



“Gheorghe Asachi” Technical University of Iasi, Romania



EFFICIENCY OF DRASTIC, GODS AND TOPEFMEA MODELS IN ASSESSING THE VULNERABILITY OF THE AISIN AQUIFER TO NITRATE

Majid Pourbalighy¹, Sahar Rezayan^{2*}, Maryam Rafati^{1*}, Rokhshad Hejazi¹

¹Department of Environment Engineering, Faculty of Marine Science and Technology, North Tehran Branch, Islamic Azad University, Tehran, Iran

²Department of Environment, Faculty of Technical & Engineering, Islamic Azad University, Shahrood Branch, Shahrood, Iran

Abstract

Over the last decades, several models have been developed for assessing groundwater vulnerability to pollution, which have shown different results, and appropriate modeling will lead to better management of these important water resources. Here, the vulnerability of the Aisin aquifer in southern Iran to pollution was investigated using DRASTIC, GODS and TOPEFMEA models. The required data were ranked and weighted and vulnerability map was prepared for each model in GIS. To validate the models, linear regression was performed between the vulnerability index and the actual values of chemical pollution obtained from the wells in the area. Moreover, TOPSIS model was applied for estimating the probability of occurrence of pollution. The results showed that the DRASTIC vulnerability index values varied from 43 to 159, so that the study area was classified into six classes including no pollution (8.8%), very low (12.08%), low (12.52%), moderate (5.38%), high (44.39%) and very high (16.84%). The GODS vulnerability index values ranged from 0.15 to 0.6 and classified the aquifer into low (21.54%), moderate (66.83%) and high (11.61%) vulnerability classes. TOPEFMEA vulnerability index values ranged from 2 to 72 and classified the aquifer into four classes including very low (26.0%), low (41.4%), moderate (23.0) and high (9.6%). Also, the validation results of the models in zoning the sensitivity of the aquifer were different based on nitrate values, so that DRASTIC and GODS models showed the highest and lowest accuracy in modeling with regression coefficients of 0.63 and 0.28, respectively. Overall, the DRASTIC model showed a higher potential than the GODS and TOPEFMEA models for the aquifer vulnerability classification, possibly due to the number of parameters used.

Key words: chemical fertilizers, classification, groundwater vulnerability, vulnerability zoning

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* Author to whom all correspondence should be addressed: e-mail: s.rezayan99@yahoo.com; m.rafati.env@gmail.com