Promoting Rainwater Harvesting in the Caribbean

Project Support by the United Nations Environment Programme

Executed by the
Caribbean Environmental Health Institute (CEHI)

Regional Strategic Planning Workshop Proceedings

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Abbreviations and Acronyms

APUA	**Antigua Public Utilities Authority**
BVI	**British Virgin Islands**
BWA	**Barbados Water Authority**
CBWMP	**Caribbean Basin Water Management Programme**
CDB	**Caribbean Development Bank**
CEHI	**Caribbean Environmental Health Institute**
CEHO	**Chief Environmental Health Officer**
CSD	**Commission on Sustainable Development**
CWSA	**Central Water and Sewage Authority**
CWWA	**Caribbean Water and Waste Water Association**
EHD	**Environmental Health Department**
FAO	**Food and Agricultural Organisation**
GIPE	**Grenada Institute of Professional Engineers**
GoG	**Government of Grenada**
GWP	**Global Water Partnership**
IICA	**Inter-American Institute for Corporation in Agriculture**
IWCAM	**Integrating Watershed and Coastal Areas Management in Caribbean SIDS**
IWRM	**Integrated Water Resource Management**
MACC	**Mainstream Adaptation to Climate Change**
MCPMA	**Ministry of Carriacou and Petite Martinique Affairs**
MGDs	**Millennium Development Goals**
MoHSD	**Ministry of Health and Social Development of the BVI**
NRM	**Natural Resource Management**
PA	**Public Awareness**
POA	**Programme of Action**
RCU	**Regional Coordinating Unit of UNEP**
RWH	**Rainwater Harvesting**
SIDS	**Small Island Developing States**
UNDP	**United Nations Development Programme**
UNEP	**United Nations Environment Programme**
USD	**United States Dollars**
WASCO	**Water and Sewage Company of St. Lucia**
WRA	**Water Resources Authority**
WQM	**Water Quality Monitoring**
WRM	**Water Resources Management**

Introduction and Background

Water is a finite and limited resource required for all aspects of life. The definitive limit is nowhere more experienced than in Small Island Developing States (SIDS), which are surrounded by saltwater from the ocean, with limited catchment areas for rainfall and little storage capacity on land. This has led to regular water shortages signaling permanent water stressed conditions. Many SIDS now have reduced water quality as a result of unsustainable life patterns. The situation is worsened by the frequent natural disasters such as hurricanes and floods which destroy infrastructure and cause massive damage to the environment. The Caribbean region has the least water available per capita compared to other SIDS regions. It is therefore important to promote the use of 'non conventional' water resources and in particular rainwater harvesting (RWH) in SIDS.

A study on Water, Climate Change and Health (CEHI, 2003) indicated that change in rainfall patterns associated with climate change may cause more severe and longer droughts, limiting stream flow and reservoir storage, or may increase flooding and inundation. This is paired with the additional consideration that sea level rise may cause saltwater intrusion into coastal aquifers and impair the water quality of shallow freshwater lenses, which are important sources for public water supplies. Increased frequency of floods and drought during the dry seasons, respectively, are inevitable features of climate variability. The implications for health and potable waters supplies are already discernible. In 2002, there was an increase in the number of gastro-intestinal diseases in children in Jamaica, directly related to freshwater supplies (Ministry of Health, Jamaica). Also, in 2002 a study conducted in Cuba showed that as a result of Climate Change, there was an increase of 137,378 acute diarrhoeal cases and a corresponding increase of USD 1, 196, 000 in health care cost (World Bank, 2002). In the region RWH is an important means of securing a potable source of freshwater and can retard the propagation of some of the health impacts of climate change and climate variability.

RWH (**Appendix 1**) is a simple and low cost water supply technology that has been practised for thousands of years. Despite its advantages, this technology is not widely used in SIDS. Many countries have not included rainwater harvesting in integrated water resources management (IWRM) plans and/or water polices as has been done for ground and surface water. As a result, minimal funds are allocated towards RWH. Inadequate awareness, skills and knowledge among citizens and their governments also contribute to the poor allocation of resources. Because of this, there is inadequate capacity to undertake rainwater harvesting activities.

The thirteenth session of the Commission on Sustainable Development (CSD 13) which focused on water policy called for the use of rainwater harvesting to meet water demand and for the development of capacities in rainwater harvesting in accordance with the countries' needs involving all stakeholders in particular women, youth and local communities.

The United Nations Environment Programme (UNEP) has embarked on a global initiative to promote the use of RWH. It has implemented projects in Asia, Africa and the Pacific SIDS. Within this framework, UNEP has also facilitated the formation of the Global Rainwater

Partnership. UNEP is further extending the initiative to the Caribbean to promote RWH, using lessons learnt from other areas especially from the Pacific SIDS. Grenada was chosen as the pilot country and among a number of activities conducted was the development of a National RWH Strategy and Programme.

The purpose of this Regional Workshop was to develop a Draft Regional RWH Strategy for replicating RWH as a viable water supply augmentation measure throughout the region. The lessons learnt from the promotion of RWH in Grenada were used to inform the Draft Strategy.

Experts in the field of water resource management (WRM) from the region as well as regional and international agencies involved in aspects of RWH were invited to the Regional Strategic Planning Workshop for RWH. This Workshop, took place in the British Virgin Islands and was attended by 22 persons representing WRM agencies and water utilities, as well as sector representatives and international agencies in the region

Regrets were received by the following: the UNDP GEF-Small Grants Programme for the OECS, the Water Resources Agency of Trinidad and Tobago, the Water Resources Agency of Jamaica, IICA, the Water Utilities of St. Kitts and Nevis and the Bahamas, the CWWA and UNEP CAR RCU

Figure 1: Participants at the Close of Regional RWH Planning Workshop

Opening Ceremony

The Opening Ceremony (**Agenda Appendix 2**) was chaired by Ms. Rosalie Adams Permanent Secretary, Ministry of Health and Social Development (MoHSD), BVI.

In her remarks she noted the following:

- RWH is the main form of freshwater supply in the BVI;
- RWH is used in the agriculture sector;
- The method of collection has improved considerably over the years from crude utensils such as buckets and oil drums to cisterns;
- Pollution of the water supply is an issue;
- There is a need to improve the water filtration and purification system;
- Clean and pure water will assist in healthy living in the region.

She expressed a keen interest in the Project and said that she looked forward to promoting RWH in the BVI and the region with the support of the Project and CEHI.

The Programme Director, Mrs. Patricia Aquing delivered remarks (**Appendix 3**) on behalf of CEHI and gave some background of the work of CEHI especially as it focuses on Water. She indicated that the RWH Project started at the end of September 2005 and expressed thanks to the United Nations Environment Programme and to the staff of CEHI and regional partners who collaborated on the Project. The work throughout the region to promote RWH as a viable water supply augmentation complements the Global Environment Facility Integrated Coastal Area and Watershed Management (GEF-IWCAM) Project. She closed by thanking the host country BVI and indicated that the programme will benefit all Member States and the rest of the region.

Mr. Carnel Smith, Chief Environmental Health Officer (CEHO) of the MoHSD, BVI gave remarks on behalf of the host country. He noted the following:

- The practice of RWH is imbedded in the history of mankind;
- Cisterns evolved in BVI to optimize the water storage capacity through RWH;
- Municipal RWH systems only started in the early 80s;
- It is mandatory for individual/households in the BVI to have RWH systems;
- Conservation of water is an important issue;
- The prevention and control of extraneous matter entering the storage system is important;
- The Environmental Health Department (EHD) plays a major role in monitoring of RWH systems with special focus on schools and institutions;
- Water quality is important and is a special area of focus of the EHD;
- The challenge for the region is the monitoring and control of atmospheric pollution and holistic management of the environment.

He concluded by wishing everyone a pleasant stay in BVI and looked forward to the workshop providing knowledge to enhance the RWH systems in the BVI and the region.

Remarks (**Appendix 4**) by the UNEP-RCU focal point Mr. Christopher Corbin was given in absentia by Dr. Christopher Cox, Senior Programme Officer of CEHI. He made special mention of Agenda 21 and the Johannesburg Plan of Implementation which all called for an Integrated Water Resources Management (IWRM) approach. The UNEP CEHI collaboration for the execution of the Caribbean component of the RWH Project, the choice of Grenada as the Pilot Country and objectives of the Project were also noted.

In closing, Ms. Adams wished everyone a productive Workshop and indicated that she was looking forward to the recommendations of the meeting.

Working Session

Workshop Day One Proceedings

The Working session (**Appendix 5 Agenda**) began with the introduction of participants (**Appendix 6**) followed by presentations on the Project Background (**Appendix 7**) by Mrs. Patricia Aquing.

Her presentation noted the importance of the RWH Project with respect to:

- The Millennium Development Goals (MGDs) which aims to reduce by half the number of the world's poorest people who do not have access to safe drinking water by 2015;
- The Small Island Development States (SIDS) Programme of Action and Mauritius 2005 Declaration which indicated that access to safe drinking water, promotion of sanitation and hygiene are among the priorities for small island developing States;
- The 13th Session of the Commission on Sustainable Development (CSD) which called for the development of capacities in RWH;
- Economic, environmental and social considerations of SIDS;
- Water resources in SIDS;
- Need to promote and develop RWH;
- Water related initiatives in SIDS;

She concluded her presentation by outlining the various components of the Project and the progress made in its execution.

Dr. Christopher Cox outlined of the objectives of the workshop which was basically to: *Develop a Regional Programme and Strategy for RWH*.

These were to:

1. Apprise participants about the RWH initiative
2. Present the findings of the Needs Assessment in RWH conducted in Grenada
3. Present the products of the Project (such as the maps, brochures and posters) for review

4. Determine the elements of a Regional Strategy for RWH in the Caribbean and
5. Share information, views and experiences on RWH among participants

Agency Presentations

(1) Food and Agriculture Organisation

The first agency presentation (**Appendix 8**) was made by Dr. Lystra Fletcher-Paul, Integrated Natural Resource Officer, Food and Agricultural Organisation of the United Nations (UN-FAO). Highlights of the presentation included:

- Project on RWH for irrigation in St. Kitts in collaboration with the Brace Centre for Water Resources Management;
- Collaboration with the Caribbean Development Bank (CDB) for technical assistance to build capacity in water harvesting in the Caribbean;
- CARICOM/CARIFORM Regional Food Security Project;
- The need for collaboration with CEHI to improve RWH especially in the agricultural sector.
- The FAO has produced a video on RWH related to cropping

Points of discussion:

NAWASA: The need for countries to address RWH in the context of National Integrated Water Resources Management (IWRM) and for National Water Plans. Further, that this should be done within an integrated planning approach.

FAO: The islands of the region need to consider a differential pricing system for water, based on competing needs, such as water for irrigation and for human consumption.

APUA, Antigua: The policy of water allocation giving priority to domestic use is to the disadvantage of the farmer but there is a need for farmers to practice conservation measures. It was noted that there are problems with backwater runoff from excessive use of irrigation water (with agro-chemicals and sediment) contaminating the reservoirs used for potable supply. This is a challenge for the Water Utilities and education is important in dealing with this issue.

MCPMA, Grenada: There is a need to educate the farmers in drip irrigation techniques as a conservation measure.

GWP-C: Enforcement of the law is a problem within the countries. Crop scheduling and type of irrigation methods are important factors that must be considered by farmers.

FAO: The issue is that in most of the countries, farmers do not pay for the water used in irrigation and there is no monitoring of water use, which leads to wastage. In the case of Jamaica for instance, which has a National Irrigation Company, farmers get an irrigation bill at the end of the month so there is pressure on them to use it wisely.

CWSA, St. Vincent: In St. Vincent, the Irrigation Management Authority was established in 1994/95 with the objective of provision of water (from the potable system) for irrigation of bananas. The provision of water for vegetable farming is being done, however this water is to be used only for post-harvest processing, not for irrigation. These farmers are metered; they pay the same rate as domestic users.

BWA: The problem is institutional in that there is diverse institutional responsibility for WRM in the countries. Water resources in Trinidad, Barbados and St. Vincent are managed by the Water Utilities. Unaccounted for water is an issue and this needs to be addressed, since the very agencies who are charged with managing water are often accused of wasting it.

