyana's economic activities and accounted for 21 percent of gross domestic product in 2011. Yet irrigation infrastructure is vulnerable to periodic flooding, which leads to significant economic losses. The geographic size of the country and the concentration of population and economic activity in the flood-prone coastal areas highlight the importance of IWRM. Although an IWRM-informed water policy and legislation have yet to be articulated, various activities in this direction include the ongoing execution of an IDB-funded water supply and sanitation infrastructure improvement project and the personal interest of the minister. This would seem to indicate that developments will eventually take place.

4.2.10 Jamaica

The water sector in Jamaica has undergone the most organisational change away from the centralised government service provision model (Cashman, 2012). While service provision for domestic, rural, and irrigation activities is still undertaken by various government agencies, these are separate from economic (Office of Utilities Regulation) and environmental (National Environment and Planning Agency [NEPA]) regulatory functions. The current institutional framework was set up in the late 1990s and, although the need for a water policy had been identified in the early 1990s, it was not until 1999, with the assistance of the IDB, that a draft water policy was drawn up. The policy was adopted by the Jamaican cabinet in 2000 and revised in 2004. In 2001, the National Water Commission Act was amended to allow private sector participation in the water services business through the granting of licences and, at present, there are eight such undertakings. The National Water Commission has responsibility for urban water services, while Rural Water Supply Ltd. has responsibilities for rural water supply. Water resources management is a separate function and is undertaken by the Water Resources Authority, working in collaboration with NEPA. It has responsibility for data collection and the management, protection, allocation, and use of water. In addition, the National Irrigation Commission, an agency within the Ministry of Agriculture, develops, operates, and manages irrigation systems throughout the country.

In 2013 Jamaica reorganised ministerial responsibilities and created the Ministry of Water, Land, Environment and Climate Change, providing oversight and responsibility for policy, legislation, and monitoring of all water agencies. The inclusion of water, land, the environment, and climate

change under one ministry clearly signals an integrated approach to water management and is clearly a leading example for others. However, it is recognised that the current policy requires revisions to address issues such as global warming and climate change. The current policy and action plans have led to increased cooperation among water sector agencies and have improved consideration of Jamaica's water sector by international agencies, especially funding agencies. One of the biggest challenges though, is the loss of skilled water sector professionals.

Inevitably, in a country of Jamaica's size and importance, there are many water initiatives that have focused on watershed management or contributed to IWRM. Activities include the World Bank's Pilot Projects for Climate Resilience, which focused on interventions among small farmers to improve water resource use and productivity, to increase rural incomes, and enhance reforestation efforts. The GEF-IWCAM project in the area around Port Antonio has captured and promoted best practices and lessons learnt through coastal, watershed, and community management initiatives to create effective watershed management mechanisms for the Eastern Portland area (Merla and Simmons, 2012). This work demonstrated the importance of community participation and building skills and technical capacity, and NEPA has announced its intention to replicate the approach in all of the country's watersheds. For wastewater, Jamaica has enacted the Natural Resources Conservation (Water and Sludge) Regulations 2013 as a compliance measure for the LBS Protocol, signalling Jamaica's intention to ratify and enforce the Protocol in the very near future.

4.2.11 Montserrat

In 2007, a Utilities Act provided for the merger of water and electricity services, with the water utility being responsible for water resources management, though the Environment Department has overall responsibility and oversees environmental issues. From the interviews conducted, the issue of water policy does not appear to be on the agenda of either water sector professionals or the political class.

4.2.12 Saint Kitts and Nevis

Water management is governed by the 1956 Water Courses and Water Works Act which, by the admission of the water utility, is outdated. The need for a water policy and a revamp of the institutional arrangements was identified as a priority by the Water Services Department (Saint Kitts) and the Nevis Water Department as a result of a policy and legislative review carried out in 2010. These two agencies share responsibility, within their respective territories, for water resources management and the provision of water services under the federal governance structure of the state. In both jurisdictions the majority of supply comes from groundwater. However, in Nevis extensive use is made of rainwater harvesting, while in Saint Kitts there are two privately owned desalination plants. Water resource management focuses on the vulnerability of aquifers on both islands to pollution and seawater intrusion. Other concerns include inadequate wastewater management, water infrastructure, and institutional and regulatory capacities. Under the GEF-IWCAM Project a Strategic Plan for the Water Resources Management Agency was developed, emerging from the development of a National Water Policy. However, there is little progress in implementing the provisions. Saint Kitts and Nevis, as a member of the OECS, may well benefit from the development of the OECS Model Water Policy and Legislation (CEHI, 2013). These processes are being driven by national water sector practitioners.

