CARIWIN COMMUNITY WATER STRATEGY BACKGROUND DOCUMENT:
GREAT RIVER WATERSHED, GRENADA
December 2009
List of Acronyms

CAMP — Catchment Management and Poverty Alleviation Project
CARIWIN — Caribbean Water Initiative
CDEMA — Caribbean Disaster Emergency Response Strategy
CDPMN — Caribbean Drought and Precipitation Monitoring Network
CEHI — Caribbean Environmental Health Institute
CEP — Caribbean Environment Programme
CIMH — Caribbean Institute for Meteorology and Hydrology
CWS — Community Water Strategy
FAO — Food and Agriculture Organisation
GoG — Government of Grenada
GPA — Global Programme of Action
IWCAM — Integrating Watershed and Coastal Areas Management project
IWRM — Integrated Water Resources Management
JICA — Japan International Cooperation Agency
LBS Protocol — Protocol on Land Based Sources of Marine Pollution
NaDMA — National Disaster Management Agency
NAWASA — National Water and Sewerage Authority
NPA — National Programme of Action
NWIS — National Water Information System
OECS — Organisation of Eastern Caribbean States
RWH — Rainwater Harvesting
SCWSN — Small Community Water Supply Network
SIDS — Small Island Developing States
UNEP — United Nations Environment Programme
WHO — World Health Organisation
WSP — Water Safety Plan
1. Introduction
Given the wide range of issues connected to the water sector and the various scales they impact, the last few decades have seen a broadening of the approach to water management, and an emergence of new guiding principles such as decentralised decision-making, stakeholder involvement, and cross-sector integration and collaboration under the umbrella of Integrated Water Resources Management (IWRM). The Caribbean Water Initiative (CARIWIN) has as its goal to increase the capacity of Caribbean countries to deliver IWRM, through collaboration with government agencies, regional and national networks, and community water users in its three partner countries – Grenada, Guyana and Jamaica. Jointly led by the Brace Centre for Water Resources at McGill University, Canada, and the Caribbean Institute for Meteorology and Hydrology (CIMH), Barbados, CARIWIN aims to integrate the IWRM approach into the CIMH activities in order to build regional capacity to meet water management needs. CIMH is the regional organisation whose mandate includes providing training and capacity development in meteorology and hydrology to its CARICOM member states, and is therefore well placed to create a multiplier effect with respect to IWRM learning in the Caribbean. In addition, one of CIMH’s primary functions is to collect, store and publish meteorological and hydrological data from the region. The Institute is proactively modernizing its data archiving infrastructure in order to host the databases from the newly developed National Water Information Systems, born from IWRM principles. The Water Forum for the Americas was held in 2008 in preparation for the 5th World Water Forum in Istanbul in 2009. In its report for the Caribbean sub-region, a number of challenges for water resources management were highlighted: population growth, increased water demand resulting from rapid growth in urbanisation and tourism, increased competition for land and water resources, increased climate variability and frequency of natural disasters, and pollution from industrial, agricultural and municipal wastes (Chase, 2008). CARIWIN’s contributions to water resources management in the Caribbean were recognised in this report in the section “Progress made to meet the challenges”. The report concluded that “an integrated and comprehensive approach towards water management is the correct way to face the challenges of managing a multiple-use resource, such as water”.

Since its launch in February 2007, CARIWIN has developed and delivered short courses on IWRM to technicians, water managers and senior administrators in its three partner countries, providing learning opportunities for over 167 trainees. In addition to trained human resources for the national partners, two major outputs of CARIWIN to-date are the Caribbean Drought and Precipitation Monitoring Network (CDPMN) and the Grenada National Water Information System (NWIS). The CDPMN was initiated following a CARIWIN learning event where the need for a centralised information system that incorporates climate risk management into decision-making was identified (Trotman et al., 2008). The Grenada NWIS was launched in January 2009 as a tool to generate information products for decision-making and a repository for all hydrologic, climate, land, watershed, infrastructure and water related data in the country, displaying information from the national scale down to the community level. It is intended to provide access to information for all stakeholders, including community water users, with the goal to improve the ability to address water management challenges.

