World Academy of Science, Engineering and Technology
International Journal of Environmental and Ecological Engineering
Vol:13, No:05, 2019

Integrating GIS and Analytical Hierarchy Process-Multicriteria Decision Analysis for Identification of Suitable Areas for Artificial Recharge with Reclaimed Water

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Abstract : This work represents a coupling between the geographic information system (GIS) and the multicriteria analysis aiming at the selection of an artificial recharge site by the treated wastewater for the Ariana governorate. On regional characteristics, bibliography and available data on artificial recharge, 13 constraints and 5 factors were hierarchically structured for the adequacy of an artificial recharge. The factors are subdivided into two main groups: environmental factors and economic factors. The adopted methodology allows a preliminary assessment of a recharge site, the weighted linear combination (WLC) and the analytical hierarchy process (AHP) in a GIS. The standardization of the criteria is carried out by the application of the different membership functions. The form and control points of the latter are defined by the consultation of the experts. The weighting of the selected criteria is allocated according to relative importance using the AHP methodology. The weighted linear combination (WLC) integrates the different criteria and factors to delineate the most suitable areas for artificial recharge site selection by treated wastewater. The results of this study showed three potential candidate sites that appear when environmental factors are more important than economic factors. These sites are ranked in descending order using the ELECTRE III method. Nevertheless, decision making for the selection of an artificial recharge site will depend on the decision makers in force.

Keywords : artificial recharge site, treated wastewater, analytical hierarchy process, ELECTRE III
Conference Title : ICEWW 2019 : International Conference on Environment, Water and Wetlands
Conference Location : Montreal, Canada
Conference Dates : May 23-24, 2019