Management of the Basseterre Valley aquifer

The Basseterre Valley aquifer on the island of Saint Kitts accounts for 40 percent of the country's potable water supply. This important source of supply is under threat from urban encroachment and pollution. A project, financed under the GEF-IWCAM project, was initiated to promote the proper management and protection of the aquifer through measures to mitigate the threats from pollution and improved user-resource management. The project resulted in the development of a Water resources management plan and the passing of an Act of Parliament that set up a National Park and protected area. Through the project, local authorities were able to increase their capacity to sustainably manage the resource and improve aquifer monitoring.

4.2.13 Saint Lucia

The country's water supply is operated by the Water and Sewerage Company (WASCO). The supply comes almost entirely from surface water sources, produced from 4 major and some 19 minor water supply systems. In response to the growing demand, the government of Saint Lucia undertook a number of initiatives in the most water-stressed areas to identify new surface and potential groundwater sources. Hurricane Tomas of 2010 severely affected all the surface water supply systems in the country, leaving many, including the John Compton Dam, in a highly vulnerable state. Wastewater treatment across most areas of the country is predominantly via on-site septic systems. However, there are several commercial enterprises that operate on-site wastewater treatment facilities as well as the main municipal wastewater treatment system servicing the extreme northern portion of the country. Some of the critical issues of concern for water resources management include:

- water supply deficits and inadequate water infrastructure island-wide
- agricultural activities affecting water quantity and quality
- pollution of coastal waters
- inadequate data
- inadequate implementation of the water and land use policies as they relate to improved governance for water resources.

A National Water Policy was developed and legislation passed to give effect to the policy (GoSL, 2004). A contributory factor in bringing about the changes was the roles of the EU Water Resources Management project and the Organization of American States in supporting the process. In 2005, the Saint Lucia Water and Sewerage Act was passed, giving effect to many of the provisions of the Water Policy document. The Act established a Water Management Agency as well as the National Water and Sewerage Commission to regulate the delivery of water supplies and sewerage services. The Act does not mention the Water and Sewerage Company (WASCO) except in as much as it would be a water service licensee. In 2008, there were moves to transform WASCO into a shareholder company, with a majority of the shares to be held by St Lucian institutions and citizens and a minority interest to be held by an external company taking over the running and management of WASCO. However, as a result of legal difficulties with the tendering process the partial privatisation was stopped. In 2010 an IWRM roadmap was finalised under the GEF-IWCAM project. The road map recommended the development of an Action Plan to facilitate the effective planning and implementation of IWRM in St Lucia (CEHI, 2013).

In addition to these policy-level initiatives, under the GEF-IWCAM project an IWRM demonstration project was initiated in the Fond D'or Watershed. Through a variety of actions the project

addressed the adverse effects of the intensive use of the catchment for agriculture and livestock by developing a participatory approach to catchment management. The initiatives included:

- development of a demonstration wastewater wetland treatment system using reed beds and gravel filters
- rainwater harvesting and the preparation of a policy brief on rainwater harvesting for the cabinet
- an integrated pig-waste management system for small farmers
- an integrated watershed management strategy and spatial development plan.

More significantly, these initiatives led to the establishment of a community-based organisation 'The Trust for the Management of Rivers', which has taken over responsibility for continuing the management of the watershed. Hence, in Saint Lucia, national-level IWRM initiatives are complemented by local community-level actions.

4.2.14 Saint Vincent and the Grenadines

On Saint Vincent all the water supplied is from surface sources and it does not suffer from significant water supply constraints. The Central Water and Sewerage Authority (CWSA) operates the public water supply on mainland Saint Vincent. The case for the Grenadines is very different as these small islands are arid with no perennial streams and very limited groundwater. On the more developed islands with a tourism orientation, hotels operate desalination plants with significant augmentation from rainwater sources. All households, commercial enterprises, and instructional entities harvest rainwater to meet domestic needs. Under a climate change project on the island of Bequia, a solar-powered desalination plant was installed to service the island community. Wastewater treatment is mainly through on-site septic systems with municipal sewers servicing the capital city of Kingston and its environs. Some industrial operations use dedicated on-site wastewater treatment options. In the Grenadines, where the yachting subsector is significant, there is also concern over the increasing influx of untreated yacht-generated waste into the marine environment.