CARIWIN is now preparing to launch its Community Water Strategy (CWS) component, which intends to build on several of the CARIWIN achievements to-date in order strengthen activities in its pilot communities. The purpose of the CWS exercise is to:

- reinforce the principles of IWRM;
• promote leadership of CIMH, its institutional role and knowledge;
• conduct capacity-building exercise with National Partners focused on addressing needs and priorities in water management in the pilot community; and
• provide a forum for discussion amongst collaborators and regional, national, and community level stakeholders.

The CARIWIN pilot community in Grenada is the Great River watershed. The installation of a rain gauge and stream level recorder was completed at Castaigne Bridge in the summer 2009, and a multi-parameter probe for water quality monitoring has been purchased. Through collaboration with the Ministry of Agriculture as the main national partner, outputs from the CWS Seminar are expected to be incorporated to strengthen water management in the Great River watershed, including focusing efforts for strengthening the CDPMN and NWIS to meet the needs of the pilot community.

This CARIWIN CWS Background Document for Grenada examines water resources management at the national level in Grenada, establishing the context for the CWS in the Great River watershed. The information is summarised from country policy documents, strategies, and ongoing programs and projects. The document is meant to provide some background for discussions at the Regional Seminar to be held in Guyana on January 14-15th 2010, where an Implementation Framework will be further developed with CARIWIN's major regional and national stakeholders. Specific outputs expected from the discussion will include:

1) Prioritisation of the needs for the Great River watershed
   a. Are the target areas identified relevant? Are any key issues missing?
   b. What resources are needed for strengthened water management and where should efforts be focused?

2) Preliminary identification of the key players for the Great River watershed
   a. What are the respective roles and responsibilities of the key players?
   b. Who can provide the necessary resources to address the priorities identified?
   c. What is needed to get the necessary commitment from the different players (government, civil society, universities, community organisations)?

3) Steps to implementation
   a. What are the steps required for strengthened water management in the Great River watershed?
   b. How can CARIWIN achievements to date (e.g. NWIS, CDPMN) be strengthened to meet the needs in the Great River watershed?

2. Water Resources in Grenada
Grenada is a tri-island state, comprised of the main island of Grenada, Carriacou, and Petit Martinique. The main island of Grenada is 34km long and 18km wide, with a total land area of 120 km². The country counts 71 watersheds, with 90% of the island’s water supply coming from surface water, groundwater being mainly used to augment supply during the dry season (Geoghegan et al., 2003). Grenada is primarily of volcanic origin, with soils dominated by clay loams (84.5%), clays (11.6%) and sandy loams (2.9%). Average annual rainfall ranges from 1,000 to 1,500mm along the coastal zone to 4,000mm in the interior, averaging 2,350mm for the country (CEHI, 2006).
Characterised by a humid tropical marine climate, the country experiences levels of rainfall that significantly differ between the wet season (June to December) and dry season (January to May), with the most pronounced differences occurring in the northern and southern extremes of the island where the climate is drier (Jackson et al., 2004).

The main island is characterised by a mountainous terrain, with a steep rise on the West Coast and a gentler slope towards the East Coast, with some coastal plains (Government of Grenada [GoG], 2001). Given the small size of the island and its geography, the entire island can be considered as coastal, and watershed and coastal management are therefore closely tied together (Jackson et al., 2004). The topography of the island also accounts for the relative abundance of water resources as compared to its two sister islands, which are smaller and of lower elevation, and are as a result significantly drier (average annual rainfall of 1 000 mm). All three islands do experience extreme drought conditions during the dry season, when the water demand increases mainly due to tourism and irrigation (GoG, 2007c).