(2) United Nations Development Programme

Mr. Ottis Joslyn of United Nations Development Programme (UNDP) and World Bank Project on Mainstreaming for Adaptation to Climate Change (MACC) gave a presentation (**Appendix 9**) on Vulnerability and Capacity Assessment (VCA). This assessment was previously done on a static approach. However in a revised approach, social and environmental aspects are now included. He highlighted:

- VCAs for countries;
- The aim, goals and objectives of the VCAs;
- VCA methodology, process and outputs;
- Disaster situation, preparedness and water resources management.

Points of discussion:

CEHI: The VCA uses an ecosystem approach as opposed to a sector approach. How are the two aspects related with respect to the needs identified by sectors such as agriculture and tourism in the Caribbean?

UNDP: Even though the ecosystem approach is being used, the climate impacts are felt at the community level first and foremost. Water resources data on rain days and volume of water generated can be generated for use by communities.

APUA, Antigua: Rainfall in the region is uncertain. Is there a way of correlating the pattern of rainfall and drought and predicting when the major drought periods are likely?

UNDP: Information is currently requested from countries to do climate modeling for the 30 years. The daily rainfall will give a generic model which can be superimposed on El Nino and La Nina events. This will give some indication as to the extended wet and dry periods.

NAWASA: For the last 2-3 years, Grenada experienced extended dry seasons with the month of March having good rainfall. Is this trend consistent with the climate model study?

UNDP: Climate variability is making prediction difficult and causes problems for the agricultural sector and the choice of crops. Agro-meteorology is practised in Belize to assist farmers.

CEHI: The UNDP/MACC presentation points to the need for information generated within MACC Project to be packaged and made available to various users in a manner that it will be useful for decision-making and direct interventions.

(3) Global Water Partnership - Caribbean

The Global Water Partnership – Caribbean (GWP) represented by Mrs. Marilyn Crichlow, made a presentation on their initiatives in RWH. The GWP is also in the process of executing a Project to Develop a Model for RWH in the Caribbean with special emphasis on poor communities. The main deliverable is a model to be adopted within each island that will act as a toolkit for the territories. This model will be developed based on experiences in the Caribbean and the result of work done in water resources management.

IWRM and RWH programme planning - Discussion

An open discussion on IWRM and RWH was conducted facilitated by CEHI. The session involved a presentation of the status of IWRM and IWRM initiatives in the respective countries. The IWRM should speak to all elements of management instruments in terms of optimizing supply and managing demand, creating the enabling environment and institutional framework.

The following points were given for consideration:

- Lack of IWRM approach which is constantly identified as a challenge;
- Need to find entry point for RWH in IWRM at the regional level;
- Institutional arrangements to deal with WRM is advanced in Jamaica;
- Need to get the impression on IWRM and RWH from a national standpoint.

Figure 2: Participants discussing RWH at the National Level

Barbados

- There is an income tax rebate for minimum capacity water storage devices;
- The incentive is a blanket one and does not make allowances for the type of house or the location;
- Mechanism was not built-in to quantify storage and thus the amount of rainwater stored can not be determined;
- Barbados has 99% coverage of water supply and 90% get water on a continuous basis hence, RHW may be hard to sell as a supply augmentation;
- There is a need to review the legislation and provisions and modify to allow for flexibility;
- Some roof materials may not be suitable as catchments where the water is used for drinking and additional treatment may be required.

St. Lucia

- RWH is practised in rural areas;
- Currently the demand for water has outstripped the ability of WASCO to supply;
- The south of the island is particularly problematic with numerous small surface water sources which do not produce water in the dry season;
- RWH can be promoted since WASCO cannot meet demand;
- The water sector is presently under reform; the new Water and Sewage Act (2005) makes provision for a Water Resources Authority (WRA) within the Ministry of Agriculture (MOA) with a mandate for management;
- Licenses will be required for abstraction and supply of water;
- RWH is not restricted to the household level;
- Applying RWH to sectors can ease the stress on the municipal supply;
- The model of selling wastewater to hotels for irrigation can be used.

Antigua and Barbuda

- RWH is a historical practice and is promoted since the islands suffer from drought periods;
- In the rainy season, RWH systems complements the public supply at the household level;
- In the dry season, the public supply becomes additionally stressed due to the added volumes of water needed to fill the capacity existing for RWH;
- Houses have to be inspected to prevent backflow into the public distribution network since there are problems with contamination: check valves malfunction and this poses a challenge in managing RWH systems;
- Available RWH systems need to be managed;
- RWH catchments cost about EC$3 per gallon; (US$1= EC$2.7)
- Desalinated water cost about EC$ 5 – 6) per gallon;

- Surface water cost about EC$2 -3 per gallon;
- The Town and Country Planning Act requires onsite storage for housing developments;
- Where there is pipe-borne water, 4000 gallons per bedroom is required;
- In the rainy season the total freshwater demand is 5 - 6 million gallons per day (mgd); this demand increases to 9 mgd during the drought periods, which coincides with the tourist season, thereby placing stress on the public supply.

Grenada Carriacou and Petite Martinique

- On the mainland Grenada, RWH is not part of the management of water resources;
- It has the potential to be an important source of freshwater supplies, although deep well ground water exploitation is also being considered;
- Incorporation of RWH as an augmentation strategy is possible;
- There is an issue of cross-contamination where the RWH system and the public supply is providing freshwater to households; water quality becomes an issue which may have legal implications;
- In Carriacou and Petite Martinique where RWH is practiced on a continuous basis, treatment of the water is done chemically by the use of chlorination and biologically by the use of fish. Schools have large catchments and provide water to neighbouring communities;
- On the mainland Grenada, RWH is practised in areas where the public supply is intermittent;
- Proposed bed rock drilling for freshwater may not be able to address water shortage in areas where the pipe distribution network is inadequate.

British Virgin Islands

- Householders are mandated by law to build a cistern;
- RWH supply 90% of the population with potable water;
- The size of the cistern is determined by the Town and Country Planning Department;
- Most hotels use desalination plants;
- Non-toxic roofing materials are used as the catchment (roof sealants must not contain lead and asphalt shingles are being phased out);
- Contamination of the stored water from detritus and other organic matter is the biggest concern;
- A study is needed on chlorination and possible implications for health;
- The 1972 Building Guidelines propose 1000 gallons of water storage capacity per 100 square feet of floor area;
- Currently about 1 million gallons of rainwater is stored in cisterns on the island;
- Storm water runoff is also collected and stored for irrigation purposes;
- Retention ponds from the runoff also supply social amenities such as swimming pools;

Jamaica

- The public water supply system is presently serving 72% of the population;

- Due to topography and competition for water, the Water Utilities can only attain a maximum coverage of 85%;
- RWH systems are common in areas where there is no reliable public supply;
- In rural areas, small scale rural water development companies (registered as Benevolent Societies) are established;
- The lack of potable water is known to delay the development of housing areas;
- Provision of a minimum standard of 100 litres potable water per capita per day is used for the approval of developments in low rainfall areas (230 litres/person/day is the standard normally applied);
- Reclaimed lands from abandoned bauxite plants are used to establish housing areas with RWH systems being the source of potable water;
- Post- Hurricane Ivan, RWH systems were used in institutions;
- Community members are empowered to operate and maintain RWH systems;
- The Environmental Health Department (EHD) educates persons in RWH systems and sanitation;
- Routine water quality monitoring (WQM) is done for these areas;
- EHD regulates the design and materials for the RWH systems;
- Water Resources Authority (WRA) is responsible for the management, protection, and monitoring of groundwater resources;
- The Authority recommends the establishment of RWH systems especially in areas of rural water supplies. The Authority can play a significant role in promotion of RWH. The WRA is presently working with a hotel in St. Ann in a RWH application;
- The Water Resources Master Plan is to be completed and can be used for management purposes.

St. Vincent and the Grenadines

- 95% of the island have access to the public water supply;
- 92% of the consumers are metered;
- A WRA responsible for the management of the water resources will be established in the near future;
- RWH is practised on the mainland St. Vincent where topography precludes accessing the public supply;
- RWH is a common practice in the Grenadines.

Points of Discussion:

BWA: RWH is the singular aspect of water resource management in some places such as Carriacou and there is a need for a clear definition of what constitutes RWH. The parameters could be unclear and this has implications from a legal standpoint. Additionally, in Barbados RWH is viewed as a backward step and this can have implications for the promotion of the practice. However, RWH can fit into a risk management approach.

FAO: The question was whether the RWH Project was UNEP driven or country driven?

CEHI: The UNEP global Work Programme is presented at the annual UNEP Council of which Caribbean countries are Members. Once the Work Programme is approved by countries, then UNEP undertakes to leverage resources and to implement the Programme. Given CEHI's experience and mandate for water resources management in the region it was determined to be most appropriate agency for executing the Project on behalf of Caribbean Member States.

MCPMA, Grenada: The Project is seen as an opportunity to formalize what is taking place in Carriacou for decades. Hurricane Ivan emphasised the need for RWH and having adequate water stored.

APUA, Antigua: Antigua's water demands ranges between 5 to 6 million gallons per day during non-drought periods and 9 million gallons per day in drought periods. A large proportion of the country's supply comes from the sea (desal) or well sources. Desal water is relatively expensive at EC$ 5 to EC$6 per 1,000 gallons as compared to EC$1.60 to EC$2.75 per 1,000 gallons for conventional sources. According to the Town and Country Planning Act all dwellings must be built with facilities to contain at least 3 to 4 days storage based on the house size. In general for each gallon of storage, EC$3.00 needs to be invested in the cistern construction. The general guide is 4,000 gallons for each bedroom. All hotels practice RWH.

Antigua's experience during the last 5 hurricanes that hit the island demonstrated that RWH is a necessary practice.

Synopsis of Grenada Pilot

A presentation (**Appendix 10**) was made by Lyndon Robertson Senior Programme Officer, CEHI on the Project activities conducted in the Pilot Country Grenada. This included:

- Collaboration with the Project partners;
- Data collection from Institutions ;
- Community data collection in Grenada, Carriacou and Petite Martinique;
- Findings of the Institutions and Community surveys;
- Way forward for RWH in Grenada, Carriacou and Petite Martinique and the region.

Points of Discussion

The choice of Grenada as the pilot country was discussed and rationalized by four factors:

- The effects of Hurricane Ivan demonstrated the vulnerability of the public water supply and elucidated the importance of alternate source augmentation;

- Grenada and the sister islands represent a broad range of water issues faced by the rest of the Caribbean and is therefore ideal for use as a the pilot;
- Disparity in water availability and scarcity between Grenada and Grenadines islands offer opportunity to learn and examine the issues and formulate solutions and interventions that will serve to bridge the gap with augmentation options;

- Learning from the diverse range of experiences in Grenada, Carriacou and Petite Martinique acquired while addressing freshwater augmentation challenges provided an opportunity to benefit other Member States.

The discussion session also covered the need for the pilot country and the way forward for RWH. The main elements identified and elaborated were:

- Policy and incentives for RWH in Grenada, Carriacou and Petite Martinique;
- A programme for the protection, monitoring and treatment of RWH systems;
- Provision to the less fortunate households in the acquisition of RWH systems;
- Refurbishment of selected communal cisterns;
- Propagating ongoing initiatives such as RWH and food security programme;
- Putting emphasis on public awareness programmes for RWH at the national and regional levels;
- Regional policy planning for RWH;
- Involvement of NGOs and other private sector agencies;
- Accessing RWH equipment and supplies.

BWA: Questioned the driving force to realizing a regional approach to RWH.

CEHI: Response: A regional approach can achieve economies of scale in some aspects, for example in the preparation of public awareness products and harmonizing the IWRM process in the context of integrating RWH.

Jamaica: Desalination is expensive and RWH has to be viewed as an alternative to avoid or offset costly investment in desalination.

FAO: Asked whether the project originated from a ground-swell of public concern.

CEHI (response): The project originated from a UNEP global initiative via the UNEP Council which is constituted by country representatives.