The management of water resources and water service provision is currently governed by the 1991 Water and Sewerage Act. In 2008, an EU-funded project looked at the management of water resources in Saint Vincent, at tariffs, monitoring, and at the issue of developing a water policy. This project ended in 2010 with one of its outputs being a draft policy document on water resources management. The report noted that there was a lack of expertise in the field of water resources management and recommended institutional changes, including setting up a Water Resources Management Agency, particularly as a way of promoting IWRM in Saint Vincent and the Grenadines. To this end it also proposed a Water Resources Act to give effect both to the proposed water policy as well as the institutional changes. Although widely endorsed by those in the water sector, no further action was taken (CEHI, 2013).

Prior to this initiative, the GEF-IWCAM project focused on Union Island as an island within Saint Vincent and the Grenadines with acute water management issues, particularly water scarcity. Demand-supply issues coupled with environmental concerns had not previously been addressed and nor had an integrated approach been taken to the island's water management. A road-mapping approach was adopted involving national stakeholder consultations and situational analysis. The results were communicated to local communities and, with feedback, an IWRM road map for Union Island was produced.

Water safety plans: Saint Vincent and the Grenadines (SVG)

The Ministry of Health, Wellness and the Environment (MoH), with financial support from the Pan American Health Organization, developed a Water Safety Plan (WSP) with the technical guidance of a WSP Steering Committee and input from key stakeholders.

The WSP approach is arguably the most effective way of ensuring that the public water supply in SVG is safe for human consumption, and that it meets the health-based standards and other regulatory requirements. It is based on a comprehensive risk assessment and risk management approach to all steps in the public water supply chain. It provides an opportunity for SVG's Central Water and Sewerage Authority (CWSA) and other water sector stakeholders, the MoH and the Environmental Health Department – the regulatory agency – assess, modify, and build upon existing good management practices. The methodology comprised analysis of water systems and water quality data and information to validate the data and collect additional information.

Given the limitations of the WSP study, the sanitary survey was restricted to the catchment and intake of the Majorca surface water source (average daily production of 3,150 m^3 and estimated demand population of 11,300). An assessment was carried out for the Majorca water system, which identified the potential hazards and hazardous events in each part of the water supply chain and the level of risk presented by each hazard and hazardous event, using a semi-quantitative risk scoring and rating method. Existing control or mitigation measures were identified for each of the hazards, following which the risks were reassessed and prioritised, post-control. This provided the foundation for the development of a water quality improvement plan, along with the requirements for the operational monitoring of the control measures and verification monitoring.

Key findings of the WSP process included the importance of conducting sanitary surveys for the water catchment areas of all water supply systems in SVG and of implementing catchment and intake protection measures. The key findings also recommended implementing measures for water storage tank security and pollution protection, protection of the distribution pipe network; and development and implementation of a water quality monitoring programme for the islands of the Grenadines. A further recommendation was that the WSP approach be used to analyse other water systems in SVG. This could be used to mobilise financing to fund implementation of the recommendations (Bartram et al., 2009).

4.2.15 Trinidad and Tobago

In spite of being a relatively water abundant country, Trinidad and Tobago has its fair share of water sector problems. Supplies are intermittent, leakage levels are high, and demand is suppressed because of restricted supplies. All this has led to a high degree of frustration among Trinidadians, which sometimes boils over into direct action, such as the reported hijacking of a water truck by angry rural residents (Nero, 2008). A degree of impetus for water sector reform arose out of a World Bank public sector institutional strengthening exercise in the 1990s, which seems to have been revived through a proposed IDB multiphase wastewater rehabilitation programme. This will result in the preparation of a new corporate governance model and management structure for the country. One of the outcomes was a water resources management strategy study completed in 2000. This recommended the adoption of IWRM and the need to establish an effective and financially autonomous institutional framework (GoTT, 2005).

