Rainwater harvesting as a water supply alternative for health centres in rural Ethiopia

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Background

In an effort to improve the performance of and access to health centers in rural areas as well as cross-border regions, where many refugees travel and settle, Deutschen Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH implemented a series of infrastructure rehabilitation and upgrades. The overall aim of these projects was to improve the work conditions of local Bureau of Health staff as well as the access of local populations to basic health services. Many health centers serving rural and refugee populations in Ethiopia are disconnected from any municipal water source and have inadequate water supply. Rainwater can be harnessed in innovative ways and used as supplemental or total water supply for households and institutions, particularly in areas affected by water stress and scarcity, whether urban or rural [1][2]. In this presentation, 1) an assessment of the water needs of 14 health centers in Jimma, Oromia and the Sudan-Ethiopia border region in Benishangul-Gumuz, and 2) the design of appropriate rainwater harvesting systems will be discussed.

Methodology

The water needs assessment involved a mixture of qualitative and quantitative methods. The project sites were chosen by GIZ Ethiopia country program staff in consultation with zonal (regional) and woreda (district) health officials, and included the following health centers: Korjo, Lalo, Gera, and Defkela in Dedo woreda; Darge and Irgibo in Mencho woreda; Chefe Nega and Nada Bidaru in Omo Nada woreda; Dakeno Ilke and Yala Sesecha in Omo Beyem; and Kurmuk, Homosha, and Sherkole in Benishangul-Gumuz. These sites were determined based on the number of daily patients (health centers with high admission rates were prioritized in Benishangul-Gumuz), accessibility (remote health centers in Jimma, Oromia were prioritized), geographic location, and diverse demographics.

The assessment involved interviews with health care staff to determine baseline water usage, analysis of roof materials and cleanliness, measurement of building roof areas, surveying of health center area using low-tech and accessible tools (e.g., GPS app, measuring tape), research of historical meteorological data and international water use standards for clinics, and modelling and tank sizing in Excel. Proposed RWH and distribution system designs for each health center were then created using AutoCAD, based on site data and findings from the analysis, and used in tender documents.

Results

Most of these health centers retrieve their water themselves from sources several kilometers away or purchase jerry cans from a water vendor. The quality of this water is often quite low, often collected from polluted rivers and streams or rarely a community water point several kilometers away. Additionally, the health centers are usually only able to carry or purchase two to six jerricans per day (40-120 liters) which is often not enough water for the health center staff to carry out their daily activities to international health

standards; furthermore, these sources often dry up seasonally, further restricting water access. Interviewed health center management and staff, as a way of coping with water shortages, generally prioritized sterilizing equipment, cleaning any bodily fluids from the intensive care unit and maternity wards, and cleaning their scrubs if necessary, however health center staff at all project sites all stated that they generally did not have enough water to wash their hands.

Results from the modelling showed that demand from these health centers, if functioning at minimum World Health Organization (WHO) health center standards [1], would be at least 10 times greater than baseline demand and that there was enough rainfall to meet the higher demand, even when projected 20 years into the future (if present population growth trends continue).

Challenges and lessons learned

A major challenge for carrying out this project was a low trust in rainwater as a sufficient water source among health authorities. Rainwater has long been considered too contaminated and unsanitary to use, however techniques have been developed to reduce debris and contamination in collected rainwater. To convince health authorities, we presented several examples of successful rainwater harvesting schemes in Kenya, the Horn of Africa, and even parts of Asia. We also worked with rainwater harvesting advocates in Ethiopia to help address the concerns of the health officials.

Regional conflict was another challenge. In Benishangul-Gumuz particularly, there was ongoing ethnic and political conflict. While we were working in the region, several high-ranking officials were arrested amidst ethnic clashes in the region [4]. Field work halted while staff evaluated if there might be any unrest or instability in response that would make it unsafe for us to travel to the project sites. This delayed our work slightly but our flexible field schedule provided enough of a buffer for us to assess zones to avoid and to find safe routes to the project sites in order to complete our work and leave on time.

In Jimma, the remote locations and poor road conditions leading to the health centers created accessibility challenges for our team and raised questions of how patients would be able to reach these improved health centers if we were struggling to in a 4x4. Though our project scope did not allow us to do anything about the roads, it made me more mindful of which interventions ought to be prioritized in future projects.

Conclusion

Key takeaways of this study are: (1) rural health centers in Ethiopia face severe water shortages that impact clinic performance and, consequently, health outcomes, (2) rainwater harvesting could supply enough water to meet demands that exceed minimum WHO standards for health centers, and (3) it is crucial in this context to change perceptions around rainwater as a water source for increased adoption of rainwater harvesting systems. With the limitations of this assessment due to funding, political conflict, and short time frame, it was difficult to determine long term impacts of this work; however, there is potential for future study and the impacts of rainwater harvesting in rural health centers could be far-reaching. Each of the 14 health centers assessed in this study serve over 23,000 community members on average, potentially impacting at least 322,000 people. Comparisons can be explored as several studies show the impact that access to basic water services at health centers have on health outcomes in the communities they serve, including infection prevention and control, patient safety, and child and maternal health [5].

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Nadia Makara is a civil and environmental engineer passionate about addressing water insecurity, WASH inequity, climate change, and sustainable development challenges. She has worked as a volunteer, researcher, consultant, and program manager on various water supply and sanitation projects in Honduras, Colombia, Ethiopia, and Cambodia respectively. In Ethiopia, she consulted for Population Services International (PSI) and GIZ GmbH, performing construction analyses and creating prototypes for sanitation infrastructure as well as conducting rapid water assessments for rural health centers.
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