Sector	**Water Resources**
Subsector/ Category	Diversification of water supply/sources
Technology	Rainwater harvesting – Above ground (Collection, Storage & Treatment)
Scale of Application	Household level and community scale
Availability	Domestic rainwater harvesting (DRWH) can be regarded as a mature technology in Guyana. Approximately, 14.6% of the population depends on rainwater harvesting as their primary source for drinking water. Data from 2005 and 2006 show that in urban areas 12.8-16.4% of the population use rainwater collection as a drinking water source and in rural areas the percent is even higher at 25.6-27.2%. Domestic use of rainwater suggest that the Guyanese population views rainwater as high quality water and harvests it more specifically, for drinking purposes (Intven,L, 2009)

Technology Characteristics

Introduction

Guyana will be severely affected by climate change through changes in rainfall patterns including floods and droughts (SNC, 2012). The impact on the water sector will be felt not only at the points of water supply and distribution for domestic and commercial (industrial) sectors, but also in agriculture and health. According to the assessment for the water sector in the Guyana's Second National Communication, water availability due to projected rainfall patterns and evapotranspiration for the period 2040-2069 in Regions 5, 6, & 10 will decrease. Temperatures will increase, while precipitation is projected to decrease, thus, leading to overall water shortages for domestic, industrial and agricultural uses (SNC, 2012).

Recognizing the high dependence of the country on ground water sources, projected increase expansion in the housing sector, and vulnerability due to variability of precipitation leading to projected water deficits, it is paramount that adaptation strategies be implemented in the water sector. One such option is through the application of water conservation techniques by diversifying the water supply as in the adoption of technologies such as Rainwater Harvesting.

Rainwater harvesting (RWH) is a low cost practice that is easy to implement and is being promoted by the Guyana Water Inc. (GWI) for application at the individual household level. RWH can also be pursued at the community level, allowing for collection in small concrete reservoirs. Rooftop rainwater harvesting require primarily containers for collection and storage, and conveyance (gutters & pipes). The most common collection/storage containers used are the 450 gallons, tuff water tanks and to a lesser extent, 55 gallons, blue shipping barrels. Many households are equipped with rooftop harvesting , using 1 to 2 tuff storage tanks. Construction of new catchment area and reservoir increases the cost for RWH. This depends on the size of the catchment area and capacity of the reservoir.



Institutional /Organizational requirements	The GWI is the primary institution responsible for water supply in Guyana. However, there is no specific institution with core responsibility for RWH. The GWI partner with

	other institutions such as the Environmental Protection Agency, Ministry of Health and the Guyana Red Cross to promote and encourage RWH. The specific system will be designed for the household and/or the community levels. However, community systems will require more planning and resources.
Adequacy for Current Climate	This technology application is highly suitable to Guyana's climatic conditions since the country benefits from two (2) rainy seasons annually, April to August and November to January. Annual average rainfall totals between 1600-3000mm. Geographical influences, such as mountains and oceans, results in three major climate types: *Tropical savannahs*, which are very dry regions with annual rainfall of less than 1788mm; *very wet tropical forest climate,* with annual rainfall exceeding 2728mm, and the *wet-dry tropical forest*, which represent the rest of the country, with annual rainfall between 1778mm to 2800mm (SNC,2012).
Size of Potential Beneficiary	The entire population could benefit from its application, especially, the agriculture sector. Guyana is currently experiencing severe dry conditions, resulting in the loss of major crops, such as, rice and vegetable crops in Regions 2,3,5 and 6. Currently, approximately 90% of the population resides on the coastland of Guyana where agriculture is a dominant activity. With the development of inland agriculture as a high priority in the sector, RWH is becoming more important within those regions.
Disadvantages	• Not reliable during dry periods or periods of prolong drought due to limited or variability of precipitation; • The size of the storage devices can limit storage capacity and the harvesting potential; and • Larger storage capacity could lead to increase installation and operating cost making the technology less viable in the longer term.
Endorsement by experts	RWH is widely practiced in many countries worldwide. Over 60 million people were using RWH as their main source of drinking water in 2006 and that number is projected to increase to more than 75 million by 2020 (WHO and DFID, 2010). It is likely that hundreds of millions more collect rainwater as a supplementary source of water for potable and non-potable uses. RWH can aid climate change adaptation even in the most developed countries. If safe, reliable piped supplies are available, RWH for non-potable uses can partially offset the increase in household use. Simple rain barrels are commonly used to water landscapes without taxing the piped water supply. One-third of residential water in Europe is used for toilet flushing and 15% in washing machines and dishwashers (UNEP, 2004).
Capital Costs	
Cost to implement/Operate/Maintain	*Implementation:* • The cost of the RWH system depends on catchment area, conveyance system, storage devices and capacity. Quantity of rainwater from catchment is estimated using the following formula: *Water harvested= catchment area x amount of rainfall x conversion factor (differs for catchment type)* • Rooftop rainwater harvesting require primarily containers for collection and storage, and conveyance (gutters & pipes). The most common collection/storage containers used are the 450 gallons, tuff water tanks and to a lesser extent, 55 gallons, blue shipping barrels. Many households are equipped with rooftop harvesting , using 1 to 2 tuff storage tanks. The cost of the tanks can range from US$25 to US$100. A single household system is estimated at US$ 140; and