In order to address these problems, the Ministry of Public Utilities and the Environment drafted a National Water Resources Management Policy in 2003 with the support of the IDB. Accordingly, there should be a separation of water resources management from water services, but this has yet to be implemented. One reason given for this is the lack of consensus over the jurisdiction of such a body, its responsibility for the management of watersheds, and its relationship with the

Environmental Management Authority. Anecdotal evidence suggests that this policy process was driven by the then minister responsible for water and that, when the minister was transferred to another ministry, the process lacked the necessary political patronage to progress.

The National Water Resources Management Policy was adopted in 2005 and a Water Resources Agency was set up and located institutionally with the Water and Sewerage Authority (WASA), though it does operate semi-autonomously. WASA was set up in 1965 and is the largest public utility in the country. It is responsible for the provision of water services throughout Trinidad and Tobago, which includes water supply and wastewater services. Given the difficulties experienced in the management of wastewater services, there were suggestions in the past that this function should be transferred to the Solid Waste Management Company. However, that suggestion was shelved. The activities of WASA are regulated by the Regulated Industries Commission (RIC), which was set up as a statutory body in 2000. The role of RIC is to award operating licences, establish the basis for tariffs, prescribe standards of service, and study the efficiency of operation and performance. It does not itself set tariffs, but rather makes recommendations to the minister responsible. The last water price review was carried out in 2007, but no action was taken (Cashman, 2012).

With a regional office in Trinidad, GWP-C has, over the last five years, sought to engage with WASA in promoting the adoption of IWRM and to encourage its implementation. However, despite a number of stakeholder consultation meetings with WASA, little progress has been made in encouraging WASA towards action on this matter. Encouraging actions, such as the development of a water and wastewater master plan for the country in 2008, do not appear to have progressed beyond the report stage. There also appears to be little attention paid to incorporating agriculture and land management issues into approaches to water resources management. To date no IWRM road map or plan has been prepared, and it is unclear as to whether there is any institutional or political support for IWRM in either Trinidad or Tobago.

Water safety plans

The water safety plan approach was advocated by the World Health Organization as a means of ensuring the safety and integrity of water supplies through the use of a risk identification, assessment, and management approach. It blends catchment-based approaches with consideration of the overall water supply chain and, as such, incorporates the important element of land use into the process, thereby moving beyond the water management aspects to adopt an integrated approach. There are several examples of water service providers having adopted this approach in the Caribbean, often working in conjunction with the US Centre for Disease Control and CEHI. Examples of its application can be found in Jamaica (with the Spanish Town Water Supply System), in Guyana (with the Linden Water Supply System), and Saint Lucia (with the Dennery and Mabouya Valley Water Supply System).

5 Adoption of IWRM – so where are we?

The evidence indicates that for nearly a decade there have been a number of interventions with the overall purpose of improving and implementing plans, and that the main efforts have been either initiated or promoted by international or regional actors. After such a period of time, it is reasonable to reassess the ongoing implementation of reform to management of the water sector in the English-speaking (and predominantly insular) Caribbean. The essential goal of the promotion and adoption of plans as the basis on which national water sectors should be managed is reform; trying to do things better.

5.1 Public participation

In spite of the acknowledged failings, particularly in service delivery, consumers have shown very little appetite for change, and there is implicit support for continuing with existing arrangements. Suggestions of privatisation, or even contracts, have generally been met with opposition. The example of Saint Lucia and the proposed privatisation as a means of addressing that country's water woes is the most recent case in point. It was suggested that this is based on the assumption that only governments can ensure access to basic services, such as water and sanitation. There is little conviction that changes would bring about any improvement in the quality of service (Batley, 2004). Furthermore, given the monopolistic way water services are organised and provided, usually with only one service provider in the whole country, customers have little influence over the service provider or ability to hold them to account. The corporate nature of Caribbean water service providers also creates obstacles between citizens, politicians, administrators, and service providers that lessen the ability of citizens and customers to exert influence on the service provider. This appears to be concomitant with the weak regime for consumer protection and little understanding by the general public of their entitlements with regard to quality of service and products, including water. Thus, impetus for reform is unlikely to arise from this quarter.

What is interesting is that the often employed exhortation that the public needs to be educated about water matters has resulted in efforts within many of the projects to raise levels of awareness. This suggests that the onus for at least some of the problems experienced in water services lies with the consumers and that, if they were to change their ways, things would be better. Paradoxically, none of the projects or efforts reported has addressed the need to educate the service providers to be responsive to the needs of their customers and citizens. This is clearly not in line with one of the Dublin Principles on which IWRM is based – the importance of stakeholder involvement and a participatory approach to water management involving users at all levels.

