

## **Assessment of groundwater quality contamination by nitrate leaching using multivariate statistics and Geographic Information Systems**

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**Abstract** The present study examines nitrate contamination and groundwater quality in the Megara basin of Attica Prefecture (Greece). Hydrochemical data were assessed using descriptive and multivariate statistical analysis to: (1) classify the data into hydrochemically similar groups, and (2) to investigate geochemical and human-related factors responsible for the observed groundwater quality. Geographic Information Systems (GIS) were used to incorporate both thematic (land-use) data and groundwater chemistry to study the extent and variation of nitrate contamination and to establish spatial relationships with specific land-use types. The results indicate that more than 70% of the groundwater samples located around the national highway had nitrate concentrations that exceeded acceptable levels according to international legislation and guidelines (Directive 98/83/EC, EPA, WHO). The combined spatial analysis and statistical hydrochemical evaluation show that nitrate contamination in groundwater is closely associated with specific land-use classes and activities (e.g. agriculture, pasture, industries, urban effluents).

**Key words** groundwater; nitrate leaching; multivariate statistical analysis; GIS analysis