Impact of Urbanization on Groundwater Quality – A GIS Perspective

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An attempt has been made to assess the influence of changing land-use patterns on the groundwater quality of the hard rock aquifer system in the Maheshwaram watershed, near Hyderabad, India. The study area is a rapidly urbanizing region with land development progressing at a fast pace. To study the impact of this rapid urbanization and overall land-use transition, a Groundwater Quality Index (GQI) was prepared within GIS environment. The GQI integrates the different water quality parameters to give a final index value that can be used for spatio-temporal comparisons. The land-use transitions were closely monitored from 2003 to 2008 using multispectral satellite images. The land-use pattern has changed drastically with an increase in the built-up area at the expense of other land uses. The analysis reveals a rapid deterioration of groundwater quality related mainly to the increase in built-up land with unsewered sanitation and poultry farms. Seasonal variability of the groundwater quality was also assessed. Mean GQI decreased from 84.16 to 83.26 over a period of five years from 2003 to 2008, while seasonal variability of water quality increased. Groundwater Quality Index and Seasonal Variability of water quality were integrated in GIS to yield a Groundwater Sustainability Map, in terms of water quality. Zones of sustainable and unsustainable groundwater use were demarcated for better decision making related to municipal land allotment in this rapidly urbanizing region.

Keywords: GIS, GQI, seasonal variability, land-use, sustainability, Maheshwaram.