3. Linkages to National and Regional Programmes and Priorities

The objectives of CARIWIN are very relevant in the context of Grenada, which has recently adopted the IWRM approach as a guide to reform its water sector. The Grenadian Government completed in 2007 a Review of the Water Sector in Grenada and a Road Map Toward Integrated Water Resources Management Planning for Grenada. These two documents have formed the basis for the development of a National Water Policy and a Framework for Integrated Water Resources Management, which outlines clear actions to implement the National Water Policy. The National Water Policy states the commitment of the Government to an approach that follows IWRM principles and that seeks to coordinate decision-making by stakeholders from the national level down to the community level. At the regional level, the role of CIMH as a regional training institute in meteorology and hydrology is central to support CARIWIN’s monitoring sites as well as the storage, sharing and processing of data, and information provision. The objectives of the CWS are aligned with a number of priorities, programmes and policies both in Grenada and at the regional level in the Caribbean, ranging across multiple sectors described in the following sections.

3.1 Water Supply and Sanitation

The National Water and Sewerage Authority (NAWASA) Act was passed in 1990 and delegated full responsibility for the provision of water supply in the country to NAWASA, acting both as provider and regulator (CEHI, 2006). The coverage of NAWASA is estimated at 90%, with a reliability of water supply between 85 and 90%; the storage of water at the household level to cope with intermittent water supply is problematic as it can become a significant source of contamination.

The distribution network is primarily gravity-fed from surface stream sources located at high elevations, with a water production ranging between 27,300 and 31,800 m³/day during the dry and wet seasons respectively (Chase, 2008). Due to their location at the ends of the distribution network, communities in the extreme south and north of the island are more vulnerable to water stress (Chase, 2008). Most importantly, the National Water Policy recognises that the infrastructure in the country is inadequate to ensure both water quality and quantity, especially during the dry season (GoG, 2007).

Domestic water meters were introduced to the island in 1994, following a harsh dry season, and the majority of domestic users are now metered; unmetered customers are charged according to fixed monthly tariffs based on property market value (GoG, 2001). Water tariffs fund NAWASA’s running
costs. With respect to sanitation, the Government acknowledges that the lack of sewerage systems is a main problem: most of the country relies on septic tanks, while the rest of the wastewater is released immediately offshore after a coarse particle screening only (GoG, 2007b).

3.2 Water Uses
Water users in Grenada are classified as either domestic (over 60% of the users) or non-domestic (includes commercial, industrial, hotels, schools, public service). Most non-domestic uses are concentrated in the south east of the island (85% of non-domestic use in St. Georges parish (Krishnarayan, 2002). Farmers are classified as domestic users and are supplied with potable water at the same metered rate as household users (Geoghegan et al., 2003). As of 2001 the metering system had resulted in 40% water conservation in the 3 parishes that were fully metered (St. Andrew, St. David and St. George); however, water metering has also encouraged greater use of alternative sources such as rivers especially for agricultural purposes, and in some cases led to farm abandonment due to the inability of poor farmers to pay (GoG, 2001). The high irrigation cost and the location of arable land in water-scarce areas are major factors restricting the development of irrigation and constraining agriculture in the country, with only approximately 2.2% of the farmland currently under irrigation (GoG, 2007b). Most of the agriculture on the island is rainfed (e.g. cocoa and nutmeg) and does not require any irrigation; however, the crops that do require irrigation (e.g. vegetable production) are severely constrained during the dry season due to lack of irrigation. A decrease in the productivity of banana farming has led to the creation of the Banana Rehabilitation Programme, which indicated that 80% of the banana cultivation would have to be irrigated for banana farming to remain viable, compared to 10-15% in 2001. Another FAO project has been approved to increase irrigation for food production (GoG, 2001). Taking those into consideration, agricultural water demand is expected to increase significantly, adding further strain on water resources. Conflicts also occur due to water contamination from farming activities upstream of the water utility intake points (GoG, 2001).