5.2 Political support

Evidence also indicates that the lack of public interest in change is compounded by the perceived political risks of change (Batley, 2004). The risks arise from raising water rates, improved collection of unpaid bills, de-politicising investment decisions, loss of political patronage, and changes in employment levels and conditions. In contrast, the potential benefits arising from more efficient service provision are less visible, often long term, and

difficult to quantify and convey to an electorate. It is easier to make the case for the retention of existing rights and privileges than to alter them. Given such a combination of disincentives, the incentives for politically-driven reform are low, and even if there was a ministerial championing of reform efforts, this has seldom been sufficient to bring about change. Only when there has been sustained support at the highest political level has there been a degree of success.

Potentially, the cabinet-based approach to political decision-making in much of the Caribbean and the subordinate role of parliaments could have provide a mechanism for mobilising political support, if ministers become champions of reform, but this does not seem to have been the case. There has been ministerial championing of efforts to inculcate IWRM into the workings of the water sector in Grenada, Guyana, Jamaica, and Saint Kitts and Nevis, but with mixed results. The perception at the political level that the disadvantages of reform outweigh the advantages helps to explain the historically slow pace at which any environment-centred reforms happen.

Support for this argument can be seen in progress towards the adoption of IWRM. Belize, Grenada, Saint Lucia, and Trinidad and Tobago are examples in which external influence, predominately in the form of funding and grants, has brought about change. In such cases funding was conditional on the adoption or implementation of changes in institutional frameworks or the enabling environment. The fact that, in most cases, plans have not been fully adopted and implemented also accords with other international evidence. This suggests that governments cannot be wholly influenced or controlled by external influences. External influence appears to be most easily asserted in the short term, where immediate goals can be met.

A more long-term view reveals that, since 2008, the region as a whole has been feeling the effects of the world economic downturn. The effects are particularly acute for those countries whose economies are heavily dependent on the economic fortunes of North America and Europe. The signs are that in 2014 the economic positions of many countries in the region will further deteriorate and they will require external support (CCMF, 2013). Economic crises create windows of opportunity and can bring about change. An obvious place to start will be the need for institutional reform of the public sector. It is therefore not unreasonable to think that this could result in changes in the institutional framework of the water sector, which is among those most affected by worsening economic conditions. A positive assessment might forecast that water sector professionals would capitalise on this, building on the many years of advocacy and sensitisation to demonstrate how IWRM could inform the changes to the water sector. Other opportunities for reform have arisen out of crises of an environmental rather than an economic nature. The 2009–2010 drought was cited as just such an opportunity, as well as the floods that affected Saint Lucia and Saint Vincent and the Grenadines in the wake of Hurricane Tomas, and the extreme rainfall events of 2011 and 2013. However, the water sector failed to capitalise on these events. It may have been the case that the urgent need for short-term crisis management obscured the longer-term commitment required for more far-reaching reforms.

5.3 Institutional and professional support

International evidence indicates that sector bureaucrats and professionals play a key role in promoting or resisting change (Batley, 2004). Many of the changes implicit in the adoption of IWRM – changing institutional frameworks, changing the enabling environment, and the adoption of management instruments – are essentially of a bureaucratic nature. In addition, the changes demand a redistribution of the functions and power of government agencies, in which these same agencies would have to cooperate in the reduction of their own power. Further, acceptance of a different 'role of government' requires changes in attitudes and work practices, which in turn demand sustained administrative and political commitment. This puts existing administrative and professional apparatus in a strong position to assist or resist reforms. So for water sector bureaucrats and professionals to act as agents of change, there have to be incentives for them to support change. International evidence (Saleth and Dinar, 2005) suggests that, in many cases, changes have often been initiated by this cadre as a result of such incentives, and there is further evidence for a strong and ongoing role for these professionals, irrespective of the changes proposed. This facilitation of change appears to be most apparent when professionals are able to direct the incremental emergence of new arrangements and practices, while loosening the constraints associated with being part of government service.

