

Integrated structural, geophysical and hydrogeological approaches for sustainable groundwater resources in Precambrian basement rock terranes, India

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The flow and occurrence of groundwater in Precambrian basement rock aquifers are mainly governed by various factors such as geologic structures, lithology, fault and fracture densities, and topography. The study attempts to investigate sustainable groundwater resources to meet the demand in semi-arid Precambrian basement terrane using integrated field-based structural, geophysical, and hydrogeological approaches. The study area is a part of the Aravalli Delhi Mobile Belt (ADMB) that comprises low to high-grade rocks. Structural features such as brittle and ductile shear zones have mapped in detail followed by subsurface resistivity tomography for mapping deep-seated aquifers. The paleostress results from the fault slip data show two prominent stress regimes i.e. NE-SW and NW-SE extensional regimes in the study area. Further, resistivity imaging data have been collected based on the structural features in 07 different locations and interpreted to obtain the resistivity parameters and to locate high yielding groundwater bearing zones. For a pilot study, a total of 06 boreholes (150 m depth) were drilled for pumping test analysis based on the acquired structural and geophysical data. The study reveals that the high yielding aquifers ($Q=180-220$ lpm) are confined to ductile shear zones than brittle shear zones. Thus, the hydrogeological importance of various factors related to movement and occurrence of groundwater presented here will provide a basis for future water supply development programs to meet the groundwater needs.

Keywords: Brittle and Ductile Shear zones, Precambrian terranes, Sustainable groundwater resources

