Groundwater Vulnerability and Hazard Mapping in an Arid Region: Case Study, Amman-Zarqa Basin (AZB)-Jordan

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Abstract

The importance of groundwater portability and the possible sources of anthropogenic contamination have led to the development of intrinsic groundwater vulnerability mapping. In this study, groundwater vulnerability map for Amman Zarqa Basin (AZB) has been generated based on information derived and calculated from processed remote sensing information and laboratory analysis. The database was prepared from soil hydro geological and hydrological data, Digital Elevation Model (DEM), and geological maps. For assessment of groundwater vulnerability, the method proposed by the state geological surveys of Germany (GLA-method) has been adapted and applied. The vulnerability map shows about 77% which is about 2919 Km² of the AZB is classified as very low to low which could be corresponding to the pollution sources due to the absence of potential hazards and also due to low vulnerabilities. These areas could consequently be interesting for future development as they set preferable in view of ground water protection. In addition, about 14% (530 km²) is classified within the moderate vulnerability zone. About 5% (around 19 km²) of the study area lies under the area of high vulnerability zone. Only 4% can be classified as very high risk areas. Groundwater quality results revealed that water leachate from point source is the main cause for groundwater contaminations in highly vulnerable karstic limestone aquifer (Amman Wadi Es Sir Aquifer-B2/A7). On the other hand, the Kurnub Sandstone aquifer (K) is generally well protected in the central and eastern part of the AZB due to its thick cover of partly marly sequences. However, the Kurnub aquifer might have a potential risk from the recharged infiltrating surface water from the Zarqa River, which is highly polluted due to industrial activities located along the river.