Caribbean Water Security and Climate Resilient Development:

A Regional Framework for Investment

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Global Water Partnership Caribbean

About the Global Water Partnership-Caribbean

The Global Water Partnership-Caribbean (GWP-C) is one of thirteen Regional Water Partnerships of the Global Water Partnership (GWP) Organisation. GWP-C works with its partners to promote and strengthen interaction and co-operation at all levels and across different sectors to sustain Integrated Water Resources Management (IWRM) in the Caribbean region. IWRM is a process that promotes the coordinated development and management of water, land and related resources in order to maximise economic and social welfare in an equitable manner, without compromising the sustainability of vital ecosystems and the environment. The vision of the GWP-C is for a water secure Caribbean. For more information on GWP-C please visit ***www.gwp-caribbean.org***

Caribbean Community Climate Change Centre

About the Caribbean Community Climate Change Centre

The Caribbean Community Climate Change Centre (CCCCC) coordinates the Caribbean region's response to climate change, working on effective adaptation and mitigation solutions through programmes and projects to combat the impacts of climate change, global warming and extreme weather events. It provides climate change-related policy advice and guidelines to the Caribbean Community (CARICOM) Member States and to the UK Caribbean Overseas Territories. The Centre maintains the Caribbean's most extensive repository of information and data on climate change specific to the region. For more information on CCCCC please visit ***www.caribbeanclimate.bz***

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TABLE OF Contents

Acronyms

CAMI	Caribbean Agrometeorological Initiative
Cap-Net	Capacity Development in Sustainable Water Management
CARDI	Caribbean Agricultural Research and Development Agency
CARICOM	Caribbean Community
Cari-WOP	Caribbean Water Operators' Partnerships Platform
CARPHA	Caribbean Public Health Agency
CAWASA	Caribbean Water and Sewerage Association Inc.
CBOs	Community-Based Organisations
CCCCC	Caribbean Community Climate Change Centre
CCORAL	Caribbean Climate Online Risk and Adaptation tooL
CDB	Caribbean Development Bank
CDEMA	Caribbean Disaster and Emergency Management Agency
CDM	Comprehensive Disaster Management
CERMES	Centre for Resource Management and Environmental Studies
CHARIM	Caribbean Handbook on Risk Management
CIMH	Caribbean Institute of Meteorology and Hydrology
COTED	Council for Trade and Economic Development
CRIP	Caribbean Regional Indicative Programme
CTO	Caribbean Tourism Organisation
CWWA	Caribbean Water and Wastewater Association
DFID	Department for International Development
DRM	Disaster Risk Management
ECCU	Eastern Caribbean Currency Union
EDF	European Development Fund
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF-CReW	Caribbean Regional Fund for Wastewater Management
GEF-IWCAM	Integrating Watershed & Coastal Areas Management in Caribbean Small Island Developing States
GIZ	Gesellschaft für Internationale Zusammenarbeit
GWOPA	The Global Water Operators' Partnerships Alliance
GWP-C	Global Water Partnership - Caribbean
IaDB	Inter-American Development Bank
IBRD	International Bank for Reconstruction and Development

Acronyms

IFIs	International Financial Institutions
IFM	Integrated Flood Management
IUCN	International Union for the Conservation of Nature
IUWM	Integrated Urban Water Management
IWRM	Integrated Water Resources Management
LBS Protocol	Cartagena Convention's Protocol on Land-based Sources of Marine Pollution
M&E	Monitoring and Evaluation
MDGs	Millennium Development Goals
NEMOs	National Emergency Management Organisations
NGOs	Non-Governmental Organisations
NRW	Non-Revenue Water
ODA	Official Development Assistance
OECS	Organisation of Eastern Caribbean States
OOF	Other Official Flows
PAHO	Pan American Health Organisation
RIE	Regional Implementing Entity of the Green Climate Fund
RWH	Rainwater Harvesting
SDG	Sustainable Development Goal
SIDS	Small Island Developing States
SPACC	Special Pilot Adaptation to Climate Change
TPA	Thematic Programme of Action
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
UNEP CAR/ RCU	United Nations Environment Program Regional Coordinating Unit for the Caribbean Environment Programme
UN-Water	United Nations inter-agency coordination mechanism for all freshwater and sanitation related matters
UWI	University of the West Indies

Executive Summary

Caribbean Water Security and Climate Resilient Development: *A Regional Framework for Investment*

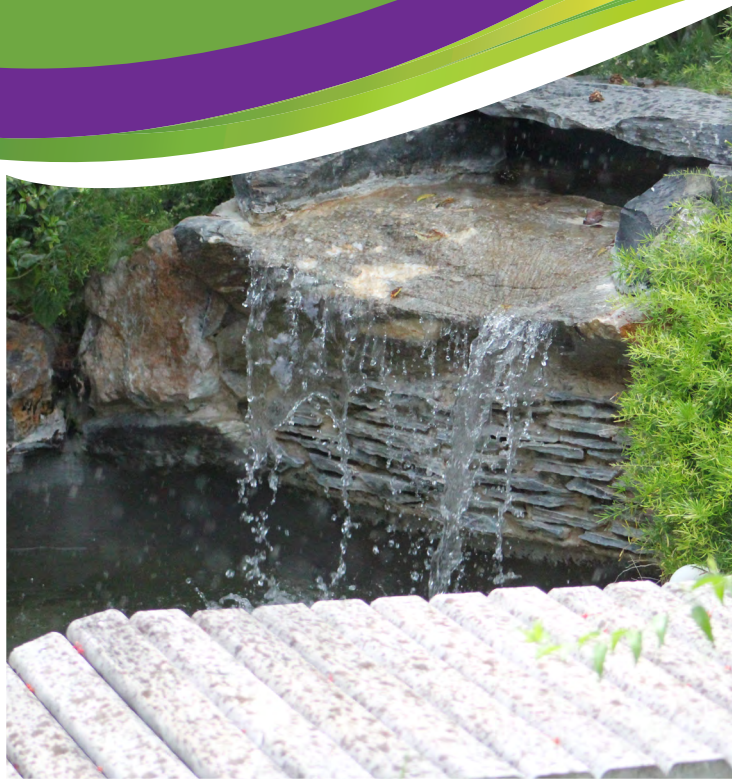
This document is the *Regional Framework for Investment in Water Security and Climate Resilient Development*. It has been developed by the Caribbean Community Climate Change Centre (CCCCC) and Global Water Partnership Caribbean (GWP-C) through an extensive process of consultation with regional Caribbean Community (CARICOM) institutions, development partners and national stakeholders.

The *Regional Framework for Investment* provides an outline of critical climate resilience programmes and projects organised into six thematic areas, which CARICOM national stakeholders have identified as priority for implementation by regional institutions working on water security issues. It also sets out a framework for regional institutions to work together and with national counterparts to further refine, develop and implement these programmes.

The *Regional Framework for Investment* is organised into an executive summary and seven chapters as summarised below:

Executive Summary

1. **Water security and climate resilient development:** Overview of water security and climate resilience context and challenges in the Caribbean
2. **Responding to the challenges:** The rationale behind the *Regional Framework for Investment* and the process for its development
3. **A *Regional Framework for Investment*:** The six Thematic Programmes of Action and their supporting activities and projects which are the priorities for implementation
4. **Implementing the *Regional Framework for Investment*:** Overview of the implementation process, roles and responsibilities
5. **Financing the *Regional Framework for Investment*:** Financing options for the implementation process for the *Regional Framework for Investment* and resulting Programmes
6. **Monitoring and evaluation (M&E) of the *Regional Framework for Investment*:** An indicative M&E framework for the implementation process and the longer term outcomes
7. **Next steps:** The immediate actions to progress the *Regional Framework for Investment*



Background

Climate resilience is high on the agenda in the Caribbean. At the request of CARICOM Heads of State, the CCCCC prepared a Regional Framework for Achieving Development Resilient to Climate Change[1] and associated Implementation Plan[2]. These documents set out CARICOM's strategic approach for coping with climate change. The water sector is identified as a high priority within the Implementation Plan, as it supports other key economic sectors.

Water security plays a pivotal role in promoting and safeguarding economic growth and development from the adverse effects of climate variability and change. Achieving and sustaining water security has risen up the political agenda in the Caribbean as the demands from economic growth increase and as climate change intensifies. In 2012 the High-level Ministerial Forum of Caribbean Water Ministers emphasised the importance of ensuring long-term water security as a driver for economic and social development. The CARICOM Council of Trade and Economic Development (COTED) called for CARICOM Member States to continue to treat water resource management as an area of critical importance[3]. CARICOM has also recognised the cross cutting nature of water challenges at a regional level in promoting a Consortium of CARICOM Institutions on Water.

Key challenges

Water security challenges in the Caribbean are locally specific, yet it is possible to identify common challenges:

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

Water security challenges in the Caribbean are set within **a complex institutional landscape**. The cross cutting nature of the challenges, small size of Caribbean countries and the high level of regional integration, means that a broad range of national and regional stakeholders are actively engaged in improving water security. At the national level, water security challenges cut across different government organisations, communities and businesses. At the regional level a number of CARICOM institutions have an interest in water security. In addition, a large number of development partners have a stake in water security in the region.

[1] Caribbean Community Climate Change Centre (CCCCC), 2009, Regional Framework for Achieving Development Resilient to Climate Change (2009-2015).
[2] Caribbean Community Climate Change Centre (CCCCC), 2012, Delivering Transformational Change 2011-21, Implementing the CARICOM Regional Framework for Achieving Development Resilient to Climate Change.
[3] Message from Dr. Douglas Slater, Assistant Secretary-General Human and Social Development On the Occasion of WORLD WATER DAY 22 March 2015 (CARICOM Secretariat, Turkeyen, Greater Georgetown, Guyana)

A Regional Framework for Investment in Water

The *Regional Framework for Investment* responds directly to identified water security and climate resilience challenges. The outline structure and content of the *Regional Framework for Investment* is summarised in Figure 1.

It is presented as six Thematic Programmes of Action focussed on the identified challenges. Supporting activities and projects are recommended based on priorities highlighted during regional and national consultations.

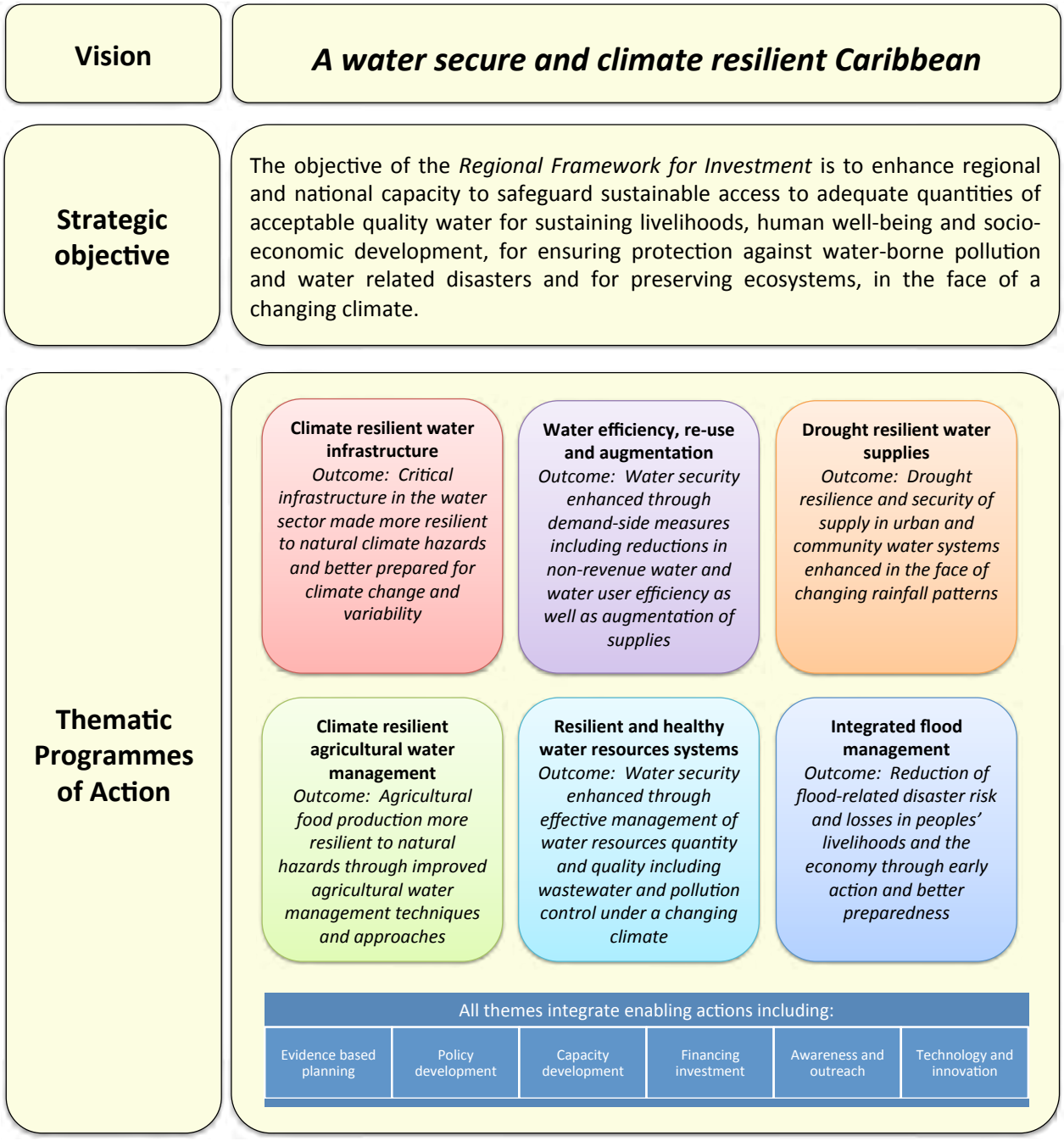


Figure 1: Vision, strategic objective and Thematic Programmes of Action

What is it for?

The *Regional Framework for Investment* is **a regional document**, aimed at supporting the work of regional institutions to deliver relevant support to CARICOM Member States. It does this by providing outline programmes and projects which **regional institutions (singly or jointly) working with national counterparts** may wish to adapt and develop in more detail with the aim of securing funding to implement. It is **a starting point for the co-development of demand-led, shared programmes of action**.

How will it be used?

The Thematic Programmes of Action provide a **'menu of options'** as a starting point for developing detailed programmes which respond to national needs. The activities within these are designed to be refined and adapted to suit particular national contexts and priorities. They are **focussed on actions where regional support will add value**, such as investment planning, capacity development, pilot projects, evidence generation and innovation. A key focus is to assist governments and other national stakeholders in their **investment decision making** and to **catalyse the process for securing finance and funding** for much needed water security projects in both hard and soft infrastructure, capacity development, institutional strengthening and information services.

What are the benefits?

Regional programmatic approaches offer an efficient and cost effective means to help deliver a water secure and climate resilient Caribbean. Regional water institutions specialise in providing technical support and capacity development to strengthen national development initiatives. Sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development demands holistic approaches that cut across different disciplines. **Cooperation and collaboration among regional water institutions** can provide such support and add-value to solving national water security and climate resilience challenges.

Regional programmatic approaches offer a number of advantages and **economies of scale** including: scaling-up tried and tested solutions, sharing knowledge and lessons on over-coming barriers, and streamlined mechanisms for strengthening national capacity. In addition, regional institutions are well placed to provide the **technical capacity** and **know-how to access a range of sources of finance**, such as specialist climate finance, which may be challenging for national organisations.

The cross-cutting nature of the challenges, and broad range of institutional partners working on these issues, makes the positioning of any new initiatives in the region challenging. The preparation of the *Regional Framework for Investment* and its supporting Thematic Programmes of Action has therefore comprised a **combination of top-down and bottom-up approaches, including a thorough consultation process**.

Implementing the Regional Framework for Investment

Implementation process

The *Regional Framework for Investment* is a process, rather than just a document. It has been founded on a partnership approach and this principle will be carried forward into its implementation. Implementing the *Regional Framework for Investment* will involve three components as shown in Figure 2.

The first component is the overall **coordination** of the process, to be led by CCCCC and GWP-C. This will provide support for programme development as well as management, monitoring and evaluation support to the process. The second component is the **co-development of the programmes** which will be led by regional institutions with support from the coordination unit. Finally, the **implementation of the programmes** themselves is the end goal of the *Regional Framework for Investment* and will be led by regional and national institutions as appropriate, depending on the nature of the programme.

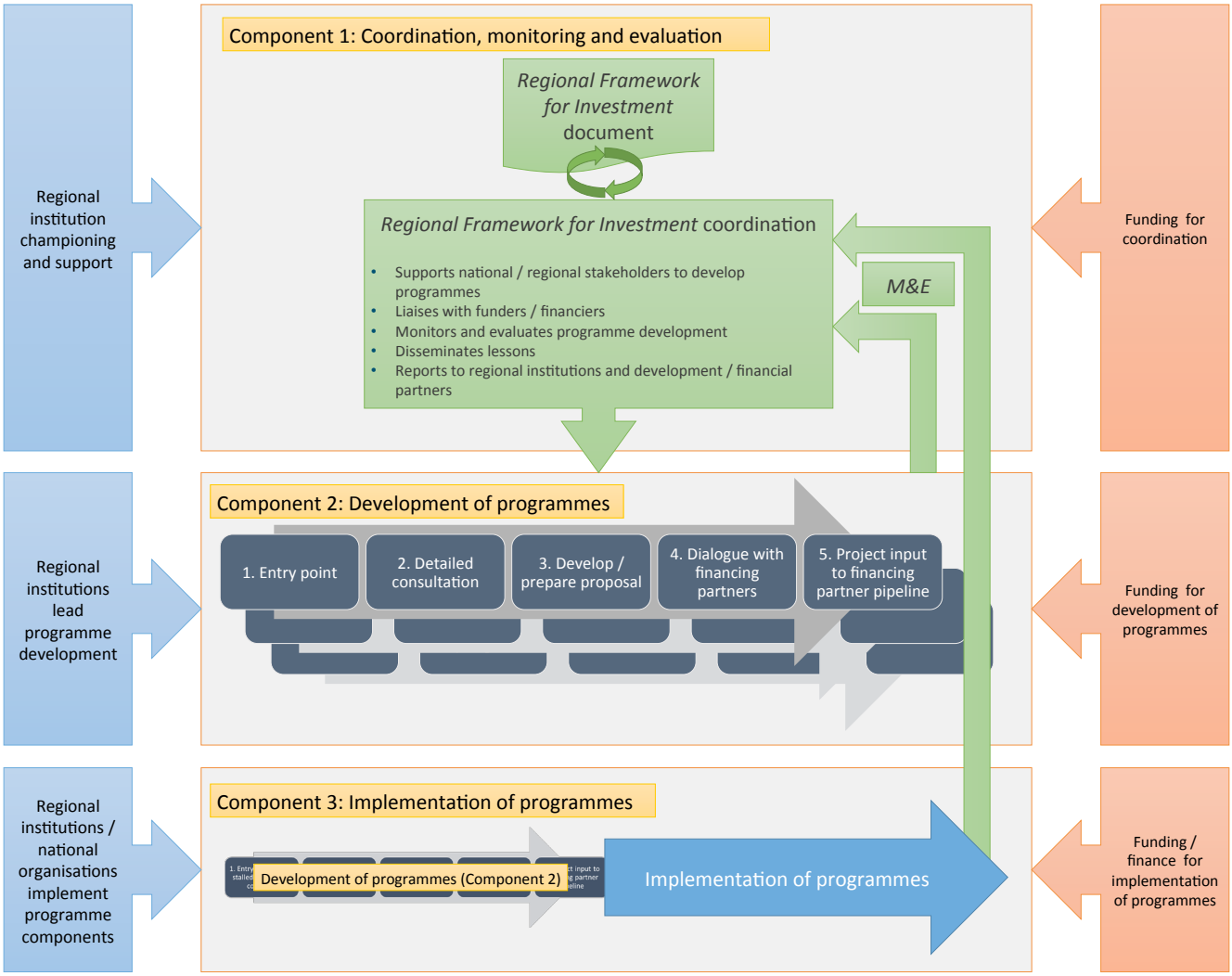


Figure 2: Overview of the Regional Framework for Investment implementation process

Roles and responsibilities

The process to deliver the *Regional Framework for Investment* is a shared responsibility. Oversight for coordination rests with CCCCC and GWP-C, but development and implementation of programmes and projects will rest with regional institutions and national stakeholders. Regional water institutions, jointly or individually, have a key role to facilitate and guide detailed preparation of the programmes in collaboration with national stakeholders. national stakeholders (at national and local levels) will be the direct beneficiaries of the regional programme and project outcomes and will therefore be actively involved in the co-development and management of national components during implementation.

Development partners, including donors and development banks, can play a key role by reflecting identified priorities in their development cooperation strategies, by providing technical assistance, and by providing financing and funding for implementation through grants, loans and co-financing as appropriate. Regional coordination and harmonisation among development partners will also be important to maximise the benefits of a regional programmatic approach.

Financing

Resources need to be secured if the *Regional Framework for Investment* is to progress and deliver on-the-ground benefits. Resources will be required for coordination, programme preparation and implementation, monitoring and reporting.

Climate resilience and water security present a significant opportunity for the region to access resources to underpin and sustain regional and national economic growth and development. The most appropriate financing modalities and funding opportunities will depend on the scope and scale of the programme investments.

Climate finance is a growing source of potential funding as it seeks to increase resilience to climate variability and change and to cover the costs of transitioning to a low-carbon and climate change resilient economies. The region has already benefitted from a number of specialist climate funding streams including the Global Climate Change Alliance, the Adaptation Fund and the Pilot Program for Climate Resilience. In addition, the Green Climate Fund (GCF) is now being seen as a key source of potential funding for the region.

Monitoring and evaluation

A twin track approach is required to determine the effectiveness of the *Regional Framework for Investment* and the climate resilience and water security actions it delivers. Monitoring and evaluation considerations should encapsulate both process indicators for the *Regional Framework for Investment* implementation process and output and outcome indicators of the programmes and projects themselves.

Periodic review and amendment of the *Regional Framework for Investment* is anticipated to ensure it maintains relevance to evolving needs, and learns from implementation experience.

Next steps

The next steps towards implementing the Regional Framework for Investment will be crucial to ensure that momentum can be maintained. These include:

- *GWP-C to establish an interim Coordination Unit;*
- *Regional and national dissemination of the **Regional Framework for Investment**;*
- *Enhancement of political support (for example through endorsement at the High Level Forum (HLF) of Caribbean Water Ministers);*
- *Investigation of opportunities for funding and technical support for the coordination activities and preparation of programmes; and*
- *Preparation of a 12 month plan for development of programmes including resources, schedule and objectives and a longer term outline plan.*

The development of the first Programme will be important to demonstrate the implementation approach. Early progress has been made on developing a more detailed Programme under the Integrated Flood Management Thematic Programme of Action and lessons learned from this process will be valuable to others that follow.

1

Water Security and Climate Resilient Development

This chapter provides an overview of water security and climate resilience in the Caribbean context with a focus on current political drivers, the high level challenges faced by the region and the institutional landscape of regional and national stakeholders working on the issues.

1.1. Caribbean regional context

Climate resilience is already high on the agenda at a regional level in the Caribbean. At the request of Caribbean Community (CARICOM) Heads of State, the Caribbean Community Climate Change Centre (CCCCC) prepared a Regional Framework for Achieving Development Resilient to Climate Change[5] and associated Implementation Plan[6]. These documents set out CARICOM's strategic approach for coping with climate change. The water sector is identified as a high priority within the Implementation Plan, as it supports other key economic sectors.

The strategic vision of the Regional Framework for Achieving Development Resilient to Climate Change is "a regional society and economy which is resilient to a changing climate". The associated Implementation Plan emphasises action to reduce vulnerability and to ensure that economic, social and environmental development in the Caribbean is safeguarded from the adverse impacts of climate variability and change.

5 Caribbean Community Climate Change Centre (CCCCC), 2009, Regional Framework for Achieving Development Resilient to Climate Change (2009-2015).

6 Caribbean Community Climate Change Centre (CCCCC), 2012, Delivering Transformational Change 2011-21, Implementing the CARICOM Regional Framework for Achieving Development Resilient to Climate Change.

The five strategic elements within the Regional Framework for Achieving Development Resilient to Climate Change

1. *Mainstreaming climate change adaptation strategies into the sustainable development agendas of CARICOM states.*
2. *Promoting the implementation of specific adaptation measures to address key vulnerabilities in the region.*
3. *Promoting actions to reduce greenhouse gas emissions through fossil fuel reduction and conservation, and switching to renewable and cleaner energy sources.*
4. *Encouraging action to reduce the vulnerability of natural and human systems in CARICOM countries to the impacts of a changing climate.*
5. *Promoting action to derive social, economic and environmental benefits through the prudent management of standing forests in CARICOM countries.*

Caribbean Water Ministers recognise the benefits of water security investments. Water security plays a pivotal role in promoting and safeguarding economic growth and development from the adverse effects of climate variability and change. Achieving and sustaining water security has risen up the political agenda in the Caribbean as the demands from economic growth increase and as climate change intensifies. In 2012, the High-level Ministerial Forum of Caribbean Water Ministers emphasised the importance of ensuring long-term water security as a driver for economic and social development. More recently, the CARICOM Council of Trade and Economic Development (COTED) called for CARICOM Member States to continue to treat water resource management as an area of critical importance [7].

CARICOM has also recognised the cross cutting nature of water challenges at a regional level in promoting a Consortium of CARICOM Institutions on Water. The Consortium arose from a decision of the COTED at its Twenty-Fifth Special Meeting in April 2008. Consortium members are drawn from the CARICOM institutions and associate institutions. This Consortium provides a focal point for regional organisations with a stake in water security and is designed to facilitate and coordinate technical work and advise on policy directions on water resources management.

Defining water security

Water security can be defined as "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development for ensuring protection against water-borne pollution and water related disasters and for preserving ecosystems in a climate of peace and political stability".

Source: UN-Water. 2013. Analytical Brief on Water Security and the Global Water Agenda

Water security is an important driver for international organisations and development partners. The importance of water security has been signalled by a dedicated Sustainable Development Goal (SDG) for water. The water goal and targets (SDG6) go beyond water supply and sanitation alone and encapsulate water resources management, governance, and environmental and disaster risks, see Box 1.1. The SDGs promote a more holistic approach to water issues than the earlier Millennium Development Goals (MDGs). The cross cutting nature of water security also necessitates alignment with other SDG goals and targets including those related to climate change adaptation, mitigation, resilient infrastructure, food security and livelihoods, amongst others.

