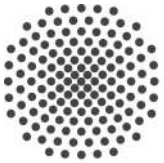

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Development of Regionalized Rainwater Harvesting Design Curves in Ecuador

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Abstract

The need to find alternative sources of water to cover the increasing urban water demand has given more importance in the last decades to rainwater harvesting techniques. However, there is still a lack of general approaches to determine and compare the proper size of storage tanks at the domestic scale. Previous studies have focused generally in specific cases and conditions, making difficult to adapt and interpret their results at different locations. One means of understanding local potentials of rainwater harvesting is to describe the expected performance of the system under diverse physical conditions. This study assesses the influence that different storage tank sizes, roof catchment areas, and daily water demand have in the efficiency of these systems in Ecuador, at sixteen sites that represent four different climates. Based on a daily water balance model and employing TRMM 3B42V7 records, three sets of curves are proposed to evaluate the influence of these design parameters in the reliability of the system and to estimate optimal dimensions of the units. The results show a high correlation between the general performance, annual rainfall, and temporal distribution regime, suggesting that the expected behavior of a storage tank can be generalized for locations with similar characteristics. For those sites with related hydrological conditions, regional equations are obtained in order to estimate the required storage volume based on the expected water saving efficiency. To show the applicability of these curves, the required volumes and rainwater supply capacities are calculated in four locations considering a 100 m^2 roof catchment area and 90% reliability. These results show that rainwater harvesting strategies are required at the regional level because the potential at each zone is significantly different. Public advice should consider these limitations when implementing future policies.

Keywords: rainwater harvesting; regional climate; water balance model; reliability; TRMM; Ecuador