BWA: The regional approach to developing a strategy for RWH can be well-founded in disaster mitigation.

GIS Mapping and RWH Harvesting

Targeting zones for RWH implementation using GIS mapping of water availability was conducted for the pilot country Grenada. The methodology used, finding and limitations of the model were presented (**Appendix 11**) by Dr. Christopher Cox of CEHI. The following were highlighted:

- The model is based on evapo-transpiration rates;
- Spatial distribution of rainfall stations in Grenada was relatively good;
- Rainfall data used to model spatial and temporal variability in wet and dry periods;
- Areas and times where there is a net deficit in water availability were determined;
- Further geological observations needed to verify the evapo-transpiration model.

The participants noted that this can be a significant planning tool once verification in the field is used to determine the level of accuracy.

Workshop Day 2 Proceedings

Regional Programme for RWH (Appendix 12)

The session on the development of the Draft Regional RWH programme was facilitated by Dr. Cox and Mrs. Aquing. A Logical Framework Process was followed:

- A step by step review of the Draft National Programme for the State of Grenada which was used as the template;

- Review of the national template for Grenada with a view to expansion and modification into a Regional template;

- Formulating the regional programme for appropriateness and applicability so that it can be adopted and readily incorporated into national RWH programmes.

The regional RWH programme is divided into 4 components:

A. Public Awareness;

B. Capacity Building;

C. Legislative and Policy Component;

D. Infrastructure Development Component.

These components and their corresponding sub-components (**Appendix 12**) were outlined and the justifications were given.

Points of Discussion:

A. Public Awareness

WASCO St. Lucia: The experiences of WASCO have shown that technologically based public awareness (PA) programmes such as websites were not very effective. It was found that there was a need to identify target groups depending on areas of focus and acquiring key information such as literacy level and number of households with computers. There is also a need for traditional community related activities as well as the more modern or technologically based activities.

CEHI: A targeted approach has to be use and segmentation of the target audience is necessary in order to develop the appropriate message and to determine the best medium for its delivery. A generic programme for the countries will use scoping exercises to determine the preferred mode of communication. The "public" is used in the broadest sense and includes those at the highest level of policy and decision-making as well as the "grass roots". Cultural differences exist between the islands and the regional template has to be tailored for the specific State and community levels.

MoH Jamaica: A programme for communal water supply systems in Jamaica failed due to the absence of ownership. A strategy of establishing Community Water Supply companies and Benevolent Societies and educating them in water management issues was used. Responsibility was given to persons to manage the water supply systems and arrangement for revenue collection was made. Community representatives were also empowered to enforce management measures. This Jamaican experience can form a model for Governance for communal RWH systems and the dissemination in the region of best practice is important.

WASCO St. Lucia: Sensitization of the policy makers is necessary. The allocation of resource is based on political will. In many cases, there is too much concentration on technical issues and technicians and not enough focus on the political directorate.

The other sub-components of the Public Awareness item were deliberated and adjusted to ensure they conform to what was deemed most applicable to the regional setting. This led to the modification of the objectives, results and Objectively Verifiable Indicators (OVIs) based on consensus.

B. Capacity Building

CEHI: This component included various levels of training as well as institutional capacity building.

WASCO, St. Lucia: There should be emphasis on the development of capacity of regional institutions to act as a resource base for RWH. Educational institutions should be engaged and involved, as well as the governmental and non-governmental national agencies. In this regard, when a regional programme is fully developed, it will address the allocation of responsibilities for optimum delivery of the activities

APUA, Antigua: Countries need assistance in developing water policies.

CEHI: Water availability and water resource management is becoming an increasingly important issue worldwide and in the region. It is on regional and international agendas. The Prime Minister of Trinidad and Tobago recently noted that water has to be on the political agenda of the Caribbean region.

C. Legislative and Policy Component

CEHI: This section looks at the legislative and policy component that need to be harmonized for a fit throughout the region. Incentive schemes such as the St. Lucia Tourism Incentive Act and the tax rebate for RWH systems in Barbados are examples of initiatives to build on.

APUA, Antigua: In Antigua, hotels are conscious of the need for water conservation since the water cost XCD 50 per 1000 gallons and have employed innovative measures to achieve such. Cisterns cost about 6% of the house and there is a need for Government to consider offsetting some of that cost with a reduction on property tax.

WASCO, St. Lucia: In St. Lucia the hotel sector is a good candidate to work with due to limited water supply in the dry season. Trucking of water can be a substantial cost. Promoting RWH in terms of policy and legislation will be attractive incentives for adoption of the practice.

CEHI: The question was raised as to whether the development of a regional model policy and legislation which countries can then adapt to their own needs is a worthwhile approach

APUA, Antigua: The OECS Solid and Ship Generated Waste Management Project is a good example and so is Cricket World Cup 2007. RWH and water reuse can be used to develop similar regional models.

CEHI: Under the CEHI/UNEP/UNDP/GEF IWCAM Project, there is a component for assisting countries to develop IWRM and Water Safety Plans. Since CEHI is leading this component, it will ensure that RWH is included in these plans.

APUA, Antigua: CEHI should convince Ministers of Health to have the model for RWH developed and funding sourced.

CEHI: It was indicated that CEHI would undertake to use the political process of CARICOM to promote the RWH Strategy at the highest level in the region. This would involve country level endorsement of the key stakeholders and then presentations to the CARICOM Council for Human and Social Development (COHSOD) as well as the Council for Trade and Economic Development (COTED which covers the Environment). Once approved, this would facilitate resource mobilization for programme implementation.

BWA: Water Governance is an important issue and should be clearly included as part of the Legislative and Policy Component.

UNDP: Rainwater management is needed under the Legislative component. Governance can be included in the management.

CEHI: Water Governance is a key issue that has emerged internationally as need special focus, the case in point being the EU Water Facility which is funding programmes in this area.

D. Infrastructure Development

BWA: Improving the potability of water can only be obtained from improving the raw water quality and improving the design and sanitation of the storage system.

APUA, Antigua: There is a need to invest in the development of and use of disinfection methods for cisterns. Simple charts needed to verify the level of disinfection that is applicable at the household level.

WASCO: There is a need for emphasis on quality issues especially in the dry season.

MCPMA, Grenada: In Carriacou there is emphasis on the disinfection of water in RWH systems in public buildings. These systems have significant storage and are used as community supplies during the drier periods. Normally these cisterns are partitioned to separate the water used by the community from that used by the premises.

CEHI: Exchange visits and technical cooperation among countries should be promoted as a means of learning from the practical experiences of what the various territories are doing.

FAO: The RWH Project is important and further justification can be that it supports water security during post disaster recovery.

APUA, Antigua: Most of the water distribution systems in the islands are outdated and in a state of disrepair. This is further compounded by natural disasters when the network can be disrupted for extended periods. RWH is therefore important for fulfilling the water demand under these situations.

Definition of RWH

APUA, Antigua: There is concern of the cross-connection of the RWH system with the municipal supply which impacts on the quality of the water in the distribution systems. This suggests that there is a need to establish a definition of what constitute a RWH system.

A discussion was held on the definition which included aspects such as: structural components, management, regulatory, anthropogenicity, geographic scope, applications, and social factors. Finally, adhering to the official definition of RWH: The capture and storage of rainwater for uses in many applications which can be domestic, agricultural or other purposes, was proposed and accepted.

CEHI: Rather than redefine RWH there is a need to consider the scope and issues of the programme that will be developed which will be referenced against these issues for completeness.

Promoting RWH in the Region

Propagating the RWH initiative in the Caribbean will require actions to be taken at the regional and national levels. Suggestions for promoting RWH at the regional level were given by participants in their capacity as regional water resources experts:

- A website for the capture and dissemination of best practices in RWH can be an important tool for the region;
- The toolkit to be developed by GWP could be included as a component and other public awareness and technical materials can also be made available;
- Toolkit can be used as a guidance including technical aspects such as design of RWH systems and selection of pumps;
- Manufacturers of RWH supplies and equipment can contribute to the upkeep of the website;
- The school feeding, school gardening programme initiated by the FAO can be used to promote RWH;
- Collaboration with the Government Information Systems of the respective territories can assist with the airing of the Public Awareness programmes for RWH;
- Target school children in promoting RWH in the region;
- Ministry of Health should be given responsibility for enforcement and monitoring;
- CEHI should monitor the level of success of RWH programme by a survey which can be done jointly with a marketing survey conducted by private companies;
- The plan for identification of target groups and measurement of the effectiveness of the FAO's Food Security Project can be used to support the focus of the RWH Project;
- CEHI should enter negotiations with Caribbean Basin Water Management Programme (CBWMP) to include RWH as a component of the certification system;
- The competent agency in RWH in the region should be determined and this agency should be responsible for providing technical assistance; CEHI has a regional mandate for water.
- There is a need to build capacity within agencies and develop a skills bank to provide technical assistance in RWH to territories;
- Income tax incentives and water conservation programmes can be grouped together for the provision of incentives for RWH;
- In water-scarce States, commercial establishments can be given tax concessions for the harvesting and distribution of rainwater;
- RWH may need to be harmonized with the municipal system;
- Harmonization should be from a legislative and engineering standpoint;
- Where the municipal and RWH systems run parallel there should be an attempt to integrate the two;

- The potential of cross-contamination of the municipal supplies through backflow is critical, and prevention of cross-contamination should be considered under the RWH Project;
- The utilities should be responsible for meeting and enforcing cross-connection standards;
- Water quality, engineering and legal issues should be detailed in the national plans;
- Appropriate models for RWH based on research and development should be devised;
- Resource mobilization is needed for the promotion of the RWH programme in the region and collaboration between agencies for the execution of various components may be necessary;
- Alternative approach is to get the approval of Member States and seek funding to continue the Project;
- The draft regional programme will be submitted to agencies for their input and will be distributed to key stakeholders and collaborating agencies;
- The RWH Project should do an update of the UNEP (1996) Water Augmentation Handbook.

Way Forward

The participant agreed that RWH was a viable and appropriate water augmentation measure in the region. Furthermore, the Regional Programme and Strategy for RWH is a vital element in the promotion and for getting buy-in into the practice. In discussions on the way forward for RWH in the region, the following were noted:

- The draft regional RWH Programme will be presented to UNEP and once approved will be distributed to participants and key agencies and other stakeholders;
- The Programme will be modified based on feedback and will be finalized before implementation;
- The IWRM programme of the IWCAM will most likely be launched within the year and will provide an opportunity to promote RWH in the region;
- Funding and political support should be sought to promote RWH in the region;
- CWWA should be involved in promoting the RWH programme;
- Collaboration between agencies for RWH in the region is necessary;
- Planning and finance personnel should be sensitized and involved in RWH initiatives in the region;
- The regional programme should stress water quality issues.

Closing Ceremony

Closing remarks were made by the Deputy PS Mrs. Ritzia Turnbull-Smith (**Figure 3**) in the Ministry of Health and Social Development of the BVI.

The Workshop was closed with remarks by the Mrs. Aquing (**Figure 4**) on behalf of CEHI and UNEP. She thanked everyone for their participation and for taking the time to contribute to this important initiative. The host country BVI was also thanked for its hospitality.

The participant's evaluation form is included as **Appendix 13** while the results are summarized in **Appendix 14**.

Figure 4: Deputy PS Ritzia Turnbull-Smith Delivering Closing Remarks

Figure 5: Programme Director Mrs. Patricia Aquing Delivering Closing Remarks

Appendices

Appendix 1: Overview of RWH and the Hydrological Cycle

Rainwater Harvesting

RWH has been around from ancient times and is basically a technology used for collecting and storing rainwater from a catchment which can be rooftops, the land surface, rock or paved areas. It can be used at the household or communal levels for the provision of water for all domestic purposes. Alternatively, it can be used to complement the public supply in municipal areas finding applications in non consumptive uses. Other uses in agriculture and construction are common in the third world and SIDS. A typical RWH system for a single household domestic use is shown in **Figure 1.2.1**.

