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Potentials and limits of urban rainwater harvesting in the Middle East

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In the Middle East, water is scarce and population growth causes a rapid rise of urban centers. Since many towns of the Palestinian Authority (PA) suffer from water shortage, the use of rainwater harvesting (RWH) as an alternative to conventional water supply has gained increasing interest among water resources planners. This study quantifies actual volumes of urban RWH to be expected from highly variable Mediterranean rainfall. A one-parameter model uses measured potential evaporation and high resolution rainfall data as input to calculate RWH volumes from rooftops inside Ramallah, a traditional Arab town. While during average seasons a 87% runoff harvest can be expected, this value decreases to about 75% during drought seasons. A survey comprising more than 500 questionnaires suggests that approximately 40% of the houses are equipped with RWH systems from which one third are out of use. Although water quality is perceived to be favourable, only 3% of the active RWH systems are actually used for drinking and only 18% for domestic purposes. All active RWH systems investigated may harvest approximately 16 x 103 m3 of rooftop runoff during an average season and 6 x 103 m3 during a typical drought. When these numbers are extrapolated to all houses in Ramallah, theoretical maximum potentials increase to approximately 298 x 103 m3 during an average season and 118 x 103 m3 during a typical drought. A part of this potential can easily be exhausted by rehabilitation of installed RWH systems. Also, the use of collected water for drinking should be advocated. This should go along with regular checks of water quality and regulations concerning adequate water storage and treatment/disinfection procedures where necessary. Finally, we extrapolate our findings to the entire Lower Jordan River Basin. Our analysis suggests that urban RWH is a relatively small contribution to overcome water scarcity in the region and decreases significantly during droughts. Yet it is a sustainable water resource, which is available on spot for everybody. Due to population growth and ongoing urbanization it will be more important in future.
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