7 Message from Dr. Douglas Slater, Assistant Secretary-General Human and Social Development On the Occasion of WORLD WATER DAY 22 March 2015 (CARICOM Secretariat, Turkeyen, Greater Georgetown, Guyana)

Box 1.1 Water and the SDGs

The dedicated SDG for water (SDG6) has six specific targets, although water-related action is also inferred in other goal areas including water-related disasters under SDG11 and as a cross cutting issue under climate change adaptation in SDG13. The targets include:

Target 6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all.
Target 6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.
Target 6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.
Target 6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
Target 6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
Target 6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
Target 11.5	By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations.
Target 13.1	Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries.
Target 13.2	Integrate climate change measures into national policies, strategies and planning.
Target 13.3	Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

It is also notable that the SDGs include a final goal (SDG17) which seeks to strengthen the means of implementation and revitalise the global partnership for sustainable development.

Source: See UN Sustainable Development Knowledge Platform at https://sustainabledevelopment.un.org/sdgs

1.2. Water security challenges

Water security challenges in the Caribbean are locally specific, yet it is possible to identify common regional challenges. The diverse range of water security and climate resilience challenges in the region have been assessed as part of a Situational Analysis [8] which reviewed existing analyses and studies on challenges and opportunities. Regional and national level consultations re-confirmed the most common challenges that manifest themselves in a wide range of national and local contexts. Annex A of this document signposts further background literature on the challenges facing the region.

Challenge 1: Water sector infrastructure exposed to damage and disruption from water-related hazards

Caribbean islands are amongst the most heavily exposed locations on earth to natural hazards. Within the Eastern Caribbean Currency Union (ECCU) countries, a natural disaster inflicting damage equivalent to more than 2% of the affected country's Gross Domestic Product (GDP) can be expected to hit the ECCU around once every two and a half years. Flooding, landslides and high sediment loads in water sources frequently damage water infrastructure leading to loss of service for businesses and communities. This places a heavy financial burden for repair costs. When Hurricane Tomas struck Saint Lucia in 2010, 80% of the population was left with limited water supplies due to a landslide which damaged the main reservoir and auxiliary pumping and power systems. These natural hazards are combined with ageing water infrastructure and a low level of investment in replacement and rehabilitation in many cases. A more comprehensive approach to risk management for water infrastructure is needed. This should be coupled with increased investment in asset management.

Challenge 2: Increasing demand and inefficient water use exacerbating the vulnerability of existing water supply systems and sources

Caribbean water utilities suffer high rates of non-revenue water (NRW) (in some cases up to 50%) due to a combination of factors including high levels of leakage, aging infrastructure and the prioritisation of new connections over maintenance programmes. These issues compound the effects of drought by increasing the demand placed on water sources. Climate change projections which indicate reduction in water availability will compound water scarcity issues in the future. Leakage exacerbates the high expenditures on energy required for pumping and treatment, with some utilities expending 40% of their budgets on energy. Managing the demand for water will help countries make better use of existing water resources, reducing the need for expensive desalination and maintaining more water for other users and the environment. Demand management at the household, business and utility level through technological, process and behavioural change will be required to support the overall efficiency of water management and use across the region.

Challenge 3: Effectiveness of community and urban water supply systems exposed to increasing climate variability

A combination of seasonally variable rainfall coupled with insufficient storage infrastructure and limited data for strategic planning means that many Caribbean islands suffer from seasonal water shortages. This issue is exacerbated in exceptional drought years, manifested as saline intrusion into aquifers or the emptying of storage reservoirs. This necessitates rationing, often with expensive trucking of water. For example, the 2009-10 drought in Jamaica resulted in reductions in water production of up to 90% at some plants. This led to widespread disruption and health impacts as consumers were obliged to use unsafe sources. In the future, rainfall is projected to reduce over much of the Caribbean region. Furthermore, population growth and changing patterns of water demand could also compound drought impacts. Action is needed to enhance the reliability of water supplies and secure their long-term sustainability through more effective management of drought and strategic planning.

8 GWP-C & CCCCC. 2015. Climate Proofing Water Investment in the Caribbean: Situational Analysis.

Challenge 4: Agricultural production vulnerable to seasonal rainfall and drought
The Caribbean agricultural sector plays a critical role in food and livelihood provision and the servicing of other economic sectors such as tourism and manufacturing. Agricultural employment accounts for at least 20% of total employment in some countries and is close to 30% in Belize, Dominica and Guyana. The majority of the region's agriculture is rain-fed and production and profitability are strongly influenced by variations in rainfall and in particular rainfall extremes. In 2009/2010, a severe drought caused millions of dollars in lost income in the Caribbean agricultural sector which was worsened by increased bush fires on farms resulting from the hot, dry conditions. Water for irrigation, when necessary, is a major constraint for most small scale farmers. In order to safeguard this key sector from drought, increased investment in securing water supplies for agriculture is needed alongside improving the efficiency of agricultural water management to improve 'crop per drop' yields. This will be especially important given climate change projections of a reduction in rainfall across much of the region.

Challenge 5: Effective management of water resource quantity and quality threatened by a changing climate
Integrated governance and management of water resources is a continuing issue across the region and while Integrated Water Resources Management (IWRM) has been progressed through the development of IWRM plans and policies, their translation into action has been limited. Many decision making processes are still within sectoral silos, rather than taking a catchment-wide planning approach. Further, the management of wastewater and pollution within the freshwater and receiving marine environment is an area requiring substantial investment, in-line with the Cartagena Convention's Protocol on Land-based Sources of Marine Pollution (LBS Protocol). It has been estimated that 85% of wastewater entering the Caribbean Sea remains untreated. Action will be crucial in order to protect the water resources and ecosystems on which Caribbean businesses and livelihoods depend.

Challenge 6: Escalating costs of flood-related damage and losses
Flood risk ranks high amongst the disaster risks facing Caribbean islands, and considerable work is ongoing in the region under the umbrella of Disaster Risk Management (DRM). However, approaches to flood risk management vary from country to country. Opportunities exist at the regional level to strengthen and harmonise flood risk management tools and planning processes. Ensuring that the modelling, mapping and decision making tools are fit for purpose, and that relevant stakeholders have the capacity and mandate to use these tools is crucial to managing flood risk, especially as climate changes in future. Furthermore, opportunities exist to take a more strategic, long-term view of flood risk management considering future development in a changing climate, as well as focussing on shorter term disaster response.

1.3. Institutional context

Water security challenges in the Caribbean are set within a complex institutional landscape. The cross cutting nature of the challenges, the small size of Caribbean countries and the high level of regional integration, means that a broad range of national and regional stakeholders are actively engaged in improving water security. Figure 1.1 summarises some of the key linkages between the stakeholder groups.

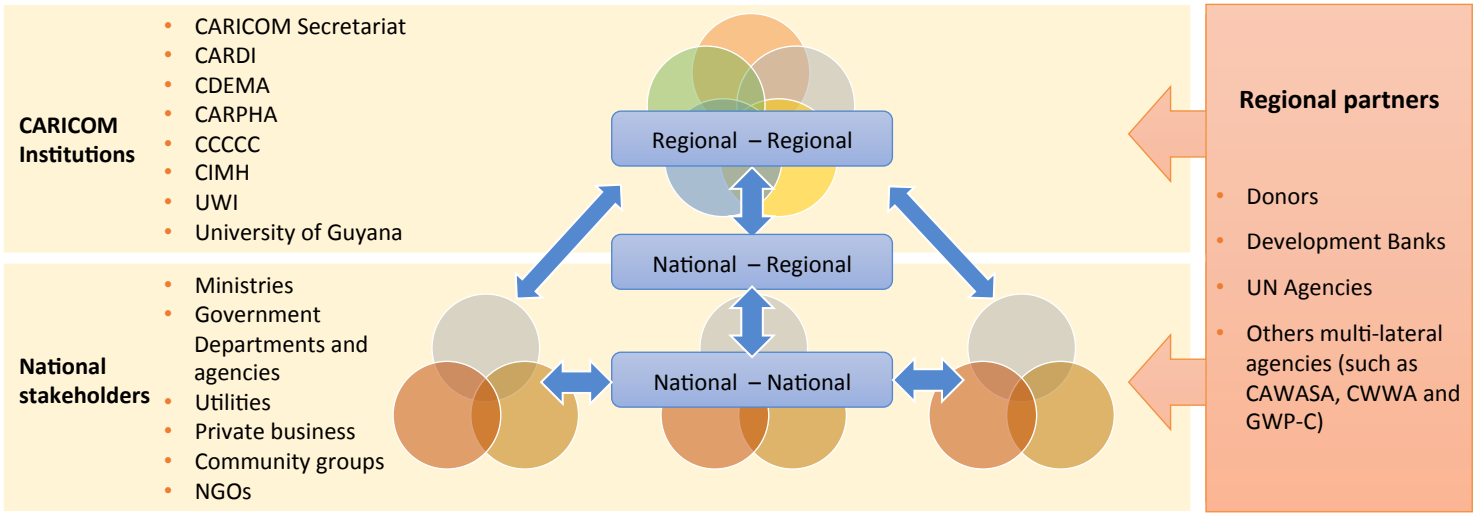


Figure 1.1: Overview of regional and national stakeholder links

At the national level, water security challenges cut across different government organisations. Effective governance and integrated management processes are a continuing issue across the region. Whilst Integrated Water Resources Management (IWRM) has been progressed through the development of IWRM plans and policies further work is required in translating policy into action. The challenges cut across government departments including water, environment, disaster management, planning and finance (although ministerial responsibility for water resources differs between countries). In addition, water utilities, communities and businesses all have a role to play in water security.

At the regional level a number of CARICOM institutions have an interest in water security. This has been recognised by the development of the Consortium of CARICOM Institutions on Water. The Consortium arose from a decision of the Council for Trade and Economic Development (COTED) at its Twenty-Fifth Special Meeting in April 2008.

The core Consortium members are the CARICOM Secretariat, Caribbean Agricultural Research & Development Institute (CARDI), Caribbean Disaster Emergency Management Agency (CDEMA), the Caribbean Public Health Agency (CARPHA), Caribbean Community Climate Change Centre (CCCCC), Caribbean Institute for Meteorology and Hydrology (CIMH), the University of the West Indies (UWI) and the University of Guyana. Other regional institutions such as CAWASA, CWWA and GWP-C also play a role at a regional level supporting national stakeholders and regional institutions. The Consortium does not act as an implementing entity, but fosters collaborative working between regional institutions.

In addition, a large number of development partners have a stake in water security in the region. These include financial partners such as bilateral donors and development banks, UN agencies including UNEP, FAO and UNDP, and international NGOs.

2

Responding to the challenges

This chapter summarises how a regional approach to water security and climate resilience can offer advantages. The *Regional Framework for Investment* is introduced as a mechanism to respond to the identified challenges and the chapter outlines the process of its development.

2.1. Benefits of a regional approach

Regional programmatic approaches offer an efficient and cost effective means to help deliver a water secure and climate resilient Caribbean, see Box 2.1.

Regional water institutions specialise in providing technical support and capacity development to strengthen national development initiatives. Sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development demands holistic approaches that cut across different disciplines. Cooperation and collaboration among regional water institutions can provide such support and add-value to solving national climate resilience and water security challenges.

Increased knowledge sharing across the region helps to identify what works well, and what does not, and ensure common lessons are learned. Scaling up successful pilots and demonstration projects whilst tailoring these individual national contexts and policy environments brings economies of scale.

Box 2.1 – The benefits and challenges of a regional approach

In the Caribbean context, regional programmatic approaches offer a number of advantages individual national or bi-lateral approaches and can add value to solving national climate resilience and water security challenges:

- **Economies of scale:** Regional planning may offer cost savings over individual planning approaches on a country by country basis.
- **Scaling-up:** A regional approach, in conjunction with national initiatives, is an effective approach for regions such as the Caribbean as it enables a phased approach to trial solutions whilst also providing a wider framework under which tried and tested solutions can be scaled-up across the region.
- **Accessing sources of finance:** Regional water institutions are well placed to provide the technical capacity and know-how to access a range of sources of finance, such as specialist climate finance, which may be challenging for national organisations.
- **Technical excellence:** National capacity can be limited and regional approaches maximise the availability of technical skills and knowhow available within regional water institutions, and provides a mechanism to harmonise on approaches and best practice.
- **Showcasing innovation and new solutions:** Provides a mechanism for show-casing innovative technologies and new solutions. Innovations and demonstration projects trialled in specific locations during the initial phases of project implementation.
- **Interdisciplinary approach:** Collaborative work among regional water institutions to facilitate cross-fertilisation of ideas and to stimulate an interdisciplinary approach to problem solving. This brings together dispersed knowledge and skills to break down traditional silos and to promote 'out of the box' thinking.
- **Knowledge sharing and management:** Knowledge sharing across the region helps identify what works well, and what does not, and provides lessons on overcoming barriers to deliver successful outcomes. Working with, and through, regional water institutions ensures knowledge management and dissemination is a truly regional activity.
- **Capacity development:** Regional water institutions specialise in providing technical support and capacity development. They offer a cost effective and streamlined mechanism for strengthening national capacity development initiatives or for filling capacity gaps where needed.

These benefits and challenges have been identified through regional consultation, and review of existing literature on regional initiatives in the Caribbean.

Source: For further background information see GWP-C. 2014. Sustainability of IWRM initiatives in the Caribbean and GWP-C. 2014. Database of IWRM initiatives in the Caribbean.

Whilst regional approaches offer many advantages they can also face organisational challenges. Ownership in planning and investment decisions rests firmly with national-level stakeholders. Regional support partners need to demonstrate flexibility and credibility to respond to these. Ultimately, to deliver benefits on-the-ground, regional programmes must be geared toward national level planning processes so that these influence investment decisions. Regional approaches should not preclude existing bilateral arrangements where these are more appropriate than a regional response.

2.2. The need for regional action with 'on-the-ground' benefits

Expectations of national governments and communities, regional organisations and development partners are for tangible benefits 'on-the-ground'. Supporting national investment in water security and climate resilience is paramount. Knowledge and capacity are stepping stones to supporting sound investment decision making, and regional organisations have a key role to play in delivering this support. Providing support to countries to access finance is a key role regional institutions can play.

For example, a growing body of knowledge is available within regional institutions on preparing programmes that can access finance from specialist climate funds. Making this knowledge more widely available and specific to national water security needs and priorities will help countries leverage greater benefits from these funds. Regional capacity development to prepare programmes and access finance, including specialist climate finance can bring benefits to multiple countries in the region. It must be recognised that any decision on finance for national level activities rests with the relevant national authorities, and this should be respected in developing regional support programmes.

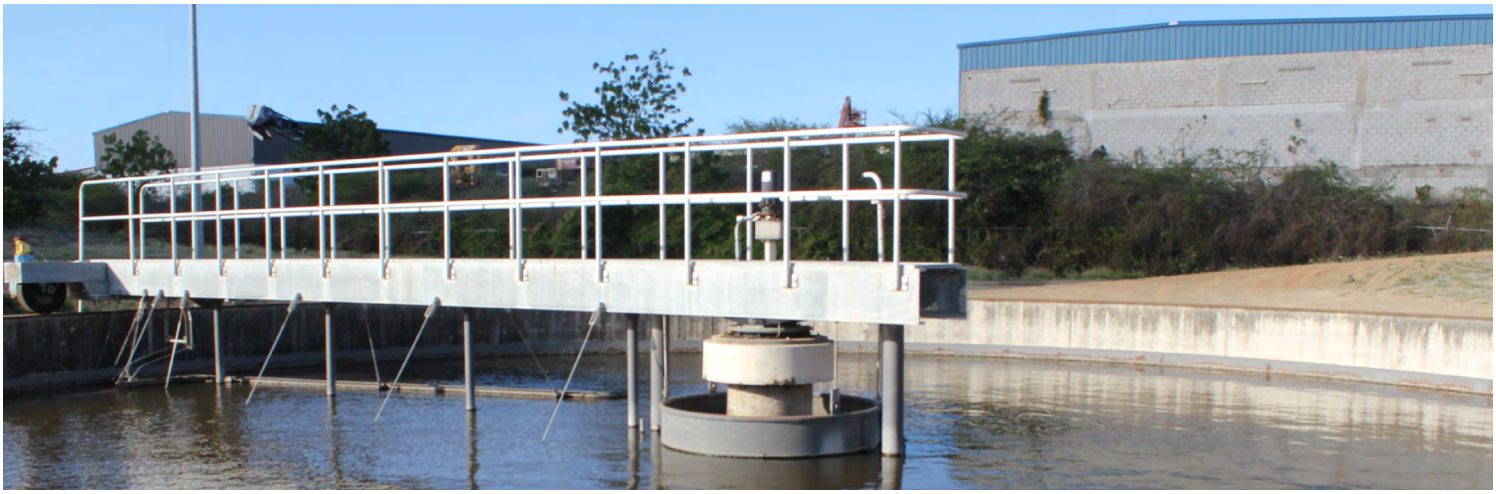
2.3. Preparation of a Regional Framework for Investment

The *Regional Framework for Investment* has been developed to respond to identified challenges. It provides six Thematic Programmes of Action which address water security and climate resilience, and sets out a framework for regional institutions to work together and with national counterparts to further refine, develop and implement these programmes. The overall objective is to enhance water security and climate resilience in the Caribbean.

The cross cutting nature of the region's climate resilience and water security challenges, and the broad range of institutional partners working on these issues, makes the positioning of any new initiatives in the region challenging. The preparation of the *Regional Framework for Investment* and its supporting Thematic Programmes of Action has therefore comprised a combination of top-down and bottom-up approaches. This included a thorough consultation process to ensure that it is demand-led and responds to stakeholder needs, see Box 2.2.

A situational analysis[5] set the scene for the challenges, institutional context, and priority needs. Literature reviews and interviews with regional stakeholders identified opportunities for priority areas of support. This resulted in the grouping of six Thematic Programmes of Action focussed on the main issues and challenges. Within each Thematic Programme of Action, supporting programmes were recommended. Activities within each programme were subsequently validated by national level consultation through surveys which enabled national stakeholders to prioritise and add to the activities.

Programmes respond to the broad challenges faced across the region, rather than specific challenges facing any one country. As the detailed programmes are developed towards implementation, national components addressing the specific national and local needs will be developed under the broad umbrella of the thematic programmes. These will take into account the varying policies, practices and ongoing projects across Caribbean countries.



5 GWP-C & CCCCC. 2015. Climate Proofing Water Investment in the Caribbean: Situational Analysis.

Box 2.2: Summary of regional and national consultation processes

The consultation process for the development of the *Regional Framework for Investment* included:

- Meeting of 'Regional Partners in the Caribbean Water and Wastewater Sector' in April 2014 hosted by GWP-C & UNEP-CAR/RCU to discuss priorities for water security and climate resilience, including the need for collaboration between regional institutions working on water issues;
- Consultations with project Steering Committee throughout the development of the *Regional Framework for Investment*;
- Regional consultation meetings under the 'Climate-proofing water investment in the Caribbean' project to discuss a Situational Analysis on key issues, existing regional strategic response, an assessment of stakeholder roles and mandates and an analysis of financing for climate resilient development and water security during April 2015;
- Bilateral consultations on funding / investment for the water sector between GWP-C and a sampling of CARICOM regional institutions in July 2015;
- Submission of projects and programmes by regional institutions for inclusion in the *Regional Framework for Investment* August to November 2015;
- Broad based web-survey of national level stakeholders to support the development of thematic programmes, identifying priorities and gaps; and
- Final face-to-face consultation in December 2015 with regional stakeholders to discuss implementation modalities and gain feedback on thematic programmes before the finalisation of the *Regional Framework for Investment.*

The consultation process led to the articulation of an overall regional vision for climate resilience and water security and consolidated agreed priorities in terms of the six Thematic Programmes of Action to be addressed, see Chapter 3: A *Regional Framework for Investment.*

3

A Regional Framework for Investment

The *Regional Framework for Investment* responds directly to identified water security and climate resilience challenges. It comprises an overall vision, strategic objective and six Thematic Programmes of Action as shown in Figure 3.1. Each Thematic Programme of Action responds an identified challenge and contains supporting programmes and activities. The six Thematic Programme of Action are provided in more detail in this chapter.

3.1. Thematic Programmes of Action

The Thematic Programmes of Action are organised using a consistent template as set out in Figure 3.2. This includes an overview, relevant regional and national partners and a summary of each programme. Note that the partners identified are indicative, not exhaustive, and are intended as a starting point. Each programme has its own table providing additional details on indicative costs, timings and a description of potential actions to be implemented. Finally, a summary table is provided with project concepts identified by regional organisations which have the potential for rapid implementation as part of an implementation plan. Annex A of this document provides further reading associated with each Thematic Programme of Action to give additional background and context on the challenges being addressed.

Vision

A water secure and climate resilient Caribbean

Strategic objective

The objective of the *Regional Framework for Investment* is to enhance regional and national capacity to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being and socio-economic development, for ensuring protection against water-borne pollution and water related disasters and for preserving ecosystems, in the face of a changing climate.

Thematic Programmes of Action

Climate resilient water infrastructure
Outcome: Critical infrastructure in the water sector made more resilient to natural climate hazards and better prepared for climate change and variability

Water efficiency, re-use and augmentation
Outcome: Water security enhanced through demand-side measures including reductions in non-revenue water and water user efficiency as well as augmentation of supplies

Drought resilient water supplies
Outcome: Drought resilience and security of supply in urban and community water systems enhanced in the face of changing rainfall patterns

Climate resilient agricultural water management
Outcome: Agricultural food production more resilient to natural hazards through improved agricultural water management techniques and approaches

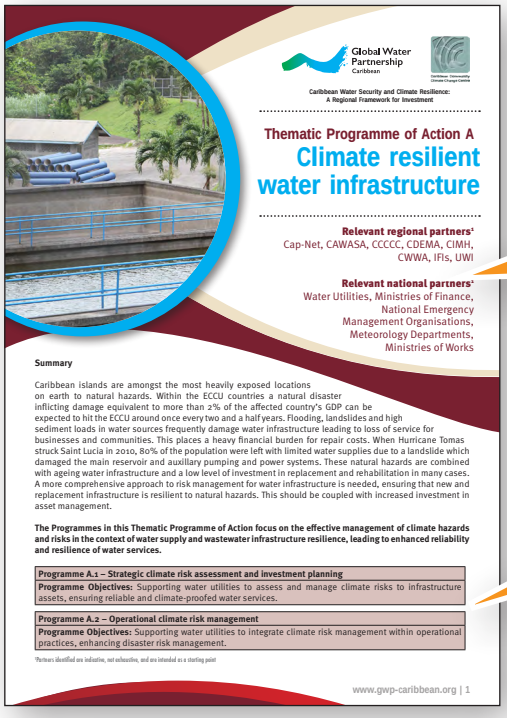
Resilient and healthy water resources systems
Outcome: Water security enhanced through effective management of water resources quantity and quality including wastewater and pollution control under a changing climate

Integrated flood management
Outcome: Reduction of flood-related disaster risk and losses in peoples' livelihoods and the economy through early action and better preparedness

All themes integrate enabling actions including:

Evidence based planning	Policy development	Capacity development	Financing investment	Awareness and outreach	Technology and innovation

Figure 3.1: Vision, strategic objectives and Thematic Programmes of Action



Global Water Partnership Caribbean

Caribbean Water Security and Climate Resilience: A Regional Framework for Investment

Thematic Programme of Action A

Climate resilient water infrastructure

Relevant regional partners[1]
Cap-Net, CAWASA, CCCCC, CDEMA, CIMH, CWWA, IFIs, UWI

Relevant national partners[1]
Water Utilities, Ministries of Finance, National Emergency Management Organisations, Meteorology Departments, Ministries of Works

Summary

Caribbean islands are amongst the most heavily exposed locations on earth to natural hazards. Within the ECCU countries a natural disaster inflicting damage equivalent to more than 2% of the affected country's GDP can be expected to hit the ECCU around once every two and a half years. Flooding, landslides and high sediment loads in water sources frequently damage water infrastructure leading to loss of service for businesses and communities. This places a heavy financial burden for repair costs. When Hurricane Tomas struck Saint Lucia in 2010, 80% of the population were left with limited water supplies due to a landslide which damaged the main reservoir and auxiliary pumping and power systems. These natural hazards are combined with ageing water infrastructure and a low level of investment in replacement and rehabilitation in many cases. A more comprehensive approach to risk management for water infrastructure is needed, ensuring that new and replacement infrastructure is resilient to natural hazards. This should be coupled with increased investment in asset management.

The Programmes in this Thematic Programme of Action focus on the effective management of climate hazards and risks in the context of water supply and wastewater infrastructure resilience, leading to enhanced reliability and resilience of water services.

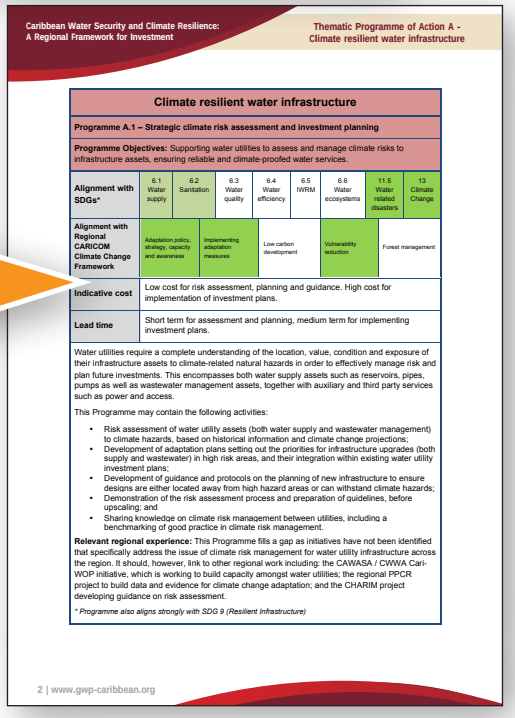
Programme A.1 – Strategic climate risk assessment and investment planning
Programme Objectives: Supporting water utilities to assess and manage climate risks to infrastructure assets, ensuring reliable and climate-proofed water services.

Programme A.2 – Operational climate risk management
Programme Objectives: Supporting water utilities to integrate climate risk management within operational practices, enhancing disaster risk management.

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Thematic Programme of Action overview (LEVEL 1)
- *Relevant Regional and National Stakeholders*
- *Summary of problem being addressed and objective*

Overview of supporting programmes (LEVEL 2)



Climate resilient water infrastructure

Programme A.1 – Strategic climate risk assessment and investment planning

Programme Objectives: Supporting water utilities to assess and manage climate risks to infrastructure assets, ensuring reliable and climate-proofed water services.

Alignment with SDGs*	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for risk assessment, planning and guidance. High cost for implementation of investment plans.							
Lead time	Short term for assessment and planning, medium term for implementing investment plans.							

Water utilities require a complete understanding of the location, value, condition and exposure of their infrastructure assets to climate-related natural hazards in order to effectively manage risk and plan future investments. This encompasses both water supply assets such as reservoirs, pipes, pumps as well as wastewater management assets, together with auxiliary and third party services such as power and access.

