Spatial and seasonal variation of ground water quality in Qaenat, South Khorasan, Iran

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Abstract:
The spatial distribution and seasonal variation of Cl^-, Ca^{+2}, EC, Mg^{+2}, Na^+, NO_3^-, SO_4^{-2}, TDS, HCO_3^-, Alkalinity, and Total Hardness were obtained by surveying 25 sampling stations in 2009 and 2010. All the parameters were analyzed by standard methods and spatial distribution maps drown using Arc GIS 9.3 and GS^+5.1 softwares using kriging method. In the present study an attempt has been made to evaluate the variation of the contaminated parameters in the different seasons and years with the help of normalized scatter coefficient formula which for EC, Mg^+ Ca^{+2}, ^{2} NO_3^-, SO_4^{-2}, HCO_3^-, Alkalinity, and Total Hardness show consistent increase form 2009 to 2010 while there is a general decrease in Cl^-, TDS, Na^+ concentrations. The results of the study showed in 2009 and 2010 with passing the time from cold seasons to warm seasons the contaminated parameters EC, TDS ,Cl-, Na+ are seen to be increasing throughout the ground water**.**

Keywords: Qaenat, ground water, spatial maps, seasonal variation.

Introduction:

Groundwater is a vital natural resource for the reliable and economic provision of potable water supply in both the urban and rural areas (1). Groundwater contributes nearly half of the total water supply (i.e., 120 million liters per day) during wet season, which reaches up to 60–70% during the dry seasons (2). Urbanization and the unregulated growth of the population have altered the surface and sub-surface terrains of the many areas(3).

Worldwide, groundwater resources are facing an increasing threat of pollution from urbanization, industrial development, agricultural and mining activities. Thus extensive study of the quality of groundwater leading to proactive campaigns and practical actions to protect the quality of groundwater is widely required.
Groundwater quality depends not only on natural factors: such as aquifer litho logy, groundwater velocity, quality of recharge waters, atmospheric precipitation, inland surface water and sub-surface geochemical processes and interaction with other types of water or aquifers. But also on human activities and the environment temporal changes in the origin and constitution of the recharged water, hydrologic and may cause periodic changes in groundwater quality (2,4).
Naturally, ground water contains mineral ions and these ions slowly dissolve from soil particles, sediments, and rocks as the water travels along mineral surfaces in the pores or fractures of the unsaturated zone and the aquifer. Some dissolved solids may have originated in the precipitation water or river water that recharges the aquifer. However, human activities can change the natural composition of ground water e.g. mining activities, the disposal or dissemination of chemicals and microbial matter at the land surface and in to soils, or through injection of wastes directly in to ground water (3). Hence, evaluation of groundwater quantity and quality and establishing data base are important for the development of further civilization and for future water resources development strategies (4).

This paper proposes, spatial distribution and seasonal variation of contaminated parameters like Cl^-, Ca^{+2}, EC, Mg^{+2}, Na^+, NO_3^{-2}, SO_4^{-2}, TDS, HCO_3^-, Alkalinity, and Total Hardness were obtained by surveying 25 sampling stations in 2009 and 2010.