



Assessment and Estimating Groundwater Vulnerability to Pollution Using a Modified DRASTIC and GODS Models (Case Study: Malayer Plain of Iran)

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Abstract

This study deals with the intrinsic vulnerability of groundwater reservoirs to pollution, by the use of two models DRASTIC and GODS, this study is done by taking samples from 17 water resources of Malayer plain Aquifer area of southern Hamedan Province, Iran. 30 physicochemical parameters and heavy metals have been studied and vulnerability of this aquifer to the nitrate concentration, was determined. The study showed that results from DRASTIC were better than GODS in Assessment and Estimating groundwater vulnerability to pollution, also DRASTIC model has been corrected, and compared the ability of these two models in vulnerability zoning has been evaluated. According to high correlation between DRASTIC index and nitrate concentration, ranking and weighting of nitrate pollutant is inserted in the DRASTIC equation, and zoning map of DRASTIC method has been calibrated by nitrate concentration. By this method, vulnerability zoning is determined between very low to very high, which shows the increase of DRASTIC index by nitrate concentration. DRASTIC parameters uncertainty has affected the zoning results in this method, but its calibration with nitrate concentration, gives more accurate vulnerability results.

Keywords: Vulnerability; Sensitivity Analysis; Nitrate; DRASTIC; GODS.

1. Introduction

Water plays a vital role in every biological society in the globe. The socioeconomic development of a region predominantly depends on the availability of good quality water. Groundwater vulnerability assessment could be defined as the degree of assimilation capacity of the area to the contaminant from surrounding surface above the aquifer [1]. Groundwater pollution is a universal problem. Sometimes the nature is the cause of water quality decrease, but in the most cases, human is the main cause of water pollution [2]. The concept of aquifer vulnerability was first introduced by Marget. Vulnerability assessment has been conducted as an essential part of protection strategies for land use planning and groundwater protection zoning [3]. In fact, the term “vulnerability of groundwater to contamination was first used by [4]. This concept refers to the sensitivity of an aquifer to deterioration due to an external action and is based on the assumption that physical environment may provide some degrees of protection to groundwater against contaminants entering the subsurface zone. Consequently, some land areas are more vulnerable to groundwater contamination than others [5, 6]. Groundwater pollution vulnerability mapping is an important tool to identify areas that are more sensitive to contamination. GIS is an effective technique for the zone mapping and risk assessment on environmental health problems. GIS can be useful for taking quick decisions as graphical representation would be easy to take a policy decision by the makers [7]. GIS techniques have been becoming the most commonly

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