

## MAPPING GROUND WATER POTENTIAL RECHARGE ZONES OF WADI AL-BATIN ALLUVIAL FAN, USING REMOTE SENSING AND GIS TECHNIQUES, SOUTHWESTERN IRAQ

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### ABSTRACT

Groundwater potential recharge (GWPR) zones are an important process in managing water resources. Six thematic layers were used to produce GWPR mapping for Wadi Al-Batin alluvial fan, Southwestern Iraq with GIS environment and analytical hierarchical process (AHP), including geology, lineaments density, slope gradient, drainage density, soil, and slope aspect. Based on the importance, the thematic layers are ranked, which control the GWPR. Drainage density, lineament density, slope aspect, and slope gradient maps are classified into five classes, whereas, geology and soil are classified into six classes. The classes are weighted based on the magnitude of groundwater recharge potential. The AHP technique divides the entire into three zones based on GWPR values: high, moderate, and low. The final GWPR map demonstrated that the western and northwestern parts of the alluvial fan have greater groundwater recharge potentials with 70% of the total area due to the increase in the infiltration rates as a result of the gravely and sandy soils besides the agricultural land use in the present areas. However, the other part of the fan ranged between moderate and low with 25% and 5% of the total area, indicating suitable zones for groundwater artificial recharge processes.

### INTRODUCTION

Subsurface water is a vital source of the natural water cycle, which is stored beneath the water table in the pore spaces of soil and rock (Fitts, 2002). Its availability provides a valuable resource for residential, agricultural, and socioeconomic development operations (Ayazi *et al.*, 2010) Alluvial fans are conical fan-shaped slopes that start at steep mountain drainage outlets and end in low-relief basins with little stream intensity. The cone-shaped deposit appears to be fan-shaped. In certain spots, stream channels have been carved out of the alluvial fan material. In contrast to alluvial plains, alluvial fans have a distributary fluvial system, whereas plains have a through-flowing system (Al-Sahlani, 2020).

The Wadi Al-Batin alluvial fan is regarded as the primary source of groundwater water for southern governorates, such as Basra and Samawah. Many authors have researched it, including Maala (2009), who identified four stages of the fan. Al-Batin alluvial fan was defined by Sissakian and Abdul Jab'bar (2014) as a "multistage, huge fan encased in gyperete". Al-Kinani and Merkel (2017) described the groundwater of the Al-Batin alluvial fan aquifer using hydrochemical and isotopic analysis. Whereas Abd Al Karim (2009) stated

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