The farming sector in Grenada is characterised by an abundance of small farms; holdings less than 5 acres represent 31% of the cultivated area (Thomas, 2000). The Upland Watershed Management Unit was formed within the Forestry Department as part of the new National Forest Policy to encourage stakeholder involvement in watershed management, particularly given the fact that a large part of the land is privately owned, and management therefore requires the coordination of several small land owners. Examples of incentives adopted to improve land management have included small loans to farmers for the diversification of banana farming through the establishment of fruit tree orchards, or for the maintenance of drains (Geoghegan et al., 2003). Private ownership has however also resulted in fragmented and inefficient land use, inappropriate farming practices and lack of government control over land use (Thomas, 2000).

Predicted impacts of climate change in Grenada include an overall decrease in annual rainfall, increased evapotranspiration, and more extreme wet and dry seasons (GoG, 2001). Given that agriculture is dominated by rainfed production, it is expected that increased irrigation will be required to compensate for the predicted reduced rainfall and maintain the current production.

3.3 Natural Disasters
As most other Caribbean islands, Grenada is very vulnerable to natural disasters. The National Water Policy highlights the lack of planning for mitigation of natural disasters and climate change,
and the need to adopt measures to reduce vulnerability to them. Hurricane Ivan, which struck the island in 2004, is estimated to have caused over USD 900 million in damages, followed by Hurricane Emily in 2005 which caused an additional USD 107.5 million loss (GoG, 2007c). According to a damage assessment conducted by the Organisation of Eastern Caribbean States (OECS, 2004), 89% of the housing was affected by the hurricane. In rural areas, the agricultural sector was particularly affected, with the majority of the damage occurring in the parish of St. Andrew. The main export crops (nutmeg, cocoa and banana) all suffered extreme losses. Although natural disasters affect the entire population, poor women who head large households were particularly vulnerable to the economic effects of the hurricanes. Hurricane Ivan had limited impacts on the water sector due to the limited rainfall, and water supply was restored within three weeks of the hurricane; on the other hand, Hurricane Emily had a greater impact on water distribution infrastructure as a result of flash flooding events (World Bank, 2005). The main impact on water supply was however not due to damage to water infrastructure itself, but rather to the electricity grid. Watershed degradation brought about by Hurricane Ivan did increase the vulnerability to flash flooding and the resulting siltation of water intakes and damage to water pipes during Hurricane Emily (World Bank, 2005). Increasingly in the Caribbean, community-based Early Flood Warning Systems are being adopted as part of the prevention and mitigation measure for natural disasters.

3.4 Rainwater Harvesting
Although Rainwater Harvesting (RWH) is commonly practiced on the islands of Carriacou and Petit Martinique, providing almost 100% of the demand, it is much less widespread on the main island of Grenada where it has become less common following the expansion of NAWASA’s distribution system on the island (Caribbean Environmental Health Institute [CEHI], 2006). The effects of Hurricanes Ivan and Emily in 2004 and 2005 were more severe in mainland Grenada as compared to its two sister islands Carriacou and Petit Martinique, where rainwater harvesting allowed to meet water demand despite disruptions in water supply and landslides associated with the hurricanes. Both Carriacou and Petit Martinique have a long established culture of RWH; this is not the case in Grenada, which is likely due to the relative abundance of streams and underground springs.

Following from this, CEHI has established a regional RWH programme for the Caribbean under UNEP’s global initiative to promote RWH, with a national pilot programme in Grenada (CEHI, 2006). The programme is envisioned to become a major component of Grenada’s IWRM Plan and adaptive programme to climate change once fully developed. The programme consists of four main components:

- Awareness raising on RWH for the general public and policy makers
- Capacity building (individual and institutional levels)
- Governance (legislation and policy formulation) – integration of RWH within the national IWRM plan
- Infrastructural development

At the regional scale, there has been a recent move away from traditional RWH methods in the Caribbean towards modern technologies such as desalination and deep-well abstraction, which rely on centralized management, wide distribution networks, and significant financial investments. RWH represents a less financially strenuous option and its potential to enhance water security following natural disasters is especially relevant for the Caribbean region (CEHI, 2006).
3.5 Cartagena Convention and Protocol on Land-Based Sources of Pollution (LBS Protocol)

