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## GIS-based modeling for selection of dam sites in the Kurdistan Region, Iraq

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### GIS-based modeling for selection of dam sites in the Kurdistan Region, Iraq

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### Abstract

Iraq is a country in the Middle East experienced serious drought events in the past two decades due to significant decline in the discharge of its two main rivers and severe decrease in annual precipitation. Water storage by building dams can minimize drought impacts and assure water supply. This work aims at identifying suitable sites to build new dams within the Al-Khabur River Basin (KhRB), using GIS and remote sensing methods. We evaluated 14 geological, environmental,

topographical, hydrological, and socio-economic factors, derived from the Digital Elevation Model (DEM), Landsat 8, QuickBird, geological, and soil maps. The fuzzy analytic hierarchy process (AHP) and the weighted sum method (WSM) approaches were used to determine suitable dam sites and compared for accuracy. Based on the integrated use of GIS, remote sensing, and geology, 11 dam sites have been suggested for potential runoff harvesting. Three of the sites correspond to three of the 21 dams, which were preselected by Ministry of Agricultural and Water Resources (MAWR) within the KhrB. The accuracy of the suggested 11 dam sites was evaluated in both of the AHP and the WSM methods in relation to the location of 21 preselected dams. Three types of accuracies have been tested, which are: overall, suitable pixels by number, and suitable pixels by weight accuracies. Overall accuracies of the 11 dams ranged between 76.2 % and 91.8 %. Locations of the two most suitable dam sites are in the center of the study area. Comparative analyses of the two methods show that the AHP method is more precise than WSM. We argue that the use of QuickBird imageries to determine stream width for discharge estimation, when no in-situ data is available, is adequate and can be used for preliminary dam site selection.

The most suitable site for dams identified from this study have favorable geology, adequate reservoir storage capacity, and are close to population center. The study offers a valuable and relatively inexpensive tool to decision-makers for eliminating sites having severe limitations (less suitable sites) and focus on those with least limitation (more suitable sites) for selection of the final site for dam construction.