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# Thematic Programme of Action E Resilient and healthy water resources systems

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**Relevant regional partners<sup>1</sup>**

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

**Relevant national partners<sup>1</sup>**

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

<sup>1</sup>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

<b>Alignment with SDGs</b>	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
<b>Alignment with Regional CARICOM Climate Change Framework</b>	Adaptation policy, strategy, capacity and awareness		Implementing adaptation measures	Low carbon development		Vulnerability reduction	Forest management	
<b>Indicative cost</b>	Low cost for planning, medium to high cost for implementing plans (including institutional, policy, regulatory and monitoring systems).							
<b>Lead time</b>	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.

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<b>Programme E.2 – Investing in wastewater management</b>								
<b>Programme Objectives:</b> 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								
<b>Alignment with SDGs</b>	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
<b>Alignment with Regional CARICOM Climate Change Framework</b>	Adaptation policy, strategy, capacity and awareness		Implementing adaptation measures		Low carbon development	Vulnerability reduction		Forest management
<b>Indicative cost</b>	Low cost for planning, medium to high cost for implementing plans (including institutional, policy, regulatory and monitoring systems).							
<b>Lead time</b>	Short term, building on the GEF-CReW project. Medium to long term for infrastructure investment.							
<p>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 Jamaica 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:</p> <ul style="list-style-type: none"> <li>• Further progression of work under the GEF-CReW project, for example: <ul style="list-style-type: none"> <li>○ Supporting the development of wastewater targets and measurement frameworks for countries to take a more strategic approach to wastewater management;</li> <li>○ Development of cost-benefit analyses for wastewater infrastructure in terms of financial, social and environmental costs and benefits;</li> <li>○ Supporting the development of wastewater infrastructure investment plans for wastewater;</li> <li>○ Development of pilot projects to investigate low cost technologies for wastewater management;</li> <li>○ Capacity development for wastewater management professionals at a variety of levels;</li> <li>○ 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</li> <li>○ Further outreach and engagement to raise the profile and importance of wastewater management amongst the general public and government decision makers.</li> </ul> </li> <li>• 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.</li> </ul> <p><b>Relevant regional experience:</b> 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.</p>								

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<b>Programme E.3 – Integrated land and water management for environmental resilience</b>								
<b>Programme Objectives:</b> Supporting integrated and sustainable water and land use practices which reduce pollution, sedimentation and other risks to water resources and water-dependant ecosystems								
<b>Alignment with SDGs</b>	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
<b>Alignment with Regional CARICOM Climate Change Framework</b>	Adaptation policy, strategy, capacity and awareness		Implementing adaptation measures	Low carbon development		Vulnerability reduction	Forest management	
<b>Indicative cost</b>	Low cost for planning and policy development, medium to high cost for regulation and incentivising behavioural change.							
<b>Lead time</b>	Short lead-time for policy development, long timescales for regulatory enforcement and behavioural change.							
<p>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:</p> <ul style="list-style-type: none"> <li>• The following programmes would support countries implementing the LBS protocol as it relates to point and diffuse sources of pollution in the aquatic environment: <ul style="list-style-type: none"> <li>○ Clarification of policy objectives regarding implementation of the LBS protocol at national level;</li> <li>○ Inventories of discharges of point source pollutants to aquatic ecosystems from all sources (business, domestic, tourism, industry);</li> <li>○ Inventories of diffuse pollution and sediment loadings to aquatic ecosystems from a range of land use practices;</li> <li>○ Risk assessment of pollution loadings to aquatic ecosystems (freshwater and marine), including the impact of desalination brine on coastal ecosystems;</li> <li>○ Assessment of the impacts of desalination on coastal water quality and ecosystem health;</li> <li>○ 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</li> <li>○ Development of regulatory and incentive structures to achieve policy objectives, including financing plans for monitoring compliance.</li> </ul> </li> </ul> <p><b>Relevant regional experience:</b> 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.</p>								

### 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
<b>Cap-Net</b>	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.
<b>GWP-C / CARPHA</b>	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.
<b>GWP-C</b>	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
<b>UNEP CAR/RCU</b>	FAO, CARDI, CARPHA	GWP-C	National LBS and SPAW Focal Points	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.
<b>CARPHA</b>		UNEP, FAO	Water Utilities, Ministries responsible for Water, Water Resources Agencies	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.
<b>OECS</b>		GWP-C	Water Resources Agencies	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.
<b>CERMES at UWI</b>	CCCC, FAO, GWP-C		Agriculture Department, CARDI, Hydrological Unit, Water Utility and Irrigation, Ministry of Natural Resources and Agriculture	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.	
<b>CERMES at UWI</b>		CIMH, CCCCC	All relevant national agencies	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.

Cap-Net	Capacity Development in Sustainable Water Management	GEF-IWCAM	Integrating Watershed & Coastal Areas Management in Caribbean Small Island Developing States
CARDI	Caribbean Agricultural Research and Development Agency	GWP-C	Global Water Partnership Caribbean
CARPHA	Caribbean Public Health Agency	IFIs	International Financial Institutions
CCCCC	Caribbean Community Climate Change Centre	IUCN	International Union for the Conservation of Nature
CCORAL	Caribbean Climate Online Risk and Adaptation tool	IWRM	Integrated Water Resources Management
CDB	Caribbean Development Bank	LBS Protocol	Cartagena Convention's Protocol on Land-based Sources of Marine Pollution
CERMES	Centre for Resource Management and Environmental Studies	OECS	Organisation of Eastern Caribbean States
CIMH	Caribbean Institute of Meteorology and Hydrology	PAHO	Pan American Health Organisation
CTO	Caribbean Tourism Organisation	SIDS	Small Island Developing States
FAO	Food and Agriculture Organisation of the United Nations	SPACC	Special Pilot Adaptation to Climate Change
GEF-CReW	Caribbean Regional Fund for Wastewater Management	UNEP CAR/RCU	United Nations Environmental Program Regional Coordinating Unit for the Caribbean Environment Programme
		UWI	University of the West Indies

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