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Determining Optimum Locations for Runoff Water Harvesting in W. Watir, South Sinai, Using RS, GIS, and WMS Techniques

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Abstract : Rainfall water harvesting is considered as an important tool for overcoming water scarcity in arid and semi-arid region. Wadi Watir in the southeastern part of Sinai Peninsula is considered as one of the main and active basins in the Gulf of Aqaba drainage system. It is characterized by steep hills mainly consist of impermeable rocks, whereas the streambeds are covered by a highly permeable mixture of gravel and sand. A comprehensive approach involving the integration of geographic information systems, remote sensing and watershed modeling was followed to identify the RWH capability in this area. Eight thematic layers, viz volume of annual flood, overland flow distance, maximum flow distance, rock or soil infiltration, drainage frequency density, basin area, basin slope and basin length were used as a multi-parametric decision support system for conducting weighted spatial probability models (WSPMs) to determine the potential areas for the RWH. The WSPMs maps classified the area into five RWH potentiality classes ranging from the very low to very high. Three performed WSPMs' scenarios for W. Watir reflected identical results among their maps for the high and very high RWH potentiality classes, which are the most suitable ones for conducting surface water harvesting techniques. There is also a reasonable match with respect to the potentiality of runoff harvesting areas with a probability of moderate, low and very low among the three scenarios. WSPM results have shown that the high and very high classes, which are the most suitable for the RWH are representing approximately 40.23% of the total area of the basin. Accordingly, several locations were decided for the establishment of water harvesting dams and cisterns to improve the water conditions and living environment in the study area.

Keywords : Sinai, Wadi Watir, remote sensing, geographic information systems, watershed modeling, runoff water harvesting
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