Rainwater harvesting for storage

Challenge: Too little water **Adaptation response:** Water storage

Description

Rainwater harvesting for storage, also known as *ex situ* water harvesting, is a practice in which rainwater is collected and stored for productive use, for example drinking water, agriculture, sanitation and more. The rainwater can be directly captured in open storage systems, but can also be collected from roofs, soil surfaces or roads. The most common storage devices for harvesting rainwater are tanks. The tanks are commonly plastic, but also can be made from fiberglass, wood, metal, concrete, or stone and plastered tires, depending on resource availability and costs. Simple tanks are commonly used for water capture and storage at the household level, while large capture ponds built into the ground are often for community initiatives.

Unpredictable weather patterns and seasonal water resource scarcity make this technology relevant in assuring rainwater lasts for longer time spans. It is particularly important in arid and semi-arid areas that may experience extended periods without rain mixed with periods of intense precipitation. These challenges are further exacerbated by changing climate.

Implementation

Calculations based on historic records of rainfall intensity and seasonal distribution help inform the necessary and feasible storage capacity of the harvesting structures. Structure examples include catchment dams, rooftop water harvesting tanks and courtyard water harvesting systems. In most cases construction would require regular maintenance to ensure optimal functioning and prevent health hazards, for example conducting necessary water treatment prior to use in households, securing structures against proliferation of water borne disease carrying organisms, and cleaning and maintenance of tanks.

Environmental Benefits

- Contributes to groundwater recharge (when utilizing stored rainwater for irrigation), and removes pressures on other depleted water sources. Assists in diversification of water sources.
- Reduces the risk of soil erosion and soil loss from runoff, especially if substantial amounts of rainwater are collected, for example, in large community capture ponds. This has a positive effect on the surrounding vegetation and cropland.

Socioeconomic Benefits

- Helps reduce volumes of storm water runoff, and therefore also reduces the number of pollutants entering water collection systems in urban settings.
- Decreases pressures on water drainage and sewage systems and reduces the risk of sewage water overflows, as well as costs and energy needed for water treatment and transport.
- Builds climate resilience.

Opportunities and Barriers

Opportunities:

- Low cost technology

- Flexible infrastructure: it can be built from a number of different materials and in various storage capacities
- Directly benefits local communities

Barriers:

- Large water harvesting systems can have negative effects on runoff and groundwater levels, which in turn can affect ecosystem dynamics and downstream users of the water source
- Still-sitting water in the storage tanks can create habitats for carriers (e.g. mosquitos) of vector-borne diseases, and therefore preventative measures are often required, particularly in warmer climates
- Collected water may require treatment before direct use, particularly in urban settings (e.g. pollutants collected from roof surfaces)
- Because of the largely local impact, initial investments in the technology often need to be borne by the households. Alternatives may be programmatic approaches financed by local governments, or other projects
- Some areas may have local restrictions on rainwater harvesting

Implementation considerations*

Technological maturity:	4-5
Initial investment:	1-3
Operational costs:	1-3
Implementation timeframe:	1-2

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

Agriwaterpedia (2016). Available at: http://agriwaterpedia.info/wiki/Rainwater_harvesting

Batchelor, C. and others. (2011). Life-cycle costs of rainwater harvesting systems, Occasional Paper 46. The Hague, The Netherlands: IRC International Water and Sanitation Centre, WASHCost and RAIN. Available at: http://www.ircwash.org/sites/default/files/Batchelor-2011-Lifecycle.pdf

CMHC (2012). Guidelines for Residential Rainwater Harvesting Systems Handbook. Canada Mortgage and Housing Cooperation. Available at: https://www.cmhc-schl.gc.ca/odpub/pdf/67608.pdf

CVC & TRCA (2010). Low Impact Development Stormwater Management Planning and Design Guide, *Version 1*, Credit Valley Conservation Authority and Toronto and Region Conservation Authority. Available at: http://www.creditvalleyca.ca/wp-content/uploads/2014/04/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf

EPA (2013). United State Environmental Protection Agency, Rainwater Harvesting: Conservation, Credit, Codes, and Cost. Literature Review and Case Studies. Available at: https://www.epa.gov/sites/production/files/2015-11/documents/rainharvesting.pdf

HarvestH2O (2016). Regulations and Statutes. Available at: http://www.harvesth2o.com/statues_regulations.shtml

Rainwaterharvesting.org (2016). Available at: http://rainwaterharvesting.org/

Studer, R.M. and Liniger, H. (2013). Water Harvesting Guidelines to Good Practice. Centre for Development and Environment (CDE) and Institute of Geography, University of Bern; Rainwater Harvesting Implementation Network (RAIN), Amsterdam; MetaMeta, Wageningen; The International Fund for Agricultural Development (IFAD), Rome. Available at: https://www.wocat.net/fileadmin/user_upload/documents/Books/WaterHarvesting_lowresolution.pdf

UNEP (2014). Green Infrastructure Guide for Water Management: Ecosystem-based management approaches for water related infrastructure projects. UNEP-DHI, IUCN, TNC, WRI, Green Community Ventures, U.S. Army Corps of Engineers. Available at: http://www.unep.org/ecosystems/resources/publications/green-infrastructure-guide-water-management