

**Identification of aquifer-recharge zones and sources in an urban development area (Delhi, India), by correlating isotopic tracers with hydrological features**

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**ABSTRACT**

Recharge zones and sources in an urban setup (NCT of Delhi, India) were identified using environmental isotopes ( $^2\text{H}$ ,  $^3\text{H}$ ,  $^{18}\text{O}$ ); they were then correlated with hydrogeological conditions. The isotopic results showed that groundwater is being recharged by surface water during the dry season, while recharge associated with local precipitation becomes prominent during the monsoon. The effect of source-water evaporation and altitude on the isotopic characteristics of groundwater was clearly noted. A gradual increase in groundwater age, i.e. decrease in tritium content, while moving away from the river/canals/drains, suggests a degree of mixing of old-aged groundwater with relatively young recharging water. Further, to substantiate the findings of isotopic investigations, surface recharge conditions were differentiated into potential pervious (recharge prone) and impervious (recharge resistant) surfaces through mapping of potential recharge areas based on soil type and water-table depth, to depict a three-dimensional illustration of hydrogeologically mediated recharge zones of the area. The hydrogeological evidence thus obtained about the spatial distribution of permeable zones, slope and boundary conditions, aptly substantiates the isotopic findings. The study seeks its impact by correlation of the isotopic findings with the regional groundwater flow regime which has been altered by the urban development.