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### **Spatial temporal analysis of groundwater quality: A case study of Islamabad**

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Islamabad is a planned city of Pakistan. Over the years, due to economic growth it has been a hub for immigrants. Apart from Rawal and Simly Lakes, most of the city's water supply demand is met by the groundwater resources. However, urbanization and industrialization has brought these groundwater resources under high risks of contamination. This study assesses the groundwater pollution risk in Islamabad. The study demonstrated that GIS technology is an efficient environment for analyses of spatial data. The combined use of DRASTIC model and GIS was adopted to provide a spatial assessment of groundwater quality. Seven thematic maps of the DRASTIC model were developed in order to assess the vulnerability of groundwater to contamination and these include the depth to water table, recharge, aquifer media, soil media, topography, impact of vadose zone and hydraulic conductivity. The GIS software (ArcGIS) was used to create an integrated vulnerability map of Islamabad to demarcate vulnerable zones. Temporal monitoring of land cover areas were derived from classified land-cover maps. This was done to describe the relative degree of natural protection of the groundwater from contamination due to the physical characteristics of the land and subsurface. Most of the area of Islamabad lies within the moderate vulnerability which means that the increase in vulnerability from 2003 to 2010 has been from 5% to 8.5%. These results indicate that reforms are required by the government to protect this groundwater asset. Reforming these policies requires governments to implement far-reaching institutional change and promote technical innovation.

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