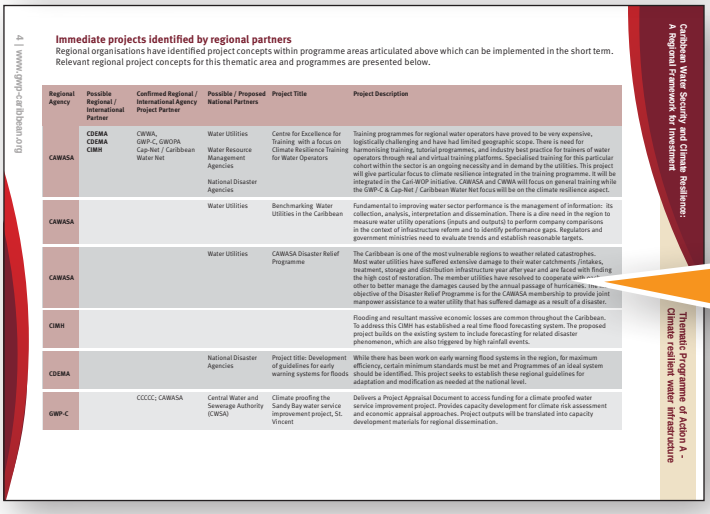
This Programme may contain the following activities:

- Risk assessment of water utility assets (both water supply and wastewater management) to climate hazards, based on historical information and climate change projections;
- Development of adaptation plans setting out the priorities for infrastructure upgrades (both supply and wastewater) in high risk areas, and their integration within existing water utility investment plans;
- Development of guidance and protocols on the planning of new infrastructure to ensure designs are either located away from high hazard areas or can withstand climate hazards;
- Demonstration of the risk assessment process and preparation of guidelines, before upscaling; and
- Sharing knowledge on climate risk management between utilities, including a benchmarking of good practice in climate risk management.

Relevant regional experience: This Programme fills a gap as initiatives have not been identified that specifically address the issue of climate risk management for water utility infrastructure across the region. It should, however, link to other regional work including: the CAWASA / CWWA Cari-WOP initiative, which is working to build capacity amongst water utilities; the regional PPCR project to build data and evidence for climate change adaptation; and the CHARIM project developing guidance on risk assessment.

** Programme also aligns strongly with SDG 9 (Resilient Infrastructure)*

Summary of Programme (LEVEL 2) (one table per Programme)
- *Alignment with SDGs*
- *Alignment with Regional Framework*
- *Indicative cost: Low / medium / high (to be determined)*
- *Lead time: short (<1 year), medium (1-5 years), long (>5 years)*
- *A description of the potential actions within the component (LEVEL 3)*



Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Agency Partner	Confirmed Regional / International Agency Project Partner	Possible / Proposed National Partners	Project Title	Project Description
CAWASA	CDEMA CDEMA CIMH	CWWA, GWP-C, GWOPA Cap-Net / Caribbean Water Net	Water Utilities Water Resource Management Agencies National Disaster Agencies	Centre for Excellence for Training with a focus on Climate Resilience Training for Water Operators	Training programmes for regional water operators have proved to be very expensive, logistically challenging and have had limited geographic scope. There is need for harmonising training, tutorial programmes, and industry best practice for trainers of water operators through real and virtual training platforms. Specialised training for this particular cohort within the sector is an ongoing necessity and in demand by the utilities. This project will give particular focus to climate resilience integrated in the training programme. It will be integrated in the Cari-WOP initiative. CAWASA and CWWA will focus on general training while the GWP-C & Cap-Net / Caribbean Water Net focus will be on the climate resilience aspect.
CAWASA			Water Utilities	Benchmarking Water Utilities in the Caribbean	Fundamental to improving water sector performance is the management of information: its collection, analysis, interpretation and dissemination. There is a dire need in the region to measure water utility operations (inputs and outputs) to perform company comparisons in the context of infrastructure reform and to identify performance gaps. Regulators and government ministries need to evaluate trends and establish reasonable targets.
CAWASA			Water Utilities	CAWASA Disaster Relief Programme	The Caribbean is one of the most vulnerable regions to weather related catastrophes. Most water utilities have suffered extensive damage to their water catchments /intakes, treatment, storage and distribution infrastructure year after year and are faced with finding the high cost of restoration. The member utilities have resolved to cooperate with one another to better manage the damages caused by the annual passage of hurricanes. The objective of the Disaster Relief Programme is for the CAWASA membership to provide joint manpower assistance to a water utility that has suffered damage as a result of a disaster.
CIMH					Flooding and resultant massive economic losses are common throughout the Caribbean. To address this CIMH has established a real time flood forecasting system. The proposed project builds on the existing system to include forecasting for related disaster phenomenon, which are also triggered by high rainfall events.
CDEMA			National Disaster Agencies	Project title: Development of guidelines for early warning systems for floods	While there has been work on early warning flood systems in the region, for maximum efficiency, certain minimum standards must be met and Programmes of an ideal system should be identified. This project seeks to establish these regional guidelines for adaptation and modification as needed at the national level.
GWP-C		CCCCC; CAWASA	Central Water and Sewerage Authority (CWSA)	Climate proofing the Sandy Bay water service improvement project, St. Vincent	Delivers a Project Appraisal Document to access funding for a climate proofed water service improvement project. Provides capacity development for climate risk assessment and economic appraisal approaches. Project outputs will be translated into capacity development materials for regional dissemination.

Table of project concepts provided by regional organisations for short term implementation (LEVEL 4)

Figure 3.2: Structure of each of the Thematic Programmes of Action

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Caribbean Water Security and Climate Resilience:
A Regional Framework for Investment

Thematic Programme of Action A

Climate resilient water infrastructure

Relevant regional partners[1]
Cap-Net, CAWASA, CCCCC, CDEMA, CIMH, CWWA, IFIs, UWI

Relevant national partners[1]
Water Utilities, Ministries of Finance, National Emergency Management Organisations, Meteorology Departments, Ministries of Works

Summary

Caribbean islands are amongst the most heavily exposed locations on earth to natural hazards. Within the ECCU countries a natural disaster inflicting damage equivalent to more than 2% of the affected country's GDP can be expected to hit the ECCU around once every two and a half years. Flooding, landslides and high sediment loads in water sources frequently damage water infrastructure leading to loss of service for businesses and communities. This places a heavy financial burden for repair costs. When Hurricane Tomas struck Saint Lucia in 2010, 80% of the population were left with limited water supplies due to a landslide which damaged the main reservoir and auxillary pumping and power systems. These natural hazards are combined with ageing water infrastructure and a low level of investment in replacement and rehabilitation in many cases. A more comprehensive approach to risk management for water infrastructure is needed, ensuring that new and replacement infrastructure is resilient to natural hazards. This should be coupled with increased investment in asset management.

The Programmes in this Thematic Programme of Action focus on the effective management of climate hazards and risks in the context of water supply and wastewater infrastructure resilience, leading to enhanced reliability and resilience of water services.

Programme A.1 – Strategic climate risk assessment and investment planning
Programme Objectives: Supporting water utilities to assess and manage climate risks to infrastructure assets, ensuring reliable and climate-proofed water services.

Programme A.2 – Operational climate risk management
Programme Objectives: Supporting water utilities to integrate climate risk management within operational practices, enhancing disaster risk management.

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Climate resilient water infrastructure

Programme A.1 – Strategic climate risk assessment and investment planning

Programme Objectives: Supporting water utilities to assess and manage climate risks to infrastructure assets, ensuring reliable and climate-proofed water services.

Alignment with SDGs*	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for risk assessment, planning and guidance. High cost for implementation of investment plans.							
Lead time	Short term for assessment and planning, medium term for implementing investment plans.							

Water utilities require a complete understanding of the location, value, condition and exposure of their infrastructure assets to climate-related natural hazards in order to effectively manage risk and plan future investments. This encompasses both water supply assets such as reservoirs, pipes, pumps as well as wastewater management assets, together with auxiliary and third party services such as power and access.

This Programme may contain the following activities:

- Risk assessment of water utility assets (both water supply and wastewater management) to climate hazards, based on historical information and climate change projections;
- Development of adaptation plans setting out the priorities for infrastructure upgrades (both supply and wastewater) in high risk areas, and their integration within existing water utility investment plans;
- Development of guidance and protocols on the planning of new infrastructure to ensure designs are either located away from high hazard areas or can withstand climate hazards;
- Demonstration of the risk assessment process and preparation of guidelines, before upscaling; and
- Sharing knowledge on climate risk management between utilities, including a benchmarking of good practice in climate risk management.

Relevant regional experience: This Programme fills a gap as initiatives have not been identified that specifically address the issue of climate risk management for water utility infrastructure across the region. It should, however, link to other regional work including: the CAWASA / CWWA Cari-WOP initiative, which is working to build capacity amongst water utilities; the regional PPCR project to build data and evidence for climate change adaptation; and the CHARIM project developing guidance on risk assessment.

** Programme also aligns strongly with SDG 9 (Resilient Infrastructure)*

Climate resilient water infrastructure

Programme A.2 – Operational climate risk management

Programme Objectives: Supporting water utilities to integrate climate risk management with operational practices, enhancing disaster risk management.

Alignment with SDGs*	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	Low cost, most actions are operational rather than involving new infrastructure.
Lead time	Short, this builds on existing work.

Water utilities exploit a range of contingency plans and procedures to deal with the impacts of climate hazards which disrupt services and damage infrastructure. However, opportunities exist to further improve contingency planning, operational practices and to reduce the level of disruption when climate hazards occur. This Programme may contain the following activities:

- Strengthening regional cooperation between national water utilities to share resources and expertise for rapid recovery following climate hazards;
- Further development of data collection and hazard modelling capabilities across the region, taking into account data scarcity and long term sustainability of data collection and management;
- Linking water utility operational practices with real time weather forecasting and early warning systems;
- Linking seasonal water resources operational activities with medium term weather forecasting in order to improve early action and contingency planning for drought events;
- Strengthening the provision of cost effective approaches to provide potable water during disruptions due to floods, storms or droughts to provide communities with continued access to safe water supplies during adverse emergency situations; and
- Improving contingency planning for hazard events based on a detailed understanding of risks associated with hazards occurring, such as health impacts and outages of service, focussing on priority services such as the emergency services, hospitals and schools, for example.

Relevant regional experience: This work builds on ongoing initiatives of CAWASA in regional utility cooperation and CIMH in climate hazard forecasting, and would further strengthen the linkages between water utilities and the climate services providers. In addition, this Programme may build on existing disaster risk management activities led by NEMOs.

** Also aligns strongly with SDG 9 (Resilient Infrastructure)*

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Possible / Proposed National Partners	Project Title	Project Description
CAWASA	**CDEMA** **CDEMA** **CIMH**	CWWA, GWP-C, GWOPA Cap-Net / Caribbean Water Net	Water Utilities Water Resource Management Agencies National Disaster Agencies	Centre for Excellence for Training with a focus on Climate Resilience Training for Water Operators	Training programmes for regional water operators have proved to be very expensive, logistically challenging and have had limited geographic scope. There is need for harmonising training, tutorial programmes, and industry best practice for trainers of water operators through real and virtual training platforms. Specialised training for this particular cohort within the sector is an ongoing necessity and in demand by the utilities. This project will give particular focus to climate resilience integrated in the training programme. It will be integrated in the Cari-WOP initiative. CAWASA and CWWA will focus on general training while the GWP-C & Cap-Net / Caribbean Water Net focus will be on the climate resilience aspect.
CAWASA			Water Utilities	Benchmarking Water Utilities in the Caribbean	Fundamental to improving water sector performance is the management of information: its collection, analysis, interpretation and dissemination. There is a dire need in the region to measure water utility operations (inputs and outputs) to perform company comparisons in the context of infrastructure reform and to identify performance gaps. Regulators and government ministries need to evaluate trends and establish reasonable targets.
CAWASA			Water Utilities	CAWASA Disaster Relief Programme	The Caribbean is one of the most vulnerable regions to weather related catastrophes. Most water utilities have suffered extensive damage to their water catchments /intakes, treatment, storage and distribution infrastructure year after year and are faced with finding the high cost of restoration. The member utilities have resolved to cooperate with each other to better manage the damages caused by the annual passage of hurricanes. The main objective of the Disaster Relief Programme is for the CAWASA membership to provide joint manpower assistance to a water utility that has suffered damage as a result of a disaster.
CIMH					Flooding and resultant massive economic losses are common throughout the Caribbean. To address this CIMH has established a real time flood forecasting system. The proposed project builds on the existing system to include forecasting for related disaster phenomenon, which are also triggered by high rainfall events.
CDEMA			National Disaster Agencies	Project title: Development of guidelines for early warning systems for floods	While there has been work on early warning flood systems in the region, for maximum efficiency, certain minimum standards must be met and Programmes of an ideal system should be identified. This project seeks to establish these regional guidelines for adaptation and modification as needed at the national level.
GWP-C		CCCCC; CAWASA	Central Water and Sewerage Authority (CWSA)	Climate proofing the Sandy Bay water service improvement project, St. Vincent	Delivers a Project Appraisal Document to access funding for a climate proofed water service improvement project. Provides capacity development for climate risk assessment and economic appraisal approaches. Project outputs will be translated into capacity development materials for regional dissemination.

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Thematic Programme of Action B

Water efficiency, re-use and augmentation

Relevant regional partners[1]
CARPHA, CAWASA, CCCCC, CTO, CWWA, GWP-C, IFIs, PAHO, UNEP CAR/RCU, UWI

Relevant national partners[1]
Ministries responsible for Water Resources and supply, Ministries of Finance, Ministries of Environment, Water Utilities, Industry Associations

Summary

Caribbean water utilities suffer high rates of non-revenue water (in some cases up to 50%) due to a combination of factors including high levels of leakage, aging infrastructure and the prioritisation of new connections over maintenance programmes. These issues compound the effects of drought by increasing the demand placed on water sources. Climate change is likely to impact on water availability and compound water scarcity issues in the future. In addition, leakage exacerbates the high expenditures on energy required for pumping and treatment, with some utilities expending 40% of their budgets on energy. Managing the demand for water will help countries make better use of existing water resources, reducing the need for expensive desalination and maintaining more water for other users and the environment. Demand management at the household, business and utility level through technological, process and behavioural change is required to support the overall efficiency of water use across the region.

The Programmes in this Thematic Programme of Action focus on enhancing water security through improved efficiency in water use.

Programme B.1 – Household demand management
Programme Objectives: Supporting community resilience to drought through enhanced water efficiency and water augmentation at the household level

Programme B.2 – Water and energy efficiency for water utilities
Programme Objectives: Supporting water utilities manage leakage, non-revenue water, energy demands and carbon emissions for multiple environment and economic benefits

Programme B.3 –Water user efficiency for large scale water consumers
Programme Objectives: Targeted interventions aimed at large consumers of water to increase efficiencies, providing cost savings and enhancing resilience to drought risks

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Water efficiency, re-use and augmentation

Programme B.1 – Household demand management

Programme Objectives: Supporting community resilience to drought through enhanced water efficiency and water augmentation at the household level

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	• Low cost for behavioural change and pilot projects. • High costs for large scale subsidies and financial incentives.
Lead time	Short – building on ongoing initiatives and expertise in the region.

In some countries, demand for domestic water forms a substantial component of total water abstractions. Managing water demand at the household level will help communities become more resilient to drought and support utilities by reducing the volumes of water which are treated and pumped to consumers. This Programme may contain the following activities:

- Awareness, advocacy and education campaigns at a variety of levels;
- Investigation of incentive schemes such as subsidies on household demand management devices;
- Review and realignment of planning regulation to move towards low consumption domestic development;
- Promotion of rainwater harvesting to augment piped water supplies; and
- Investigation of the potential to re-use and recycle grey water at the domestic level for irrigation and other non-potable uses, when properly controlled.

Relevant regional experience: A number of regional organisations work on these elements including GWP-C and CARPHA's work on rainwater harvesting, and these types of programmes would be relatively straightforward to scale-up and implement.

Water efficiency, re-use and augmentation

Programme B.2 – Water and energy efficiency for water utilities

Programme Objectives: Supporting water utilities manage leakage, non-revenue water, energy demands and carbon emissions for multiple environment and economic benefits

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for studies, assessments and behavioural change interventions. High cost for capital works.							
Lead time	Short for initial studies and pilots, medium to long term for investment in infrastructure.							

Leakage and non-revenue water (NRW) are key issues for Caribbean utilities with rates reaching up to 50% of total water inputs to supply systems in some cases. This means that utilities are abstracting, treating and pumping more water than is required, increasing operating costs and reducing environmental flows. The region is already working on NRW and leakage, for example Barbados is currently implementing a programme to address this issue. Leakage and NRW also results in high energy costs for treating and pumping water. Increasing water and energy efficiencies and deploying low-carbon energy sources brings multiple environmental and economic benefits. A regional programme could include the following activities:

- Knowledge sharing, capacity building and learning lessons intra-regionally and inter-regionally;
- Comprehensive hydraulic modelling of water supply systems, including capacity development, to allow assessment of NRW and development of cost effective interventions to manage NRW;
- Technical studies on the economic case for NRW reduction and preparation of investment plans;
- Technical studies on energy and carbon efficiency in water supply, including the identification and assessment of options to reduce energy consumption and carbon intensity through actions such as more efficient technology;
- Investigation of the economic, social and environmental potential for closed cycle systems such as recycling grey water, energy and nutrients from wastewater;
- Developing investment plans for energy efficiency and investment in low carbon green energy solutions such as solar and energy / nutrients from waste; and
- Facilitating access to finance to support programmes including metering, network upgrades and information management systems.

Relevant regional experience: This Programme will build on the experience of water utilities across the region in managing leakage and non-revenue water through a various projects and initiatives, and benefit from regional cooperation and knowledge sharing regional organisations such as CAWASA and CWWA.

Water efficiency, re-use and augmentation

Programme B.3 –Water user efficiency for large scale water consumers

Programme Objectives: Targeted interventions aimed at large consumers of water to increase efficiencies, providing cost savings and enhancing resilience to drought risks

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	Low cost for studies and assessments (where gaps exist). Medium cost for pilot projects. High cost for capital works.
Lead time	Short for initial studies and pilots, medium terms for regulatory and policy regimes and to long term for investment in infrastructure.

Water use in agriculture, tourism and industry are major components of overall water abstraction in many Caribbean countries. Given the importance of these activities in maintaining livelihoods and economic development, ensuring their efficient use of water resources is important for maintaining a competitive edge. Increasing the efficiency of large water users also brings benefits in terms of conserving water for environmental and other uses, especially during periods of drought. This Programme could include the following activities:

- Identification and assessment of major water consumers, such as industrial facilities, tourism businesses and agro-businesses, amongst others;
- Development of initiatives with major water users to identify feasible water efficiency options, including the piloting of innovative technological solutions where appropriate; and
- Development of incentives and support interventions to support efficiency (financial, policy, regulatory) with all water consumers including domestic users.

Relevant Regional Experience: This work builds on work carried out by PAHO and the CTO on water demand management and by GWP-C on water use efficiency.

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
CARPHA/ GWP-C		UNEP-CAR/RCU, GIZ	Regional	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Caribbean Rainwater Harvesting (RWH) Programme	Caribbean Rainwater Harvesting Programme - Updating and Continuation of the Programme developed by CEHI/CARPHA. The Programme speaks to RWH awareness raising, capacity building, legislative and policy development and infrastructural development.
CARPHA	PAHO, CTO		Regional	Ministries of Tourism, Ministries of Health	Water Use Efficiency and Water Safety Planning for the Tourism Sector	Demand side water management within the tourism sector, including water loss reduction devices, low volume water use fixtures and conservation practices. Also focuses on the protection of water quality.
CERMES at UWI	CAWASA, CWWA		Regional	Water Utilities	Water supply modelling for NRW reduction	A key entry point to effectively managing NRW is the ability to understand water network performance, and to model the impact of upgrades and changes to operational practices. This project would undertake comprehensive hydraulic modelling of water supply systems, including capacity development, to allow assessment of NRW and development of cost effective interventions to manage NRW.

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Thematic Programme of Action C

Drought resilient water supplies

Relevant regional partners[1]

CARPHA, CAWASA, CCCCC, CDEMA, CIMH, CWWA, GWP-C, IFIs, OECS, PAHO, UWI

Relevant national partners[1]

Ministries responsible for Water Resources and supply, Ministries of Finance, Ministries of Environment, Water Utilities, National Emergency Management Organisations

Summary

A combination of seasonally variable rainfall coupled with insufficient storage infrastructure and limited data for strategic planning means that many Caribbean islands suffer from seasonal water shortages. This issue is exacerbated in drought years, manifested as saline intrusion into aquifers or the emptying of storage reservoirs. This necessitates rationing, often with expensive trucking of water. For example, the 2009-2010 drought in Jamaica resulted in reductions in water production of up to 90% at some plants. This led to widespread disruption and health impacts as consumers were obliged to use unsafe sources. In the future, rainfall is projected to reduce over much of the Caribbean region. Furthermore, population growth and changing patterns of water demand could also compound drought impacts. Action is needed to enhance the reliability of water supplies and secure their long-term sustainability through more effective management of drought and strategic planning.

The Programmes in this Thematic Programme of Action focus on enhancing the resilience of water services to drought through investment in infrastructure and operational drought management.

Programme C.1 – Strategic water supply planning for sustainable supplies
Programme Objectives: Support to water utilities in developing strategic investment plans to enhance resilience and secure water supplies in the medium to long term (decades)

Programme C.2 – Drought management planning
Programme Objectives: Supporting water utilities to plan for and manage drought events, reducing disruption to essential services

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Drought resilient water supplies

Programme C.1 – Strategic water supply planning for sustainable supplies

Programme Objectives: Support to water utilities in developing strategic investment plans to enhance resilience and secure water supplies in the medium to long term (decades)

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for studies and strategic water supply planning, high cost for resulting infrastructure projects.							
Lead time	Short term for development of plans and long term for infrastructure investment.							

Strategic water supply planning is a key prerequisite for water utilities to ensure sustainable water services in the face of developing populations and changing climate. The adoption of a broad range of supply side and demand side options, coupled with investment planning and supported by research and development will be important to maintain supplies in the face of a changing climate. This Programme will work closely with strategic planners within water utilities and Ministries with responsibilities for water supply and may include the following activities:

- Knowledge sharing and capacity development on current good practice for strategic supply planning across the region, and developing harmonised strategic planning approaches for the Caribbean Water Utilities;
- Rolling out the Water Safety Planning (WSP) process across the region and ensuring risk assessments under the WSP process incorporate consideration of water availability, drought and climate change risks;
- Further strengthening the tools and capacity to measure and model water sources and supply systems in order to increase the reliability of yield estimates for investment planning and to operationally manage supplies;
- Developing scenarios of future water demand, and future water supply under a range of future climate change scenarios and including these in strategic planning approaches;
- Identification of a range of supply and demand side investment options to address high priorities and assessing their performance to ensure they are robust to climate change. These should use innovative approaches where appropriate, building on pilot projects from across the region (for example, water efficiency measures, rainwater harvesting, water re-use and recycling, utilising a mix of groundwater and surface water and low carbon desalination, amongst others);
- Initiating a dialogue on levels of service to consider the balance between future investment costs and the levels of service which can be feasibly achieved;
- Developing costed long term investment strategies to close supply / demand deficits over a medium term investment horizon, and integration of these within existing planning frameworks; and
- Investing in research and development to support the development of innovative solutions for sustainable water supplies.

Relevant regional experience: The CDB Water Sector Study has undertaken an assessment of water authority benchmarking and priority investments which can be used as a building block for strategic planning. The CAWASA / CWWA Cari-WOP initiative is also working on building capacity amongst water utilities and may be able to link in to the above activities.

Drought resilient water supplies

Programme C.2 – Drought management planning

Programme Objectives: Supporting Water Utilities to plan for and manage drought events, reducing disruption to essential services

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost, most activities are operational. Medium cost for investment to support implementation of Drought Management Plans.							
Lead time	Short term, this can build on existing work ongoing in the region.							

Although investment in water supply can help improve the resilience of supplies to drought in the long term, drought management planning is a crucial component to increase preparedness and minimise the impacts of severe drought events when they occur. Drought management planning is present within the region, and many countries have been required to act during recent droughts. However, further opportunities exist to harmonise and strengthen drought management planning and implementation across the region. This Programme may include the following activities:

- Review of Drought Management Plans for water related stakeholders across the region, focusing mainly on water utilities, but also considering water related business continuity plans for critical and major water users e.g. large scale farms and key government facilities such as emergency services, schools and hospitals as well as private businesses, including the tourism industry;
- Development of water resources modelling including hydrological models to represent supplies as well as demand side models and projections. Linking supply and demand models to project water balances over medium term (~1 year) based on seasonal forecasting and scenario testing;
- Development of Drought Management Plans building on regional and national good practice and lessons from recent droughts in order to minimise disruption and maintain water quality; and
- Capacity development to support development of Drought Management Plans, and to support the implementation of these plans within water utility operational practices.

Relevant regional experience: This Programme would link into a proposed CDEMA programme Capacity Building for National Drought Risk Management Planning, and would aim to build capacity to implement drought management plans across key sectors.