While there is no research that provides evidence of this in the Caribbean, the degree to which water sector professionals, rather than bureaucrats, have involved themselves in the various IWRM-related initiatives over many years would seem to provide a degree of support for the contention. An assessment of the key actors involved in initiatives undertaken by GWP-C, the GEF-IWCAM project, and others, reveals a high level of support among professional engineers, working alongside water agencies and utilities. These professionals were in senior positions and thus well able to provide and mobilise a range of resources. Conversely, if they had so chosen, they could very easily have frustrated the initiatives. An interpretation of the BWA's Water and Sanitation Upgrade Project funded by the IDB and the Review of the Groundwater Protection Zone Policy lends support for the role of water professionals in bringing about reform. Elements of both projects address the modernisation of the institutional setting, strengthening the role of professionals, and giving them greater autonomy and control over the workings of the organisation. At the same time the proposals do not entail additional bureaucratic conditions that could pose a challenge to the organisation. Similar factors could be cited to account for the support for organisational changes in Saint Lucia (with the setting up of the Water Resource Unit) and for the protection of the Basseterre aquifer in Saint Kitts and Nevis.

What is also clear is that the same level of support from bureaucrats and administrators within line ministries has not been as typical, particularly where this pertained to reforms of the institutional framework or enabling environment. Much more universal support was evident in non-policy-related (demonstration) projects. One explanation for this could be that it is easier to secure support from communities of interest in projects that focus on physical implementation, and in which there is less of a challenge to existing organisational arrangements.

5.4 Project-based support

The most successful and visible aspects of interventions over the last decade were projects implemented to address specific concerns or issues and which were identified by 'stakeholders' at national and community levels. The GEF-IWCAM project is the most significant, and reflects the fact that, with adequate funding and co-financing, meaningful interventions are possible. These projects were facilitated through a regionally based mechanism, but actual work was carried out by local partners, and this not only contributed to their success, but resulted in capacity building, ensuring dual benefits. The availability of funding was an important factor in promoting IWRM interventions. Projects that had a specific set of objectives and deliverables to be achieved over the short to medium term were most likely to result in positive change.

Complementing these projects are the ongoing efforts in training and capacity building. The most notable players in this respect are GWP-C, Caribbean WaterNet, and the CARIWIN project, although the GEF-IWCAM project also contributed. The knowledge and understanding of IWRM within the region have been significantly enhanced by these efforts, which included:

- training for water operators and service providers by CAWASA
- training in wastewater management under the GEF-Caribbean Regional Fund for Wastewater Management project
- the professional networking maintained and promoted by CWWA
- training provided by GWP-C and Caribbean WaterNet
- training provided under the GEF-IWCAM Project.

The initiatives have helped to introduce IWRM precepts to policy-making and institutional actors, and have become the common currency for shaping water sector reform. The fact that there have been few positive outcomes is not a reflection of their failure, but rather speaks to other factors. Inevitably, with such a collection of actors, each with their own set of interests and needs, there could have been a greater degree of coordination, although how to achieve this in practice is a different matter. As noted, this issue is particularly acute with respect to the symbiotic relationship between the management of land use and land use change, and water resources.

It is evident from this review that there has been far less success in reforming the institutional frameworks and the enabling environment. Only five countries have approved and adopted sector water policies: Belize (2010), Grenada (2007), Jamaica (2004), Saint Lucia (2004), and Trinidad and Tobago (2005). Participation and IWRM are being considered and there may be future policy revisions. Six countries developed a National Water Policy: Anguilla, Antigua and Barbuda, Barbados, British Virgin Islands, Dominica, and Guyana. Saint Vincent and the Grenadines engaged in a process of reviewing water resources and services, and one output will be a draft water resources management policy, but not a sector-wide water policy. However, in most cases, these water policies have not received any formal endorsement or implementation by their respective governments. In one case – the Commonwealth of the Bahamas – climate change is considered to be such an overarching issue that water policy has been subsumed into the country's climate change policy. In the OECS countries (Antigua and Barbuda, Dominica, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines) the development of a model for water policy and legislation, which is to form a template for national policy initiatives, might provide an acceptable way forward, endorsed as it is by the OECS Secretariat. In all of this the CARICOM Secretariat has played virtually no role whatsoever, except to provide a platform for the Consortium.

A 'project-oriented' approach can be adopted by many external agencies to promote IWRM road maps and plans. However, the process of transitioning and reforming national water sectors is a protracted and time consuming exercise that does not work well with a 'project-oriented approach' and any associated implications for funding activities. More importantly, almost all of the IWRM road maps set out in the last decade were initiated by external agencies, though they have necessarily moved the processes forward with the assistance of national actors.