The CWS is closely related to the wider objectives of the LBS Protocol, which promotes the protection of the marine environment from land-based sources of pollution through the formulation of a National Programme of Action (NPA). At the regional level in the Caribbean, the NPA principles are articulated in the Cartagena Convention. Although a signatory to the Cartagena Convention, Grenada has yet to ratify the LBS Protocol specifically. Nonetheless, the GEF-IWCAM project recently facilitated a workshop on LBS Awareness and Implementation in St. George's, Grenada, on April 6-7, 2009, to assist the country in its deliberations relating to the ratification of the LBS Protocol. Examples of issues to be addressed by the NPA and that relate to CARIWIN's objectives include:

- Food security and poverty alleviation; public health, ecosystem health and biological diversity; economic and social benefits and uses including cultural values
- Sources of contamination (sewage, persistent organic pollutants, radioactive substances, heavy metals, oils, nutrients, sediment and litter)
- Habitat modification and destruction
- Sources of degradation (point and nonpoint sources, atmospheric deposition)
- Vulnerable areas (critical habitats, endangered species, shorelines, coastal watersheds, protected areas, small islands)

3.6 Watershed Management

Upstream/downstream interactions are particularly relevant in the dry season, when there have been reports of downstream supply being affected by damming of watercourses by upland farmers. The Catchment Management and Poverty Alleviation (CAMP) project funded by the UK Department for International Development used case studies in Grenada to examine the relationships between catchment management, ecosystem services and livelihoods, using the Concord River and Annandale catchments as case studies. The project originated from the goal to protect upland watersheds identified in the Forest Management strategy articulated by the Grenada Department of Forestry. The CAMP project particularly focused on the potential of compensation schemes to ensure water quality. Natural erosion has been exacerbated over the years by land use change from forestry to farming, leading to increased dam sedimentation and pollution where NAWASA abstracts water (Jackson et al., 2004). Compensation schemes are seen as one way to fund good upstream farming practices with the savings from downstream water treatment costs. Applications of compensation mechanisms have also been suggested for the creation of buffer strips in riparian areas, which would allow to cover the cost for the farmer associated with the loss of farm income from the buffer zone.

Within the Ministry of Agriculture, the Forestry Division is responsible for the protection of water catchment areas while irrigation falls under the Agronomy Division. Land degradation and poor management practices are particularly relevant in small islands as they tend to increase the severity of the impacts of natural disasters such as erosion and siltation of rivers and coastal areas (GoG, 2007c). Given the steep topography of the island, farming of bananas and vegetables is particularly problematic for erosion and sediment loading (GoG, 2001). Similarly, forest destruction has led to concerns over the level of water that can now be supported by aquifers.
Finally, at a more local level, the 2001 IWCAM study on water resources in Grenada (GoG, 2001) reports a general lack of community initiatives in watershed management. Among the main gaps noted were public awareness/education and the recognition of gender issues in watershed management.

### 3.7 Key Water Management Challenges in Grenada

Despite improvements in the reliability of water supply in Grenada, concerns remain over pollution, turbidity, shortages during the dry season, water storage capacity and distribution infrastructure (Krishnarayan, 2002). In addition to increased demand for irrigation, water demand is expected to increase due to population growth and expansion of the tourism sector. Some of the main challenges for watershed management on the island include (GoG, 2001; Jackson et al., 2004; Krishnarayan, 2002):

