GIS-based spatio-temporal studies of groundwater quality and depth in Kaithal District of Haryana, India

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ABSTRACT
Haryana is one of the northern states of India and is dominantly covered by Indo-Gangetic alluvium. It is well known for its rich granary and ranks second among the contributors of wheat to the central pool of India. The present study pertains to the Kaithal district of the state covering an area of 2317 km^2 and is famous for wheat and paddy crops. The change in rainfall pattern over a period of more than 35 years and with concomitant changes in the groundwater conditions both quantity and quality are posing a new threat for sustained production of agriculture. To address the problem, analyses of groundwater depths and quality from 1974 to 2009 have been carried out. Land use, geomorphology, seasonal fluctuations and groundwater prospects, depth and quality maps were generated in a GIS environment. The study reveals a recession of groundwater levels from 6.21 meters in 1974 to 19.16 meters in 2009 with a net average decline of 1.5 m/year during 1974-1999 as compared to more than 11 m in the next ten years. Up to 1998, the rainwater was able to recoup the ground water to some extent, however during the last decade, even the post-monsoon depths were found greater than the pre-monsoon depths. Moreover, the value of pH has changed from 8.1 in 1997 to 7.54 in 2007. Similarly, the TDS has changed from 637 to 1360 mg/l, TH from 172 to 173 mg/l, EC from 1061 to 2267 µS/cm, SAR from 5.6 to 16, RSC from 1.4 to 2.8 meq/l whereas PS changed from 44 to 81 percent over a period of 10 years from 1997 to 2007. It has been observed that the decline in depth to water level is associated with the decline in the quality, which poses a threat to the farmers for its use in agricultural activities.