

ASSESSMENT OF GROUNDWATER QUALITY FOR DRINKING AND IRRIGATION FROM A SEMI-ARID WATERSHED IN SOUTHERN INDIA

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Abstract

In the present study, groundwater types and water quality indices (WQI) from a semi-arid watershed hosting ~45 villages in southern India are evaluated. This region experiences severe water crisis, particularly in pre-monsoon season resulting in drilling of deep bore wells both for domestic and agricultural activities as evidenced by the deeper groundwater table levels. A typical trend in concentration of the cations: $\text{Na}^+ > \text{Ca}^{2+} > \text{Mg}^{2+} > \text{K}^+$ and anions: $\text{HCO}_3^- > \text{Cl}^- > \text{NO}_3^- > \text{SO}_4^{2-} > \text{PO}_4^{3-}$ is observed irrespective of seasons. Groundwater in the present study is classified as being sodium-bicarbonate-chloride ($\text{Na}^+ - \text{HCO}_3^- - \text{Cl}^-$) type similar to most of the regions in Peninsular India. Pearson correlation, a prominent statistical analysis tool of major ions, demonstrates that natural sources have a greater influence on groundwater composition across the villages in the watershed area than anthropogenic activities (agriculture and land use and land cover changes). Graphical representation like the (Gibbs, 1970) plot suggests that interaction of rock and water during infiltration and aquifer storage could be the driving mechanism for the observed water composition in the study area. Irrigation suitability indices such as SAR, Na%, and RSC indicate > 75% of samples are found suitable for irrigation. However, results from MHR and KR indicate ~ 50% of the groundwater samples are found to be unsuitable for irrigation irrespective of the seasons. Groundwater in villages nearer to the local Bukleru River is only found suitable ($\text{KR} > 1$) for irrigation exclusively during the post-monsoon season. Results from the present study reveal that groundwater in the study region is partially suitable for irrigation. Overall, the calculated WQI scores highlight that groundwaters in the studied villages show mostly (~90%) poor water quality and hence, strictly not suitable for drinking during both the seasons.

Keywords: Semi-arid; Groundwater contamination; Water Quality Index; Bukleru watershed; Peninsular India.