



COMMUNITY SCALE RAINWATER HARVESTING SYSTEMS AND STORAGE

TECHNOLOGY DESCRIPTION

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Community scaled rainwater harvesting system will consist of large 20,000-gallon concrete water containment tanks (or multiple 1000-gallon above ground tanks) which harvest water from direct rainfall or surface runoff. Associated catchment areas (or barbeques) will be connected to water storage tanks, water treatment, and distribution systems. The proposed rainwater harvesting, storage and water tank networks will be developed across communities facing severe water shortages.

It is intended to serve as a collection and storage system to help stabilize water supply in communities facing water insecurity. One of the main objectives is to increase the capacity of potable water storage and distribution systems by 20% in non-utility service areas (NUSA), rural communities and communities facing severe water shortages by 2024.

Depending on the selected communities and their existing infrastructure, the project would involve either installing new, or restoring damaged or silted storage tanks. An assessment of the communities and the size of the area to be supplied will also help to determine whether tanks will be gravity fed to houses or to a communal pipe (to support small communities). For densely populated communities, or communities where extensive piping is needed to supply homes, solar water pumping will be installed to elevated tanks which will gravity feed to the community. This will alleviate the need for diesel pumps, avoiding GHG emissions, while providing a more sustainable and reliable water distribution system.

Each rainwater harvesting system will include a 1 x 10 kW solar-driven PV pumping system to fill the secondary storage tanks and distribute water across the community. This will be dependent on factors like topography, size, and altitude i.e., whether the areas are flat or have varying elevations, or whether pressured systems are necessary for extensive piping within communities.

CURRENT TECHNOLOGY READINESS LEVEL OR COMMERCIAL READINESS INDEX

The Technology Readiness Level (TRL) outlines the current state of the technology in the country. Large community scaled water tanks are common in mostly rural communities across Jamaica. Several local companies provide design and construction services for various types of large water storage tanks using various materials and storage options. Additionally, large 2,000-gallon black water storage tanks are widely available across the island. Within the last 5-years several projects have created large-scale rainwater harvesting systems. Some of these include:

- The rehabilitation of two concrete catchment areas connected to two underground concrete water storage tanks to increase capacity to 292,000 Liters in Victoria and Richmond Park, Clarendon. Three 1,000-gallon above ground tanks were installed as well as a Solar PV pumping system to fill the secondary storage tanks; This system is expected to benefit more than 4,000 residents.
- In Crooked River, Clarendon the installation of gravity-fed systems that channel water to a 22,000-gallon tamper-proof catchment tank. The water is channeled from the tank to six strategically located community pipes.

Based on the availability and use of large water collection and storage systems and rainwater harvesting systems across Jamaica, as well as the availability of the material, knowledge and know-how for design, operation and maintenance in Jamaica, this technology is rated as "TRL 9 – System is Proven in Operational Environment".



CLIMATE RATIONALE OF THE TECHNOLOGY

Water is a critical input for most economic sectors, as well as for household, sanitation, and health services. Approximately 15% of Jamaicans, especially those in rural communities, depend directly on rainfall catchment systems and rivers as their main source of water (GoJ, 2019). The urban areas which house more than 50% of the population depend on river diversion, reservoirs, and dams for piped water to satisfy domestic and commercial needs.

Attributed to climate change, Jamaica has seen changes in annual precipitation patterns and associated stormwater runoff and aquifer recharge coupled with warming temperatures and sea level rise have all significantly affected sustainability and the quality of water supply. More specifically, within the last decade, Jamaica has experienced a reduction in rainfall period (i.e., shorter wet season, however with more intense periods of rainfall) with subsequent increases in temperature and the length of the dry season. This trend is expected to continue as the mean annual temperature for Jamaica is projected to increase between a range of 0.7 to 1.8°C by the 2050s, while changes in rainfall are expected to range between -44% to +18% by the 2050s (CSGM, 2012). These changes have led to prolonged drought in most areas, and coupled with markedly lower and flashy river flow, have resulted in a reduction in both groundwater recharge and the distribution of water across river basins and watersheds.

Providing the infrastructure to install rainwater harvesting in these communities can help members to adapt to effects of climate change. By implementing RWH systems in the selected communities, residents will have greater access to water which can serve their domestic needs year-round. Most importantly, having the capacity to store much of the rainwater or surface runoff is also essential as this can help to combat water shortage issues experienced during drier periods of the year. Therefore, it is expected that RWH systems will significantly enhance the communities' water supply sources.

The intervention with solar energy could avoid an estimated 1,036.2 metric tons of CO₂ equivalent¹ from 9,258 gallons of diesel fuel using solar powered water pumps. Solar Photovoltaic Panels can generate some 1,101.43 MWh from solar energy over the project period (3 years) for water pumping. This target is in keeping with the National Water Sector Policy and Implementation Plan 2019 which outlines the GoJ's goal to provide potable water access to everyone by 2030.