- Agro-chemical pollutants and sediment draining into surface water dams, leading to increased soil erosion and contamination of groundwater sources
- General downturn in agriculture, and associated abandonment particularly of banana farms. While this may lead to a reduction of pollution issues, it is also reported to be associated with a neglect of the maintenance of infrastructure (e.g. drains) that support soil and water conservation. However, extension workers also suggested that the adoption of soil and water conservation practices is lower under these conditions.
- Expansion of residential areas and tourism (hotels) in the South has led to deforestation, sedimentation and pollution, and is leading to increased water demand
- Poor land use practices (e.g. farming close to the banks or on steep slopes, ploughing every year for peanut production)
- Limited data on watershed management, associated with inadequate information reliability and quality control (although the creation of a National Water Information System (NWIS) aims to address these concerns)
- Microbial contamination of drinking water, particularly associated with storage and intermittent water supply
- Lack of measures for disaster preparedness and mitigation (floods and droughts)
- Direct and indirect discharge of wastewatert
- Overpumping of lakes during the dry season
- Heavy sediment load due to deforestation and resulting erosion, and associated inefficient dams (much of the available land for farming is on steep slopes, which is prone to erosion and runoff)
- Unplanned land use and development, land tenure rights, loss of tree cover for housing at lower elevations
- Nutrient and sediment loading of coastal areas due land-based activities and associated degradation of coastal ecosystems (mangroves, coral reefs, sea grass beds)
- Poor sanitation and waste disposal practices persist despite effort to raise awareness by the Ministry of Health and the Environment
- Although groundwater represents only a small portion of the island’s water supply, saltwater intrusion is an important issue on the island as several wells are within 100m of the coastline (GoG, 2001)
4. Vision for CARIWIN and the CWS in Grenada

4.1 Aim & Principles of a CWS

A Community Water Strategy defines the process to identify relevant water management challenges at the community level and outlines an appropriate management plan to address them. The framework used to develop the CWS should be as inclusive as possible of a variety of applications relevant to the Caribbean context, including water supply and sanitation, watershed management, agricultural practices, environmental sustainability, rainwater harvesting, and flood and drought management.

Literature on community water management and examples of case studies are detailed more fully in CARIWIN's reference document *Community Water Strategies: A Framework for Implementation* (available online at [http://www.mcgill.ca/cariwin/2009/cwsseminar/](http://www.mcgill.ca/cariwin/2009/cwsseminar/)). In this document, five key summary points are suggested from the literature/experiences reviewed as essential building blocks for a CWS:

- **Integration**: A CWS involves identifying and prioritising problems, and developing specific plans to address them. Inherent to this however is the recognition that the different uses of water and the various water-related problems are interconnected and require an integrated approach. Most importantly, this involves acknowledging that good water management practices can only be achieved by considering the broader context that affect them (e.g. economic sustainability).

- **Ownership and accountability**: The participatory process fosters the development of a sense of ownership in the community, which is essential for long-term commitment. A clear definition of roles and responsibilities combined with accountability mechanisms throughout the process are essential to ensure an adequate balance between ownership and external support.

- **Capacity and empowerment**: A CWS involves the development of plans to address existing water-related problems, but most importantly it aims to build the capacity of the community to respond to future water issues in an adaptive manner. Given that a variety of new responsibilities are required from the community for the establishment of a CWS, capacity building elements are needed at every step of the process.

- **Transparency and information**: Equal access to information prevents power inequalities. Information flow within the community contributes to awareness-raising, while information sharing with outside actors will ensure alignment across scales and a stronger support environment.

- **Adaptation and flexibility**: The emphasis on assessment, monitoring, and knowledge sharing is important for the cyclical nature of the process. The CWS is not a rigid framework and should allow adaptation to changing conditions.
Elements to consider as part of a CWS, which are all described more fully in the document referred to above, are outlined in the table below:

<table>
<thead>
<tr>
<th>Phases</th>
<th>Components</th>
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| A. Assessment | A1. Stakeholder analysis  
|            | A2. Socio-economic context  
|            | A3. Governance framework  
|            | A4. Environmental assessment  
|            | A5. Information management  
|            | A6. Awareness-raising  |
| B. Planning | B1. Priority setting  
|            | B2. Detailed plan development  
|            | B3. Creation/reform of decision-making body  
|            | B4. Definition of roles & responsibilities  
|            | B5. Enabling environment  
|            | B6. Financing & cost recovery  
|            | B7. Conflict management  |
| C. Implementation | C1. Plan implementation  
|            | C2. Process monitoring and documentation  
|            | C3. Information sharing & communications  |
| D. Monitoring | D1. Development of indicators  
|            | D2. Monitoring system  
|            | D3. Sharing & learning  |