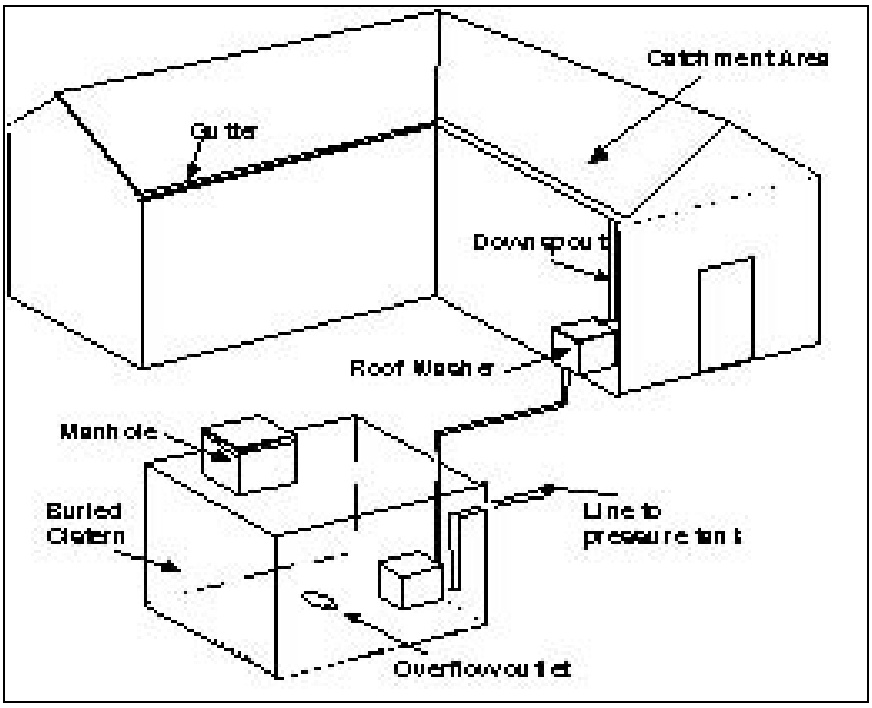

Figure 1.2.1: Typical Single Household RWH System (Source: Rupp, 199**7)**

The RWH system consists of four main elements which are:

- The catchment which is commonly a roof surface or pavement. Generally, smooth materials made of inert substances are used to reduce the level of contamination. Water that is used for drinking should not be collected from roofs covered with asphalt shingles or coated with lead or metallic paints.

- The storage device which is a tank optionally situated on the surface or underneath the ground. The required storage capacity should be calculated to take into consideration the length of any dry spells, the amount of rainfall and the per capita water consumption rate. Precaution required for the use of storage tanks include the provision of an adequate enclosure to minimise contamination from human, animal or other environmental contaminants and properly covered to prevent algal growth and the breeding of

mosquitoes. The cistern inlet and outlet should be designed to minimize the stirring of the solids settled at the tank bottom, and the tank should include a manhole, a vent, a cleanout sump and an overflow pipe.

- The conveyance system is required to transfer the rainwater collected on the rooftops to the storage tanks. This is usually created by making connections to one or more down-pipes connected to the roof gutters. The gutters need to be sloped at least 1/16 inch per foot of run and the downspout should be sized to provide at least one square inch of opening per 100 square feet of roof area (Rupp, 1997). The down pipe opening provides a suitable location for the installation of filtering devices to preclude solids from entering the tank. Sharp bends should be avoided, with cleanout recommended where horizontal run exceed 100 feet (Rupp, 1997).

- The distribution system. This can be simply a container to extract the water from the storage tank, a pipe functioning solely as an outlet or a network of pipes serving a single or multiple households. In most cases, where affordable, small pumps are used to transmit the water throughout the internal plumbing of the house.

The system described above in its simplest form can be complemented by a host of other devices and measures in the design of the system or treatment of the water to ensure quality is maintained. This can include the fitting of filters, first flush gutters, designing of the storage facility, tank inlet and outlet configurations, disinfection, vector control and overflow management.

The Hydrological Cycle

The essential elements of the hydrological cycle are shown in **Figure 1.2.2**. The hydrologic cycle begins with the evaporation of water; largely from the surface of the ocean. As moist air is lifted, it cools and water vapor condenses to form clouds. Moisture is transported around the globe until it returns to the surface as precipitation. Once the water reaches the ground, one of following processes may occur:

1) Some of the water may evaporate back into the atmosphere

2) The water may penetrate the surface and become groundwater that either seeps its way into the oceans, rivers, and streams, or is released back into the atmosphere through transpiration.

3) The rest of the water runs off the land surface and empties into lakes, rivers and streams and is carried back to the oceans, where the cycle begins again.

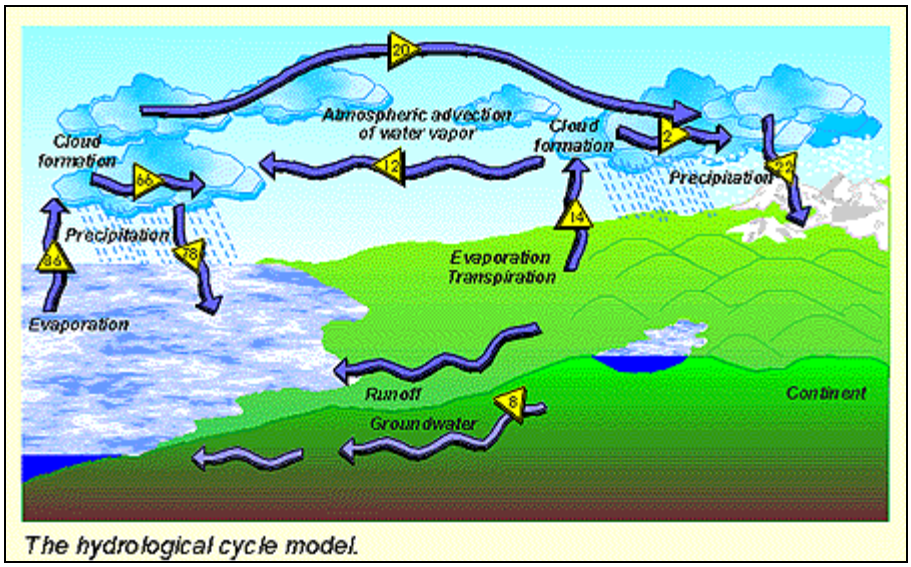

Figure 1.2.2: The Hydrological Cycle (Source: www.aquatic.uoguelph.ca/ general/page34.htm)

This hydrological cycle is the means by which the rainwater harvested is generated and made available as a result of precipitation which transfers the water from the atmosphere back to the earth surface. This is the reason why rainwater harvesting is sometimes referred to as harvesting the heavens.

Appendix 2: Opening Ceremony Agenda

Regional Workshop to Develop a Strategy for Rainwater Harvesting in the Caribbean

Tortola, BVI
March 28 & 29, 2006

Opening Ceremony Agenda

Chairperson
Ms. Rosalie Adams
P.S, Ministry of Health

Opening Remarks
Mrs. Patricia Aquing
Programme Director, CEHI

Remarks
Ms. Rosalie Adams
P.S, Ministry of Heath

Remarks (in absentia)
Mr. Christopher Corbin AMEP
Programme Officer, UNEP

Closing Remarks
Ms. Rosalie Adams
P.S, Ministry of Health

Appendix 3: Remarks by Programme Director of CEHI

Remarks of Patricia Aquing, CEHI
at
Regional Rainwater Harvesting Strategy Workshop
Tortola, British Virgin Islands
March 28 and 29 2006

1. **Salutations: Permanent Secretary, Ministry of Health, Ms. Rosalie Adams; other Permanent Secretaries (here I recognize Ms. Bernadette Lendore-Sylvester, Permanent Secretary, Ministry of Cariacou and Petite Martinique Affairs, Grenada) ; invited guests; Officials of the Ministry of Health and other Government Ministries; participants; colleagues; members of the media; ladies & gentlemen**

It gives me great pleasure to be able to address you all this morning, especially here in the British Virgin Islands on the lovely island of Tortola. The BVI is a valued Member State of the Caribbean Environmental Health Institute (CEHI) and we think that it is both strategic and timely to be conducting this Workshop on Rainwater Harvesting. I am sure that there is much to learn from your own experiences in this area and from which the rest of the Caribbean can benefit. This is my first visit and I don't think it will be my last!

I would like to thank first of all the Ministry of Health, through you Madame Permanent Secretary, for agreeing to host this Meeting. We have had very good support from Ms. Diane Liburd in organizing the logistics of the meeting and acting as your liaison. I would also ask that you please convey my best wishes to your Minister the Honourable Ronnie W. Skelton. CEHI and the BVI go back a long way, as we say. One of your colleagues, Dr. Clyde Lettsome, who I understand is on study leave, has been a regular participant at our training events and seminars. In 2003, we facilitated some work on a mould problem in one of your Government facilities. I know that the Water and Sewage Department has expressed an interest in capacity building in Quality Assurance and Quality Control in Water Quality for its laboratory. We will be following up on this.

Before I traveled here, I did some digging into the archives and I saw where in 1995, a number of you present today participated in a Workshop on Water Resources Augmentation organized by the OAS, and in which Rainwater Harvesting was considered. One of those persons was Mr. Gary Penn from your Water Department. Dr Henry Smith of the University of the USVI and Mr. John Mwansa of the Barbados Water Authority are also present with us. Mr. Vincent Sweeney, our Executive Director also participated in that Workshop in his capacity as Sanitary Engineer

For those of you who do not know much about us, CEHI is an organization that represents the entire Caribbean Community, stretching from Bahamas to Guyana and across to Belize. We therefore represent the BVI, as well as the rest of CARICOM. We were set up by Member Governments to provide technical and advisory services in all areas of environmental management, including environmental health. We emerged out of a growing concern among Caribbean Governments of the vital importance of the environment and our human health to the

well-being and future development of our region. This recognition, articulated in the 1970s and acted upon in the 1980s, resulted in CEHI's creation. We provide technical and advisory services to 16 Member States currently, in a broad range of areas, including laboratory services, engineering, scientific, information, research, and project development. Our Work is guided by Ministerial mandates and regional priorities such as the Programme of Action for Small Island States (SIDS/POA) which was endorsed by Ministers of Environment; also the Caribbean Cooperation in Health, Phase II (CCH II), which is now entering Phase III. The Sub-Priority for EH has designated CEHI as the lead agency. The CCH II is being defined with the input of the countries. Much of our work has had to do with water and waste management.

We have linkages with a number of regional and international partners. I recognize a representative of the UNDP, the Caribbean arm of the Global Water Partnership.

I must explain a bit about how we became involved in this initiative in water supply augmentation. In this specific instance, we were contacted by colleagues at UNEP in Nairobi, initially to participate in an International Rainwater Partnership. Having agreed to participate, we were later asked to also help develop a Project focusing on raising awareness in relation to rainwater harvesting. We started the Project in September 2005 and as such we have had a very short window of time to implement a number of activities. More details will come later in the Workshop but the Project consists of several elements.

Its focuses on conducting a pilot on the Island State of Grenada, including Carriacou and Petit Martinique some of the activities we have been doing:

1. Conduct A needs assessment on RWH in Grenada
2. Organise 3 district workshops in Grenada to initiate dialogue with the communities and local authorities;
3. Prepare a rainwater harvesting programme for Grenada based on the needs identified using knowledge acquired at the regional training workshop in consultation with the Government of Grenada.
4. Print 600 brochures and 100 sets of posters for distribution in Grenada and Caribbean SIDS.
5. Develop and print 20 sets of GIS maps indicating potential rainwater harvesting areas in Grenada.
6. Develop a TV and radio documentary
7. Prepare the draft regional RWH programme

Most of these activities have been going on simultaneously and we have had to do all of this between September and now. This phase of the Project closes at the end of this week.

Here I want to give credit to my two colleagues, Mr. Lyndon Roberston and Dr. Christopher Cox our Senior Programme Officers and Technical Specialists. We also had excellent support from the Authorities in Grenada, such as the Ministry of Health, NAWASA (Mr. Allan Neptune), community groups on Carriacou and Petit Martinique and private individuals such as Mr. Alphonsus Daniel, who is here with us today.