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
CARPHA		GWP-C, UNEP-CAR / RCU, GIZ	Regional	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Caribbean Rainwater Harvesting (RWH) Programme	Updating and continuation of the RWH Programme developed by CEHI / CARPHA. The Programme speaks to RWH awareness raising, capacity building, legislative and policy development and infrastructural development.
CARPHA	PAHO		Regional	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Regional Programme for Water Safety Planning	Continuation of Water Safety Planning activities carried out by CARPHA and PAHO in countries such as St. Lucia, Guyana and Jamaica. Roll out to other countries / entire region. Water Safety Planning involves the protection of water supplies from watershed source to household storage and distribution.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
GWP-C/ OECS	CERMES at UWI		Antigua and Barbuda	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Hydro-geological Mapping of Caribbean countries	This project seeks to improve the governance and management of the groundwater resources of Caribbean countries identifying hotspot areas, and utilising available and other data to develop models for the quantitative and qualitative analysis of this resource. Information to be gathered includes exploitable volumes of water available from the country's groundwater resources, the location and boundaries of these aquifers, the hydro-geological information and the identification of the critical recharge zones of aquifers. In addition to providing the tools (scientific analysis, GIS data presentation and modelling), this project also aims at building technical capacity so that the work completed can be continued and managed when the project is completed. There has been a specific request for assistance from Antigua and Barbuda in this regard, it has been suggested that initial work be conducted there and lessons learnt, techniques and methodologies be applied to other countries. The OECS is keen on the conduct of groundwater assessments for its member countries and it is anticipated that this initiative can be modified to address the OECS need with possible roll out first in the OECS countries.
GWP-C			Regional	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Development of Water Resources Master Plans for Caribbean Islands	For those countries at the just completed policy stage, this project attempts to move these countries to the next stage, namely the development of master plans taking into account climate change aspects. Funding is required for the next stage of master plan development. There is an opportunity for information sharing and exchanges among countries, e.g. those that have completed their master plans and those that are starting.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
UWI Mona, Dept. of Geography and Geology and Environmental Management Unit		UWI Mona, UWI St. Augustine, CDEMA	Initially Jamaica, then replication to other countries	Water Resources Authority, Jamaica, Met Service of Jamaica, ODPEM Jamaica	Water Security and resilience towards climate change for the water sector for Jamaica	Jamaica has been severely affected by the drought of 2010, 2014 and now 2015. The agriculture and domestic sectors have been worst affected with major impact in the parishes of Kingston and St Andrew, Clarendon, St Elizabeth, St Thomas, and St Catherine. Severe water shortages occurred in communities of the urban areas of Kingston with significantly low levels in the major water supplies. Climate projections show an increase in dry days and probability of drought for the island, hence this will affect the water sector directly in the future. There exists no significant drought management plan and adaptation strategy for water security for the island. New sources of water need to be identified, which entails detailed mapping of the existing sources, geological studies, the analysis of aquifer parameters and the analysis of the water budget for each basin with climate projections at a high resolution scale of 10km. This has not been done and needs to be conducted since drought appears to be a more frequent event in recent years. Separate water budgets need to be conducted for water for urban areas and agricultural areas. Demand and consumption analyses are needed for agriculture, and the domestic sector with projections of climate scenarios and population growth.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
UWI Mona, Dept. of Geography And Geology and Environmental Management Unit		UWI Mona, UWI Cave Hill -CERMES, Climate Studies Group, UWI Mona, GWP-C		Water Resources Agencies, Ministries responsible for Water	Development of Rainwater Harvesting (RWH) model for the parishes of Kingston and St Andrew and St Catherine	The parishes of Kingston and St Andrew and St Catherine are the most urbanised parishes in Jamaica. Population density is highest for Kingston, capital city of Jamaica, followed by Portmore and Spanish Town of St Catherine. The prevailing drought of 2015 and the past droughts of 2010 and 2014 have severely affected these parishes with major areas of the main cities experiencing water shortages. There is no existing model or plan or policy for rainwater harvesting in these parishes as well as for Jamaica. The project would involve mapping of all houses of the urban areas, shape and size of the roof, roof material. Analysis of rainfall for these parishes would be conducted with estimation of frequency of maximum rainfall, flooding or storm water discharge per roof and will be calculated using standard formulae. The total amount of water that can be captured from extreme rainfall would be analysed. Finally, a model for RWH would be developed in consultations with local stakeholders and license agencies for implementation of the model. Impacts of climate variability will also be conditioned over the present rainfall-runoff model for estimation of flow under different emission scenarios. This initial project in Jamaica will be replicated in other islands. This project is in synergy with the Caribbean RWH programme, which speaks to RWH for communities and urban areas.
CERMES at UWI	GWP-C, CCCCC			Water Utilities, Water Resources Agencies, Ministries responsible for Water		Development of water resources modelling including hydrological models to represent supplies as well as demand side models and projections. Linking supply and demand models to project water availability balances over medium term (~1 year) based on seasonal forecasting and scenario testing.
CDEMA	CIMH, CCCCC			National Disaster Organisations	Project Title: Capacity Building for National Drought Risk Management Planning	This programme would develop a training programme for National Disaster Coordinators on adaptation and implementation of a National Drought Management Plan. The existing regional Model Drought Plan would be updated in collaboration with CDEMA NDCs, the CU and other key technical partners, in particular to better reflect how regional climate change data and climate change adaptation strategies should be incorporated into national planning for drought emergencies. A set of standardised training materials and tools would be developed as part of a capacity building programme for National Disaster Organisations (a grouping which includes the water, health and agriculture sectors). Sustainability will be built into the project design.

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Caribbean Water Security and Climate Resilience:
A Regional Framework for Investment

Thematic Programme of Action D

Climate resilient agricultural water management

Relevant regional partners[1]
CARDI, CARPHA, CCCCC, CIMH, FAO, GWP-C, IFIs, UWI

Relevant national partners[1]
Ministries of Agriculture, Ministries of Finance, Agricultural Trade Associations, Farmers Associations, Meteorology Departments

Summary

Agriculture makes a significant contribution to the GDP of several Caribbean countries. Despite its declining contribution to most national economies in the region, the agricultural sector plays a critical role in food and livelihood provision and the servicing of other economic sectors such as tourism and manufacturing. Agricultural employment accounts for at least 20% of total employment in some countries and is close to 30% in Belize, Dominica and Guyana. This profile suggests that many households across the region are at significant risk if agriculture systems are stressed by events such as prolonged drought. The majority of the region's agriculture is rain-fed and production and profitability is strongly influenced by variations in rainfall and, in particular, rainfall extremes. In 2009 and 2010, a severe drought caused millions of dollars in lost income in the Caribbean agricultural sector which was worsened by increased bush fires on farms resulting from the hot, dry conditions.

In the absence of available water from formal irrigation schemes, many small scale farmers have developed innovative ways of intercepting and storing rainwater runoff but the quantities are insufficient to meet shortfalls in agricultural water demand during dry periods. In general, water for irrigation when necessary is a major constraint for most small scale farmers.

In order to safeguard this key sector from drought, increased investment in securing water supplies for agriculture is needed alongside improving the efficiency of agricultural water management to improve 'crop per drop' yields. This will be especially important given climate change projections of a reduction in rainfall across much of the region. As an operational practice, seasonal forecasting would be a low regrets climate resilience measure to further assist in the efficient management of water resources for agriculture.

The Programmes in this Thematic Programme of Action focus on investment in securing agricultural water supplies, efficient water management and effective management of agricultural drought risk.

Programme D.1 – Securing agricultural water supply and improving efficiencies for drought resilience
Programme Objectives: Supporting small scale farmers to invest in appropriate water supply systems to support agricultural livelihoods and improve drought resilience

Programme D.2 – Drought risk reduction through seasonal forecasting
Programme Objectives: Supporting small scale farmers to manage the risks of agricultural drought through the provision of forecasting and decision support services

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Climate resilient agricultural water management

Programme D.1 – Securing agricultural water supply and improving efficiencies for drought resilience

Programme Objectives: Supporting small scale farmers to invest in appropriate water supply systems to support agricultural livelihoods and improve drought resilience

Alignment with SDGs*	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for technical studies and capacity development, medium for pilot projects and high costs for rolling out / financing infrastructure and technology across the region.							
Lead time	Short term for technical studies and capacity development and pilot projects, building on existing work, medium to long term for rolling out / financing infrastructure and technology across the region.							

The region has a strong track record in piloting projects on the provision of reliable water supplies through rainwater harvesting and other approaches to water storage at a farm level. In addition, efficient irrigation techniques such as drip irrigation, protected agriculture and the use of solar water pumps have been trialled across the region. However, opportunities exist to develop approaches for scaling up and financing these types of technology to provide smallholder farmers with a more resilient source of livelihood in a changing climate. This Programme could contain the following activities:

- Strengthen capacity to identify and appraise options for on-farm water management, building on best practice across the region and existing outreach programmes;
- Investigation of the economic case for a range of on-farm water management options to build a strong business case for investment, and gain an understanding of the existing institutional, financial and cultural barriers to investment in on-farm water management;
- Technical investigations of the current and future water availability and demands under a range of socio-economic and development scenarios to assess the strategic requirements for agricultural water management across the region;
- Producing plans for the upscaling of water management interventions such as efficient irrigation infrastructure, re-use and recycling of grey water, nutrients from waste, rainwater harvesting technology, pumping and storage equipment. This should include appropriate financing and implementation mechanisms and provision to support capacity development; and
- Continuation of the testing and piloting of emerging technology for on-farm water management such as bio-char to manage degraded soils.

Relevant regional experience: This Programme would build on the strong track record of organisations including CARDI and FAO, but would focus primarily on the water management aspects of agricultural resilience.

Climate resilient agricultural water management

Programme D.2 – Drought risk reduction through seasonal forecasting

Programme Objectives: Supporting small scale farmers to manage the risks of agricultural drought through the provision of forecasting and decision support services

Alignment with SDGs*	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate Change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	Low cost for planning and technical development, medium cost for installing and maintaining monitoring systems.
Lead time	Short term, building on pervious projects such as CAMI.

In addition to investing in water management infrastructure, usage of seasonal forecasting can provide a low cost, low regrets option to manage drought risk. The region has experience in seasonal forecasting but opportunities exist to further enhance technical capacity and to strengthen capacity of farmers to access and utilise seasonal forecasting in their operational practices such as planting and water management. This Programme could contain the following activities:

- Develop regional and national level implementation and financing plans for basic data collection to improve technical capacity to analyse and forecast drought events;
- Expand the technical services in drought modelling, mapping and information service provision;
- Review the institutional and technical barriers and opportunities for successful uptake and use of drought forecasts within agricultural decision making at a variety of levels, from small scale farmers to large scale agribusiness; and
- Strengthen capacity amongst agricultural extension workers and farmer associations on the use of forecast information, and the opportunities for reducing negative impacts of droughts.

Relevant regional experience: This Programme would build on the considerable experience in drought forecasting for agriculture at CIMH and CARDI.

** Programme also aligns strongly with SDG 2 (Food Security)*

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
CARDI	UWI	GWP-C		National Ministries of Agriculture / Water	On farm water management and water use efficiency training	Regional training of stakeholders in on-farm water management and water use efficiency. Provide training on Water Use Efficiency for the Agriculture Sector utilising the Water Use Efficiency Manual developed by the GWP-C and Aquacrop modelling developed by FAO.
CARDI	CCCCC	FAO, GWP-C		National Ministries of Agriculture / Water	Biochar for soil water and nutrient capacity enhancement	Use of biochar for soil water and nutrient capacity enhancement. The soil is a limited resource, a great portion of which has been degraded by poor use and management.
CARDI	FAO	GWP-C		National Ministries of Agriculture / Water	On farm water management economics and financing	Rolling out improved on farm water management across the region – cost-benefit analysis / value for money analysis of on farm water management interventions and financing modalities.
CARDI	GWP-C, UWI, FAO			National Ministries of Agriculture / Water	Crop consumptive use study	With increased droughts, the volume of water available to the farming community is decreasing therefore more efficient agricultural practices are needed to ensure that the maximum “crop per drop” is achieved. This project would determine the consumptive use of water for crops of economic importance in the Caribbean to ensure the most efficient use of soil water to obtain maximum economic returns.
CARDI	UWI	GWP-C		National Ministries of Agriculture / Water, private industry	Water re-use for agriculture	Due to ongoing droughts and the forecast for more droughts in the future there is an ever increasing need to explore all sources of irrigation water. Recycling of water is one such source for agricultural production. This project would identify and assess the potential for re-use in agriculture of water utilised by major consumers such as industrial facilities, tourism businesses, agro processors etc. (note this also aligns with theme B).

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
CARDI	GWP-C		St Kitts	Water Utility, Ministry of Agriculture	Desalinated water for agriculture	With the shortage of water being experienced across some Caribbean States, there is an emergent need to seek alternate water sources to augment the water supply. Equipment set up cost for desalination plants are decreasing and with the use of renewable energy it is possible that desalinated water can compete with other sources for use in agriculture. This pilot project would evaluate the economics of the use of desalinated water in agricultural production in the Caribbean (St. Kitts).
CERMES at UWI	FAO			Water Utility, Ministry of Agriculture	Vertical farming for improved water resources management	Pilot Project to investigate the potential for small-medium vertical farming in Cariacou.

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Thematic Programme of Action E

Resilient and healthy water resources systems

Relevant regional partners[1]

Cap-Net, CARDI, CARPHA, CCCCC, CIMH, CTO, FAO, GWP-C, IFIs, PAHO, UNEP CAR-RCU, UWI

Relevant national partners[1]

Ministries and government agencies with responsibility for environment, agriculture, forestry, land use planning, finance, works and coastal zone management; Water Utilities; representatives of agricultural, tourism and fisheries communities and industry associations

Summary

Integrated governance and management of water resources is a continuing issue across the region and while Integrated Water Resources Management has been progressed through the development of plans and policies, their translation into action has been limited. Many decision making processes are still within sectoral silos, rather than taking a catchment-wide planning approach. Further, the management of wastewater and pollution within the freshwater and receiving marine environment is an area requiring substantial investment, in-line with the Cartagena Convention's Protocol on Land-based Sources of Marine Pollution. It has been estimated that 85% of wastewater entering the Caribbean Sea remains untreated. Action will be crucial in order to protect the water resources and ecosystems on which Caribbean businesses and livelihoods depend.

The Programmes in this Thematic Programme of Action focus on the holistic management of water resources and of pollution and wastewater in the water environment.

Programme E.1 – Cross sectoral water resources management and planning
Programme Objectives: Supporting the effective governance and management of water resources across sectors to ensure long-term water security in a changing climate

Programme E.2 – Investing in wastewater management
Programme Objectives: Supporting investment in wastewater management to deliver multiple benefits in public health, pollution reduction and maintaining the health of Caribbean ecosystems in a changing climate

Programme E.3 – Integrated land and water management for environmental resilience
Programme Objectives: Supporting integrated and sustainable water and land use practices which reduce pollution, sedimentation and other risks to water resources and water-related ecosystems

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Resilient and healthy water resources systems

Programme E.1 – Cross sectoral water resources management and planning

Programme Objectives: Supporting the effective governance and management of water resources across sectors to ensure long term water security in a changing climate

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for planning, medium to high cost for implementing plans (including institutional, policy, regulatory and monitoring systems).							
Lead time	Short term, building on existing IWRM plans and policies. Medium to long term for policy reform and regulatory development.							

Integrated Water Resources Management serves a critical role as an overarching framework for the management and allocation of water between public water supply, agriculture, private supplies and the environment. The absence of effective water governance can lead to inequalities in allocation and the degradation and pollution of water sources, and exacerbated drought impacts are often the result. The region has made progress through the development of national IWRM plans and road maps, yet in many countries water resources management is still 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. Opportunities exist to further progress towards holistic and systematic approaches to the management of water resources across the region. This programme would contain the following activities:

- Continuation of the development and implementation of IWRM policies and plans;
- Development of regional harmonised guidelines for water resources management, and support to national countries to tailor approaches to national contexts and capacity development on water resources governance and management;
- Development of water resource management plans at catchment scale to monitor and manage the allocation of abstractions and discharges between water users, including investigation of the linkages between water, food and energy production and consumption;
- Continuation of Regional / National Training Programme on IWRM as a Tool for Adaptation to Climate Change;
- Assessment of water resources at catchment scale including river flows, groundwater recharge modelling;
- Development of future scenarios of water availability and demand at catchment scale in order to allow the strategic planning of water resources management for future decades, and including all sources of demand (domestic, business, tourism, industry, agricultural);
- Inventories of water abstractions and discharges at catchment scale, and integration with the overall water balance at a catchment scale, including average and drought conditions;
- Development of guidelines on environmental flows for Caribbean rivers, including pilot projects and studies to develop approaches for implementing systematic approaches for environmental flow enforcement; and
- Development of regional databases of water and climate data in order to allow more effective and efficient use by researchers and analysts to support the production of policies and plans for decision makers.

Relevant regional experience: This Programme would build on the IWRM planning experience to date which has been led by GWP-C, UWI, CARPHA and UNEP, as well as the considerable work on regional data management at UWI and CIMH.

Resilient and healthy water resources systems

Programme E.2 – Investing in wastewater management

Programme Objectives: Supporting investment in wastewater management to deliver multiple benefits in public health, pollution reduction and maintaining the health of Caribbean ecosystems in a changing climate

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for planning, medium to high cost for implementing plans (including institutional, policy, regulatory and monitoring systems).							
Lead time	Short term, building on the GEF-CReW project. Medium to long term for infrastructure investment.							

It has been estimated that 85% of wastewater entering the Caribbean Sea remains untreated. This results in social, environmental and economic impacts such as disease from drinking and bathing in polluted waters and the economic impacts of loss of tourism revenues due to polluted coral reefs and beaches used in the tourism industry. It also adds to the cost of water treatment, for example as in the treatment of nitrate contamination in Jamaican aquifers. The coming into force of the Cartagena Convention's Protocol on Land-based Sources of Marine Pollution (LBS), administered by the UNEP Caribbean Regional Coordinating Unit for the Wider Caribbean Region, had a positive impact as it has allowed the development of innovative approaches to funding the expansion of wastewater services under the GEF-CReW programme. Demonstrating the benefits of wastewater treatment will be important to gaining traction on the issue. A cost-benefit analysis of Barbados' proposed West Coast Sewerage Scheme demonstrated that although the public health benefits were relatively minor, those arising from the avoided costs associated with deterioration of the marine environment were on the order of US$260 million and yielded benefit-cost ratios of between 1.3 and 1.6. Action is needed to enhance wastewater management throughout the region. This programme could contain the following activities:

- Further progression of work under the GEF-CReW project, for example:
  - Supporting the development of wastewater targets and measurement frameworks for countries to take a more strategic approach to wastewater management;
  - Development of cost-benefit analyses for wastewater infrastructure in terms of financial, social and environmental costs and benefits;
  - Supporting the development of wastewater infrastructure investment plans for wastewater;
  - Development of pilot projects to investigate low cost technologies for wastewater management;
  - Capacity development for wastewater management professionals at a variety of levels;
  - Further progression towards wastewater re-use for agriculture and other purposes, energy from waste and other efficiency and co-beneficial waste recycling initiatives, through pilot projects, investment planning, policy and regulation; and
  - Further outreach and engagement to raise the profile and importance of wastewater management amongst the general public and government decision makers.
- Investing in tools to help water authorities measure and monitor environmental water quality, in order to ensure the quality of source water used for supply and support the development of more cost effective water treatment solutions.

Relevant regional experience: This work would build on the regional experience of agencies including CDB and UNEP CAR-RCU gained through the GEF-CReW project as well as national level initiatives. In addition, CARPHA has considerable experience in environmental water quality management which is relevant to this programme.

Resilient and healthy water resources systems

Programme E.3 – Integrated land and water management for environmental resilience

Programme Objectives: Supporting integrated and sustainable water and land use practices which reduce pollution, sedimentation and other risks to water resources and water-dependant ecosystems

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change
Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management			
Indicative cost	Low cost for planning and policy development, medium to high cost for regulation and incentivising behavioural change.							
Lead time	Short lead-time for policy development, long timescales for regulatory enforcement and behavioural change.							

Pollution of rivers, aquifers and the marine environment is a key concern for the region as it impacts on key economic sectors such as tourism as well as presenting public health risks. Degradation of catchments due to inappropriate land use practices causes erosion and soil loss, and exacerbates natural hazards such as flooding. Together this can lead to erosion of river banks, siltation of water infrastructure and turbid coastal waters. Point and diffuse sources of pollution such as agricultural chemicals and industrial wastes can damage aquatic ecosystems and put water supplies at risk. The Cartagena Convention's Protocol on Land-based Sources of Marine Pollution (LBS Protocol) has raised the profile of these issues, facilitated by projects such as the GEF IWCAM. However, substantial additional investment is required to maintain momentum in dealing with these issues. Healthy ecosystems, both freshwater and marine, support economic activities (especially tourism); clean water in the environment secures water supplies for human use and minimises public health risks. Action is especially crucial given the projected climate change for the region is likely to further stress aquatic ecosystems and water resources. This programme would contain the following activities:

- The following programmes would support countries implementing the LBS protocol as it relates to point and diffuse sources of pollution in the aquatic environment:
  - Clarification of policy objectives regarding implementation of the LBS protocol at national level;
  - Inventories of discharges of point source pollutants to aquatic ecosystems from all sources (business, domestic, tourism, industry);
  - Inventories of diffuse pollution and sediment loadings to aquatic ecosystems from a range of land use practices;
  - Risk assessment of pollution loadings to aquatic ecosystems (freshwater and marine), including the impact of desalination brine on coastal ecosystems;
  - Assessment of the impacts of desalination on coastal water quality and ecosystem health;
  - Review of EIA and strategic land use planning and enforcement processes, in order to assess gaps and needs across the region, scoping harmonised approaches for implementing the LBS Protocol; and
  - Development of regulatory and incentive structures to achieve policy objectives, including financing plans for monitoring compliance.

Relevant regional experience: This programme builds directly on the experience gained by regional organisations including CARPHA and UNEP CAR-RCU through the IWCAM project and ongoing IWECO projects.

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
Cap-Net	International Research Institute for Climate and Society, UWI-CERMES	GWP-C	Regional	Water Utilities, Water Resources Agencies, Ministries responsible for Water	Regional Training on IWRM as a Tool for Adaptation to Climate Change	Continuation of Regional / National Training Programme on IWRM as a Tool for Adaptation to Climate Change. This training is based on a Cap-Net manual which has been modified to the Caribbean context. Training has already been conducted in OECS countries, Guyana by GWP-C / Cap-Net / Caribbean Water Net. Further funding is sought to roll out the training package across the region.
GWP-C/ CARPHA	IUCN			Water Resources Agencies	Determination and implementation of environmental flows for rivers in Caribbean SIDS	Given climate change and climate variability, river water supplies need to be properly allocated by inter alia calculation, application and enforcement of environmental flows (minimum volume to be left in river for environmental and social needs, factoring in climate change uncertainty). Preliminary work in the Caribbean has relied on methods for calculation of environmental flows based on large temperate rivers. Specific Caribbean methodologies need to be fleshed out. Additionally, there need to be pilot projects demonstrating these methods as well as a programme to promote the use and application of environmental flows to safeguard river water sources.
GWP-C	UWI		Regional	Ministries responsible for Environment	Managing environmental impacts of desalination in Caribbean countries	Given water scarcity, many countries are turning to desalination. Apart from energy costs, pollution aspects are a major concern. Disposal of brine for example is a key issue. This project seeks to investigate impacts, propose and implement solutions to manage brine disposal in the Caribbean.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
UNEP CAR/RCU	WRI	GWP-C		GEF CReW Project and LBS Protocol national focal points	Capacity building for wastewater professionals	Improvement of the capacity of wastewater professionals, economic planners and project developers to design and propose water and wastewater treatment options that better quantify the economic benefits to natural capital from proposed wastewater improvements and also consider added benefits from the use of green / natural infrastructural solutions. This will be done through the development of targeted educational and technical materials as well as mechanisms for online training for a variety of audiences including primary and secondary schools, government agencies, civil society and the general public on economic and resource valuation.
UNEP CAR/RCU	PAHO, CARPHA, GWP-C, FAP			GEF CReW Project and LBS Protocol national focal points	Promotion / replication of wastewater reuse initiatives and building a framework for wastewater reuse	Enhance the use of domestic wastewater including bio-solids as a resource throughout the Caribbean for nutrients, energy and potable water recovery. This will be achieved through the design and implementation of cost effective and culturally appropriate technologies and practices supported by reforms in existing national policy, legislative and regulatory frameworks and outreach and advocacy to change perceptions on wastewater reuse. As part of this there will be replication of wastewater reuse initiatives in progress in Saint Vincent and the Grenadines and Antigua currently being executed by UNEP, FAO, PAHO and GWP-C.
UNEP CAR/RCU	CARPHA			GEF CReW Project and LBS Protocol national focal points	Integrated wastewater solutions for coastal communities	Develop site / location specific treatment approaches and financing options for integrated wastewater solutions coastal communities vulnerable to the impacts of climate change and variability. This would be done through the development of criteria for effective governance of community / local water use / wastewater solutions consistent with IWRM approaches; design and implementation of cost effective water and wastewater solutions, including maximising the use of natural approaches; and the development of sustainable management plans that minimise water demand.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
UNEP CAR/RCU	FAO, CARDI, CARPHA	GWP-C		National LBS and SPAW Focal Points	Implementation of IWRM plans and policies	The IWRM process includes the development of water policies to be followed by plans. Countries are at different stages in the development of these, some already have Master Plans while others have only recently developed Water Policies. This project seeks to assist with the implementation of country IWRM Master Plans.
CARPHA		UNEP, FAO		Water Utilities, Ministries responsible for Water, Water Resources Agencies	Decision support tools for water quality	Concerns exist over the ability of water and wastewater utilities to monitor source water and effluent for emerging pollutants including hormones, endocrine disruptors and micro-plastics. This project would build on existing decision support tools, such as CCORAL, to support water utilities to more effectively understand and manage clean and wastewater quality.
OECS	GWP-C			Water Resources Agencies	Governance arrangements for OECS Water Resources Management	Caribbean countries use a variety of water resources management structures, although in most cases water resources are managed by the utility. Disparities in the development and application of policies and legislation also exist across the region. This project proposes a gap analysis study to identify and replicate the factors which promoted a successful enabling environment for IWRM.
CERMES at UWI	CCCCC, FAO, GWP-C				Agriculture Department, CARDI, Hydrological Unit, Water Utility and Irrigation, Ministry of Natural Resources and Agriculture	Investigation of the water, energy and food security nexus in Belize – use of a mathematically-based approach to model and evaluate the water, energy and food security nexus in Belize.
CERMES at UWI	CIMH, CCCCC				All relevant national agencies	Compilation of water and climate data for the region – development of a water and climate database management system that would enable research to be carried out more efficiently, effectively and extensively.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Description
CERMES at UWI	CIMH, CCCCC, UWI			National water authorities and relevant Ministries	Quantification of flow for various water resources found at the catchment and national level in Caribbean countries - hydrological modelling of groundwater, surface water and coupled resources (surface + groundwater).
CERMES at UWI	GWP-C, CCCCC, CTO			Local water utilities, with national statistical offices	Forecast water demand for Caribbean countries under various climate change scenarios. This would be carried out by analysing consumption patterns and using statistical techniques to forecast the water demand for all sectors e.g. tourism, agriculture, domestic.
CERMES at UWI	CCCCC			Ministries of Agriculture, Fisheries, Water and Coastal Resources.	Assessment of the impact of land-based pollution on marine ecosystems – conducting a quantitative impact assessment of the water quality in surrounding or down-stream marine environments due to runoff from land-based sources of pollution.

Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

Caribbean Water Security and Climate Resilience:
A Regional Framework for Investment

Thematic Programme of Action F
Integrated flood management

Relevant regional partners[1]
CCCCC, CDEMA, CIMH, GWP-C, IFIs, UNEP CAR-RCU, UWI

Relevant national partners[1]
National Emergency Management Organisations, Ministries of Finance, Ministries of Works, Departments of Planning, government agencies responsible for drainage and hydraulic works, irrigation system managers

Summary

Flood risk ranks high amongst the disaster risks facing Caribbean islands, and considerable work is ongoing in the region under the umbrella of DRM. However, approaches to flood risk management can be fragmented and vary from country to country. Opportunities exist at the regional level to strengthen and harmonise flood risk management tools and planning processes. Ensuring that modelling, mapping and decision making tools are fit for purpose, and that relevant stakeholders have the capacity and mandate to use these tools is crucial to managing flood risk especially as climate changes in future. Furthermore, opportunities exist to take a more strategic, long-term view of flood risk management considering future development in a changing climate, as well as focussing on shorter term disaster responses. This thematic area does not attempt to overlap with the body of work already ongoing in the region, but to strengthen the tools and approaches specific to integrated flood management.