	• Construction of new catchment area and reservoir increases the cost for RWH. This depends on the size of the catchment area and capacity of the reservoir. *Operation/Maintenance:* • The system is designed to protect water quality through the installation of filters or screens and a 'first flush' system to discard the initial volume of precipitation; • Storage devices are usually covered to avoid the breeding of mosquitoes and to protect water quality. One such system is the rainwater harvesting model designed by the Global Water Partnership-Caribbean and promoted by GWI. Maintenance can be done every three (3) to four (4) months in preparation of the rainy season; and • Generally, has very low running cost and is not labor intensive.
Development Benefits – direct/indirect benefits	
Adaptation benefits	Considering the water demand on ground water sources and surface water by coastal and riverine communities, the deployment of this technology contributes greatly to climate change adaptation, through diversification of water supply at the household, industry and community levels. It allows for water conservation by reducing pressure and dependence on the traditional water sources through decreased demand.
Economic benefits	• Alternative or non-potable uses of rainwater can offset piped-water costs; • Employment opportunities as a result of construction of RWH systems and the supply of materials; and • Additional income due to the stimulation of commercial enterprises.
Social benefits	• Stable and sustained access to potable water especially to communities with limited or no access; • Diversified sources of potable water for coastal communities; • Reduced incidence of water-borne diseases caused by the dependence on surface water sources for domestic purposes in inland communities; and • Increases per capita water availability and sustainability of water resources. .
Environmental benefits	• Promote water savings; • Diversified water supply; • Reduced stress on ground and surface water sources; • Mitigate flooding by capturing runoff during rainstorms; and • Capture water that would have otherwise evaporated.
Local Context	
Status of Technology	RWH is a mature technology in Guyana. Its application has been mainly along the coastal regions of the country, to augment the tapped-water supply during periods of rationing and well maintenance. In land regions have traditionally used a combination of rain water and freshwater from rivers/streams. Over the years, wells have been dug and piped water is available in some communities. However, tapped water supplied through GWI's piped distribution network is inconsistent in some communities, whereby, water is supplied for a few hours during the day. In addition, there are still some communities which have limited or no access to potable sources of water. These communities depend on other sources of potable water. The GWI in partnership with the Global Water Partnership – Caribbean have been promoting

	rainwater harvesting as a water conservation and diversification technique within the framework of building climate resilience in the water sector.
Market potential	This technology is trans-generational, well-proven and extends to the entire population residing on the coast, as well as, communities in the inland regions. A significant market exists in the inland regions in Guyana once the technology is deployed to communities as methods of water conservation and diversification. The simplicity of this technology makes it easy to diffuse in the market. Materials are locally available for installation, operation and maintenance.
Acceptability to stakeholders	RWH is easily acceptable to all stakeholders. Individual household rainwater harvesting currently exists along coastal areas, to supplement tap and surface water sources with limited application in the inland regions.
Opportunities and Barriers	*Opportunities:* • Promote economic development and general wellbeing due to improved access and water quality; and • Increased savings due to less use of piped water; *Barriers :* • Vegetative roofing used by most inland communities may be inadequate or unsuitable for the application of RWH; • The cost of the rainwater storage devices is often seen as the costliest component and a notable barrier for deployment of the technology in poor households; • Adequate space for storage containers; and • Treatment options, such as, filters and filtration devices can increase overall operational/maintenance cost.
Time Frame	Short to medium term.

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