This project complements nicely a number of other initiatives at CEHI. These include the GEF initiative on "*Integrating Watershed & Coastal Area Management in Caribbean SIDS*" (IWCAM). That initiative, estimated to provide US$14M in grant funding for the region is our "flagship" project. We will soon be starting a programme for the development of Integrated Water Resources Management (IWRM) and Water Safety Plans totaling close to US$1.2M.

We are also implementing a project development phase or PDF –B funded by the GEF for a Sustainable Land Management project, involving 8 CEHI Member States. We just recently completed a study for UNESCO, looking at desalination in the region and in April (next month) we will be convening a small Experts Group to discuss regional issues on Desalination.

CEHI is excited by this Project which we hope to develop further by getting it on the regional agenda and implementing it on a regional scale, funding permitting. We see this as critical, given that the Caribbean is one of the most water-stressed regions among SIDS and we have to look now, and as a matter of urgency, at the various means of augmentation of our water resources. We are susceptible given our island vulnerabilities such as to climate variability, small land space, pollution and contamination of our water sources, just to mention some aspects.

We are therefore extremely grateful for your participation and the benefit of your expertise.

We look forward to a successful Workshop and Project. Thank you.

Appendix 4: Remarks by UNEP

Regional Workshop to Develop a Strategy for Rainwater Harvesting in the Caribbean

Tortola, BVI
28th – 29th March 2006

Welcome Remarks

Christopher Corbin
AMEP Programme Officer
UNEP CAR/RCU
Kingston, JAMAICA

Good Morning

Please accept my apologies for being unable to be here in person at this important workshop. Unfortunately, prior meeting and travel commitments made it impossible for me to be with you.

Both Agenda 21 and the Johannesburg Plan of Implementation (JPOI) have called for the integrated water resources management (IWRM) approach for managing water. Although rainwater harvesting is a low cost and highly decentralized technique, enabling individuals to manage their own water, it has often not been included in the development of water policies. This is particularly the case in many developing countries including Caribbean SIDS.

The United Nations Environment Programme (UNEP) is especially pleased to have teamed up with the Caribbean Environmental Health Institute (CEHI), one of the region's leading regional institutions, to promote the use of rainwater harvesting (RWH) in the region.

UNEP has been implementing similar pilot projects in Asia, Africa and the Pacific. The importance of extending this initiative to the Caribbean, through CEHI, and using the lessons learnt from other areas, especially from the Pacific Small Island Developing States (SIDS) is very significant.

The recent devastating effects of hurricanes Ivan and Emily on Grenada with the resulting impact on water availability and quality, and sanitation again highlighted the extreme vulnerability of Caribbean SIDS. The opportunity to conduct pilot activities in Grenada was important to illustrate how RHW can be used to augment water supply and the matching sanitation facilities after a natural disaster.

Our four key objectives for rain water harvesting are:

- To promote the mainstreaming of rainwater harvesting into water policies and strategies in particular the integrated water resources management (IWRM) at global, regional and national levels.
- To promote implementation of rainwater harvesting as part of IWRM.
- To encourage governments and their development partners to allocate human and financial resources for implementing rainwater harvesting. and
- To promote the effective cooperation between different institutions and networks involved in rainwater harvesting

It is hoped that the results of this pilot project will promote the mainstreaming of rainwater harvesting through a regional strategy so that it is taken as part of water resources in line with the principles of IWRM. Now is an opportune time as countries are at various stages of preparing their IWRM plans which were supposed to have been completed in 2005 in line with JPOI.

Your active participation, comment and feedback will be an essential ingredient to enable the proposed programme to be modified and customized for other Caribbean countries.

In conclusion, I am happy to recognize the important link between this pilot project and the GEF funded Integrated Watershed and Coastal Area Management Project (IWCAM) being co-executed by Caribbean Regional Coordinating Unit of UNEP (UNEP CAR/RCU) and CEHI. This project which will benefit all 13 Caribbean SIDS has as one of its objectives the development of Integrated Water Resources Management Plans.

Finally, the Caribbean Environment Programme (CEP) of UNEP recommits itself during this year, our 25th anniversary year, to continue to work with all our partners and most of all with Regional Governments towards the effective implementation of the Cartagena Convention and its Protocols. We stand ready to respond to the emerging global environmental challenges, and at the same time to provide practical and cost effective solutions to national and regional needs and priorities.

I wish you success in your upcoming discussions.

Thank you

Appendix 5: Working Session Agenda

Caribbean Environmental Health Institute

UNEP/CEHI Project on Promoting Rainwater Harvesting in the Caribbean

Regional Strategic Planning Workshop

Prospect Reef Resort
28 and 29th March, 2006

Day One

Time	Agenda Item	Presenter
9:00 – 9:30	Opening Ceremony	
9:30 – 9:40	Introduction of participants	
9:40 – 10:00	***Refreshments***	
10:00 – 10:15	Objectives of the Workshop	Chris Cox, CEHI
10:15 – 10:30	Background on Initiative Rainwater Harvesting Global Partnership	Patricia Aquing, CEHI
10:30 – 11:30	Technical Agency presentations on related programmes	FAO/IICA/UNDP/CAST
11:30 – 12:30	IWRM and RWH programme planning • Key considerations • Status of IWRM planning in Caribbean	Facilitated CEHI
12:30 – 1:30	***Lunch***	
1:30 – 2:15	Synopsis of Grenada Pilot initiative • Findings of National Assessment • National Workshop Outcomes • National Programme for RWH in Grenada	Lyndon Robertson, CEHI
2:15 – 2:30	Discussion on critical success factors to sustainability - Grenada pilot	Facilitated CEHI
2:30 – 3:00	GIS mapping of water availability – targeting zones for RWH implementation	Christopher Cox, CEHI
3:00 – 3:30	Discussion – application to wider Caribbean	Facilitated CEHI
3:30 – 3:45	***Refreshments/RWH Video Presentation***	
3:45 – 4:30	Day 2 planning for working session Developing a Regional RWH Programme	Facilitated CEHI

Day Two

Time	Agenda Item	Presenter
9:00 – 9:20	Summary of previous day's proceedings	Facilitated CEHI
9:20 – 10:30	**Working Session** Regional RWH Programme Development • Core elements • Objectives	Facilitated CEHI
10:30 – 10:45	***Refreshments***	
	Working Session Regional RWH Programme Development • OVIs • Indicative Costing	
12:30 – 1:30	***Lunch***	
1:30 – 3:00	**Working Session (cont'd)** • Core elements • Objectives • OVIs • Indicative Costing	Facilitated CEHI
3:00 – 3:15	***Refreshments***	
3:15 – 3:45	Review of Working Session	Facilitated CEHI
3:45 – 4:00	Closing Remarks, Way Forward	CEHI

Appendix 6: Regional Workshop to Develop a Strategy for Rainwater Harvesting in the Caribbean - PARTICIPANTS LIST

Tortola BVI, March 28-29, 2006

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Appendix 7: Project Background Presentation

Rainwater Harvesting in the Caribbean:
Regional Strategic Planning Workshop
28 to 29th March 2006
Tortola, BVI

RWH Background and Context

- Millenium Development Goals (MDGs) adopted by 191 Member countries of the United Nations at the World Summit on Sustainable Development (WSSD) South Africa 2002

- To reduce by half the number of the world's poorest people who do not have access to safe drinking water by the year 2015

Background and Context

- **Review of the Implementation of the Barbados Programme of Action for Small Island Developing States (SIDS/POA), Mauritius 2005**

-Access to safe water, the provision of sanitation and the promotion of hygiene are the foundations of human dignity, public health and economic and social development and are among the priorities for small island developing States.

Background and Context

- The 13th Session of the Commission on Sustainable Development (CSD 13)

Water policy: the use of RWH to meet water demand and for the development of capacities in RWH in accordance with the countries' needs involving all stakeholders in particular women, youth and local communities.

UNEP Initiative

- To promote the use of RWH.
- Implemented projects in Asia, Africa and the Pacific SIDS.
- UNEP extending the initiative to the Caribbean to promote the lessons learnt from other areas especially from the Pacific SIDS.
- UNEP facilitated the formation of the Global Rainwater Partnership. CEHI is a member

Economic Characteristics of SIDS

- Small population size
- Extreme economic openness
- Narrow resource base
- Limitations in volume and range of production factors
- Small size of domestic markets
- High per capita cost of installing and maintaining infrastructure
- Excessive transport and transshipment costs
- Low capacity for risk absorption

Environmental Characteristics

- Relatively limited surface areas
- Limited natural resources base (arable land, freshwater, mineral resources, conventional energy sources)
- Greater sensitivity to natural disasters (typhoons, hurricanes, cyclones, earthquakes, volcanoes)
- Isolation from mainlands, all of which contribute to the vulnerability of their water resources
- The impact of the surrounding sea more pronounced for small islands than for large islands and mainlands

Social Characteristics

- High population densities
- Limited human resource capacity
- Limited institutional capacity
- Increased consumption rates due to population growth
- Geographically dispersed settlements
- Vulnerability to external shocks
- Susceptibility to "brain drain"
- Underdeveloped public and private sectors

Water Resources in SIDS

- One-third of the population has no access to safe drinking water.
- Unsustainable land resource management has compromised the quality of water resources
- The geomorphology of the Caribbean islands limits the availability of freshwater reserves; relatively small landmass areas; typical mountainous terrain
- Frequent natural disasters (hurricanes and floods) exacerbated by human activity compromise water supply systems for extended periods
- Impact of CC/CV on water regime in SIDs constitutes an additional threat to water security.

Why RWH?

- Rainwater harvesting (RWH) practised for more then 4,000 years
- Only source of fresh water to many communities (located away from potable water distribution infrastructure)
- Increasing pressures on limited conventional reserves, RWH has tremendous potential in the Caribbean, (household, commercial purpose, agriculture, tourism)
- RWH has been improved with the introduction of simple technologies

Why RWH?

- RWH a simple and low-cost water supply technology; generally easy to install and maintain.
- RWH declining use in Caribbean SIDS that traditionally relied on RWH as central systems service more communities.
- Many countries have not included rainwater harvesting in IWRM plans
- Little commitment to investment in the practice in many islands

Water Related Initiatives in SIDS

- Joint Programme of Action for Water for Caribbean & Pacific SIDS (WWF3, Kyoto 2003) SOPAC and CEHI
- Project on Integrating Watershed and Coastal Area Management in Caribbean SIDS (IWCAM) GEF/CEHI/UNEP/UNDP (IWRM and Water Safety Plans)
- Mainstreaming and Adaptation to Climate Change in the Caribbean (MACC) World Bank and CARICOM

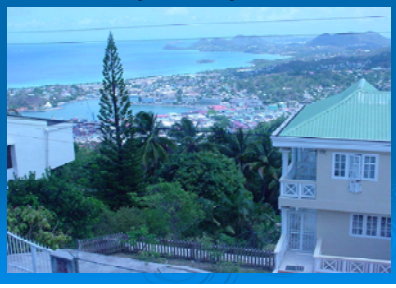
Water Related Initiatives in SIDS

- Project on Integrated Water Resources Management for Pacific SIDS (GEF PDF SOPAC) linked to IWCAM
- Preventing Land Degradation in Caribbean SIDS through Sustainable Land Management (GEF PDF/ CEHI)
- LDC SIDS Portfolio Approach for Capacity Development and Mainstreaming of Sustainable Land Management (re UNCCD) GEF/UNDP

