

Hydro-environmental assessment of a regional ground water aquifer: Hirakud command area (India)

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Abstract A hydro-environmental assessment has been performed for Hirakud command area (India) in terms of quantity and physicochemical quality analysis of groundwater. Quantity analysis has been performed in terms of water level variation and groundwater potential zone identification. Groundwater table fluctuation analysis reveals that water level is declining rapidly due to insufficient recharge owing to frequent recession of monsoon and excessive pumping of groundwater. Inefficient distribution of canal water especially in the tail end of the Hirakud command is accentuating the high dependency on ground water. The groundwater potential zone index map is generated using analytic hierarchy process along with different influencing features, e.g., land use/cover, soil type, geology. Three zones have been identified for Hirakud command area (poor: 21.15 %, moderate: 46.32 %, and good: 32.53 %). Physical and chemical parameters of

groundwater, e.g., electrical conductivity, pH, total dissolved solids, total hardness, nitrate, iron, sodium, potassium, calcium, magnesium, chlorine, bicarbonate and fluoride are analyzed for the study area. Piper analysis is used to identify dominant hydrochemical facies. United States Salinity Laboratory and Wilcox Diagram are used to determine the irrigation water quality. Principal component analysis is utilized to find out key groundwater quality parameters. The chemical analysis shows that values of all parameters are within permissible limit. However, nitrate, iron and fluoride are found above permissible limit in some areas. The assessment reveals the state of the aquifer in terms of quantity and quality.

Keywords Groundwater · Potential zone · PCA · USSL · Wilcox diagram