

Risk Assessment using WQI and Multivariate Analysis of Groundwater of Taluka Hala, District Matiari, Sindh, Pakistan

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ABSTRACT

The current study explores the quality of groundwater of taluka Hala district Matiari for irrigation and drinking purposes using Arc-GIS maps. The 30 samples were collected from different sites mostly used for human consumption. The water samples were examined for 26 parameters. The results of EC and TDS varied from 370 to 5010 uS/cm and 237 to 3206 mg/L. The results of anions Cl⁻, HCO₃⁻, SO₄²⁻ varied from 11 to 1032, 150 to 620, 15 to 530 mg/L respectively and cations Ca²⁺, K⁺, Mg²⁺, N⁺ varied from 24 to 208, 1.0 to 75, 8.0 to 192, 10 to 425 mg/L respectively. The results indicated that arsenic 43% and fluoride 40% samples were higher than acceptable limits of WHO. The samples were examined for Correlation matrix, Piper diagrams, cluster analysis, Gibbs diagrams, Principal Component Analysis, and water quality index (WQI). The principal component analysis indicated 8 components and accounted for 85.317% of the cumulative variance in the data set. The calculated parameters for that 53-100% samples of Hala were suitable for irrigation.

Keywords: Cluster analysis, groundwater samples, Physico-chemical characteristics, principal component analysis.

INTRODUCTION

Water is vital for human life. Drinking of the safe water has remained concern in most of the parts of Pakistan. The chief sources of the drinking water are groundwater and surface water. The surface water is mostly supplied through canals network from river Indus and its tributaries (Azizullah et al, 2011). The quality of water supplied through water supply schemes, raw water from canals and groundwater are subject to a lot of uncertainty for their suitability for human consumption. Groundwater is a universal and liable resource. Hydrogeological investigations are conducted to protect and sustain these water resources. To achieve these goals, there is a need to control natural water quality and quantity (Hashimi et al, 2009).

OBJECTIVES

The present work examines the water quality of groundwater of Taluka Hala, Matiari in terms of Physicochemical analysis to assess the suitability of the groundwater for human consumption and irrigation.

METHODOLOGY

The samples of water were investigated on the site for conductivity, dissolved solids total, salinity, pH and the reading for Global Positioning System (GPS). chloride (Cl), sulphate (SO₄), total hardness (TH), alkalinity, (NO₃-N), (NO₂-N), orthophosphate, total phosphate, chemical oxygen demand (COD), fluoride (F), Ca, Na,

Mg, K, Fe, Mn, Cr, Cu, Ni, Pb, Co, Cd and As were analyzed at the laboratories of IARSCS. The analysis was carried out by electro analytical techniques, UV/Visible spectrophotometry, flame atomic absorption spectrophotometry (FAAS), volumetric techniques and Merck arsenic kit by using standard analytical procedures (Jahangir et al 2010; Khuhawar et al 2019).

CONCLUSION

The study was undertaken to evaluate the quality of ground water samples of Taluka Hala. The TDS of 37% samples were higher than WHO permissible limit of 1000 mg/l and were not considered applicable for drinking purposes. The TH 17%, T-PO₄-P 30% and COD 24% samples were higher than the limits of WHO while other parameters are above, the limits of WHO. The concentrations for essential metals were about above the permissible limit of WHO while anions most of the samples were within the safe limits of WHO. The heavy metal concentrations of Pb, Ni and Cr indicated 3-40% samples were higher the limits of WHO while Arsenic 43% and fluoride 40% samples were higher than the acceptable limits of WHO. The samples with high salts contents, could cause some health hazards.

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