Rainwater

Rain is liquid water in the form of droplets that have condensed from atmospheric water vapour and then fall to earth under gravity. It is one kind of 'precipitation', which also includes other forms of condensed atmospheric water (e.g. snow, sleet, hail and drizzle).

Rainwater is collected as runoff from larger surfaces. Any impermeable surface can be used for collection as long as it is sloped (e.g. from roofs, courtyards, hill slopes, roads or temporary surfaces created using cloth or plastic sheets), and the collected Rainwater can be stored using a variety of methods (e.g. ponds, Rainwater catchment dams, or water storage tanks). Rainwater is most often used as a complementary source to existing water resources when they become scarce, are polluted or, in emergency cases, are destroyed. If the runoff area is well maintained, Rainwater can provide very high-quality drinking water requiring minimal treatment. In an emergency, it will mostly be used to supplement drinking water, but if there is enough, it may also be used for gardening, irrigation or to water animals. Sometimes it may be the only source of drinking water when alternative sources are not (yet) available or accessible or have considerable quality issues.

Applicability: Rainwater can be used in all response phases to supplement existing water resources, particularly if they have become scarce (e.g. when supply systems fail) or are of low quality (e.g. if they are contaminated or saline). Rainwater is often a first-phase solution to water supply whilst water supply systems from other sources are being established, especially in rural areas where the collection is often small in scale for individual households or small community groups. Larger scale ground-based Rainwater collection systems are generally more suited to later phases of an emergency and to areas with lower annual rainfall (e.g. water-stressed arid and semi-arid areas), where intense rainfall events produce large volumes of runoff. The major advantage of Rainwater collection systems is that they are relatively quick, simple and inexpensive to install using local materials and skills.

For Rainwater collection to be viable, annual rainfall should be at least 300 mm, although in extremely arid conditions it may be considered as a measure of last resort if the rainy season is approaching. Where annual rainfall surpasses 1000 mm, other water sources are generally readily available, and Rainwater catchment systems may not be the most economical. It should be noted that rainfall patterns vary throughout the year and must be carefully analysed before designing and implementing Rainwater Harvesting **(I.1, I.2)** systems.

Operation and Maintenance: Depending on the area from which the rain is harvested and the volume of water collected, a Rainwater harvesting system can be built, operated and maintained by communities or individual households (external expertise may be required to set up the system). Community approaches require a high level of organisation to limit water usage to match availability and prevent waste, ensuring that the water supply lasts for the appropriate amount of time. Regular maintenance is essential, and the system should be regularly inspected, cleaned and repaired when needed with responsibilities clearly assigned. The Rainwater collection areas should be kept clean. If ground-based, they should at least be fenced off to prevent damage or contamination by animals or people. Properly collected and stored rainwater can be of very high quality and require minimal treatment. The amount of treatment required will depend on the collection method and level of pollution.

Health and Safety: Rainwater is usually of high quality, but may become contaminated during harvesting and storage. Air pollution in urban areas may reduce the water quality to such an extent that rainwater collection might not be recommended. The state of the catchment surface also can have an impact on water quality. For example, unprotected ground catchments can be contaminated by animal droppings or other surface pollutants. Roof catchments can be contaminated by bird droppings, leaves and dust. Certain roofing materials (e.g. paint coatings, metals) can introduce chemical contamination (e.g. heavy metals), and the subsequent danger these pose will depend on the toxicity of the material, the health of the users and the time over which Rainwater will be used for drinking.

Once in storage, water can become polluted through poor collection and storage designs, such as through exposure to light leading to algal growth and the ensuing risk of toxin formation as well as taste and odour problems. Additionally, storage tanks accessible to mosquitoes may turn into a breeding ground. This can be avoided with a well-constructed system that is maintained regularly, i.e. protected openings with lids or screened inflow and overflow pipes.

Social and Environmental Considerations: Rainwater collection is well accepted in most cultures, though its lack of minerals such as calcium and magnesium means it lacks taste, which may hamper its acceptance as drinking water. Taste and odour issues may also develop during storage or from small dead animals, sediments or algal growth in the storage tank, which may also affect its acceptance as drinking water. The use of Rainwater is a key aspect of climate change adaptation techniques and drought-mitigation activities, such as through increased water storage or control of groundwater table levels using managed aquifer recharge methods.

Strengths and Weaknesses:

- ⊕ Generally high quality when properly collected, stored and supplied
- ⊕ Rapidly deployed
- ⊕ Requires no electrical energy
- ⊕ Easily available, accessible and applicable in almost any climate

- ⊖ Limited by quantity of rainfall, size of Rainwater capturing area and storage capacity
- ⊖ Requires proper management for successful community operation
- ⊖ Potentially contaminated by air pollution, animal or bird droppings, insects, dust, or poor maintenance
- ⊖ Often lacks taste, leading to difficulties in acceptance
- ⊖ Serves as potential breeding area for mosquitoes

→ **References and further reading material for this technology can be found on page 212**