4.2 Indicators
Monitoring indicators are required at every step of the development of a CWS, and form the basis for identifying the needs and keeping track of the progress towards them. The Global Environment Facility (GEF) has established a framework for the development of indicators as part of its International Waters Project (Duda, 2002; CEHI/GEF-IWCAM, 2008). This framework has been used, among others, in IWCAM projects and in the development of Water Safety Plans. Indicators are divided in three main categories, which provide a useful framework for CARIWIN's pilots communities:

- **Process indicators** are a measure of the progress of project activities, including inputs and outputs of goods, physical structures, and services, including elements such as capacity and human resource development and stakeholder involvement. They demonstrate actual, on-the-ground institutional and political progress, and assist in tracking the reforms necessary to bring about change. Examples include: formation and documentation of a steering committee, adoption of a monitoring and evaluation plan that includes all 3 types of indicators.

- **Stress reduction indicators** reflect specific on-the-ground measures implemented to address a particular issue or problem. In contrast to process indicators which highlight...
needed reforms or programs, stress reduction indicators represent actions that have occurred. Examples include: non-point source pollution programs implemented, amount of eroded land stabilized by tree planting, protected areas designated.

- **Environmental status indicators** measure the actual performance or success in restoring or protecting a targeted water body, and reflect changes in measures of water quality. These can be combined with social indicators in order to measure whether communities and stakeholders benefit from the changes in environmental conditions. Examples include: improved ecological or biological indices, changes in local community income and social conditions as a result of improvements in environmental conditions, improved hydrologic balance as a result of reforestation.

### 4.3 Pilot Community: Great River watershed

The Great River watershed is located on the eastern side of the island in the parish of St. Andrew and empties directly to the coast. It is the largest watershed on the island with a surface area of 11,167 acres and feeds a major natural reservoir of volcanic origin, Grand Etang (Geoghegan et al., 2003). Upland portions of the watershed falls within the Grand Etang protected area.

Target areas for the CWS will vary on a case-to-case basis and their identification forms part of the process for the development of a CWS. Nonetheless, four broad focus areas and associated tools, which may vary in their importance for each of the three CARIWIN pilot communities, have been identified to guide this process. On the next two pages, these potential target areas are summarised along with a list of stakeholders that may be relevant to support the development of a CWS in Grenada.
Potential Target Areas of the CWS

1) Water Supply and drinking water contamination
The Water Safety Plan (WSP) methodology was developed by the WHO as an approach to ensure the safety of water supply. The approach builds on principles of prevention, multiple barriers, and risk assessment and management, where a WSP is defined as "a comprehensive risk assessment approach that encompasses all aspects of a drinking water supply, from catchment to consumers, to consistently ensure the safety of drinking water supplies" (Bartram et al., 2009). Underpinning the WSP approach is also the recognition of the catchment dimension of water supply, and implications for adequate watershed management and source water protection (WHO, 2008). A WSP requires the identification of risks, their prioritisation, and the establishment of controls to manage them (Day, 2009).

Although literature on WSPs for small community water supplies is still relatively scarce, especially in developing countries, the approach is slowly being integrated in a number of small community water projects (e.g. Day 2009; NHRMC, 2005). WHO (2008) identifies three core issues of a WSP in a small community water supply system: source water protection, treatment, and prevention of contamination during distribution, storage and handling. In response to these issues, the International Small Community Water Supply Network (SCWSN) was formed to focus on the specific needs of WSPs in small communities, particularly in rural areas. The Network is currently working on the development of a Draft WSP Manual for application in communities. In the context of CARIWIN’s pilot communities however, the WSP framework could be applicable at various scales; a WSP may be developed for the entire Great River watershed, for individual small community water supplies within the watershed, or for specific water technologies/sources within communities (e.g. rainwater tanks).