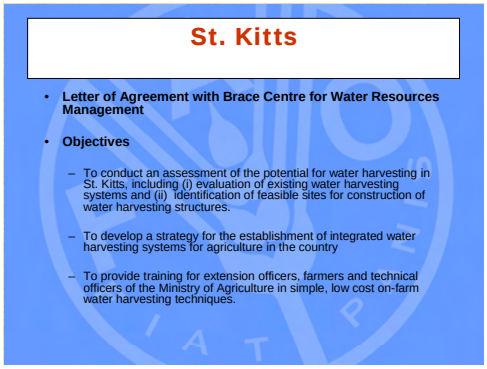
RWH Project Components

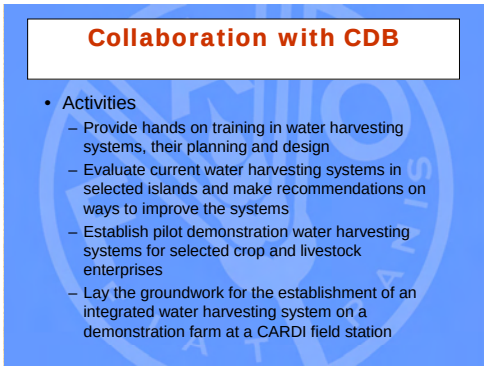
- Conduct A needs assessment on RWH in Grenada
- Organise 3 district workshops in Grenada to initiate dialogue with the communities and local authorities;
- Prepare a rainwater harvesting programme for Grenada based on the needs identified using knowledge acquired at the regional training workshop in consultation with the Government of Grenada.
- Print 600 brochures and 100 sets of posters for distribution in Grenada and Caribbean SIDS.
- Develop and print 20 sets of GIS maps indicating potential rainwater harvesting areas in Grenada.
- Develop a TV and radio documentary
- Prepare the draft regional RWH programme

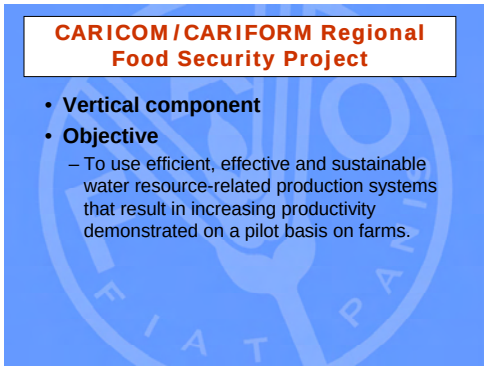
Thank you for your time



Appendix 8: FAO's Presentation on Related Programmes







Appendix 9: UNDP/MACC Presentation on VCA and Water Resources Management

Vulnerability and Capacity Assessment: UNDP CRMI & MACC Project

2nd National Communications and VCA Workshop
St. Vincent and the Grenadines

Ottis Joslyn
VCA consultant
UNDP CRMI

Overview of the VCA methodology

- Allows for developing an integrated, dynamic approach for Vulnerability and capacity assessments for climatic risks in the Caribbean
- Focus areas are, but not limited to, Agriculture, Tourism and Water Resources
- Method embedded in coupled end-goals of MACC

MACC's Goals

- To develop usable decision support information and tools to assist civic and business leaders in making critical decisions to mitigate climate hazards in regions of high consequence
- To develop a cadre of climate impacts personnel as a source for CARICOM governments

Goal of the VCA methodology

- Provide a practical approach to vulnerability and adaptive capacity assessment
  - cognizant of recent advances in the field
  - building on past efforts and interventions in the Caribbean region

Aim of the VCA methodology

- To present a structured approach to climate vulnerability assessment of the Caribbean region

Objective of the VCA methodology

- To adapt and advance vulnerability assessment methods that explicitly incorporates uncertainty and risk into system performance, technology assessment and investment strategies

Special Emphasis of the VCA Methodology

- Integrated approach to climate risk assessment and management
- Linking existing responses on extremes and variability to adapting to climate change
- Documenting impacts and responses to changes that are already occurring
- Linking community, national and regional indicators (cross scales and multiple stress indicators)
- Incorporating the dynamic nature of vulnerability – linking risk and vulnerability assessments through a political ecology system's approach
- Explicit uncertainty characterization: technical and societal
- Identification of entry points into decision processes and models
- Developing focus and usable information product processes and inputs specifically linked to sub-regional climate-sensitive program decision making needs

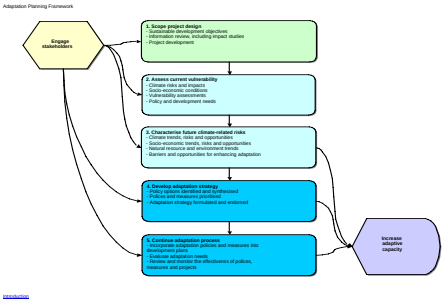
Outputs of the VCA methodology

- To instruct selected assessments team members in applying successfully approaches for assessing climatic risks in the focus areas identified and to integrate these under a common framework/protocol
- To develop cross-sectoral teams
- Provide the foundation for teams to carry out assessments under MACC guidance over a three-year period
- To recommend effective pathways for the implementation of goals & objectives of existing /planned integrated coastal zone and watershed management programs in the context of climate change and climate variability

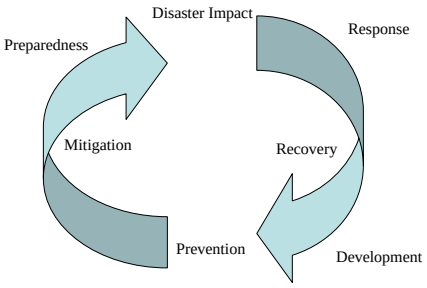
Outputs of the VCA methodology cont'd

- It provides for multi-sector and multi-agency coordination through sharing of resources to enhance response & networking to facilitate access to the communities to inform local coping capacity
- To provide a practical approach cognizant of recent advances in the field and builds on past efforts and interventions in the Caribbean region
- It explicitly incorporates uncertainty and risks into system performance, technology assessment and decision making, including investment strategies
- Identifying practical entry points into decision making and planning models

Process geared towards increasing adaptive capacity



Process of Disaster Management



Uncertainties in responding to climate change risks

- Uncertainty related to magnitude, timing, duration, frequency and location of climatic hazards
- Uncertainty about cross-scale conditioning factors and impacts
  - Local-national-regional-global factors
  - Unpredictable changes in patterns of vulnerability over length of time over which risks are being calculated
- Uncertainty about choice, alternatives and pathways for decision making
  - Economic tradeoffs vs. hedging
  - Traditional emphases on rapid post-disaster recovery rather than longer-term vulnerability reduction;

Robustness Strategies:

- Knowledge and information must be
  - Scientifically credible
  - Socially robust
    - Political legitimacy
    - Practical utility
    - Effectiveness

Dimensions of vulnerability assessment

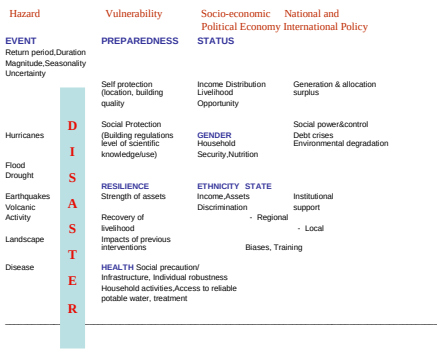
- **Physical vulnerability**-analyze impacts of events on assets such as building, infrastructure, agriculture
- **Social Vulnerability**- estimate impacts of events on highly vulnerable groups such as the poor, coping capacity, status institutional structure designed to help coping, awareness of risk
- **Economic vulnerability**-potential impacts of hazards on economic assets and processes (business interruption, secondary effects)
- **Environmental vulnerability**-Degraded environmental quality limits the natural resilience to hazard effects and reduces environmental buffering of effects

Development and utilization of climate information

- Data (spatial and temporal coverage of critical variables)
- Methods:simple correlation/trend analysis….. Integrated assessments…..vulnerability assessments
- Acceptability
  - Credibility
  - Relevance: timeliness, salience,
  - Compatibility: format,existing decision-making protocols
  - Accessibility: entry points for information
  - Receptivity: is it worth knowing, willingness
- Context: usually alters methodological assumptions

Early warning and mitigation actions will not be contingent on climate information alone

- Vulnerability:f(Risk x Hazard)
  Risk, exposure
  Coping capacity
- Integrated Assessment:
  Scale mismatch
  Knowledge hierarchy
- Prediction and uncertainty
- Early Warning:
  Usability and participatory processes



- Three questions under the CC framework:

(1) Are planning strategies for environment and development in the Caribbean supported by the climate record?

(2) What additional pressures will be placed on resources as a result of projected climatic variability and change?

(3) What practical strategies may be engaged to reduce vulnerability and enhance social, economic and ecological resilience?

- Criteria for indicator selection
- Indicators should provide a representative picture of environmental conditions, pressure on the environment, or society's response
- Indicators should be simple, easy to interpret able to show trends over time
- Indicators should be responsive to changes in the environment and related human activities
- Indicators should provide a basis for regional intercomparisons
- Indicators should be either national in scope or applicable to regional environmental issues and national significance
- Indicators should have a target or threshold against which to compare them so that users are able to assess the significance of values associated with them

Steps in a simplified Vulnerability Assessment

Step 1. What? Identifying the event and timescales of variability/change
- Probability, Magnitude, Frequency, Scope, Duration

Step 2. Who? Identifying exposure and capacity to withstand changes
- Proximate: Individuals, groups, communities,
- Quantifying economic - property risks and opportunities

Step 3. Why? Identifying the complex sources of risk
- Complexity and interrelatedness of natural, social, and development factors
- Why does a particular risk exist? Causal factors: What happened to make vulnerability high/low?
- Whose decisions and choices are involved? Who is most affected by the decisions and choices?

Step 4. Where and When? Time and space dimensions
- Dynamic change: Reversible, irreversible, cumulative or compounding
- Interconnected scales, beneficial outcomes

A VCA exercise should typically produce the following products:

- Analytical support to the country office on water, tourism, and agriculture
- A baseline analysis of structural vulnerability
- Historical socio-economic data sets constructed from
  - Basic infrastructure and logistical data for risk preparedness and response
  - Purposes
  - An analysis of climatic sensitivities across timescales
- An Information System Database (GIS) for analyzing, mapping and comparing available data sets
- An assessment of the adaptive capacity
- A final composite vulnerability analysis

Policy sciences: Problem orientation

- Goals
- Trends
- Conditioning factors
- Projections
- Alternatives

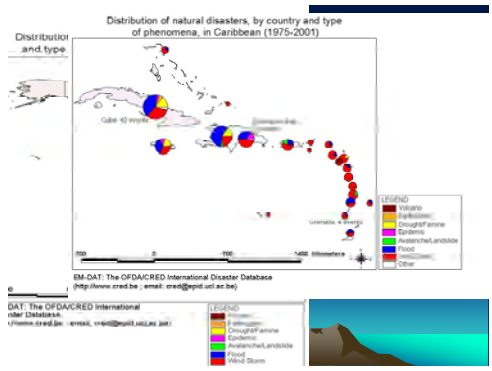
Annual projected damage to the tourism sector from hurricanes:

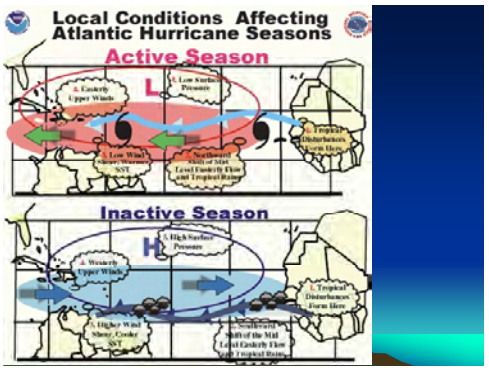
2002 – 2020 (adapted from Attz, 2005)

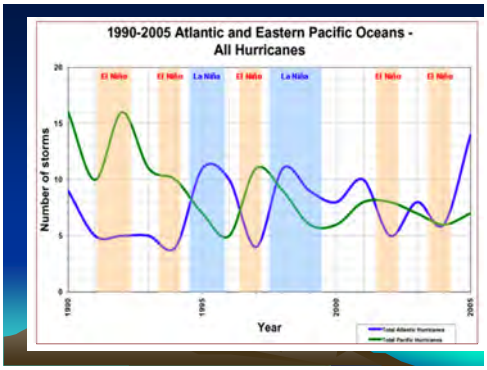
Barbados (US$ Mn)	Jamaica (US$ Mn)	St. L ucia (US$ Mn)	Antigua/Barbuda (US$ Mn)	CARICOM (US$ Mn)
Low Case				
$38.0	$71.0	$17.0	$19.0	$304.0
High Case				
$190.0	$354.0	$88.0	$96.0	$1,500.0

