The role of rainwater collection in solving water shortages

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Abstract

Lack of clean water access remains a major global issue. 2 billion people use contaminated water and live in countries with high water stress; approximately half the global population will be affected by 2025. Rainwater collection (RWC) is a potential solution; it has been found to reduce water demand by up to 65% and can have indirect benefits like flood prevention, or restoration of degraded hillsides. However, rain may be contaminated as it falls, requiring treatment by water purification systems. Political factors are also an obstacle; some American states permit RWC while others do not, and non-governmental organisations (NGOs) are blocked from facilitating RWC if they are perceived as criticising government actions on water access. Finally, annual rainfall patterns limit RWC; Sylhet City in Bangladesh receives almost no rainfall in winter, requiring collected rainwater to be split between present and future needs. These barriers must be overcome if RWC is to become a viable strategy.

1. Current global water access

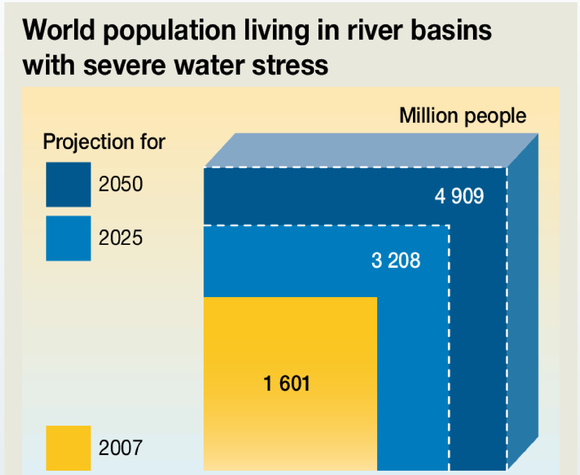

Figure 1: Graphical projections of the global population suffering from water stress in 2025 and 2050, relative to 2007 [1].

Clean water access is a basic human right and an integral resource for maintaining a high quality-of-life. However, only about **3% of global water supplies are freshwater**. Of this, **2.5% is contained in polar ice caps and glaciers** [2]. Approximately **785 million people globally** lack even basic drinking water services and **2 billion** use contaminated water [3]. This results from poor resource management strategies like **overallocation of river flow regimes** and **overextraction of groundwater from underground aquifers** [4]. Therefore, new water sources must be found to reduce global water poverty.

2. The role of rainwater collection

One solution is **rainwater collection (RWC)**.: an ancient practice based on the **'Kilimanjaro Concept'** that rainwater is naturally clean, or can be made so easily through efficient, cheap treatments like sand filters [5, 6]. Analysis of the Ringdansen residential area in Norrköping, Sweden, found that **20,000 m² tanks of rooftop RWC** met nearly **60% of water irrigation requirements** [6]. It also has environmental uses. e.g. **restoring degraded hillsides** in Ethiopia, **reducing water overflow by 86%** and limiting flood damage [7, 8].

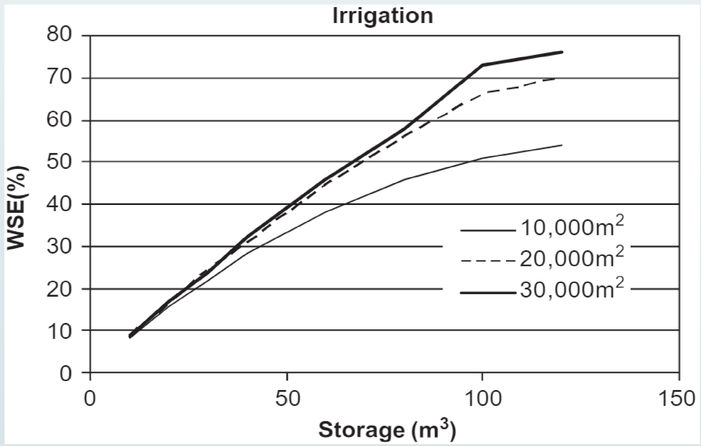

Figure 2: Water-saving irrigation efficiencies in the Ringdansen residential area, Sweden, using collection tanks with surface areas of 10,000, 20,000 and 30,000 m² tanks respectively [6].

3. Factors limiting RWC

1. **Politics = RWC is permitted in some American states like Texas,** but was outlawed in Colorado prior to 2016 to protect water-right owners [9]. In Uganda, meanwhile, **NGO (non-governmental organisation)** efforts to facilitate RWC are seen as criticising government policies and blocked [10].
2. **Varied rainfall patterns = Sylhet City, Bangladesh**, receives **little rainfall in winter**, so rainwater must be collected in summer and split between current (drinking, washing) and future needs (crop irrigation) [11].

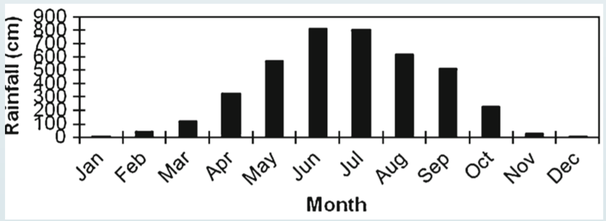

Figure 3: Average rainfall patterns throughout the year in Sylhet City, Bangladesh, between 1956 and 1999 [11].

3. **Geographical factors = falling rain accumulates harmful substances** from the air (gases like **sulphur, solid particulates**), or from surface runoff (bird faeces) [12]. This necessitates the use of **treatment systems like filters** to purify captured rainwater [12].

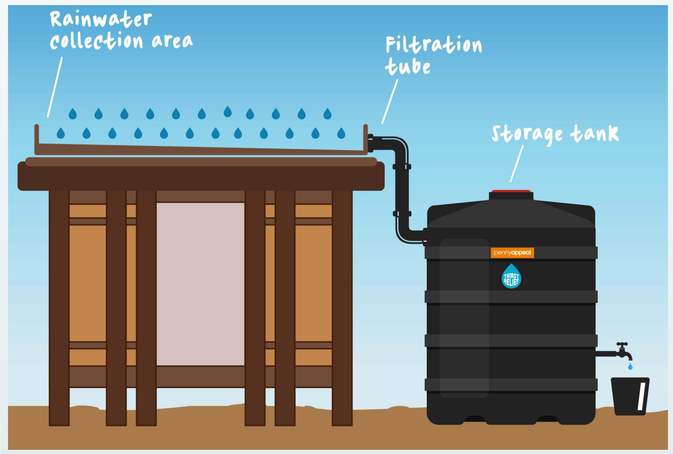

Figure 4: A typical RWC and treatment apparatus [13].

4. Conclusion

Rainwater collection is a **promising practice for sustainable water usage**, providing social, economic and environmental benefits. However, **political and geographical factors** can **hinder widespread RWC deployment** and **necessitate purification** before collected rainwater is suitable for usage.

References

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