Modeling the Risk of Groundwater Contamination Using Modified DRASTIC and Geographic Information Systems in Chahardoli Basin (Hamadan, West Iran)

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This paper develops a Modified DRASTIC model by combining the generic DRASTIC model with land use activities and lineament density for the study area with a new model map that evaluates pollution potential of groundwater resources in Chahardoli to various types of pollution. It involves the comparison of modified DRASTIC model that integrates nitrate loading along with other DRASTIC parameters. The DRASTIC model showed only 0.1% of the Chahardoli is situated in the high vulnerability area and about 32% of the basin is located in the moderately vulnerable zone (mainly in Southeast basin). After modifying the DRASTIC to account for lineament density, about 84% of the area was classified as having low pollution potential and no vulnerability class accounts for about 6.16% of the Chahardoli area. The moderately susceptible zone covers 8.02% of the basin's total area and the high vulnerability area constitutes 0.19%. The vulnerability map based on land use revealed that about 72% of the study area has low pollution potential and no vulnerability area accounts for about 0.73%, whereas moderate pollution potential zone covers an area of 27.1% and the high vulnerability class constitutes 0.10% of Chahardoli. The final DRASTIC model which combined all DRASTIC models shows that slightly more than 75.5% of the study area falls under low pollution risk and about 2% is considered areas with no vulnerability. The moderate pollution risk potential covers an area of about 22.4% of Chahardoli and the high vulnerability class constitutes 3.2% of the basin. The results also showed that an area of about, approximately 756 km2 are located within the low vulnerability zone and about 235 km2 are moderately vulnerable, which together account for about 12% of the total agriculture and urban area. These areas are contaminated with human activities, particularly from the agriculture. Management of land use must be considered when changing human or agricultural activity patterns in the study area, to reduce groundwater vulnerability in the basin. The results also showed that the wells with the highest nitrate levels (35–42 mg/l) were located in high vulnerable areas and are attributed to leakage from Agricultural fertilizers.