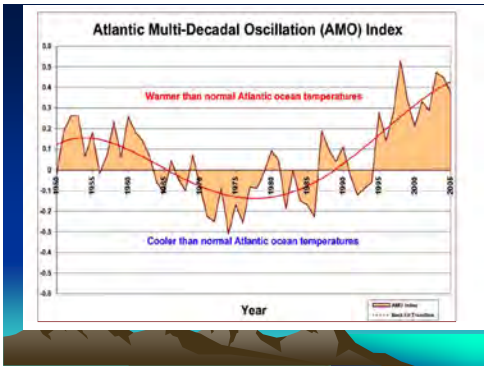
Impact on regional water supplies due to changes in climatic conditions

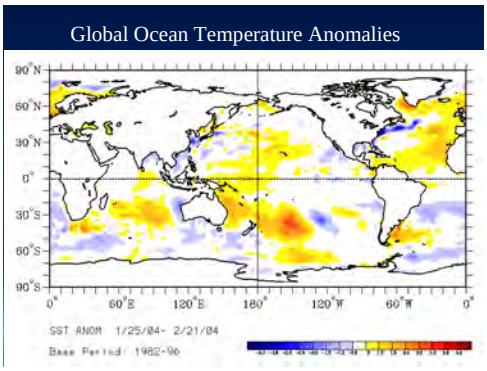
- Intense rainfall during short periods tends to result in little recharge of groundwater aquifers and lower quality surface waters
- Flooding during these periods implies significant social and economic losses and increased river pollution
- Long dry periods with high temperatures drastically reduce water availability
  - Implying increased irrigation demands
  - Increased potential for saline intrusion
  - Additional soil degradation
  - Serious damages to public health due to the proliferation of water-related diseases

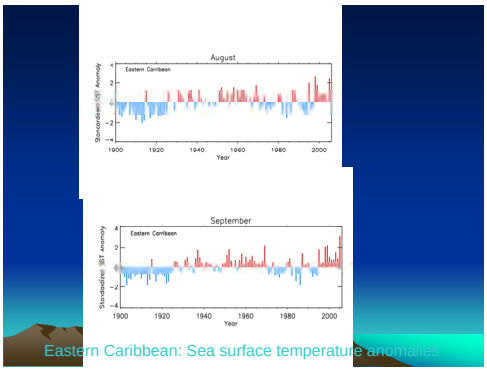

Distribution of natural disasters, by country and type of phenomena, in Caribbean (1975-2001)
Distribution and type
LEGEND
Volcano
Earthquake
Drought/Famine
Epidemic
Avalanche/Landslide
Flood
Other
EM-DAT: The OFDA/CRED International Disaster Database
(http://www.cred.be ; email: cred@epid.ucl.ac.be)

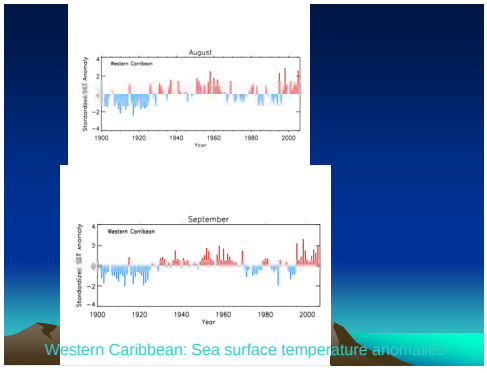

Local Conditions Affecting Atlantic Hurricane Seasons
Active Season
Inactive Season


1990-2005 Atlantic and Eastern Pacific Oceans - All Hurricanes
El Niño
La Niña
Number of storms
Year


Atlantic Multi-Decadal Oscillation (AMO) Index
Warmer than normal Atlantic ocean temperatures
Cooler than normal Atlantic ocean temperatures
Year


Global Ocean Temperature Anomalies
SST ANOM 1/25/04- 2/21/04
Base Period: 1982-96


August
Eastern Caribbean
September
Eastern Caribbean
Standardized SST anomaly
Year
Eastern Caribbean: Sea surface temperature anomalies


August
Western Caribbean
September
Western Caribbean
Standardized SST anomaly
Year
Western Caribbean: Sea surface temperature anomalies

Appendix 10: Presentation – Synopsis of the Grenada Pilot Initiative

Promoting Rainwater Harvesting in Caribbean Small Island Developing States

Regional Strategic Planning Workshop

Pilot Project funded by
The United Nations Environment Programme
Executed by
The Caribbean Environmental Health Institute
March 28 - 29, 2006

Prospect Reef Resort
Tortola, BVI

Pilot Site Selection

- Grenada chosen as pilot because:
  - Effects of Hurricane Ivan help to illustrate vulnerability and impact on water resources and sanitation
  - Grenada, Carriacou and Petit Martinique collectively represent many of the water issues faced by several Caribbean SIDS

Pilot Site Selection

- Disparity between water availability and scarcity between Grenada and the Grenadine Islands offers opportunity to learn to bridge gap with augmentation options
- Opportunity to learn from the experiences already in place in the State of Grenada for the benefit of other MS

Project Objectives

- RWH Programme for Grenada
- Regional RWH Programme
- Mainstreaming of RWH into water policy of MS
- Strengthening the institutional and human resource capacities of MS to use RWH

Approach

- Multi-stakeholder involvement
  - Ministry of Health & Environment
  - Ministry of Agriculture, Lands, Forestry and Fisheries
  - National Water and Sewerage Authority
  - Environmental NGOs

Activities

- Needs Assessment Study
- Sensitization Workshops
- Preparation of awareness building materials
- RWH potential mapping

Activities

- Regional RWH Programme
- Evaluation of Grenada Pilot Project to modify and replicate for other Member States

RWH Needs Assessment

- Checklist for Data and Information Capture
- Inter-Agency Data Collection
- Community Data Collection (EHD)

RWH Needs Assessment

NAWASA
LUD
Veterinary Division
EHD
PPU
MOA-C'cou
MCPMA
GIPE
CEC
PM-CC
GCA
GHTA
GRENCODA
ART

Petite Martinique
L' Esterre
Harvey Vale
Windward
L' Esterre Primary School
Hillsborough Secondary
Princess Alice Hospital.

Worburn;
Calivigny;
Woodlands;
Westerhall;
D' Arbeau;
River Road
Rose Hill;
Mount Rose;
Levera;
Guapo.

RWH Community Survey

Grenada

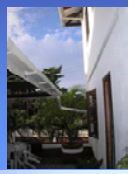
Carriacou and Petite Martinique

Assessment Findings

- Agency Survey
- 20 % of population on Grenada practices RWH to complement public supply
- Entire islands of Carriacou and PM harvest rainwater



- Benefits to be derived from RWH
- Potential to develop RWH among sectors
  - Construction
  - Agriculture and animal husbandry
  - Hospitality



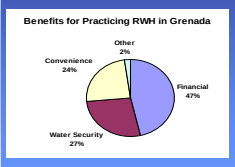
Assessment Findings

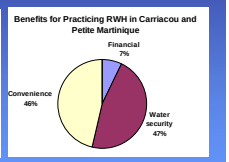
Community Survey

Elements Assessed	Grenada	Carriacou and Petite Martinique
Persons practicing RWH	55 %	100 %
RWH is the primary source of potable water	6 %	100 %
Preference for the consumption of rainwater	66 %	96 %
There is a need to develop RWH	91 %	85 %
Willing to practice RWH	83 %	100 %

Assessment Findings

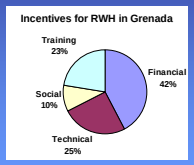
- Community Survey

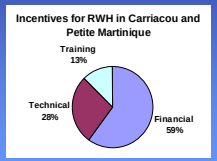




Assessment Findings

- Community Survey





RWH Needs for Pilot State

- Policy and incentives for RWH in Grenada, Carriacou and PM
- Programme for Protection, Monitoring and Treatment of RWH systems
- Assistance to the less fortunate households in the acquisition of RWH systems
- Refurbishment of Communal Cisterns

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The Morne, Castries, St. Lucia
Tel: 758 452-2501; Fax: 758 453-2721
Email: cehi@candw.lc; Web site: www.cehi.org.lc

RWH Needs for Pilot State

- Build on previous or ongoing initiatives such as:
  - RWH and Food Security (MOA)
  - RWH and Poverty Alleviation (GCA)
  - Collaborate with NGOs for project proposal specific to Carriacou and PM

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Way Forward for RWH

- National Strategic Planning:
  - Promotion of RWH for Grenada;
  - Health and Sanitation for Carriacou and PM
- Overall Project Promotion and Participation
- Regional Policy Planning
- Public Awareness

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Way Forward for RWH

- Monitoring
- Involvement of NGOs
- Storm water management
- Accessing RWH equipment and supplies

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Thank you

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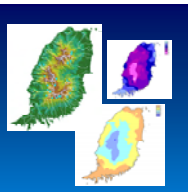
Appendix 11: Water Availability Mapping Methodologies

Promoting Rainwater Harvesting in Caribbean Small Island Developing States

Water Availability Mapping for Grenada

Preliminary findings



Regional Workshop

Pilot Project funded by
The United Nations Environment Programme
Executed by
The Caribbean Environmental Health Institute
March 2006
Tortola, British Virgin Islands

Procedural outline

- **Objective: map areas on mainland Grenada subjected to moisture deficit**
- Based on simplified water balance
  - Determine the depth of runoff from water catchment areas (areas upstream of NAWASA intakes)
- Three analytical steps
  1. Determine spatial variability in monthly rainfall
  2. Determine spatial variability in evapotranspiration (ET)
  3. Determine spatial variability in water deficit
- Catchments with low yield/runoff (during dry months) – downstream communities expected to experience shortfalls

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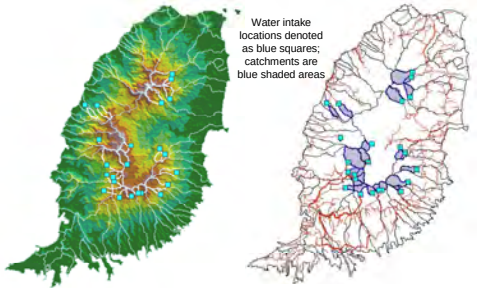
Most catchments located at high elevations; high rainfall
Water yield is function of catchment area and effective rainfall (balance after ET)



Procedure

- Water balance – partitioning of components of the hydrological cycle
- $P = R + ET + S$ (simplified)
  - P = rainfall
  - ET = evapotranspiration
  - S = storage
- In small island environments the storage component is negligible (relative to other components)
- Hence, after estimating losses to ET; remainder from precipitation input is runoff, available for use

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Procedure

- STEP1: Rainfall spatial variability estimation
  - Interpolation method; means of extrapolating rainfall estimates over unsampled areas
  - In GIS, is automated procedure as alternative to conventional isohyetal (manual) method
  - Limitation: Does not account for elevational influences at unsampled locations; with conventional method one can approximate influence of elevated terrain

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Procedure

- STEP2: Evapotranspiration spatial variability estimation
  - The FAO Penman-Monteith combination equation
  - FAO guidelines for computing crop water requirements (Allen et al., 1998)
  - Method recommended as the sole method for predicting ET_o; most closely estimates ET_o where data parameters are missing (FAO Irrigation and Drainage Paper 56)
  - Estimate for potential evapotranspiration is referenced from a well-watered grass surface

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Assumptions

Estimating ET

- Temperature (mean daily min, max) data across island not available; values derived from GIS map source. Adiabatic lapse rate to account for decrease in temps with elevation used
- Windspeed data across island not available; assumed at 2 m/s over island surface (FAO, 1998)

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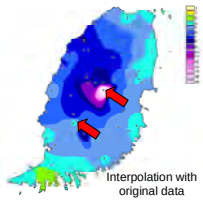
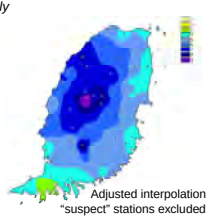
Data quality