AMBITION OF THE TECHNOLOGY

SCALE FOR IMPLEMENTATION AND TIME-LINE

Currently, there are 353 community-scale rainwater harvesting systems across Jamaica. The target is to increase rainwater harvesting, and storage systems in non-utility supplied rural communities by approximately 20% of existing number of communities with RWHS (71 systems) over a three-year period, 2021–2024.

This project will commence with the assessment of the community and subsequent installation of rainwater harvesting systems, inclusive of catchment water tanks in three communities of upper Clarendon (specifically within the Rio Minho watershed). Upon the successful installation of this system in the selected communities, other communities located within the upper Manchester and St Catherine areas (i.e., within the Milk River, Rio Minho and Rio Cobre watersheds) will be selected for similar interventions. The location of these communities affects their ability to access utility water supply and would therefore benefit from a project that provides sustainable solutions across the extent of the affected area.

With respect to the sustainable maintenance of the upgraded systems, a draft manual for the maintenance and upkeep of the water storage system will be developed to include roles and responsibilities of community personnel after project handover.

Additionally, with an aim of building the knowledge/technical capacity of the community, training in adaptation technologies and practices related to climate change will take place. To create a strong foundation for the training, the first goal will be to

¹ <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>



raise awareness as it relates to climate change. With an improved understanding of climate change, trainers can focus on educating the residents in the use and care of water harvesting systems and solar powered pumps.

EXPECTED IMPACTS OF THE TECHNOLOGY

The community scale rainwater harvesting system will have positive impacts on non-utility supplied rural communities to adapt to effects by climate change. Some of the expected impacts from implantation of this technology include: -

- Diversification of non-potable and potable water supply.
- Creation of new water catchment and storage systems and restoration of community water catchment and storage systems.
- Access to reliable and safe water supply for non-utility supplied rural community members.
- Increase in water storage capacity.
- Decrease in the need for closure of critical amenities due to water shortages as there will be greater access to water.
- Generally, a low setup cost for simple systems, however, more complex systems with greater storage capacity and reliability can be costly.
- The use of a system which is easily scalable, and components can be added over time to increase water capture rate and storage capacity.
- Rainwater harvesting systems and generally inexpensive to maintain and does not require professional skills and knowledge.

POLICY ACTIONS FOR TECHNOLOGY IMPLEMENTATION

EXISTING POLICIES IN RELATION TO THE TECHNOLOGY

- **National Water Sector Policy and Implementation Plan (2018):** The vision of the Policy is for 'the water resources of Jamaica are managed in a sustainable and integrated manner so as to facilitate the population having access to potable water and adequate sanitation but 2030'. The policy specifically refers to rainwater harvesting which includes: -
 - The promotion of rainwater harvesting for households in areas with adequate rainfall and where groundwater and surface source are inadequate and
 - The promotion of the rehabilitation and maintenance of community catchment tanks, where Municipal Corporations, Local Authorities, or the communities themselves wish to take on the responsibility of maintaining these systems. Water supply from harvested rainwater will be treated or filtered to meet MOH and WHO standards before it is used for potable uses.
 - Rainwater harvesting systems designed to deliver the most optimal volumes of water to household and communities in cases where rainwater is the primary source of water.
- **Climate Change Policy (2015):** This policy outlines special initiative for Water Resources Management in Jamaica. These initiatives will see the Ministry of Water, Land, Environment and Climate Change, the Water Resources Authority and the National Water Commission taking leading roles to develop programmes that address water resources management including watershed protection and the scaling up of conservation programmes (e.g. rainwater harvesting).
- **Policy Guideline on Rainwater Harvesting (2015):** This policy seeks to guide members of the public, developers, and the planning authorities by providing information, standards and criteria/requirements for mandatory rainwater harvesting systems and water use.
- **National Water Sector Adaptation Strategy:** This strategy provides an assessment of the water sector's vulnerability to climate change and outlines the duties of the Government and other key stakeholder groups in helping to build the resilience of the sector against climate change and other potential hazardous impacts.



- **Parish Development Orders:** Ten (10) of the fourteen (14) development orders for Jamaica mention, recommend or encourage the use of rainwater harvesting systems in residential and other developments in specific areas.

PROPOSED POLICIES TO ENHANCE TECHNOLOGY IMPLEMENTATION

Finalize and gazette Watershed Policy which has been in draft since 2003 (18 years). This is an essential support for optimizing surface runoff, controlling floods and erosion.

COSTS RELATED TO THE IMPLEMENTATION OF POLICIES

- Consultancy to develop recommended policy (USD \$30,000.00)
- Individual consultant to guide policy acceptance by Cabinet and integration (USD \$15,000.00)
- Rainwater Harvesting System with a 24,000-gallon water storage and water treatment system (USD\$50,000 per system)
- Operation and maintenance - average USD \$2,000 per year per system
- Training and capacity building for community group organizations (US\$3,000 per training session per community group)

USEFUL INFORMATION

CONTACT DETAILS

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LINKS TO TNA REPORTS

All reports can be found at: <https://tech-action.unepdtu.org/country/jamaica/>