

Groundwater Nitrate Contaminant Risk Mapping using the modified DRASTIC Model: The Case of Bahir Dar City, Ethiopia.

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Abstract

Nitrate contamination of groundwater often occurs in urban and industrial areas due to point and non-point sources of anthropological activities. Groundwater constitutes a significant portion of the water supply system for Bahir Dar City in Ethiopia, though the level of groundwater pollution is not known. This study was conducted to assess the extent of the aquifer and groundwater pollution (nitrate) based on contaminant vulnerability risk mapping using the GIS integrated modified DRASTIC model. A field survey was conducted to collect samples from boreholes for nitrate analysis and to modify the DRASTIC model. Compared to the original intrinsic vulnerability assessment, land use as external factors changed from moderate-high to high vulnerability class from 18 % to 88 %. The FR-APH modified model showed a good correlation (0.53) compared to the other methods. Based on the FR-APH modified model, about 31% of the area was under moderate to high and high vulnerability range, 39% was under moderate vulnerability range while 30% was under low and moderate to low vulnerability range. The integrated vulnerability map showed high risk in the central part of the City due to the flat slope and shallow depth to groundwater. Besides, the sensitivity analysis indicated that the contribution of aquifer media and vadose zone to contaminant risk was found trivial. In general, groundwater at Bahir Dar city was found vulnerable to nitrate contamination and needs proper management.

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