The Programmes in this Thematic Programme of Action focus on the effective management of flood risk in terms of both strategic management and the decision support tools which underpin flood risk management.

Programme F.1 – Integrated flood management policy and planning
Programme Objectives: Supporting planning authorities and NEMOs to take a strategic and integrated approach to managing flood risk

Programme F.2 – Flood risk management tools and evidence
Programme Objectives: Providing decision support tools to support planning departments, NEMOs and other stakeholders to assess and manage flood hazards and risks

[1]Partners identified are indicative, not exhaustive, and are intended as a starting point

Integrated flood management

Programme F.1 – Integrated flood management policy and planning

Programme Objectives: Supporting planning authorities and NEMOs to take a strategic and integrated approach to managing flood risk

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	Low cost research and stakeholder engagement work.
Lead time	Short.

In order to successfully manage flood risk a policy dialogue on the institutional roles and responsibilities at regional and national level is required. This should include the role of national agencies in guiding development away from areas of high flood risk, and of the most appropriate measures to manage existing flood risk in terms of insurance, investment in physical infrastructure, and operational flood risk management responses. This Programme may contain the following activities:

- Policy dialogue on current approaches to flood risk management, including sharing best practice from across the region and internationally;
- Development of approaches for integrated land and water management in urban areas, incorporating drainage, flooding and wastewater management considerations, and links to issues which exacerbate flooding such as poor land stewardship and solid waste management around watercourses;
- High level political awareness to raise the profile of integrated flood management, including the development and enforcement of planning regulations for risk reduction and sustainable development;
- Evaluation and appraisal of the costs and benefits of flood risk management options, including the costs of inaction and the financing constraints;
- Assessment of the institutional capacity needs for flood risk management; and
- Assessment of the public perception of flood risk management in terms of risk preferences, opportunities and constraints to behavioural change.

Relevant regional experience: This Programme would integrate within existing work being carried out by CDEMA, and other regional stakeholders working under the CDM strategy and Hyogo Framework for Action. GWP-C is also working on Integrated Urban Water Management (IUWM), which would be relevant to this Programme. UWI is also working on pilot projects in the region which are relevant to public perception and government policy on flood risk management.

Integrated flood management

Programme F.2 – Flood risk management tools and evidence

Programme Objectives: Providing decision support tools to support planning departments, NEMOs and other stakeholders to assess and manage flood hazards and risks

Alignment with SDGs	6.1 Water supply	6.2 Sanitation	6.3 Water quality	6.4 Water efficiency	6.5 IWRM	6.6 Water ecosystems	11.5 Water related disasters	13 Climate change

Alignment with Regional CARICOM Climate Change Framework	Adaptation policy, strategy, capacity and awareness	Implementing adaptation measures	Low carbon development	Vulnerability reduction	Forest management

Indicative cost	Low cost policy work, medium cost associated with survey data, tool development and capacity building.
Lead time	Short, this builds on existing work.

Accurate and cost effective flood risk modelling and mapping are required to support strategic planning and operational flood risk management. Typically, this will include hazard and vulnerability assessment as well as flood forecasting and warning systems. Progress has been made in developing such tools and approaches over the past decade or so but opportunities exist to build on and harmonise these across the region. This Programme would provide an opportunity for the region to increase the robustness and accuracy of flood risk assessment tools and outputs. A regional approach allows for economies of scale in tool development, data collection, modelling expertise and capacity development. This Programme could incorporate the following activities:

- National level stakeholder dialogue on the flood risk information products required for a range of decision making, including strategic land and water use planning, development control and operational flood risk management;
- Development and harmonisation of technical approaches for flood risk modelling, mapping and forecasting, building on regional and international best practice, and developing methods appropriate to national and site specific flood risk modelling. This should include detailed financial plans for the ongoing support and development of operational systems;
- Development of future scenarios of development vulnerability and future hazard risk to investigate the impact of flood risk on future economic development;
- Identification of integrated approaches to managing flood risk, including the use of green infrastructure and 'soft' catchment management interventions, through pilot projects;
- Development and sharing of key datasets to support flood risk modelling and mapping, including basic hydro-meteorology datasets and high resolution topographic survey data, which is critically absent across much of the region;
- Roll out of modelling approaches to generate systematic flood hazard and flood risk datasets across the region, utilising existing asset data such as housing, roads and other critical infrastructure;
- Capacity development at regional and national level to ensure effective utilisation and updating of flood risk modelling and mapping outputs; and
- Financing plan for continued maintenance and sustainability of a flood risk management toolbox, with technical support capabilities at a regional level, housed within an appropriate regional organisation, and with national focal points.

Relevant regional experience: This work builds on and expands the existing work being undertaken by CIMH and will complement national flood risk management activities. UWI is also progressing the development of hydrological and hydraulic flood modelling capabilities through pilot projects in the region. Partnering with CDEMA at the regional level and national stakeholders involved in flood risk management and land use planning will be required to ensure outputs are appropriate and fit for purpose.

This Programme could also build on the tools developed through the CHARIM project, in which UWI has been involved.

Immediate projects identified by regional partners

Regional organisations have identified project concepts within programme areas articulated above which can be implemented in the short term. Relevant regional project concepts for this thematic area and programmes are presented below.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
GWP-C	UNEP-CAR / RCU, GIZ, CARPHA		Regional	Disaster Agencies, Water Resource Agencies	Integrated Flood Management Demonstration Project	While IFM has been gaining traction and increasingly applied across the globe, this has not been reflected in the Caribbean. In particular, there is little Caribbean awareness and acceptance of the environmentally friendly ecosystem and watershed approaches utilised in IFM. Apart from a few ecological studies, e.g. Boodram (2009), there is little acknowledgement of the ecological values of floodplains and the need to maintain natural riverine processes for ecosystem services. There has been some progress in terms of flood hazard mapping and flood warning systems by national and regional disaster agencies which are key elements of IFM, but these tend to be carried out in isolation of the other aspects of IFM and not incorporated into a holistic IFM approach. Most of the existing IFM research and case studies are derived from large river basins often in temperate areas. There are fewer examples of IFM small island watersheds or from tropical climates. In particular, it is not known how IFM environmentally friendly and ecological approaches can be modified or adapted to suit the tropical small island watershed context. The proposed demonstration project seeks to address the issues outlined above.
GWP-C	UNEP (GEF/ CREW)				Integrated Urban Water Management	Development of an IUWM Programme, including Integrated Urban Flood Management, wastewater management etc.

Regional Agency	Possible Regional / International Partner	Confirmed Regional / International Agency Project Partner	Scope / Possible Project Countries	Possible / Proposed National Partners	Project Title	Project Description
UWI Mona, Dept Of Geography and Geology and Environmental Management Unit		UWI Mona, UWI St Augustine,	Initially Jamaica, then replication to other countries.	Water Resources Authority of Jamaica, Met Service Of Jamaica, ODPEM Jamaica.	Flood risk assessment for the Caribbean with impact of climate variability	Flood hazard mapping and modelling for the watersheds in Jamaica (Yallahs and Negril), and Trinidad and Tobago (Caroni). No detailed flood risk map exists based on social and physical vulnerability. The project would be developed for watersheds studied in past projects for Jamaica and Trinidad and extended to other Caribbean islands. The proposed work entails detailed mapping of infrastructures, costs and damage assessments. It also includes data collection on types of houses and other infrastructures, cost per roof, material of the houses. Physical and social vulnerability assessments and risk maps are important to this project.
CIMH	CDEMA			National Disaster Agencies		Flooding and resultant massive economic losses are common throughout the Caribbean. To address this CIMH has established a real time flood forecasting system. The proposed project builds on the existing system to include forecasting for related disaster phenomenon which are also triggered by high rainfall events.
CDEMA	CIMH			National Disaster Agencies	Development of guidelines for early warning systems for floods	While there has been work on early warning flood systems in the region, for maximum efficiency, certain minimum standards must be met and programmes of an ideal system should be identified. This project seeks to establish these regional guidelines for adaptation and modification as needed at the national level.
CDEMA					Developing a model national disaster volunteer programme	After natural disasters, volunteer support is useful for recovery attempts. A model for managing this human resource would allow for maximum efficiency. This regional model can be adapted to the national context as needed.

3.2. Understanding the Regional Framework for Investment

The *Regional Framework for Investment* is intended to support investment in water security and climate resilience, not to introduce additional bureaucracy.

The *Regional Framework for Investment* aims at supporting the work of regional institutions to deliver relevant support to CARICOM member states. It does this by providing outline programmes and projects which regional institutions (singly or jointly), working with national counterparts, may wish to adapt and develop in more detail with the aim of securing funding for implementation.

The benefits of this approach include:

- ***Regional institutions*** *are supported in preparing programmes and projects which respond to their respective mandates, and promote partnerships across institutions;*
- ***National stakeholders*** *benefit from the implementation of programmes and projects through improved water security and climate resilience, and technical support from regional institutions; and*
- ***Development partners*** *are provided with well-prepared, demand-led programmes and projects which they can fund or finance.*

The *Regional Framework for Investment* is not the only channel for planning water security projects and programmes. Regional institutions should use the *Regional Framework for Investment* where it is beneficial, as a starting point for developing a new programme. It is not intended to impose a new layer of bureaucracy, but offers support to regional institutions.

The Thematic Programmes of Action provide a 'menu of options' as a starting point for developing detailed programmes which respond to national needs, they are not set in stone.

The Thematic Programmes of Action contain supporting programmes and activities which have been developed on the basis of research and consultation. These are representative of the broad challenges facing the region, not the nationally or locally specific issues, which can only be defined on a national basis.

The activities are designed to present a 'menu' of options which can be refined and adapted to suit particular national contexts and priorities. They are focussed on actions where regional support will add value, such as investment planning, institutional strengthening, governance frameworks, capacity development, pilot projects, evidence generation and innovation. National stakeholders demonstrated demand for actions which demonstrate benefits 'on-the-ground', therefore regional technical support to national level investment planning is a key entry point for regional institutions in supporting 'on-the-ground' development. While regional organisations do not generally have a mandate to plan and implement national level projects, regional support to assist governments and other national stakeholders plan and organise projects will catalyse the process for securing finance and funding for much needed water security projects in both hard and soft infrastructure, capacity development, institutional strengthening and information services.

Periodic review and amendment of the *Regional Framework for Investment* is anticipated to ensure it maintains relevance to evolving needs, and learns from implementation experience.

It is expected that programmes developed through the *Regional Framework for Investment* will incorporate best practice in programme design including environmental impacts, equity and long-term sustainability.

Financing partners and governments will expect programmes developed through the *Regional Framework for Investment* to follow relevant due diligence during preparation and implementation. The due diligence will depend on the type of programme activities, financing partner requirements and national level requirements. It will include consideration of the enabling environment required for long-term success of the project, such as capacity, political and public support, and regulatory and legal frameworks. The environmental sustainability and inclusion of the necessary impact assessments will be important in many programmes. Gender issues, and the needs of the poorest and most vulnerable members of society should also be considered throughout the process of detailed co-development of programmes and activities.

Ensuring these aspects are included in programme design can be achieved by mainstreaming the use of appropriate guidance on integration of gender, equity and environment into programme development. The identification of appropriate guidance will depend on the nature of the programme, as well as any due diligence requirements of financial partners.

The sustainability of the programmes in terms of their long term benefits and ability to be self-sustained is also paramount, and should include the development of sustainability criteria and plans during the development of programmes.

The process of developing programmes will help build a body of knowledge on best practices which are appropriate. A useful co-benefit of developing programmes will be the capacity development of regional institutions in the successful design of programmes which capture best practices.

3.3. National priorities in the *Regional Framework for Investment*

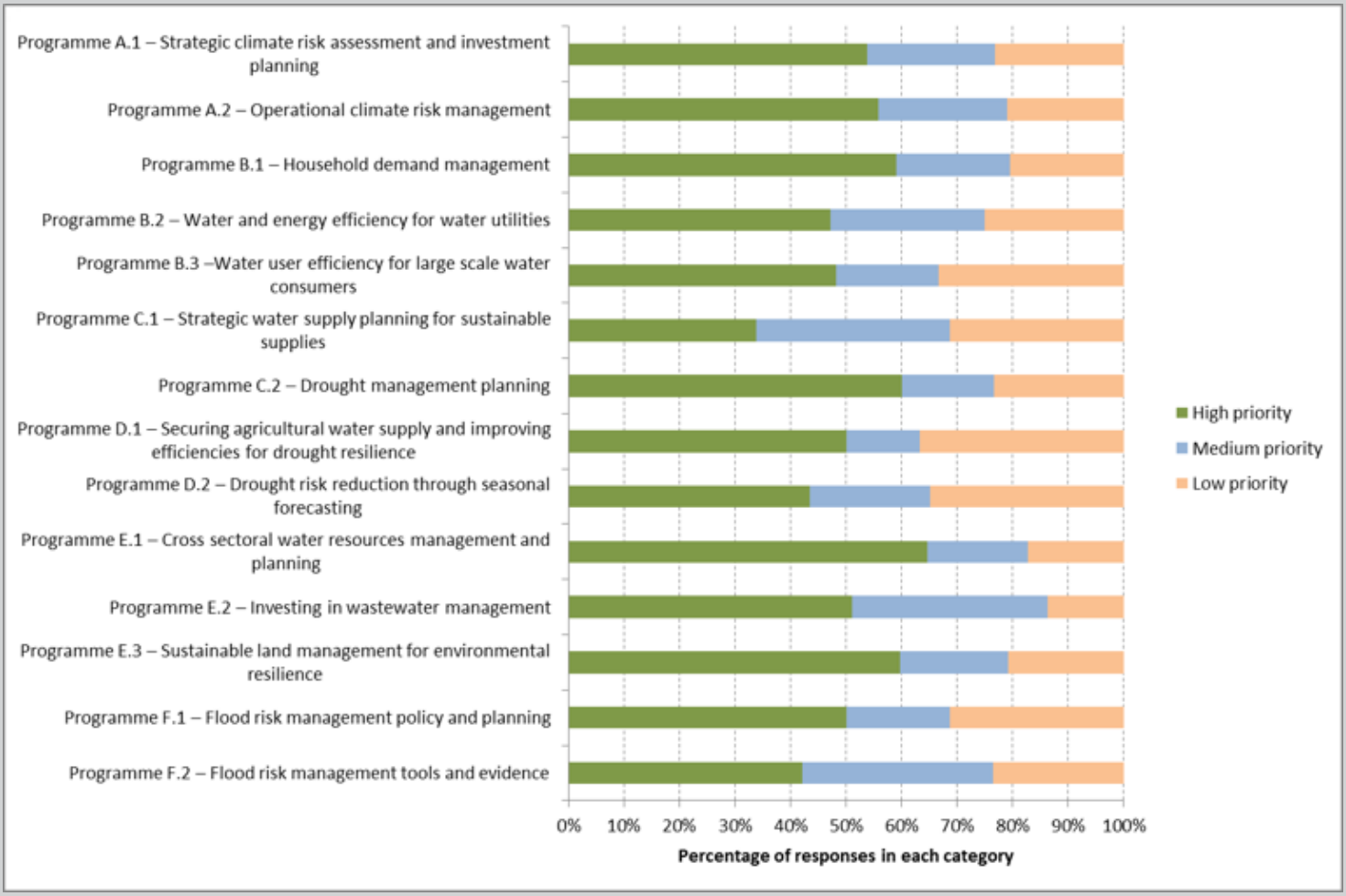
Consultation on the Thematic Programmes of Action has been undertaken with a broad range of national stakeholders, not only government Water Ministries and water utilities but also more widely among disaster management, climate adaptation, environmental, agricultural and other organisations. Feedback from national stakeholders has been used to strengthen programme activities and to substantiate evidence of demand. Regional and national stakeholders will have the opportunity to shape the detailed content of programmes throughout the scoping and planning phases. Box 3.4 summarises the national consultation feedback.

Box 3.4 – National ranking of priority programmes

National stakeholders were asked to score programmes and activities within the *Regional Framework for Investment* menu of options in terms of priority against their organisation's objectives. This was designed to assess the degree to which programmes responded to nationally perceived priorities. Sixty-two responses were received across all six surveys, with thirty-one unique respondents (some respondents provided feedback on more than one Thematic Programme of Action survey). These represented seven countries (Barbados, Belize, Grenada, Jamaica, Montserrat, Saint Lucia, Trinidad and Tobago). Respondents represented a broad range of water-related government bodies including water utilities and government Ministries / departments (water resources, agriculture, disaster management, meteorology, environment, public utilities, planning and development, forestry and health).

Cross-sectoral water resources management and planning emerged as the highest ranked priority among the national recipients. However, it also notable that even the lowest ranked programmes received at least a 60% positive response (i.e. high or medium priority) and this indicates that there is strong demand across the board for actions on water security and climate resilience.

The national level input has demonstrated that the consultation process through the development of the *Regional Framework for Investment* has resulted in programmes which reflect national priorities. It should be noted that this consultation was at a high level, encompassing all Thematic Programmes of Action. Detailed consultation will be undertaken during the development of individual programmes and projects.



4

Implementing the Regional Framework for Investment

The *Regional Framework for Investment* is a process, rather than just a document. The implementation process will prepare and deliver programmes and projects to address national-level needs and priorities. This is set within an institutional environment whereby regional water institutions will support multiple countries on a range of inter-related national climate resilience and water security issues. Implementing the *Regional Framework for Investment* will require three components as shown in Figure 4.1. Implementing the *Regional Framework for Investment* will require collaboration between regional and national stakeholders in order deliver benefits on the ground. This chapter sets out the modalities for coordination, development and implementation of programmes and projects.

The first component is the overall coordination of the process, to be led by CCCCC and GWP-C, this will provide support for programme development as well as management and M&E support to the process. The second component is the development of the programmes which will be led by regional institutions with support from the Coordination Unit. Finally, the implementation of the programmes themselves is the end goal of the *Regional Framework for Investment* and will be led by regional and national institutions as appropriate, depending on the nature of the programme.

Funding will be required for both Components 1 and 2, while more substantial funding / financing will be required for Component 3, the implementation of the resulting programmes. Development partners and financing institutions have a key role to play in this aspect.

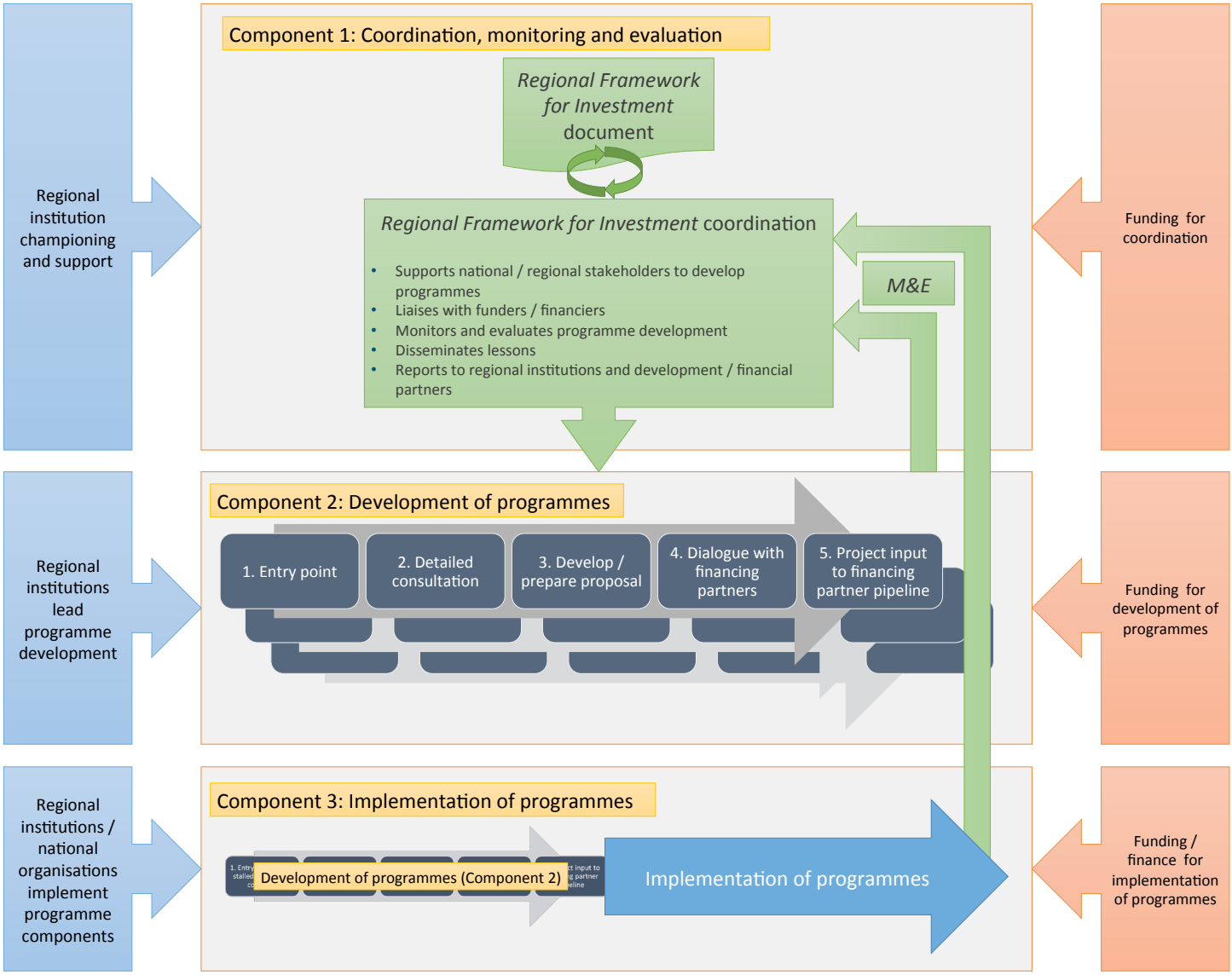


Figure 4.1: Overview of the Regional Framework for Investment implementation process

4.1. Implementing Component 1: Coordination, monitoring and evaluation

Component 1 is the overall coordination of the implementation process including support for programme development, as well as management and M&E support. Coordination of the implementation process will provide a basis for tracking overall progress and to monitor and evaluate collective results.

A Coordination Unit will be required to implement Component 1. The Coordination Unit will seek to enhance cooperation among regional water institutions, encourage the formation of new or enhanced regional partnerships and provide a clearinghouse for new knowledge and approaches that emerge from collaborative regional working. It will promote greater efficiency and effectiveness in the scaling-up of new and innovative solutions and promote coordinated regional approaches for capacity development and knowledge generation among national partners and stakeholders.

Activities for the Coordination Unit will also include:

- *Periodic M&E reporting to regional institutions and development / financial partners;*
- *Periodic public updates using for example websites and social media;*
- *Donor roundtables to present programmes in preparation, gain feedback and encourage support from financial partners;*
- *Meeting with regional institutions and development partners to discuss progress, and to review the implementation processes; and*
- *Periodic review of the Regional Framework for Investment document, based on national and regional consultation, to ensure it reflects current priorities.*

It is anticipated that the Coordination Unit roles will be led by GWP-C and CCCCC, and this is discussed further in Section 4.4 (Roles and Responsibilities).

4.2. Implementing Component 2: Development of programmes

Component 2 is anticipated to consist of a pipeline process to progressively co-develop programmes from an initial concept towards full proposal stage, financing and implementation. Although the entry points may vary, the pipeline process for the co-development of each programme is anticipated to be broadly similar and is shown in Figure 4.2, and further elaborated in Box 4.1.

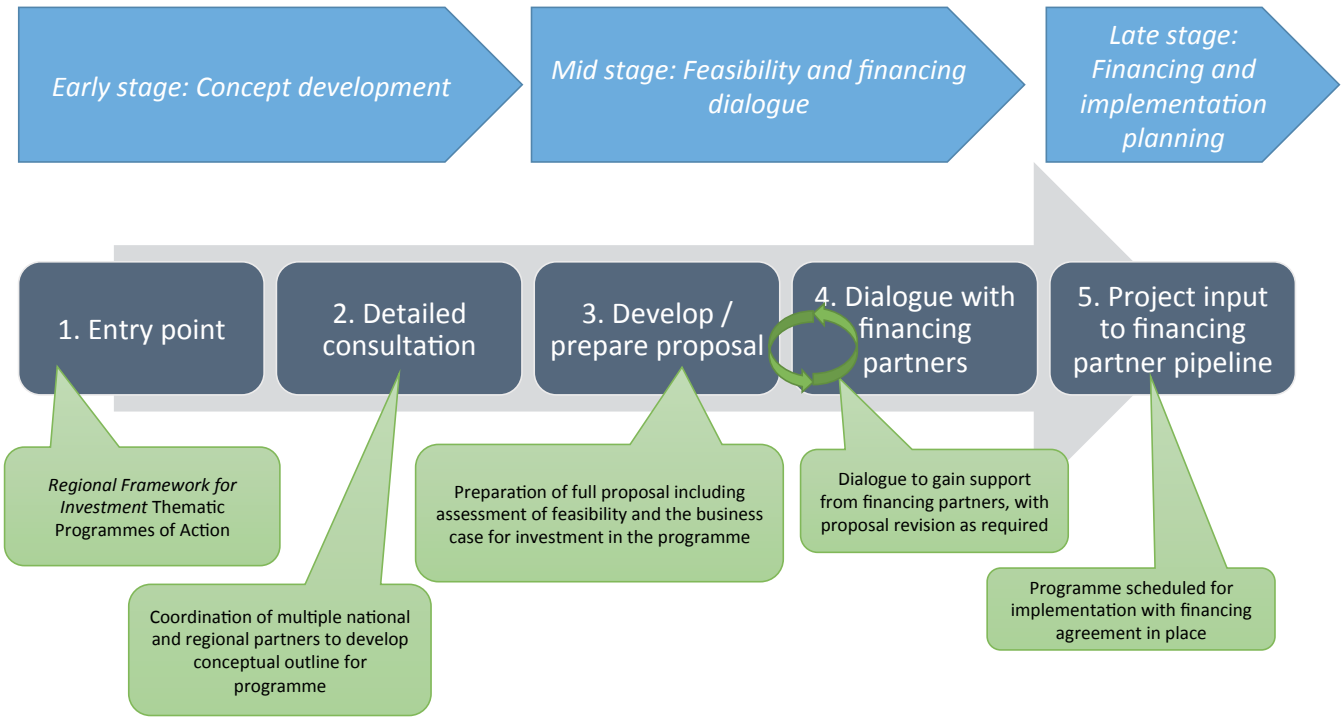


Figure 4.2: Indicative pipeline process for co-developing programmes

Programmes and activities co-developed through the *Regional Framework for Investment* implementation process can support multiple countries and may involve one or more regional institutions, depending on the nature of the demand. Partnerships across national agencies, between countries and between regional institutions should be promoted throughout the process to support shared learning and to address cross-cutting issues. Furthermore, priority should be given to those programmes and activities which clearly demonstrate the added value of a regional approach.

