

The vulnerability and quality protection zoning maps of Bojnourd aquifer (N Iran) using Fuzzy-AHP- DRASTIC techniques

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Groundwater is the main resources of water supply for agricultural, drinking, and industrial purposes in Iran and, therefore, it is essential to protect aquifers from pollution. In this paper, the vulnerability and quality protection zoning maps of Bojnourd aquifer, the capital of N-Khorasan province - North of Iran, was prepared using Fuzzy-AHP- DRASTIC techniques in GIS environment. The groundwater risk map (C_{Risk}) was prepared by integrating the aquifer intrinsic vulnerability map (DRASTIC- D_i) with the land-use map. To increase the accuracy of D_i and C_{Risk} maps, they were calibrated using aquifer nitrate concentrations map. After correcting the weights and ratings of the model parameters, the aquifer specific vulnerability (modified D_i - D_{i-m}) and special risk-taking (C_{Risk-m}) maps were prepared. Finally, by improving the weights and rates of required parameters using analytical hierarchy process (AHP) and fuzzy logic techniques, the risk-taking maps of the aquifer were prepared with AHP-DRASTIC, modified AHP-DRASTIC, Fuzzy-AHP-DRASTIC and modified Fuzzy-AHP-DRASTIC models [1, 2]. The correlation coefficient between the vulnerability/Q-protection zoning maps with aquifer nitrate map indicate that the C_{Risk-m} model, is the best model for preparing the Bojnourd aquifer vulnerability zoning map, and about 26, 23 and 51 percent of the aquifer have high, very high and very susceptible potential for contamination.

- [1] Farjad, B., Shafri, H., Mohamed, T.A., Pirasteh, S., & Wijesekara, N. (2012). Groundwater intrinsic vulnerability and risk mapping. *Water Management*, **165**, pp. 441-450 [2] Pathak, D.R., & Hiratsuka, A. (2011). An integrated GIS based fuzzy pattern recognition model to compute groundwater vulnerability index for decision making. *Journal of Hydro-environment Research*, **5**, pp. 63-77