2) Extreme climatic mitigation
A focus on the importance of strengthening community disaster management is now emerging in Grenada and elsewhere in the Caribbean. For example, the Caribbean Disaster Management Project Phase-2, a project implemented by the Caribbean Disaster Emergency Response Strategy (CDEMA) with funds from the Japan International Cooperation Agency (JICA), aims to implement pilot projects in community-based early flood warning systems in five countries, including Grenada. Disaster preparedness and Early Flood Warning Systems are a priority issue at the national level and the National Disaster Management Agency (NaDMA) is already active in the Great River Watershed working on an Early Flood Warning System project in collaboration with JICA.

3) Ecosystem Degradation
Land use practices, land degradation, natural disasters and water quality are recurring issues in a number of initiatives mentioned above, including the LBS Protocol, watershed management efforts and the mitigation of natural disasters. The GEF-IWCAM environmental status and stress-reduction indicators provide a useful framework to assess and monitor improvements in hillside erosion, sediment loading, establishment of buffer zones, etc. The water quality test kit purchased by CARIWIN would also allow for the monitoring of a number of environmental indicators, including temperature, pH, dissolved oxygen, and total dissolved solids.

4) Governance & Capacity Building
The geographic scale of the pilot area in Grenada is still unclear as to whether a specific community within the Great River watershed will be targeted, or the entire watershed. This component of the CWS would involve the development of strategies to engage stakeholders, which may include the formation of a participatory body at the community or watershed levels. Supporting programmes may also include awareness raising and training in areas such as community involvement, monitoring, and information management.
### Relevant stakeholders to support the development of the CWS

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Main Activities</th>
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<tbody>
<tr>
<td><strong>Authorities</strong></td>
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<tr>
<td>National Water and Sewerage Authority (NAWASA)</td>
<td>Primary abstractor; water supply; granting of licenses for private abstraction; water quality monitoring</td>
</tr>
<tr>
<td>Environmental Health Department (Ministry of Health and Environment)</td>
<td>Waste disposal; water quality monitoring; sanitation</td>
</tr>
<tr>
<td>Ministry of Agriculture (Land Use Division; Department of Forestry and National Parks; Department of Fisheries; Agricultural Extension Division; Irrigation Unit)</td>
<td>Agricultural land use planning and zoning; hydrological studies; mapping; management of forest resources; oversight of NAWASA and water management; watershed management</td>
</tr>
<tr>
<td>National Science and Technology Council</td>
<td>Educational and socio-economic development through environment-related projects</td>
</tr>
<tr>
<td>National Disaster Management Agency (NaDMA)</td>
<td>Natural disasters; Flood Early Warning Systems</td>
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<tr>
<td>Ministry of Works Environment Division</td>
<td>Infrastructure</td>
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<tr>
<td>Grenada Board of Tourism</td>
<td>Tourism development</td>
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<tr>
<td><strong>Civil Society</strong></td>
<td></td>
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<tr>
<td>Agency for Rural Transformation (ART)</td>
<td>Sustainable development of rural communities, empowerment, capacity building</td>
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<tr>
<td>Caribbean Youth Environmental Network (CYEN)</td>
<td>Empowerment of young people and communities in relation to socio-economic and environmental issues</td>
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<tr>
<td>Grenada Community Development Agency (GRENCODA)</td>
<td>Rural development initiatives, with focus on small farmers, women and youth (western side of Grenada)</td>
</tr>
<tr>
<td>Grenada Sustainable Development Council</td>
<td>Primary mechanism for coordination and information exchange in the implementation of sustainable development plans, public awareness; advisory role</td>
</tr>
<tr>
<td>GRENED (Grenada Education and Development Programme)</td>
<td>Education in rural communities; sustainable development; emphasis on women and youth</td>
</tr>
<tr>
<td>GRENROP (Grenada Network of Rural Women Producers)</td>
<td>Sustainable livelihoods; rural development; gender</td>
</tr>
</tbody>
</table>
References