Box 4.1 – Co-development pipeline process

Each stage of the co-development pipeline process is discussed in more detail below:

1. **Entry point.** The pipeline process may be initiated to either generate new programme concepts, or it may be used to progress programmes and projects which are already within plans and strategies, but which have stalled through lack of resources. This latter option is a potentially useful role which would avoid further duplication and the loss of valuable projects which already have national level buy in. Identifying an appropriate entry point will require identification and mapping of stakeholders, as well as reviewing recent and current work relevant to the programme being considered.

2. **Detailed consultation.** This involves bringing all the stakeholders together in order to shape up ideas for an individual programme identified in stage 1. Ideally, this will involve partnerships across regional institutions and national stakeholders to co-develop a concept which addresses cross cutting water issues. A screening may be required during the consultation phase to ensure that the aims of the programme and activities align with one or more Thematic Programmes of Action, and with the overall strategic objective and vision of the *Regional Framework for Investment*.

3. **Proposal preparation.** The consultation will result in a conceptual outline for the programme. This stage will further develop it, working closely with all stakeholders. It is anticipated that the *Regional Framework for Investment* lead organisations will provide the resources and impetus to progress the work, with technical support and championing from the programme stakeholders. The development of the programme will involve further clarifying tasks, outputs and long-term outcomes, as well as implementation modalities (regional and national) and justification of the costs and benefits of the programme. Early engagement with potential financial partners will be required in order to gain interest and allow feedback during the preparation process. Engagement with financial partners could occur during early consultation, or during proposal preparation, depending on when programme proponents believe the concept is sufficiently well agreed on to allow substantive discussions with financial partners to begin.

4. **Dialogue with financing partners.** It is anticipated that the *Regional Framework for Investment* lead organisations will support the liaison with financial partners, based on a specialist knowledge of the funding and financing options appropriate to the scope and scale of the programme. This will lead to the development of a detailed financing plan for the programme. Depending on the nature of the programme, co-financing may be required from national counterparts, and external financing may be a mixture of loans and grants. The proposal may require revision, in detailed discussion with the financing partner to accommodate any further due diligence or other criteria for eligibility.

5. **Project / programme input into financing partner implementation pipeline.** This is a key milestone for the programme as it signals the intent to implement. It will involve signing of the financing / funding agreement and developing a detailed implementation plan and schedule. Implementation modalities will be different for each programme / project as each will differ depending on the regional / national balance of activities and the financing arrangements.

4.3. Implementing Component 3: Programme implementation

The implementation of each programme will vary depending on the balance of regional and national activities. It is anticipated that the implementation of each programme will be led by a management unit within regional and national institutions as appropriate. The detailed modalities for implementation will depend on the geographical scope of the programme, requirements of financial partners and the regional institutions involved.

The Coordination Unit of the *Regional Framework for Investment* will collate M&E documentation (mid-term, completion and ex-post) from the programme and feed this into the overall M&E reporting for programmes developed through the *Regional Framework for Investment*. It is not anticipated that the Coordination Unit will be directly involved in implementation. The lessons from the M&E will be fed back into programmes under development through the *Regional Framework for Investment*.

4.4. Roles and responsibilities

The process to deliver the *Regional Framework for Investment* is a shared responsibility. Oversight for coordination rests with CCCCC and GWP-C, but development and implementation of programmes and projects will rest with regional institutions and national stakeholders, see Figure 4.3. Regional institutions, jointly or individually, have a key role to facilitate and guide the detailed preparation of the programmes in collaboration with national stakeholders. National stakeholders (at national and local levels) will be the direct beneficiaries of the regional programmes and will therefore be actively involved in the co-development and management of national activities during implementation.

Development partners, including donors and development banks, can play a key role by reflecting identified priorities in their development cooperation strategies, by providing technical assistance, and by providing financing and funding for implementation through grants, loans and co-financing as appropriate. Regional coordination and harmonisation among development partners will also be important to maximise the benefits of a regional programmatic approach.

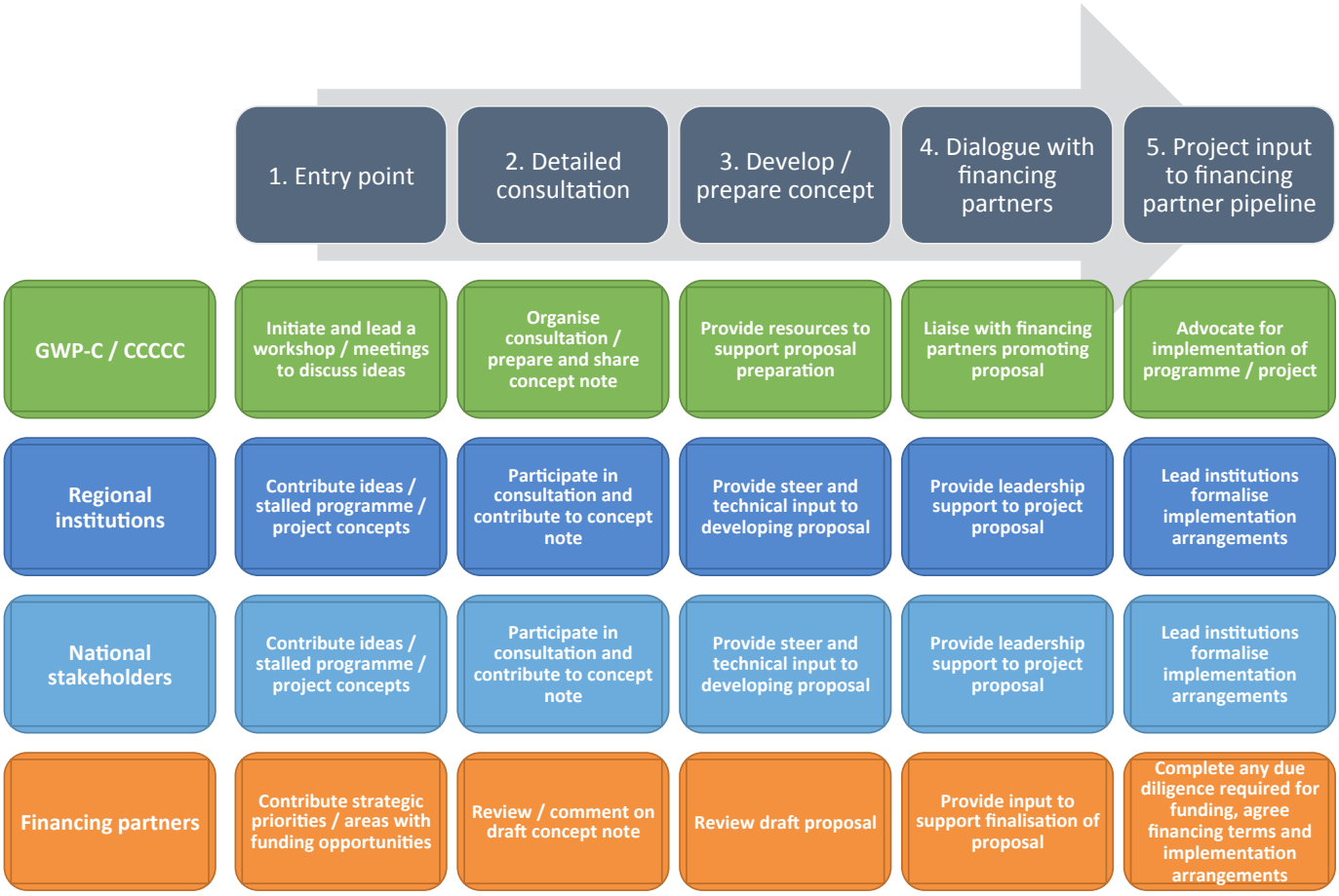


Figure 4.3: Roles of key stakeholders within the programme co-development pipeline process

Oversight / CCCCC

It is appropriate that CCCCC has primary responsibility for overseeing implementation of the *Regional Framework for Investment*, in keeping with its mandate to act as lead coordinator for the CARICOM Regional Framework for Achieving Development Resilient to Climate Change and its associated Implementation Plan.

Coordination / GWP-C

GWP-C will act as an (informal) interim coordinator prior to the formation of a more formal Coordination Unit. The role is primarily a secretariat-type function to support CCCCC and the other regional partners during implementation.

Regional water institutions

The *Regional Framework for Investment* implementation process recognises the pivotal role that regional water institutions will play in the execution of the Framework.

In this context regional water institutions are defined as the CARICOM Consortium of Water Institutions members and associates. However, the emphasis on a partnership approach should not preclude the involvement of other regional organisations working on water issues, as appropriate.

The primary role of the regional water institutions is the co-development of programmes and projects which support the Thematic Programmes, including technical input in authoring proposals. Once programmes and projects are under implementation the role will involve technical and capacity development support to national stakeholders, depending on the programme specific requirements. It is anticipated that the *Regional Framework for Investment* will provide an opportunity for regional institutions to access additional resources for developing and implementing water security and climate resilience programmes and projects.

A key benefit of the *Regional Framework for Investment* process will be to integrate regional and national interests by matching enabling and cross cutting actions (including capacity development and research) which are often supported by regional organisations, with investment planning and project development which are typically the role of national organisations.

National stakeholders

National stakeholders will include line Ministries and departments, water utilities, NGOs, community groups and the private sector, amongst others. The involvement of specific stakeholder groups will vary depending on the focus of the individual programmes. It is paramount however that Ministries of Finance, Economic Planning and Development, or similar are included and engaged in the processes as this is where decision making on priority investments will ultimately reside.

Non-Governmental Organisations (NGOs) and Community-Based Organisations (CBOs) throughout the region have developed specialised skills in areas such as advocacy; community and social development; disaster response and management; protected areas and environmental management; and public awareness and education. The preparation of detailed programmes of action should utilise and benefit from such skills and experience and engage with these organisations to develop appropriate mechanisms for project delivery, including local funding mechanisms where appropriate.

Private sector involvement in programmes will be important as it represents both a user of water and ecosystems services as well as a source of waste and pollution which can impact the water environment. Roles will vary on a case-by-case basis but may include funded or unfunded partnership contributions to programmes, and possibly the contribution towards the funding of programmes where there is a direct benefit to the private sector.

Development partners / IFIs and donors

IFIs and donors supporting the Caribbean in its efforts to tackle climate change can play a pivotal role in enhancing climate resilience and water security by supporting the implementation and delivery of the *Regional Framework for Investment* and its priority programmes.

Within these broad roles, specific responsibilities will be required to move implementation forward, set out in Table 4.1.

Table 4.1: Typical roles and responsibilities

Organisations and Partners	Typical responsibilities
Oversight / CCCCC	- Oversight and coordination on behalf of CARICOM and it Member States; - Facilitate annual "roundtables" of key stakeholders; - Promote international partnerships for water security and climate resilience; - Share information with CARICOM and its Member States; and - Advise on climate funds, in particular the GCF.
Coordination / GWP-C	- Raise awareness and disseminate the *Regional Framework for Investment* among regional and national partners and stakeholders, including regional IFIs and donors; - Facilitate multi-stakeholder consultation process during the co-development of programmes and activities; - Support the identification of financial resources to support implementation of programmes and activities; - Monitor, evaluate and review of the implementation processes (annual), including reporting on lessons learned (tri-annual); and - Knowledge sharing and management (across regional thematic programmes).
Regional water institutions	- Identify champions to lead the co-development process; - Lead the preparation and co-development of detailed programmes of action in consultation with national stakeholders, and with the support of GWP-C and CCCCC; - Consult with national stakeholders on demand for and co-development of programme activities which align with the Thematic Programmes of Action; - Consult with other regional stakeholders such as other CARICOM institutions, business and trade associations, regional / international NGOs, research institutes, etc.; - Identify financial resources from bi-lateral and multi-lateral sources to implement programmes and activities; - Lead the implementation and coordination of regional programmes and projects; and - Strengthen national capacities through training, programme and project support, technical assistance, and resources.
National stakeholders	- Support the preparation and co-development of detailed programmes of action in collaboration with regional water institutions and others; - Assist in the identification of new and / or additional financial resources from bi-lateral and multi-lateral sources to support implementation of national level actions; - Encourage participation and collaborative working among different government entities in the delivery of climate resilience and water security solutions; - Promote sustained partnerships with non-state actors including community-based and non-governmental organisations, and the private sector; - Incorporate scaled-up implementation actions in national development planning and budgeting processes; and - Report on progress and outcomes of national actions, thereby contributing to progress reporting under a regional monitoring and evaluation framework.
Development partners / IFIs and donors	- Incorporate priorities from the *Regional Framework for Investment* into regional and national development cooperation strategies and funding instruments; - Provide technical assistance and support during programme preparation to ensure programmes meet funding requirements; - Advise on access to funding and finance including upcoming opportunities, application procedures and eligibility criteria; and - Funding / financing commitments for programmes and activities, or co-financing as appropriate.

5

Financing the Regional Framework for Investment

Resources need to be secured if the *Regional Framework for Investment* process is to progress and to deliver on-the-ground benefits. Within the immediate implementation process, resources will be required for three key components: (i) Coordination, monitoring and reporting, (ii) Programme preparation and (iii) Programme implementation (see Figure 5.1). This chapter discusses the success factors in identifying and attracting funding and finance to implement the *Regional Framework for Investment*.

5.1. Financing Component 1: Coordination, monitoring and reporting

It is anticipated that GWP-C and CCCCC will provide initial support to these processes to ensure early momentum of the *Regional Framework for Investment* is not lost. These will be in-kind contributions before a more formal Coordination Unit can be instigated and resourced to fulfil the necessary coordination of roles and responsibilities. A lean Coordination Unit is anticipated that requires modest resources, compared to larger resources needed for Components 2 and 3. In addition to coordination, monitoring and reporting, resources will be required for:

- *Further dissemination and awareness;*
- *Knowledge management and sharing among thematic programmes;*
- *Periodic liaison with key regional stakeholders; and*
- *Support for identification of funding opportunities for preparation and implementation of Thematic Programmes of Action.*

In order to ensure the sustainability of the coordination activities, funding should ideally be secured on a long term basis. One option to achieve this is integrating the coordination activities into the mandates and core long term programmes of the Coordination Unit organisations. This would allow programmatic allocation and ring-fencing of resources over multiple years.

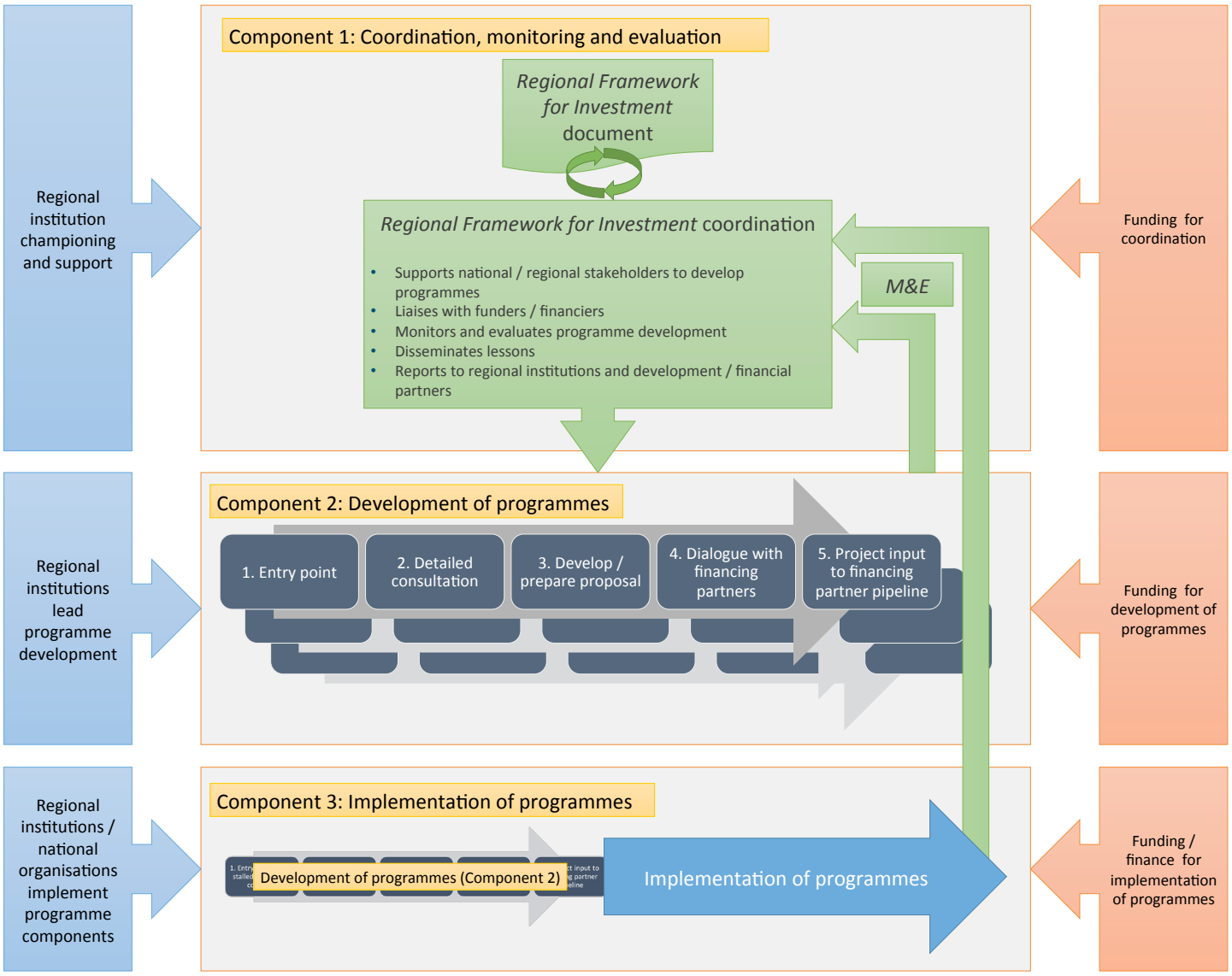


Figure 5.1: Overview of the *Regional Framework for Investment* funding considerations

5.2. Financing Component 2: Programme preparation

Programme preparation is a vital first phase that ultimately transforms an idea into a feasible and bankable venture ready for external financing. It aims to ensure the programme is viable, risks are mitigated, and that it is ready to receive funds for implementation. Without thorough preparation, it is unlikely that a programme will attract sufficient and appropriate financing to allow it to proceed. Conversely, a thorough and well-conducted preparation phase can open access to a wide pool of potential financing and significantly improve a programme's chances of success. Early preparation activities can be costly (i.e. up to 10% of a programme's total cost in some cases) and funding and financing to cover activities undertaken in this early phase is often essential to achieve a sound foundation on which to proceed.

Even at the early stages of development, it is critically important to begin conceptualising how programme implementation and operations may be funded, as this in turn will impact what form the programme should take. It is essential to therefore understand what funding is available, and what funders and financiers are looking for in terms of the benefits or returns on their investments.

Programme preparation will require resources in terms of allocation of staff resources in regional and national organisations as well as specialist technical assistance in order to prepare full proposals. Implementation of programmes will also require a larger injection of finance as a combination of grant funding and loans to carry out programme activities. Resourcing for these phases of activity may be combined or sought separately.

Seeking resources for both preparation and implementation is likely to be appropriate where a financing partner has been identified early in the concept development phase and has financing available to support both preparation and implementation. This will ensure the preparation phase is geared toward a *funders'* specific mechanisms for accessing finance, and thereby streamlining the overall financing proposal process.

If seeking resources for programme preparation separately from resources for implementation then, modest resources, for example funds required for technical assistance, are likely to be required to support the preparation process. This would lead to a more generic financing proposal for marketing with potential or yet to be agreed on development cooperation partners.

Box 5.1 – Suggested principles when seeking resources and funding

Implementation of the *Regional Framework for Investment* will enhance regional and national capacity to deliver climate resilience and water security across the Caribbean. Many of the themes included in the *Regional Framework for Investment* are already a high priority for donor and IFI development cooperation in the region, and in recent years even more so with the increase in international support for climate adaptation and mitigation. Enhancing climate resilience and water security therefore present a significant opportunity for the region to access resources to underpin national and regional economic growth and development aspirations.

In seeking resources, the following principles will be beneficial:

- **Flexibility** – identifying a range opportunities for accessing funding where funding agency and programme objectives are aligned;
- **Pragmatism** – should build on existing relationships between regional and / or national institutions and their development partners where these have proved successful;
- **Efficiency** – should build on existing expertise in the region, for example the Caribbean Development Bank (CDB) could play a key role in supporting regional institutions to navigate the complex landscape of funding and financing opportunities;
- **Innovation** – should examine innovative financing structures, subsidies and incentives (to engage the private sector for example) in water security and climate resilience in parallel with more traditional public sector investment and technical assistance; and
- **New opportunities** – should carefully examine the opportunities and scope for accessing climate finance (for example the Green Climate Fund) as a key source of finance.

5.3. Financing Component 3: Programme implementation

Financing for implementation of programmes typically uses grant funding, repayable finance or a mixture of both. Repayable finance is typically appropriate for infrastructure projects while grants fund technical assistance. Grants and concessional loans may also be used to leverage co-financing from national governments. Due to the wide and ever changing range of financing options available a Financing Options Review is recommended once agreement has been reached on a programme concept and description. This allows a systematic evaluation of appropriate financing sources.

Using the programme objectives and characteristics, as well as drawing on extensive conversations with national and regional partners and other relevant stakeholders, an analysis of potential programme preparation finance and implementation financing sources should be prepared. Options can be rated on 'likely suitable,' 'possible hurdles / constraints' and 'unlikely' so that programme partners are able to assess a funding source's appropriateness. Box 5.3 provides important considerations in the Financing Options Review process.

Box 5.3 – Financing Options Review process

Important considerations in a Financing Options Review would need to include:

- Geographic coverage - Almost every financial source targets certain countries and / or sub-regions, whilst excluding others. Programme location has an obvious impact on eligibility. In addition, certain sources will only engage with projects in countries that form a part of a certain definition or grouping, for example The Least Developed Countries group (as classified by the United Nations), and nations that are signatories to the Kyoto Protocol (for climate change).

- Timing - Financing and funding are frequently tied to the operational timeframes and disbursement targets of the financing institutions. This can mean different sources of financing are available at different times and with different lead times between programming and disbursement. Engaging with financing organisations early on is essential to understand the windows of opportunity which exist for different financing streams.

- Geographic reach - Many sources of financing will only consider programmes that have regional or national impact, or may disqualify initiatives at a sub-national level. However, whilst some programmes may only have a sub-national footprint, its upstream or downstream impact may be national (or indeed regional).

- Sub-sector focus - The sub-sector(s) a programme falls under will have an impact on the financing it can potentially access. Many funds or financiers target specific sectors, which precludes projects that fall outside of these sectors even if overarching objectives (for example, climate change resilience of rural communities) are shared. Common developmental sectors are likely to include: water (supply and sanitation, resources development and protection, rehabilitation, waste management), agriculture and food security, and biodiversity conservation. When conceptualising a project, it is important to consider its broader impact, and the implications this may have on the pool of potential financing sources. In this regard, it is also important when developing a programme concept note and full proposal, and ultimately promoting the programme, that both the direct and indirect outputs are emphasised to broaden the financing pool and speak to the sectors being targeted by regional development cooperation funders and financiers.

- Intervention Type - Each co-developed programme will be an intervention identified and designed to achieve certain objectives. Intervention characteristics, which can transcend project sectors, can also determine eligibility for funding and financing. Such characteristics include:

  - Hard or soft intervention – a hard intervention refers to that involving built infrastructure, whilst a soft intervention typically involves green infrastructure (natural interventions) development or an institutional focus. Many financial sources, such as infrastructure funds, focus only on built infrastructure initiatives, ruling out those projects with a soft nature.

  - Climate adaptation or mitigation – some climate finance sources cover only adaptation or mitigation projects, not both. In the Caribbean, there is a significantly greater adaptation need than mitigation, and in some cases climate finance will not cover the full cost but rather work on an incremental or additionality basis, i.e. cover the costs of adaptation that would not be required in the absence of climate change. This means that other financing may still need to be sourced.

By design, the Thematic Programmes of Action prioritised in the *Regional Framework for Investment* implicitly contribute to climate change resilience and reducing vulnerability to climate change. Climate finance is therefore a growing source of potential funding and financing that typically seeks to cover the costs of transitioning to a low-carbon and climate change resilient economy across sectors and across interventions.

Source: Adapted from GWP's Africa Water, Climate and Development Programme guidance documents

5.4. Opportunities for funding and financing

This section provides further information on the types of finance which may be appropriate for regional water security and climate resilience programmes including bi-lateral and multi-lateral sources, climate change finance and emerging opportunities.

Climate resilience and water security present a significant opportunity for the region to access resources to underpin and sustain regional and national economic growth and development. A complex mix of financing sources are currently used for water security and climate resilient development, see Box 5.2.

Official Development Assistance (ODA) from bilateral and multilateral sources often provides technical assistance while repayable finance from development banks supports infrastructure development projects, and can be supported by national co-financing. Specialist climate funds are likely to be applicable for a range of water security and climate resilience interventions and can be used on their own or as a catalyst to leverage other funding.

Box 5.2 - Typical sources of financing

The most appropriate financing modalities and funding opportunities will depend on the scope and scale of the programme investments. The funding and financing landscape is extremely broad, consisting of numerous disparate sources with different features, objectives, and conditionality. Single source finance may not cover all costs and co-financing from multiple sources may be an attractive alternative. For example, drawing on multi-lateral regional funds for overarching regional activities and bi-lateral national financing options for national activities may be one option.

- **Local and National Government Budgets**
  - Government fiscal support, typically in the form of grants or transfers
  - Government as a co-financer often increases project's attractiveness to external sources
- **National Agencies or Funds (with a relevant mandate)**
  - Typically grant funding, or providing technical assistance
- **Project Preparation Facilities**
  - Funds and facilities set up and supported by multilateral or bilateral development banks and funds, specifically for the purpose of supporting project preparation, and expediting and strengthening project development
  - Typically provide grant funding and technical assistance, although a small number also provide concessional loans or risk capital
- **Climate Funds**
  - Typically grant funding
  - Often on "incremental" principle
- **Bilateral / Multilateral Development Banks**
  - Typically grants and concessional loans
- **Bilateral / Multilateral Development Agencies and Donor / Trust Funds**
  - Typically grant funding, although a small number also offers technical assistance
- **Private sector**
  - Where commercial benefits may be evident

Bi-lateral and multi-lateral development assistance

Water and sanitation, environmental policy and administration, disaster preparedness and flood prevention have been key priorities for bi-lateral and multi-lateral development partners in recent years. CARICOM countries (excluding Haiti) received USD $370 million over the period 2010-2013, with a further USD $310 million going to Haiti, which faces many additional challenges in comparison with the rest of the region. Figure 5.2 shows a breakdown of ODA and other official flows (OOF) by sector and sub-sector. Key contributors include multilateral organisations such as the IDB, CDB, World Bank and EU while key bilateral funders include UK, Canada, Japan, Netherlands, USA and Australia.

