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Hydrochemical Characteristics and Spatial Variability in Coastal Aquifers Southern IraqUtilizing a GIS Technique

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Abstract

The present study investigates water quality regarding drinking and irrigation supplies by gathering and analyzing twelve groundwater samples south of Basrah, south Iraq. Many wells in the area concerned are exploited mainly for various industrial and agricultural activities, impacting the ground water quality. The standard guidelines recommended by the Iraqi Quality Standard limits and the World Health Organization have been used to determine the suitability of drinking. The physicochemica analyses showed that all sampled waters are unsuitable for the drinking supply due to high total dissolved solids (TDS) levels reaching 12925 mg/L. Four valuable indices have been applied for estimating the irrigated water quality, namely, the sodium adsorption ratio (SAR), the soluble sodium percentage (SSP%), the magnesium hazard (MH%), and Kelly's ratio (KR%). The results of water class as regards the percent of samples showed: SAR results, 25% excellent water, 41.7% good water, and 33.3% doubtful water; SSP% results, 16.7 % good water, 75% permissible water, and 8.3 % doubtful water; MH% results, 100% suitable irrigated water; and KR% results show 41.7% suitable water and 58.3 % unsuitable water. The USSL salinity diagram (Wilcox) result revealed 83.3 % of samples fall in very high salinity-very high sodium hazard class C_4S_4, and 16.7 % of samples fall in very high salinity-high sodium hazard class C_4S_3 and very high salinity-medium sodium hazard class C_4S_2, respectively. Increasing salinity of coastal aquifers has impacted sources such as seawater intrusion and intensive irrigation, and usages of excessive fertilizers and herbicides can largely pollute the groundwater quality.

Keywords: Physicochemica analysis; permissible limits; Spatial distribution; irrigated water indices; Dibdibba coastal aquifer; Iraq

1. Introduction

Groundwater, for many aquifers of the world, is considered a reliable resource for human requirements if it is protected from contamination. Those demands have quickly developed in recent decades due to population growth, increased irrigation, and the economy (Fatah et al., 2020). Intensive agricultural activity, overexploitation of wells, and uneven rainfall might lead to groundwater contamination (Chaudhary and Satheeshkumar, 2018). Due to rising evaporation and declining rainfall rates in arid and semi-arid areas, groundwater is increasingly exploited for industrial and irrigation usage (Alqurnawy et al., 2022). Expanding agricultural and anthropogenic activities on the environment might affect constituents chemistry and cause water quality deterioration (Kaur et al., 2017). Any change in the groundwater system is caused by geochemical factors such as rock-water interaction,

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