

Title: A comparison between index of entropy and catastrophe theory methods for mapping groundwater potential in an arid region

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Abstract: In this study, index of entropy and catastrophe theory methods were used for demarcating groundwater potential in an arid region using weighted linear combination techniques in geographical information system (GIS) environment. A case study from Badra area in the eastern part of central of Iraq was analyzed and discussed. Six factors believed to have influence on groundwater occurrence namely elevation, slope, aquifer transmissivity and storativity, soil, and distance to fault were prepared as raster thematic layers to facility integration into GIS environment. The factors were chosen based on the availability of data and local conditions of the study area. Both techniques were used for computing weights and assigning ranks vital for applying weighted linear combination approach. The results of application of both modes indicated that the most influential groundwater occurrence factors were slope and elevation. The other factors have relatively smaller values of weights implying that these factors have a minor role in groundwater occurrence conditions. The groundwater potential index (GPI) values for both models were classified using natural break classification scheme into five categories: very low, low, moderate, high, and very high. For validation of generated GPI, the relative operating characteristic (ROC) curves were used. According to the obtained area under the curve, the catastrophe model with 78 % prediction accuracy was found to perform better than entropy model with 77 % prediction accuracy. The overall results indicated that both models have good capability for predicting groundwater potential zones.