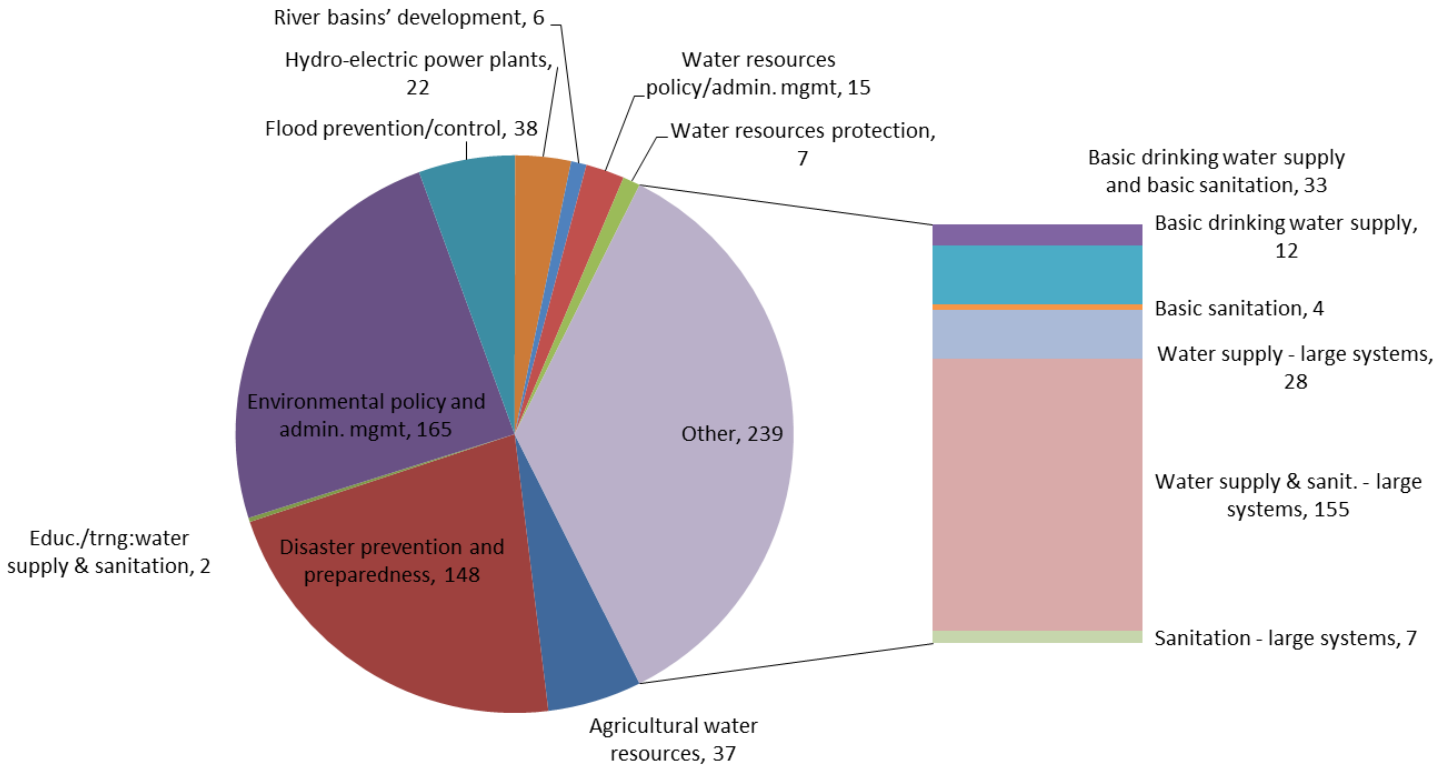


Figure 5.2: ODA and OOF financing relevant to water security and climate resilience (2010-2013 inclusive) to CARICOM member states excluding Haiti (USD $ million)
Source: OECD Creditor Reporting System (CRS) database

Many of these sectors and sub-sectors remain priorities in current bi-lateral and multi-lateral development cooperation strategies and plans (see for example see Box 5.4) and provide potential opportunities to support programmes and activities emerging from the *Regional Framework for Investment*.

Box 5.4 – Example opportunity: Regional development cooperation programmes

The Caribbean Regional Indicative Programme (CRIP) is an agreement between the CARIFORUM and the EU on areas of support. This is agreed in 7-year cycles for the disbursement of European Development Fund (EDF) resources.

The 11th EDF (2014-2020) CRIP has recently been under preparation and is valued at around €360 million. It includes a focal area for Environment, Climate Change and Energy encapsulating resilience, natural resources and renewable energy. It also includes outcomes related to supporting IWRM across the region.

It is anticipated that overall €61.5 million will go to the Environment, Climate Change and Energy focal sector. Proposals for use of this budget have been under discussion by EU / CARICOM with €20 million anticipated to be programmed in 2016.

The programming of resources under CRIP could potentially provide entry points and opportunities for resourcing selected *Regional Framework for Investment* programmes and activities. Programming activities occur only every 4-6 years and the need to act fast and at the right time are important if opportunities are not to be missed. Regional entry points through the CRIP are even more critical to EU funding over the coming years as the country-specific National Indicative Programmes (NIPs) have already been approved and unless already identified opportunities to introduce water into the country NIPs is no longer possible.

In addition to the 11th EDF, on-going implementation of the 10th EDF and its associated focal areas already includes a regional Natural Disaster Management (NDM) programme that has a focus on water and transport infrastructure. The inception phase for the NDM has been initiated (CDB and CDEMA are implementing agencies) and again it may be an opportune time in relation to this programme to feed in ideas from *Regional Framework for Investment*.

Source: For more information see https://ec.europa.eu/europeaid/caribbean-regional-indicative-programme-2014-2020-11th-edf_en

The Caribbean Development Bank (CDB) is a key provider of financial resources and technical assistance across the region. The CDB's Climate Resilience Strategy (CRS) specifically seeks to develop and operationalise a robust environmental sustainability risk framework that explicitly includes climate resilience. The strategy highlights CDB's support for climate resilience and water security through support to member countries and regional institutions alike, and to the mobilisation of financing using the global climate finance architecture. In doing so, the bank is seeking to look at climate change as an opportunity, rather just an existential threat, to attract much need investment into the region (see Box 5.5).

Box 5.5 – Taking advantage of the emergence of climate funding

The newly re-elected president of the Caribbean Development Bank (CDB), Dr Warren Smith, has emphasised the need for regional approaches to climate solutions, across both mitigation and adaptation spheres of influence. The CDB has pressed countries to build with climate change in mind for a long time, and has reiterated the need for more resilient infrastructure.

In climate change, there is an 'opportunity' rather just an 'existential threat'. The global response to bigger storms, rising seas, acidifying oceans and runaway emissions can offer new opportunities to unite the Caribbean around regional plans of action — and to attract funding to the cause. The overall philosophy is for CDB to be more aggressive in building their pipeline and in getting the money out the door.

The CDB aims to find a role as an intermediary to take advantage of the emergence of climate funding such as the Green Climate Fund and the Adaptation Fund. The strategy is to become an accredited entity to channel funds to help countries build more resilient infrastructure, reduce disaster risks, and prepare for a more turbulent climate future.

As an example, the bank has opened a USD $65 million line of credit with the European Investment Bank (EIB) to finance climate change projects. There is a technical assistance component to this credit line that has proved helpful, particularly as climate change projects require much more work and justification than more traditional projects. The CDB has used the credit line to redevelop a water supply system in St. Lucia amongst other things. The EIB has since indicated that, once the bank has disbursed a significant portion of its current credit line, a larger fund will likely follow.

Other new opportunities are also being explored, for example, to partner with emerging international financial institutions like the so-called BRICS bank, convened by the emerging economies of Brazil, Russia, India, China and South Africa.

Source: Adapted from https://www.devex.com/news/meet-warren-smith-and-his-big-caribbean-vision-87576

Climate change finance

Climate finance is a growing source of potential funding as it seeks to increase resilience to climate variability and change and to cover the costs of transitioning to low-carbon and climate change resilient economies. The region has already benefitted from a number of specialist climate funding streams including the Global Climate Change Alliance, the Adaptation Fund and the Pilot Program for Climate Resilience. In addition, the Green Climate Fund (GCF) is now being seen as a key source of potential funding for the region.

Within the context of sustainable development, the GCF promotes the paradigm shift towards low-emission and climate-resilient development pathways. It supports adaptation-related activities that aim to increase resilience in relation to livelihoods; health and well-being; food and water security; infrastructure and the built environment; and ecosystems and their services. These objectives are synonymous with those of the *Regional Framework for Investment*. Furthermore, the recent accreditation of CCCCC (see Box 5.6) as a channel through which the GCF can deploy resources to the Caribbean offers an excellent opportunity to utilise a Caribbean regional entity to progress the implementation programmes and projects.

Box 5.6 –Regional Implementing Entities for the Green Climate Fund

The Caribbean Community Climate Change Centre (CCCCC) has been accredited as a Regional Implementing Entity (RIE) by the board of the Green Climate Fund (GCF), and is the first such accreditation for the Caribbean region. This means the CCCCC will act as a channel through which the Fund will deploy resources to the Caribbean and the centre's accreditation offers Caribbean countries an excellent opportunity to utilise a Caribbean regional entity to implement programmes and projects. Financial limits set by the accreditation body for the CCCCC have been set at US$10-50 million per programme or project.

Accreditation to GCF is open to sub-national, national, regional and international, public, private and non-governmental institutions. Applicants are assessed on their abilities to meet fiduciary, environmental, social, and gender requirements set out by the Fund and are eligible to apply through the Fund's Online Accreditation System (OAS). Other regional bodies such as the CDB are also therefore eligible to apply.

The GCF was adopted as a financial mechanism of the UN Framework Convention on Climate Change (UNFCCC) at the end of 2011. It aims to make an ambitious contribution to attaining the mitigation and adaptation goals of the international community and is expected to become the main multilateral financing mechanism to support climate action in developing countries. The six GCF investment criteria are as follows:

- Climate impact potential (Potential to achieve the GCF's objectives and results);
- Paradigm shift potential (Potential to catalyse impact beyond a one-off project or programme investment);
- Sustainable development potential (Potential to provide wider development co-benefits);
- Needs of recipient (Vulnerability to climate change and financing needs of the recipients);
- Country ownership (Beneficiary country ownership of project or programme and capacity to implement the proposed activities); and
- Effectiveness and efficiency (Economic and financial soundness and effectiveness of the proposed activities).

Source: See the GCF website for further information www.greenclimate.fund/

Other opportunities

The absence of clear funding mechanisms at any one point in time should not deter from early formation of programme and project partnerships and concepts. A key principle the *Regional Framework for Investment* process is to be well-prepared and ready to seize on ad hoc opportunities as and when they arise. For example, the UK-Caribbean Infrastructure Partnership Fund announced in September 2015 offers £300 million in grant funding for rapid programming and disbursement (see Box 5.7).

Box 5.7 – Example opportunities: UK-Caribbean Infrastructure Partnership Fund

The visit by the UK Prime Minister to the Caribbean in September 2015 underlined that the links between the UK and the Caribbean are strong and enduring. Alongside other support, £300 million in grant funding was announced for the establishment of a UK-Caribbean Infrastructure Partnership Fund, which would make UK the single largest bilateral donor in the region.

The aim of the Fund is 'to provide critical infrastructure in the Caribbean to set the foundations for growth and prosperity, reducing poverty and increasing resilience to climate change'. The CDB estimates there is a £3.5 billion infrastructure gap in the Caribbean which is hampering growth. Aging, inefficient, inadequate or missing infrastructure harms the ability of Caribbean countries to grow, places them at greater risk when natural disasters occur and prolongs the period it takes for an economy to recover (for example Hurricane Ivan created damage equivalent to 200% of Grenada's annual GDP).

Examples of the types of projects expected to be funded include roads, bridges, renewable energy, ports, water and sea defences. Criteria against which projects will be reviewed are likely to be climate change proofing and disaster resilience alongside other broad development criteria, such as job creation; value for money; inclusion of and benefits for youth, women and girls, and disabled people.

The timeframe for the fund is ~4½ years from concept to finish and the UK Department for International Development (DFID) will be looking for proposals for funding as of January 2016, with concepts need to be ready for implementation within an approximate 12 month window. The fund therefore suits countries and pipeline projects that have already been well-prepared.

Source: See the CDB website for further information at http://www.caribank.org/programmes/uk-caribbean-infrastructure-fund

6

Monitoring and evaluation of the Regional Framework for Investment

The monitoring and evaluation (M&E) framework for implementation should be simple, measureable and relevant to the overall strategic objective of the *Regional Framework for Investment*.

Monitoring indicators will be required from the start of the pipeline process right through to implementation completion and beyond to the wider impacts. A twin track approach is proposed to address both the *Regional Framework for Investment* implementation (Section 6.1) and the longer term water security and climate resilience benefits it delivers (Section 6.2). A greater focus is placed in this document on the M&E for the *Regional Framework for Investment* implementation process and development of programmes because of its immediacy compared with the outcomes of programmes in the longer term. However, capturing the output and outcome indicators of the programmes themselves will be important to demonstrate long term impacts, see Figure 6.1.

Periodic review and amendment of the *Regional Framework for Investment* M&E process is anticipated to ensure it maintains relevance to evolving needs, and learns from implementation experience.

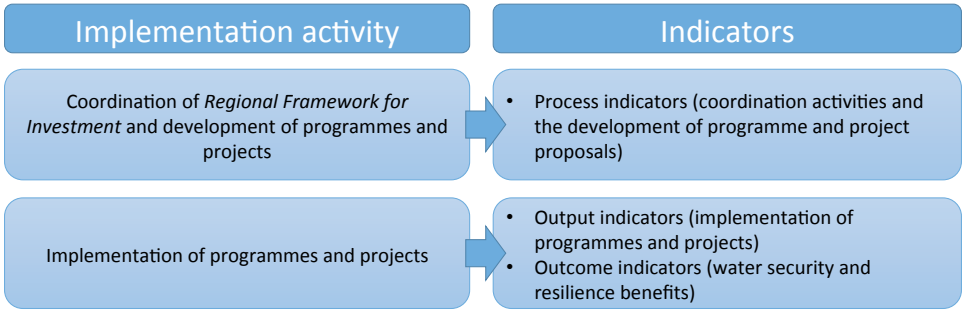


Figure 6.1: Indicator clusters for the *Regional Framework for Investment*

6.1. Monitoring Components 1 and 2; coordination and developing programmes

The objective of the *Regional Framework for Investment* is to contribute to the overall vision for a water secure and climate resilient Caribbean. A basic key indicator to measure contributions from the *Regional Framework for Investment* towards the overall vision is the number and value of programmes and projects being developed or supported through the pipeline process. Indicators for each stage of the pipeline process can then provide a means to continually track progress at each stage of the pipeline process.

An illustrative set of M&E indicators for the co-development pipeline process is shown in Figure 6.2. Disbursement of funds is included at the implementation stage as this is important to demonstrate that the programmes are under implementation, have not stalled at an earlier stage, and are delivering intended benefits 'on-the-ground'. Once disbursement has begun, the M&E of implementation outputs and outcomes (Component 3) can begin.

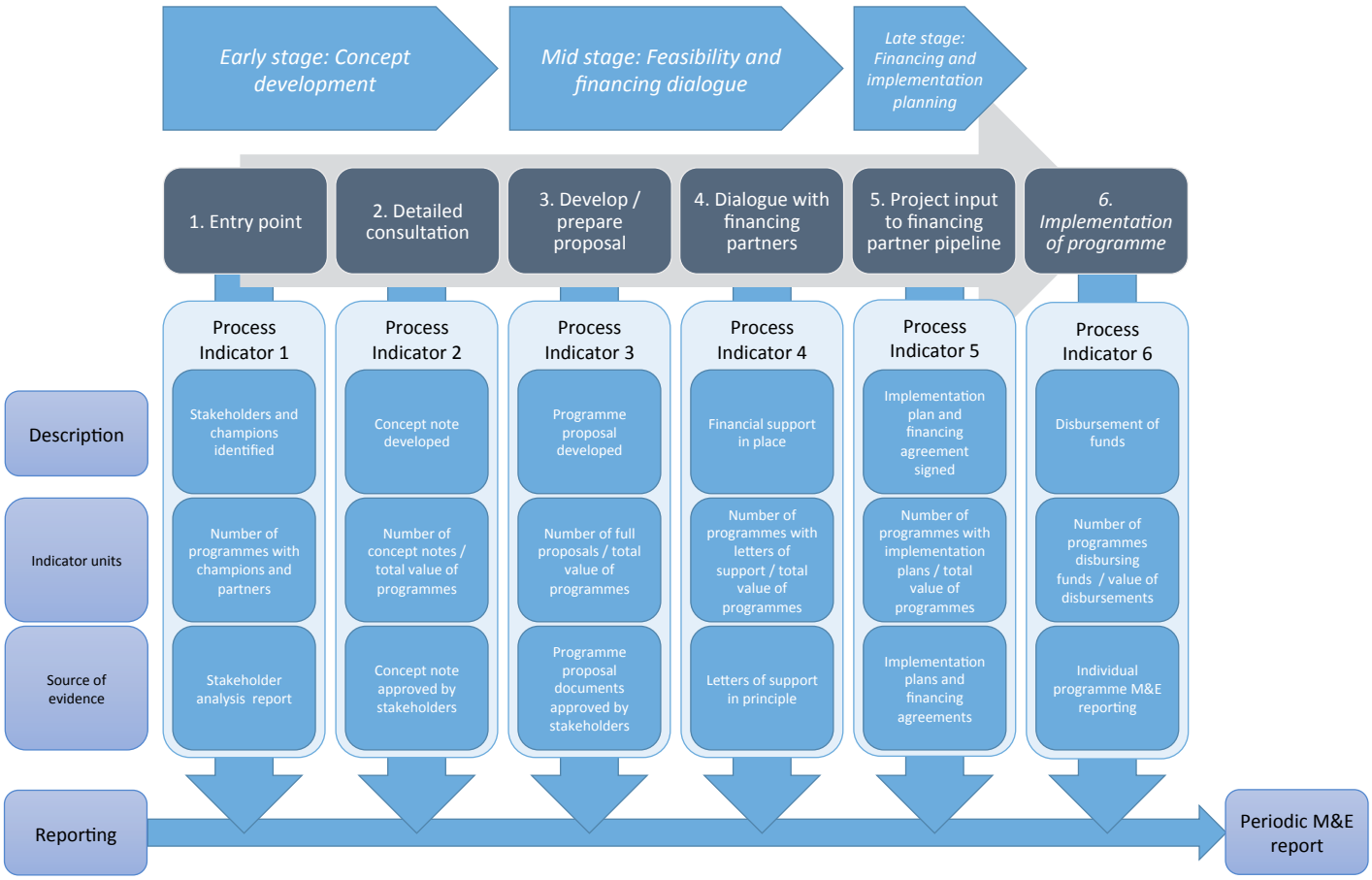


Figure 6.2: Indicators for monitoring progress of the co-development pipeline process

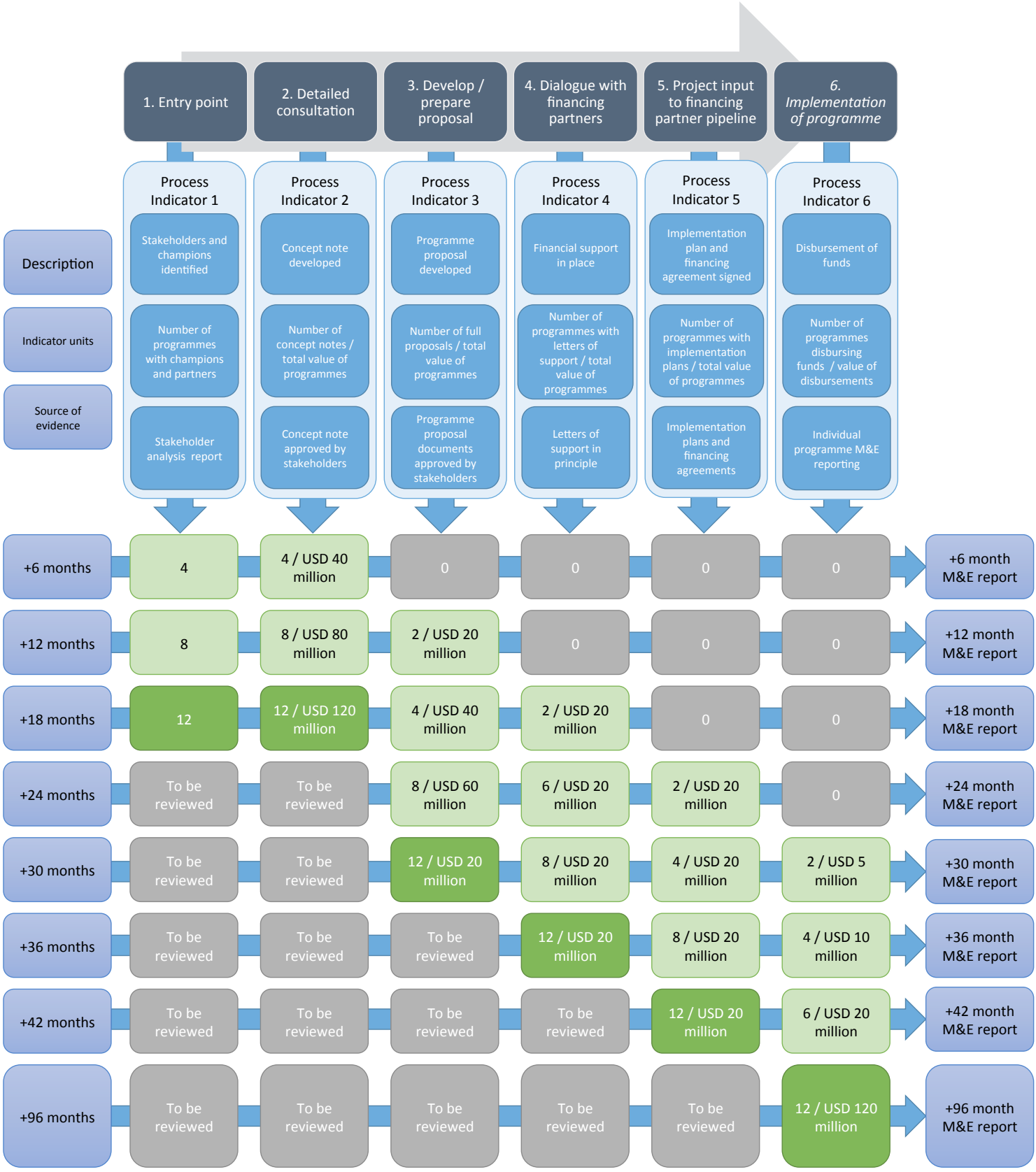


Figure 6.3: Illustrative example of progressive, time bound targets for implementation

Capturing qualitative indicators of co-beneficial activities

In addition to the quantitative process indicators, other indicators related to co-beneficial activities will also be useful to better understand the more qualitative benefits of implementation and to support periodic learning review processes. Narratives and storylines, for example, should report on enhanced regional coordination and harmonisation, new or enhanced regional partnerships, and greater efficiency and effectiveness in providing support to national water security and climate resilience activities and sectors. Numbers of countries engaged in the preparation and implementation of the thematic programmes, levels of up-scaling of new and innovative solutions, and increased levels of capacity among national partners and stakeholders will be important to report.

It is recommended that CARICOM, the regional institutions and key development partners are presented with harmonised M&E reporting on a periodic basis. This will include the quantitative indicators as well as a narrative of key successes, challenges and opportunities, and co-beneficial outcomes.

6.2. Monitoring Component 3; outputs and outcomes

M&E for Component 3 relates to the outputs and outcomes of the individual programmes developed through the *Regional Framework for Investment* process and will be important to demonstrate long term impacts. As with any programme or project, each programme that emerges through *Regional Framework for Investment* process will have its own specific M&E framework and this will necessarily have been considered from the outset of the programme preparation process.

Programmes emerging from the *Regional Framework for Investment* process will be implemented by a range of different organisations and access a range of funding and financing sources. Monitoring and evaluation processes will be dictated to some degree by those of the implementing and / or funding institutions. Emerging programmes should use the most appropriate systems, but these should also be geared toward providing harmonised, high level indicators to monitor progress of the overall *Regional Framework for Investment* process itself.

Finally, longer term outcomes and sustainability should be evaluated. Ideally, this should be built into existing higher-level national and regional monitoring frameworks to track regional and national progress toward water security and climate resilience. Climate resilience and water security are complex, long-term challenges with many other external drivers and factors. There may be long intervals between the time when programme actions are implemented and when the measurable and sustainable impact of these are realised. This time lag will therefore need to be taken into account when evaluating higher level outcomes.

7

Next Steps

The next steps towards implementing the *Regional Framework for Investment* will be crucial to ensure that momentum can be maintained.

