

Detection of suitable sites for rainwater harvesting planning in an arid region using geographic information system

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Abstract

Water is a key natural resource on earth, especially in arid and semi-arid regions with limited rainfall amounts. The impact of drought could be alleviated via constructing dams to ensure water storage and supply. The aim of the present study is to detect proper sites for planning rainwater harvesting (RWH) in the western desert of Iraq using both the Boolean overlay and the weighted linear combination (WLC) in the geographic information system (GIS). Potential sites of rainwater harvesting were identified using multi-criteria evaluation. Several criteria were used, including physical characteristics and climatological and socio-economic conditions to determine the proper location for RWH. Seven WLC parameters were used in the site selection process: runoff, slope, soil texture, land use/land cover (LULC), distance from irrigated lands, distance from residential areas, and distance from roads, while the Boolean overlay method used the stream order and distance from faults parameters. The results indicated that the final map can be classified into three classes of suitability, i.e., (i) highly suitable with 6% coverage (117 km²), (ii) moderately suitable with 4% coverage (78 km²), and (iii) least suitable with 90% coverage (1758 km²) of the basin area. It was indicated that only three earthen dams could be executed along streams. This low data-intensive and cost-effective methodology offered can be adopted in arid regions to embrace RWH as an efficient strategy to handle growing water scarcity. The proposed method could be adopted in many countries that have identical environmental and physical conditions to the western desert of Iraq, which is the case in most arid regions.