

Potential Risk Assessment Due to Groundwater Quality Deterioration and Quantifying the Major Influencing Factors Using Geographical Detectors in the Gunabay Watershed of Ethiopia

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Abstract : Groundwater quality has become deteriorated due to natural and anthropogenic activities. Poor water quality has a potential risk to human health and the environment. Therefore, the study aimed to assess the potential risk of groundwater quality contamination levels and public health risks in the Gunabay watershed. For this task, seventy-eight groundwater samples were collected from thirty-nine locations in the dry and wet seasons during 2022. The ground water contamination index was applied to assess the overall quality of groundwater. Six major driving forces (temperature, population density, soil, land cover, recharge, and geology) and their quantitative impact of each factor on groundwater quality deterioration were demonstrated using Geodetector. The results showed that low groundwater quality was detected in urban and agricultural land. Especially nitrate contamination was highly linked to groundwater quality deterioration and public health risks, and a medium contamination level was observed in the area. This indicates that the inappropriate application of fertilizer on agricultural land and wastewater from urban areas has a great impact on shallow aquifers in the study area. Furthermore, the major influencing factors are ranked as soil type (0.33-0.31)>recharge (0.17-0.15)>temperature (0.13-0.08)>population density (0.1-0.08)>land cover types (0.07- 0.04)>lithology (0.05-0.04). The interaction detector revealed that the interaction between soil \cap recharge, soil \cap temperature, and soil \cap land cover, temperature \cap recharge is more influential to deteriorate groundwater quality in both seasons. Identification and quantification of the major influencing factors may provide new insight into groundwater resource management.

Keywords : groundwater contamination index, geographical detectors, public health · influencing factors, and water resources management

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