The immediate next steps to kick start the implementation process include:

- *GWP-C to establish an interim Coordination Unit;*
- *Regional and national dissemination of the Regional Framework for Investment;*
- *Enhancement of political support (for example through endorsement at the High Level Forum (HLF) of Caribbean Water Ministers);*
- *Investigation of opportunities for funding and technical support for the coordination activities and preparation of programmes; and*
- *Preparation of a 12 month plan for development of programmes including resources, schedule and objectives and a longer term outline plan.*

The development of the first programme will be important to demonstrate the implementation approach. During the preparation of the *Regional Framework for Investment* some progress has been made on developing work under the Integrated Flood Management Thematic Programme of Action. Box 7.1 provides further detail on the current status of discussions on the programme. Immediate actions to progress the programme include:

- *Identification of a programme champion and regional partner organisations;*
- *Completion of full national surveys for stakeholder identification and mapping as well as validation of national priorities;*
- *Hosting of one-to-one meetings with key development partners to assess potential funding sources; and*
- *Liaison with CCCCC on opportunities for GCF funding.*

Box 7.1 – Example of an emerging pipeline programme process

National stakeholder needs analyses have identified integrated flood management as a priority programme area for selected countries (e.g. Trinidad and St. Lucia). Some of the areas of greatest interest include:

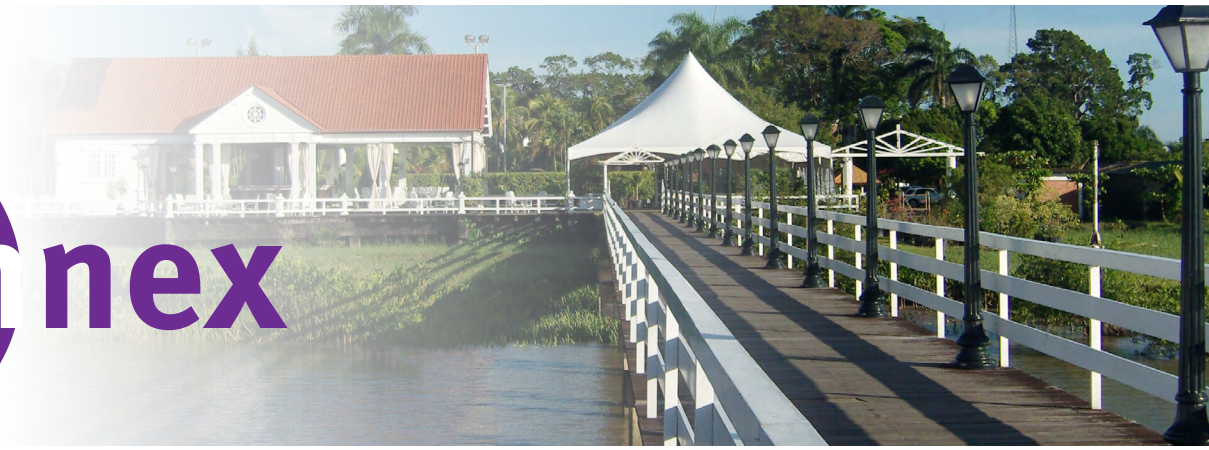
- Integrated approaches to managing flood risk, including the use of 'green infrastructure' and 'soft' catchment management interventions;
- Roll out of modelling approaches to generate systematic flood hazard and flood risk datasets, utilising existing asset data such as housing, roads and other critical infrastructure;
- Development and accessibility of a regional flood risk management 'toolbox', alongside regional technical assistance, to support national flood risk management focal points; and
- Implementation of pilot projects to develop skills and capacity.

The University of West Indies (UWI, Trinidad and Jamaica) has expressed interest in leading the co-development of a programme in the integrated flood risk management area. UWI is well placed as it specialises in flood risk management and has delivered a range of studies and research across the region. GWP-C has also expressed interest in partnering as this complements their own integrated flood risk management capacity development activities planned for 2016 onwards. Co-development of a programme should also benefit from association with other regional agencies (e.g. CDEMA and CIMH), national offices of Disaster Preparedness and Emergency Management, national Meteorological Services, and others.

Some of the current discussion on potential activities include:

- Post-experience country / local case studies to investigate what flood risk management measures have worked, where, and why;
- Application of flood risk modelling and mapping to areas of high community vulnerability, and incorporating techniques such as rapid flood spread modelling, 2D flood modelling;
- Training and skill development including the generation and use flood hazard maps, generation and interpretation of risk maps, decision making under uncertainty, and moving from risk to resilience;
- Applications of flood risk management tools incorporating high resolution digital terrain data (e.g. Light Detection and Ranging (LiDAR) data in Grenada), to demonstrate the added-value of high resolution data in decision making;
- Development of a harmonised modelling and decision support framework tailored for use by Caribbean countries, including climate change considerations;
- Incorporation of enhanced geo-spatial datasets (e.g. biomass data from LiDAR) to support ecosystem services to integrated flood risk management;
- Development of a flood risk management 'options selection' tool including green infrastructure options and guidance on selection criteria related to locally specific contexts;
- Development and demonstration of agent-based life safety modelling to support the preparation of emergency planning, response strategies and evacuation plans; and
- Development of tools to prioritise flood risk management investment (and maintenance) based on strategic risk assessment approaches.

The immediate next steps will include canvassing interest from other countries and, in collaboration with interested regional and national partners, drawing together a multi-stakeholder consultation process to co-develop an agreed conceptual programme for further elaboration. In parallel, early engagement with funders interested in natural hazards, flood and climate risk management will be needed to move towards developing a financial plan for the programme.



Annex

A. Further reading

This section provides relevant further reading supporting each of the chapters of this document, and for each of the six Thematic Programmes of Action. It is not intended to be exhaustive, but provides an introduction to relevant material and a source of further references for readers wanting explore issues in more detail.

Water security and climate resilient development

Title	**Regional Framework for Achieving Development Resilient to Climate Change (2009-2015) and Implementation Plan**
Description	The Regional Framework document sets out CARICOM's strategic approach for coping with climate change and the implementation plan sets out how this will be achieved.
Reference	Caribbean Community Climate Change Centre (CCCCC). 2009. Regional Framework for Achieving Development Resilient to Climate Change (2009-2015). Caribbean Community Climate Change Centre (CCCCC). 2012. Delivering Transformational Change 2011-21, Implementing the CARICOM Regional Framework for Achieving Development Resilient to Climate Change.
Web Link	*http://caribbeanclimate.bz/*

Title	**Achieving Development Resilient to Climate Change: A Sourcebook for the Caribbean Water Sector**
Description	This document provides an overview of a broad range of concepts, tools, methods and references to support climate resilience and water security in the Caribbean.
Reference	Global Water Partnership Caribbean (GWP-C) and Caribbean Community Climate Change Centre (CCCCC). 2014. Achieving Development Resilient to Climate Change: A Sourcebook for the Caribbean Water Sector. Global Water Partnership-Caribbean.
Web Link	*http://www.gwp.org/en/Caribbean-Water-and-Climate-Knowledge-Platform/Information-and-Resources-/WACDEP-Information-Products/*

Title	**Climate Change Risk Atlas (CCRA)**
Description	This document provides a summary and detailed reports on climate change risks and future projections for Caribbean countries. It is a useful resource to provide a broad overview of risks at a national level.
Reference	Caribbean Community Climate Change Centre (CCCCC). 2011. CARIBSAVE Climate Change Risk Atlas (CCCRA)
Web Link	*http://www.caribbeanclimate.bz/closed-projects/2009-2011-the-caribsave-climate-change-risk-atlas-cccra.html*

Title	**Caribbean Islands in a Changing Climate**
Description	This document provides an overview of climate change risks posed to the Caribbean, as well as useful references for further reading.
Reference	Pulwarty, R.S., Nurse, L. A. and Trotz, U.O. 2010. Caribbean Islands in a Changing Climate, Environment Magazine, November-December 2010.
Web Link	*http://www.environmentmagazine.org/Archives/Back%20Issues/November-December%202010/caribbean-islands-full.html*

Title	**The IPCC's Fifth Assessment Report What's in it for Small Island Developing States?**
Description	This document synthesises information from the IPCC Fifth Assessment Report relevant to SIDS, including climate change projections, impacts and adaptation responses.
Reference	CDKN. 2014. The IPCC's Fifth Assessment Report What's in it for Small Island Developing States?
Web Link	*http://cdkn.org/wp-content/uploads/2014/08/IPCC-AR5-Whats-in-it-for-SIDS_WEB.pdf*

Responding to the challenges

Title	**Database of IWRM initiatives in the Caribbean**
Description	This document provides a database of regional IWRM related initiatives in the Caribbean.
Reference	GWP-C. 2014. Database of IWRM initiatives in the Caribbean
Web Link	*http://www.gwp.org/en/Caribbean-Water-and-Climate-Knowledge-Platform/Information-and-Resources-/WACDEP-Information-Products/*

Title	**Sustainability of IWRM initiatives in the Caribbean**
Description	This document provides an analysis of the long-term sustainability of regional IWRM related initiatives in the Caribbean. Discusses the success factors for sustainability.
Reference	GWP-C. 2014. Sustainability of IWRM initiatives in the Caribbean
Web Link	*http://www.gwp.org/en/Caribbean-Water-and-Climate-Knowledge-Platform/Information-and-Resources-/WACDEP-Information-Products/*

Thematic Programmes of Action

Theme A – Climate Resilient Water Infrastructure

Title	**Macroeconomic implications of natural disasters in the Caribbean**
Description	Provides a high level analysis of impacts of natural disasters on Caribbean economies, highlighting the relative exposure of Caribbean SIDS to natural disasters.
Reference	IMF. 2004. Macroeconomic implications of natural disasters in the Caribbean. IMF Working Paper WP/04/224.
Web Link	*https://www.imf.org/external/pubs/ft/wp/2004/wp04224.pdf*

Title	**Caribbean Regional Disaster Response and Management Mechanisms: Prospects and Challenges**
Description	Provides an overview of DRM mechanisms and responses across the region, including a series of policy recommendations.
Reference	Kirton, M.2013. Caribbean Regional Disaster Response and Management Mechanisms: Prospects and Challenges
Web Link	*http://caribbean.eclac.org/content/caribbean-regional-disaster-response-and-management-mechanisms-prospects-and-challenges*

Title	**Resilient Infrastructure for Sustainable Services: Latin America: Mainstreaming of Disaster Risk Management in the Water Supply and Sanitation Sector**
Description	Provides a summary of the disaster risk issues facing water supply and sanitation and the risk management techniques which can be employed to effectively reduce risks before natural disasters occur.
Reference	Balcázar, C. 2012. Resilient Infrastructure for Sustainable Services: Latin America: Mainstreaming of Disaster Risk Management in the Water Supply and Sanitation Sector. World Bank Water and Sanitation Program.
Web Link	*http://www.wsp.org/sites/wsp.org/files/publications/wsp-mainstreaming-disaster-risk-management-wss.pdf.*

Title	**Unlocking The 'Triple Dividend' of Resilience. Why investing in disaster risk management pays off**
Description	Provides a high level analysis of the costs of investment in disaster risk management and the direct and indirect benefits which this brings. It provides key messages for financiers and policymakers on the benefits of DRM investments.
Reference	ODI. 2015. Unlocking The 'Triple Dividend' of Resilience. Why investing in disaster risk management pays off
Web Link	*https://www.gfdrr.org/sites/default/files/publication/unlocking_triple_dividend_resilience.pdf*

Title	**Challenge In Disaster Reduction For The Water And Sanitation Sector: Improving quality of life by reducing vulnerabilities**
Description	Provides a summary of the disaster risks facing water and sanitation and the key recommendations for actions to enhance the resilience of supplies.
Reference	PAHO. 2006. The Challenge In Disaster Reduction For The Water And Sanitation Sector: Improving quality of life by reducing vulnerabilities. ISBN 92 75 12629 1
Web Link	*http://www.unicef.org/lac/DesafioDelAgua_Eng%282%29.pdf*

Theme B – Water efficiency, re-use and augmentation

Title	**Toolbox on Rainwater Harvesting (RWH) in the Caribbean**
Description	Provides a resource kit of literature, information and interactive media products to support the promotion of the practice of Rainwater Harvesting (RWH) in the Caribbean.
Reference	Global Water Partnership-Caribbean (GWP-C) Toolbox on Rainwater Harvesting (RWH) in the Caribbean
Web Link	*http://www.cehi.org.lc/Rain/Rainwater%20Harvesting%20Toolbox/index.htm*

Title	**Management of Water Demand in the Caribbean Region: Current Practices and Future Needs**
Description	Assesses the availability, requirements and utilisation of water resources in the Caribbean region. It examines the water demand management measures already in place and makes recommendations for the way forward.
Reference	Ekwue. E. 2010. Management of Water Demand in the Caribbean Region: Current Practices and Future Needs. The West Indian Journal of Engineering Vol.32, Nos.1&2, January 2010, pp.28-35 ISSN 0511-5728
Web Link	*https://sta.uwi.edu/eng/wije/vol3201-02_jan2010/documents/WaterDemand.pdf*

Title	**Taking an integrated approach to implementing water efficiency**
Description	Approaches the question of efficiency from an IWRM perspective, aiming to help policy makers and practitioners develop a strategic and integrated approach to improving efficiency.
Reference	GWP. 2006b. Taking an integrated approach to implementing water efficiency. Technical Brief No. 4.
Web Link	*http://www.gwp.org/Global/ToolBox/References/Taking%20an%20integrated%20approach%20to%20implementing%20water%20efficiency%20(GWP,%202006)%20ENGLISH.pdf*

Title	**The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help: A Look at Performance-Based Service Contracting**
Description	Discusses the challenges of NRW in water supply and provides case studies with lessons learned showing the potential benefits of NRW performance-based service contracting with the private sector.
Reference	World Bank. 2006. The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries How the Private Sector Can Help: A Look at Performance-Based Service Contracting. Water Supply and Sanitation Board Discussion Paper Series. Paper No. 8.
Web Link	*http://documents.worldbank.org/curated/en/2006/12/7531078/challenge-reducing-non-revenue-water-nrw-developing-countries-private-sector-can-help-look-performance-based-service-contracting*

Theme C – Drought resilient water supplies

Title	**Drought Early Warning and Risk Reduction: A Case Study of The Caribbean Drought of 2009-2010**
Description	Illustrates the impacts of the most recent drought in the Caribbean through island specific examples. The examples show the sensitivity of key economic sectors (in particular water and agriculture) to drought and the low resilience of the region to drought. Policy recommendations are provided.
Reference	Farrell, D., Trotman, A. and Cox. C. 2010. Drought Early Warning and Risk Reduction: A Case Study of The Caribbean Drought of 2009-2010. Global Assessment Report on Disaster Risk Reduction
Web Link	*http://www.preventionweb.net/english/hyogo/gar/2011/en/bgdocs/Farrell_et_al_2010.pdf*

Title	**Managing Water Resources in the Face of Climate Change: A Caribbean Perspective**
Description	Explores the probable effect climate change will have on water resources in the Caribbean, the fall-out from these effects and strategies for mitigating potential negative impacts.
Reference	Farrell, D., Nurse, L. and Moseley, L. 2007. Managing Water Resources in the Face of Climate Change: A Caribbean Perspective.
Web Link	*http://www.eldis.org/go/home&id=60277&type=Document*

Title	**The Impact of the Recent Drought on the National Water Commission (NWC) Water Supply Services to Kingston & St. Andrew, Jamaica**
Description	Evaluates and discusses the impact of the 2009-2010 drought in Jamaica, and the lessons learnt. A discussion is also presented on an appropriate institutional arrangement and a possible planning process that could be adopted in mitigating the severe impact from future drought incidence.
Reference	Barnett, M.W. 2010. The Impact of the Recent Drought on the National Water Commission (NWC) Water Supply Services to Kingston & St. Andrew, Jamaica. http://cehi.org.lc
Web Link	*http://www.cehi.org.lc/cef5/documents/CEF%20papers%20and%20presentations/PAPERS/Parallel%20Session%205%20Water%20Resources%20and%20Coastal%20Areas%20Management/Mark%20Barnett%20The%20Impact%20of%20the%20Present%20Drought.pdf*

Theme D – Climate resilient agricultural water management

Title	**Status of Disaster Risk Management Plans for Floods, Hurricanes and Drought in the Agriculture Sector; A Caribbean Perspective**
Description	Presents the findings of a study commissioned by the Food and Agriculture Organisation of the United Nations (FAO) to review the status of development and implementation of disaster risk management (DRM) plans for the agriculture sector throughout the Caribbean. Policy recommendations on actions to enhance agricultural resilience are provided.
Reference	FAO. 2013. Status of Disaster Risk Management Plans for Floods, Hurricanes and Drought in the Agriculture Sector; A Caribbean Perspective
Web Link	*www.fao.org/3/a-i3341e.pdf*

Title	**Profile of the Small-Scale Farming in the Caribbean Workshop on Small-Scale Farming in the Caribbean**
Description	Analyses relevant data in the Census of Agriculture of eight Caribbean countries and recent studies in the sub-region to synthesise the issues facing small scale farming in the region. This includes analysis and recommendations on water management.
Reference	Graham. 2012. Profile of the Small-Scale Farming in the Caribbean Workshop on Small-Scale Farming in the Caribbean
Web Link	*www.fao.org/3/a-au343e.pdf*

Title	**Risk Mitigation for Smallholder Agricultural Production in the Caribbean**
Description	Online modules which provide Caribbean specific guidance and tools on disaster, soil and water management for Caribbean agriculture. Specifically, the course aims to provide smallholders and agricultural extension workers with an understanding of the major risks facing farmers in the Caribbean and consider the opportunities for taking actions to mitigate and manage these risks.
Reference	CARDI and World Bank. Undated. The World Bank's Risk Mitigation for Smallholder Agricultural Production in the Caribbean Course.
Web Link	*http://www.agriskmanagementforum.org/content/world-banks-caribbean-smallholder-farmer-course*

Theme E – Resilient and healthy water resources systems

Title	**Water Security and Services in the Caribbean**
Description	Provides an overview of the major factors influencing water security in the Caribbean region, using case examples to illustrate issues. The potential impact of future changes, such as demographics, climate change, and economics, are also explored.
Reference	Cashman, A .2013. Water security and services in the Caribbean / Adrian Cashman. (IDB Technical Note; 514).
Web Link	*http://www10.iadb.org/intal/intalcdi/PE/2013/11509.pdf*

Title	**Integrated Water Resources Management in the Caribbean: The Challenges facing Small Island Developing States**
Description	Technical Focus Paper which presents a critical review of progress made in IWRM planning and then putting plans into practice. It synthesises the challenges, the successes, the setbacks, and the direction for further integration. It provides valuable insights from which others can learn lessons and apply them to their particular and often unique circumstances.
Reference	GWP. 2014. Integrated water resources management in the Caribbean: The challenges facing Small Island Developing States. Technical Focus Paper. ISBN: 978-91-87823-01-5.
Web Link	*http://www.gwp.org/Global/ToolBox/Publications/Technical%20Focus%20Papers/04%20Caribbean_TFP_2014.pdf*

Title	**Situational Analysis Regional Sectoral Overview of Wastewater Management in the Wider Caribbean Region**
Description	Provides a rapid overview of the Wastewater Management sector in the Caribbean including: Social, Environmental and Economic Issues of Poor Wastewater Management, Policy, Legislative and Institutional Framework, Assessment of Wastewater Technologies in the region, Country Profiles on Wastewater Management.
Reference	GEF-CReW. 2010. Situational Analysis Regional Sectoral Overview of Wastewater Management in the Wider Caribbean Region CEP Technical Report 66
Web Link	*http://www.cep.unep.org/publications-and-resources/technical-reports/Situational%20Analysis%20Final.pdf/download*

Theme F – Integrated flood management

Title	**Climate Change Data and Risk Assessment Methodologies for the Caribbean**
Description	The purpose of this paper is to: (1) propose a step-wise process to assess climate change risks to IDB projects and (2) identify tools and methodologies to support the risk assessment process specific to the Caribbean region. The pilot risk assessment process focuses on the direct and indirect risks to projects from three climate-induced hazards: sea level rise, hurricanes (including storm surge) and flooding (both coastal and riverine) because these hazards are considered to pose the greatest threat to the Caribbean region.
Reference	IDB. 2013. Climate Change Data and Risk Assessment Methodologies for the Caribbean. Technical Note IDB-TN-633
Web Link	*https://publications.iadb.org/bitstream/handle/11319/6453/Climate%20Change%20Data%20and%20Risk%20Assessment%20Methodologies%20for%20the%20Caribbean.pdf*

Title	**Regional Comprehensive Disaster Management (CDM) Strategy and Programming Framework 2014-2024**
Description	The CDM Strategy 2014 – 2024 builds on the strengths of well-founded and functional governance structures. It is designed to continue the process of embedding and institutionalising CDM as the Caribbean's platform for achieving risk reduction.
Reference	CDEMA. 2014. Regional Comprehensive Disaster Management (CDM) Strategy and Programming Framework 2014-2024 (DRAFT). ISBN 978-976-8243-22-5
Web Link	*www.cdema.org/CDMStrategy2014-2024.pdf*

Implementing the *Regional Framework for Investment*

Title	**Guidelines for Stakeholder Identification and Analysis: A Manual for Caribbean Natural Resource Managers and Planners**
Description	Provides a reference guide for stakeholder analysis which may relevant to the design of proposals within the *Regional Framework for Investment*. It focuses on the design of equitable and sustainable initiatives, and is mainly associated with community level analysis work.
Reference	Caribbean Natural Resources Institute. 2004. Guidelines for Stakeholder Identification and Analysis: A Manual for Caribbean Natural Resource Managers and Planners. ISBN 1-890792-07-1.
Web Link	*www.alnap.org/pool/files/guidelines5.pdf*

Title	**European Commission Project Cycle Management Guidelines**
Description	Provides a useful background reference on the typical processes involved in programme and project design and management.
Reference	European Commission. 2004. Aid delivery methods. Volume 1. Project Cycle Management Guidelines
Web Link	*https://ec.europa.eu/europeaid/sites/devco/files/methodology-aid-delivery-methods-project-cycle-management-200403_en_2.pdf*

Title	**Investment framework for the Green Climate Fund**
Description	Provides the key criteria which proposals must address in order to access the Green Climate Fund. In the formulation of the proposal, the Accredited Entity is expected to respond to all six of the investment criteria but only the applicable and relevant sub-criteria and indicative assessment factors. Not all activity-specific sub-criteria and indicative assessment factors will be applicable or relevant for every proposal.
Reference	Green Climate Fund. 2015. Annex III: Initial investment framework: activity-specific sub-criteria and indicative assessment factors.
Web Link	*http://www.greenclimate.fund/documents/20182/46529/3.3_-_Criteria__Sub-criteria_and_Indicative_Assessment_Factors.pdf/771ca88e-6cf2-469d-98e8-78be2b980940*

Financing the *Regional Framework for Investment*

Title	**Green Climate Fund (GCF) Concept Note template**
Description	This is the template required by the Green Climate Fund in order to request access to funding for a proposal. An accredited entity or an executing entity (i.e. project or programme sponsor) may submit a concept note for feedback and recommendations from the Fund, in consultation with the National Designated Authority or Focal Point. The recommendation will clarify whether the concept is endorsed, not endorsed with a possibility of resubmission, or rejected.
Reference	Green Climate Fund (GCF). 2015. Concept Note template.
Web Link	*http://www.greenclimate.fund/ventures/funding#get-funded*

Title	**Climate Finance Fundamentals Series**
Description	Series of short introductory briefings on various aspects of climate finance are designed for readers new to the debate on global climate change finance. In light of the fast pace of developments in climate finance, the briefs allow the reader to gain a better understanding of the quantity and quality of financial flows going to developing countries.
Reference	ODI. 2014. Climate Finance Fundamentals Series
Web Link	*http://www.climatefundsupdate.org/resources/finance-fundamentals*

Title	**A Framework for Financing Water Resources Management**
Description	Provides a framework for policy discussions around financing water resources management that are taking place at local, basin, national or transboundary levels. The report goes beyond the traditional focus on financing water supply and sanitation to examine the full range of water management tasks that governments have to fulfil; when appropriate, a distinction is made on distinctive water issues. The report identifies four principles (Polluter Pays, Beneficiary Pays, Equity, Policy Coherence), which have to be combined.
Reference	OECD. 2012. A Framework for Financing Water Resources Management, OECD Studies on Water, OECD Publishing.
Web Link	*http://dx.doi.org/10.1787/9789264179820-en*

Title	**Financing for Water and Sanitation A Primer for Practitioners and Students in Developing Countries**
Description	Offers a non-technical introduction to financing for water and sanitation in developing countries. Target readers for the Primer are practitioners in developing countries – politicians, officials, professionals, private business people, members of civil society organisations and laypersons – involved in different ways in providing the infrastructure and services for water and sanitation.
Reference	EU Water Initiative Finance Working Group. 2011. Financing for Water and Sanitation A Primer for Practitioners and Students in Developing Countries.
Web Link	*http://www.gwp.org/Global/About%20GWP/Publications/EUWI/EUWI%20FWG%20Primer%20on%20Financing%20Final.pdf*

Monitoring and evaluation of the *Regional Framework for Investment*

Title	**GEF-IWCAM. Experience Notes & Lessons Learned**
Description	Experience notes which provide a summary of the lessons learned in various aspects of the GEF-IWCAM project and are a useful reference for project proponents engaged in preparing regional programmes or projects.
Reference	GEF-IWCAM Integrating Watershed and Coastal Area Management in the Small Island Developing States of the Caribbean (IWCAM). Experience Notes & Lessons Learned.
Web Link	*http://iwlearn.net/iw-projects/1254/experience-notes-lessons-learned*

Title	**Case Studies, Lessons Learnt, and Recommendations in the Development, Implementation and Management of GEF Projects in the Wider Caribbean Region (WCR)**
Description	Technical report which summarises the results of case studies, lessons learnt, and recommendations from the implementation of selected GEF Projects in the Wider Caribbean Region (WCR). It provides a useful resource to understand the success factors behind regional programmes.
Reference	UNEP-CAR/RCU, 2014. Case Studies, Lessons Learnt, and Recommendations in the Development, Implementation and Management of GEF Projects in the Wider Caribbean Region (WCR). United Nations Environment Programme CEP Technical Report 59
Web Link	*http://www.cep.unep.org/publications-and-resources/technical-reports/cep_technical_report_59-revised-final.pdf/download.*

Title	**Handbook on Planning, Monitoring and Evaluating for Development Results**
Description	Handbook on enhancing the results-based culture within UNDP and improve the quality of planning, monitoring and evaluation. It also aims to provide the reader with a basic understanding of the purposes, processes, norms, standards and guiding principles for planning, monitoring and evaluation within the UNDP development context and developing a robust results framework for projects and programmes, with clear indicators, baselines and targets, and setting up an effective monitoring system.
Reference	UNDP. 2009. Handbook on planning, monitoring and evaluating for development results.
Web Link	*http://web.undp.org/evaluation/handbook/*

Title	**Better Evaluation website**
Description	Website which is an international collaboration to improve evaluation practice and theory by sharing and generating information about options (methods or processes) and approaches.
Reference	Better Evaluation website. A repository for tools and methods on evaluation techniques.
Web Link	*http://betterevaluation.org/*

Title	**Monitoring and Evaluation Indicators for IWRM Strategies and Plans**
Description	Brief focusing on defining indicators as a part of a coherent M&E system. It builds directly on the discussion of M&E in Catalysing Change: A Handbook for Developing IWRM and Water Efficiency Strategies, and on the basic information about indicators provided in GWP Technical Brief 2: Tools for keeping IWRM strategic planning on track. The information and recommendations presented are based on experiences in monitoring sustainable development initiatives as well as IWRM plans and strategies.
Reference	GWP. Undated. Monitoring and evaluation indicators for IWRM strategies and plans. Technical Brief 3.
Web Link	*http://www.gwp.org/Global/ToolBox/Publications/Technical%20Briefs/03%20Monitoring%20and%20evaluation%20indicators%20for%20IWRM%20strategies%20and%20plans%20(2006)%20English.pdf*

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Global Water Partnership Caribbean

Caribbean Community Climate Change Centre

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