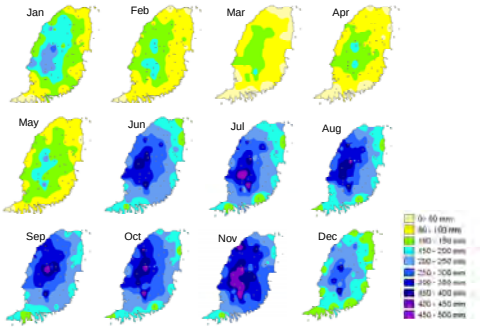
Monthly rainfall data observations

Interpolation revealed inconsistencies in rainfall monthly observations
Vendome WTP station – consistent under-reporting for all months
Nianganfoix station - large deviation for September (excess of 800 mm!)
Vendome WTP station excluded from analysis; Nianganfoix station excluded from September analysis only

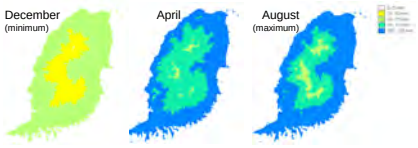

Interpolation with original data


Adjusted interpolation "suspect" stations excluded

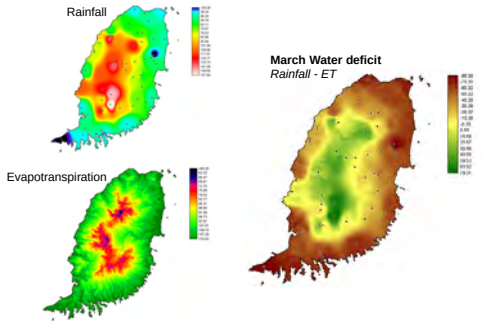
RESULTS: Spatial variation in mean monthly rainfall



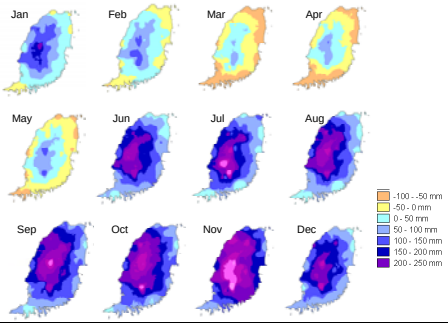
RESULTS: Spatial variation in monthly evapotranspiration

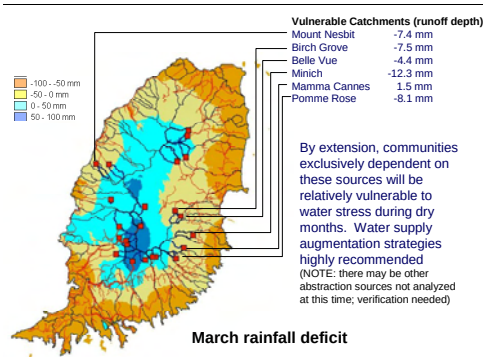


ET is primarily a function of temperature (seasonal variation and elevation)



RESULTS: Spatial variation in mean rainfall deficit



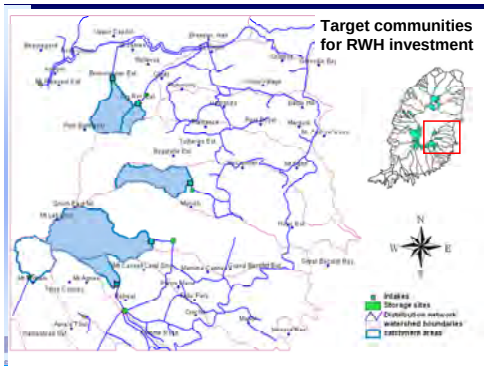


Vulnerable Catchments (runoff depth)

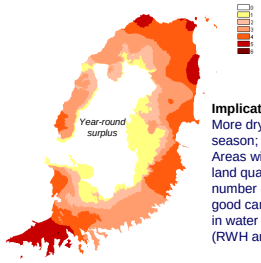
Mount Nesbit	-7.4 mm
Birch Grove	-7.5 mm
Belle Vue	-4.4 mm
Minich	-12.3 mm
Mamma Cannes	1.5 mm
Pomme Rose	-8.1 mm

By extension, communities exclusively dependent on these sources will be relatively vulnerable to water stress during dry months. Water supply augmentation strategies highly recommended
(NOTE: there may be other abstraction sources not analyzed at this time; verification needed)

March rainfall deficit



Number consecutive months where mean rainfall < ET



Implications for rain-fed agriculture
More dry months; shorter growing season; limits rain-fed production. Areas with high land capability (good land qualities) but severe deficit (high number consecutive dry months) are good candidate areas for investment in water augmentation measures (RWH and irrigation)

Planning

- Process permits objective spatial allocation (zoning) of resource distribution
  - Investment in water abstraction and distribution systems
  - Agriculture production zoning (crops, livestock)
    - Build on previous FAO-supported initiative

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Considerations

- Analysis is based on mean rainfall data observations
  - May be wide variation around the mean. Should be further investigated in context of frequency analysis
- ET analysis may be improved with better parameter estimation
- Feedback from stakeholders on whether methodology is a suitable guide
  - Are communities identified using methodology really at risk?

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Thank You!

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Appendix 12: Outline Regional RWH Programme – working document

Regional Rainwater Harvesting Programme
Duration: 5 years

(A) Public and Policy Makers Awareness Component

Objectives

To enhance public awareness on the practice of RWH
To increase investment in RWH
To promote RWH as a viable augmentation measure for conventional potable networks in water-stressed areas and promote water conservation
To improve practices in existing RWH with respect to WQ and sanitation
To facilitate the creation of an appropriate incentive environment for RWH based on informed policy making

Results

Public and policy maker awareness raised on RWH concepts, practices, water quality, sanitation issues

Key Actions

School competitions
RWH module in school curricula; link to agric(school feeding/gardening) / science programmes
Creation of a RWH website (or linked to regional web hosts),
Media productions - video, radio, print (shared by all member states)
Dissemination of technical material (tool-kits, best practices, trainer of trainers modules)
Community meetings, workshops
Policy maker seminars, workshops
M&E (Public surveys on effectiveness of programme)

Objectively verifiable indicators

Behavioural change Survey (public, policy makers, schools, other stakeholders) results complied and analyzed.

Number of schools and students participating in RWH (water conservation) awareness programmes; curricula tested and adopted in schools

Existence of dedicated rainwater harvesting resources website. No hits on web-site, no. Q&A submissions;

Percentage participation (in relation to number invited) in awareness seminars. Number of trainers trained;

Number of development applications to the Planning Ministry (households, commercial enterprises) that include RWH systems;

Number of times video, radio PSAs are broadcast via local media;

Number of handbooks and brochures disseminated; both in print and downloads electronic versions;

Indicative costs

technical workshop costs	
seminar costs	
website development	
website hosting	
brochure production	
survey execution	
school outreach	
Sub-total	**0**

(B) Capacity Building Component (indiv and institutional levels)

Objectives

To develop and improve national competency in developing (design and construction) and operating RWH systems

To train national professionals, stakeholders (incl. communities), regional institutions in water governance

To develop capacity of regional institutions (with water res. mgmt. mandates) to act as resource bases for RWH

Key result

Capacity strengthened amongst professionals (technical, advisory services), stakeholders, Regional Institutions. for the implementation, management of RWH systems

Key Actions

To determine relevant nat'l and regional agencies for capacity-building to deliver tech support and advice (skills bank)

Training workshops/seminars for stakeholders on best practices for RWH systems

Negotiate with CBWMP and other bodies to include RWH in certification programme

Technical exchange programme

Objectively verifiable indicators

Number of requests met for advisory services (nat'l and regional agencies)
Number of technical sessions (training, workshops, etc) organized and attendance level;
Number of technical professional exchanges undertaken.
Number of persons certified in RWH

Indicative costs

technical	
workshops	
exchange programme	
consultant services	
media outreach	
publication cost	
Sub-total	**0**

(C) Legislative and Policy Component (governance)

Objectives

To promote integration of RWH within national IWRM plans through policy & legislative reform
To promote the adoption of an appropriate regional model framework for RWH
To create an enabling environment to foster investment in RWH (all levels)

Key Result

Policy/ regulatory frameworks and incentive regimes to support RWH introduced, strengthened and harmonized in context of IWRM with increased investment in RWH.

Key Actions

Review existing legal and policy instruments to propose an effective legal (regulatory) and policy framework for promotion of RWH
Design appropriate model incentive regime to foster investment in RWH
Consultation/workshops with stakeholders

Objectively verifiable indicators

Regional model framework adopted by countries
Legislation revised/amended and passed by Parliament into law;
Number of consultations / stakeholder workshops held and record of attendance;
Incentive regime developed and effected at national level.

Indicative costs

workshops	
consultant services	
media outreach	
publication cost	
Sub-total	**0**

(D) Infrastructure Development Component

Objectives

To optimize RWH systems to increase the quantity & improve quality of water
To enhance capacity to manage and maintain these systems
To promote the adoption of regional models and applications through R&D

Key Result

Effective and efficient RWHs established

Key Actions

Conduct necessary assessments/feasibility studies
Conduct necessary stakeholder discussions
Project development and funding procurement
Technical / training workshops in operation and management
Develop appropriate models through R&D
Harmonize the use of RWH schemes and municipal systems

Objectively verifiable indicators

Completed studies
Number of models developed and adopted

Number of developed proposals with committed funding	
Number executed projects	
Indicative costs	
consultancy	
studies	
stakeholder consultations	
training workshops	
Sub-total	**0**

(E) Monitoring and Evaluation

GRAND TOTAL	**0**

Appendix 13: Evaluation Form

Workshop Evaluation Form

Workshop to Develop Regional Strategy for Rainwater Harvesting
in Caribbean Small Island Developing States

March 28 – 29, 2006

Prospect Reef Resort, Tortola, British Virgin Islands

We would appreciate your cooperation in completing this questionnaire.

The objectives of the workshop were to:

1. Promote RWH as a viable freshwater source augmentation measure
2. Share the information and lessons learnt form the Grenada Pilot Project
3. Develop a framework for a regional strategy for the incorporation of rainwater harvesting into national integrated water resources management plans, which will form the main output of the meeting.

Content & Format

Please tick the applicable box and add comments where necessary

	Excellent	Good	Fair	Poor	Comment
Relevance to my needs					
Sequence of activities					
Pace					

Presenters:

	Excellent	Good	Fair	Poor	Comment
Preparation					
Knowledge of Subject					
Provided answers to my questions					
Organisation					

Logistics

	Excellent	Good	Fair	Poor	Comment
Facilities (food, classroom, a/c, etc.)					

Other

Please make comments where necessary

I have benefited from the workshop in the following ways:	
What did you like about the RWH programme?	
What could be improved?	
I wish to make the following comments and recommendations for a RWH programme.	

THANK YOU

Appendix 14: Collated Workshop Evaluation Responses

The collated responses on the components of the workshop are contained below:

Area	Excellent	Good	Fair	Poor
Content and format	11%	89%		
Presenter	33%	67%		
Logistics	28%	61%	5.5%	5.5%

Main comments obtained on the evaluation forms are contained below:

Ways Benefited	• Inter Country transfer of information and experiences • Established inter-country linkages for RWH • Gained information for enhancing RWH at the national level • Gained knowledge on issues and solutions in other States for application at the local level; • Provided ideas for incorporating RWH into the water policy; • Provided ideas for incorporating RWH in IWRM;
What do you like about the RWH Workshop?	• Informative forum of regional and national experiences • Excellent participant contribution • Great knowledge sharing • Positive discussions • Convergence of ideas
What can be improved?	• Accommodation; • Including politicians and finance personnel as stakeholders • Logistics • Information about Pilot Project
Recommendations For the RWH Programme	• R&D in quality, efficiency and technologies • A regional agency take responsibility for RWH • Monitoring of RWH systems • More training and sensitization workshops • Wider stakeholder participation • Water utilities consider budgeting for RWH systems • Obtain political will for RWH initiative • Technical cooperation among countries