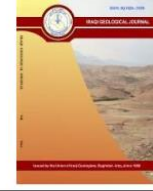




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### Groundwater Vulnerability Analysis via GALDIT-GIS Method to Seawater Intrusion, South of Iraq

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#### Abstract

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One of the most significant environmental problem that needed to be identified and managed is the intrusion of salty water into the aquifers. Human actions, such as excessive irrigation pumping, as well as the rising sea level, have generated a vulnerable state for seawater intrusion into aquifers. Six effective factors have been focused on evaluating seawater intrusion of groundwater Dibdibba aquifer in Basrah, south of Iraq mainly based on the GALDIT-GIS model involving the groundwater occurrence, aquifer hydraulic conductivity, groundwater levels above sea level, distance to shoreline, impact the existing status of seawater intrusion, and thickness of the aquifer. Water samples were collected for 19 wells over the area concerned. Chemical parameters including  $SO_4^{2-}$ ,  $Cl^-$ , and Total Dissolved Solids were applied for modeling in addition to measuring depth to groundwater level. The results of the GALDIT model showed that the Dibdibba aquifer revealed three levels of vulnerabilities arranged according to risks: a high level which occupied Umm Qasr area and the near distance of Khor Al-Zubair to shoreline with an area of 76.87  $Km^2$  and 82.56  $Km^2$ , moderate level represented the long distance of Khor Al-Zubair to shoreline and Safwan areas about 205.21  $Km^2$  and 196.61  $Km^2$ , and low level represented Al-Muwailihat area with 139.65  $Km^2$  and 142.61  $Km^2$  for the wet and dry season, respectively.

**Keywords:** GALDIT rating; Vulnerability scores; Intrusion impact; Dibdibba; Iraq

#### 1. Introduction

Everywhere in the world, the depletion of the groundwater resources close to coastal places has been markedly raising in recent decades for the purpose of agricultural, industrial, and economic investments, particularly in arid and semi-arid zones that characterized with scarce of rivers, low rainfall and high evaporation rates. The changes such reducing of water table and poor recharge rate, the hydrological system of coastal zones and other geo-environmental factors naturally lead to vulnerability of aquifers (Seenipandi et al., 2019). Water consumption with environmental health problems are significantly developing among communities that lack to environmental awareness (Awadh, 2018). The bad agricultural practices that use overexploitation of groundwater for irrigation lead to lowering water levels and capturing saline water into groundwater. Climate change and its relation with recharge has a strong influence on groundwater level variability (Awadh et al., 2021). Intrusion of seawater (IOSW) into aquifers is one of the most significant problems of water contamination that is associated with

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