

Ground water quality around Chakwal city and its representation on GIS platform for public use

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Abstract

The assessment of ground water quality and zonation is of prime importance for growing cities like Chakwal, which have limited groundwater resources. Increasing demand of drinking water due to urban sprawl coupled with poor management and monitoring has deteriorated the quality of water of both surface and groundwater sources of the area. The issue of ground water contamination and its study is an important matter to be addressed for any growing city of this region.

Total Dissolved Solids (TDS), Hardness, pH, major cations and anions can be used to gauge the drinking quality of groundwater for community use. The present study is an attempt to assess the quality of groundwater by obtaining water samples from the already bored wells at various depths in the vicinity of Chakwal city situated in the province of Punjab, Pakistan.

Thirty five ground water samples were collected from previously bored wells at various locations in an area of 64 km² around the city of Chakwal. These water samples were analyzed chemically for TDS, pH, major cations, anions and total hardness in the chemical laboratory of Geological survey of Pakistan, Lahore. The results of the analysis were carefully examined for any discrepancies. The values of TDS, hardness, Ca, Mg, Fe, CO₃, HCO₃, Cl, SO₄ and pH varied from 272 to 8788(ppm), 30 to 3663(ppm), 10 to 798(ppm), 0 to 406(ppm), BDL (Below detection limit), 27 to 240(ppm), 170 to 1025(ppm), 14 to 1099(ppm), 31 to 1416(ppm) and 6 to 9 respectively. Graphical relationships of TDS with pH, major cations, anions and total hardness were visualized to see the relationship. The graphical relationships of chemical analysis revealed that the value TDS increased with the increase in value of hardness, Ca, Mg, Cl and SO₄.

After understanding the relationships of important parameters of ground water quality, predicted distribution maps of TDS, pH and total hardness were formed by using kriging interpolation method in Arc GIS software. The obtained three maps were combined to form zones of good quality water with the help of raster calculator in Arc GIS software, where TDS values were less than 1000 (ppm), pH value was equal to 7 and hardness was less than 300 (ppm). SRTM (Shuttle Radar topography mission) digital elevation model of 90m Resolution was used for visualizing the zones with respect to topography. The map indicated two good quality water zones one just outside the city of Chakwal and other near the town of Karijala which is 10 Km southwest of Chakwal. These zones can be exploited for water supply schemes for urban and rural population around Chakwal city.