Four overarching lessons were identified from the GEF-IWCAM project, which reinforce some of the above findings. There is a need for partnering with other agencies and organisations to ensure the long-term sustainability of water use. A good way to foster public engagement with water management issues is to emphasise the detrimental effects on public health of the poor management of water resources. Equally important is public education and awareness-raising efforts, which should focus on the effects of poor water management on livelihoods and how these effects can be mitigated. Lastly, the GEF-IWCAM project identified the empowerment of local organisations as essential to these efforts.

5.5 Stakeholder legitimacy

Only through the explicit support of government administrative processes can any sort of change be brought about in the water sector, particularly legal and organisational changes. In view of this, consideration should be given to the legitimacy of external bodies to initiate processes that lead to forming national plans that facilitate restructuring national water sectors. Why should changes be supported, in the absence of any clear public support and in the absence of any clear political mandate or political support?

While the GEF-IWCAM project could justifiably claim some legitimacy to interact with government administrations, others cannot make the same claim. In the absence of crises, political initiative, or other windows of opportunity, it is hard to see how or why the benefits of adopting IWRM, and all that it involves, outweigh the burden entailed. It is clear that the process of reform is a long one and that there are advocates in all national jurisdictions who are supportive and working towards this goal. It will take time, and organisations, like GWP, should consider whether there are other ways in which the process could be supported. The larger question in the Caribbean region concerns how various regional and national bodies, advocacy and interest-based organisations, and NGOs and CBOs can coordinate their activities to better support each other and define what role they play in the region's water sector(s).

The GEF-IWCAM project was supported by and executed through CEHI, a CARICOM-mandated agency, which is empowered to act on behalf of, and provide support to, Caribbean governments. A core mandate of the agency is to support countries in water and wastewater management, environmental health, and environmental management. This gave it standing and hence a high degree of legitimacy to act. Its position was not one of an external agency. Reference to the stakeholder typology developed by Mitchell et al. (1997), which considers power, legitimacy, and urgency, shows that CEHI had the power to influence through its access to funds and expertise, as well as legitimacy, given its mandate. But these factors were insufficient to ensure that governments listened to them. They were thus what Mitchell et al. (1997) class as a 'dominant' stakeholder. Using the same approach, GWP-C, along with others such as CWWA and CAWASA, could be described as 'discretionary' stakeholders, in that they have legitimacy, but little power (in terms of resources). However they can stress the urgent need for governments and agencies to pay attention to them.

5.6 The Dublin Principles

How far have these initiatives addressed the Dublin Principles and the three supporting pillars identified by GWP?

Fresh water is a finite and vulnerable resource. Given the increasing attention to climate change and the identification of the region as being among those most vulnerable to it effects, there is an implicit realisation of this. However, the extent to which this is being operationalised through allocation metrics and heightened attention to water resources is limited.

Water development and management should be based on a participatory approach. There is very limited adoption of participatory approaches, and this does not enjoy much legal or administrative support.

Women play a central role. There is much debate about the extent to which this holds in the Caribbean and, as a result, the issue of gender in water affairs has received limited action. The urbanised nature of many of the Caribbean islands tends to mask the gender aspects around water management.

Water has an economic value in all its competing uses. It is generally accepted that water is undervalued throughout the region and that attempts to address this run up against political and social barriers.

In respect of the three supporting pillars (Jønch-Clausen, 2004) note:

Enabling environment of policies and legislation. Only a few countries have adopted IWRM-informed polices and legislation, though this may well change in the coming few years. More and more sector professionals are working towards the inclusion of IWRM in the management of the sector. The revitalisation of multilateral environmental agreements, such as the Barbados Plan of Action, the UN Framework Convention on Climate Change (UNFCCC) process, and the LBS Protocol of the Cartagena Convention, all provide a means by which strategies can be formulated that are informed by IWRM precepts, without requiring legislative changes.

Institutional framework to give effect to policies, strategies, and legislation. It has long been recognised that duplication of functions, indistinct leadership, unclear boundaries of responsibilities, and inadequate resources are barriers to the proper management of water resources in the national interests. However, the appetite for organisational change, questions of how any new bodies are going to be funded, and political sensitivities about potential economic and financial impacts have proved to be significant barriers to progress. Jamaica, Saint Lucia, and Trinidad and Tobago have made progress, while Belize is making efforts to follow suit. For the rest, it would appear that significant organisational change is unlikely in the medium term.

Management instruments (allocation, assessments, and economic tools). The only widely used economic tool is volumetric stepped block tariffs for water use and not all countries have the individual metering required for this. Little serious thought has been given to what other economic tools could be implemented, again, out of concerns for the potential economic consequences. It is widely accepted that data gathering and the availability of data are serious problem areas and one of the reasons why the assessments of the region's water resources has not been adequately carried out. This is starting to be addressed, however, and systems are

being put in place to improve data gathering, handling, and sharing, although the preparation of plans is often carried out on an ad hoc basis.

Overall, a decade of effort to significantly improve water management in the Caribbean region has so far yielded few tangible benefits, when measured against the Dublin Principles and the IWRM pillars. However, in terms of understanding and sensitivity to the need for reform, the Caribbean region is very well placed. The administrative and professional classes in the water sector are well acquainted with the issues and opportunities that an integrated approach presents and they are actively including it as far as they can in the working environment. In large part this is a result of the training and capacity building efforts that the advocacy organisations have made. The greatest impact can be seen in the specific 'demonstration' projects, usually at the community or watershed level. The tangible benefits that have emerged serve as testaments to the effectiveness and importance of an integrated approach. It reinforces the message that reform works best when it addresses real issues that resonate with people's everyday experiences with water and their environment.

5.7 Transforming water management

A key element in the improvement of water governance is the drafting and adoption of legislation that provides an enabling environment and establishes the institutional framework. The fact that in the Caribbean there are few examples of transformation through legislative reform is seen as a failure of efforts to embed an integrated approach within the Caribbean water sector. Yet this is despite clear evidence that among water sector professionals, whether in government agencies, the private sector, or NGOs, there is a high degree of awareness and knowledge of, and commitment to, the principles and precepts of integration. There is, as well, an awareness of the shortcomings associated with existing water management. On top of this, there is also a high degree of trust between actors in the Caribbean water sector and those persons who are 'champions' of the proposed reforms. In part this is a result of the dense actor networks and the presence of bridging organisations (e.g. GWP-C, CWWA, CEHI, and CIMH) and opportunities in the region. Given this level of consensus between actors and their commonly held beliefs about what constitutes good water governance, it would seem that the necessary conditions for putting plans into practice are in place. Furthermore, over the past decade, there have been a number of opportunities associated with environmentally related crises for transformative change. In addition to this, various ministers from across the region have championed IWRM, but without seeming to have made any notable impact, either at the national or regional level. The fact that the pace of change has been slow suggests that these conditions and the presence of champions alone are not sufficient to bring about change; something else is necessary.

Recent case study research (Neff, 2013) suggests that advocacy needs to be complemented by 'brokering' actions, which call for different approaches. Brokering requires the ability to recognise and reconcile the needs and aspirations of different stakeholders, particularly the political ones, by ensuring that there is a 'fit' between the problem and the proposed solution. Often the fit is poor in the eyes of the public and in the water sector. Decision-makers and politicians, on whom the responsibility for allowing and legitimising change ultimately rests, are attuned to the views of their constituencies on which they depend for support. The general public seldom identify the problems and the necessary solutions according to the Dublin Principles. The Grenadian tariff is an example of this. Advocating the need for an increase in the tariff was, by itself, not sufficient to bring about change, despite the poor financial position of

the NAWASA. Rather, it was the brokering actions located within the political arena, including agreement on complementary steps (e.g. raising public awareness) that reduced potential political fall-out and enabled the recommended increased tariff. The case also reinforces the observation that change often requires support from the very highest political level, in this case the prime minister.

These observations are based on just one case study in the Caribbean and caution should be taken before drawing any general conclusions. However, this suggests a need for further research on this aspect. We might also observe that, from the stakeholder typology discussed above, the actors advocating change in the Grenadian case (unlike in the case of interventions by CEHI, CAWASA or GWP-C) had legitimacy, power, and urgency on their side, making them definitive stakeholders. But we may infer that it was their actions and strategy as much as their position that contributed to the change. This also suggests that approaches which seek wholesale reforms according to a complex plan or road map will seldom 'fit' and that more incremental approaches that are peculiar to each country, combined with international financial contributions, may be more successful.

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