

Groundwater Vulnerability Assessment in Kharket Carbonate Karstic Region (NE) Iran, Using COP and PaPRIKa Methods

Morad Haghighatjoo^{1*} and Mojtaba Heydarizad²

1-Department of Environmental Engineering, Faculty of Environmental Sciences, Gilan University, Iran

2-Department of Geology, Faculty of Sciences, Ferdowsi University of Mashhad, Iran

**Corresponding Author's E-mail: haghighatjoo.morad@yahoo.com*

Abstract

Due to possibility of water resources pollution by anthropogenic activities, defining groundwater protection zone mainly in karstic carbonate systems is very important. In the following study, the vulnerability map of the karstic environment in Kharket region has been prepared with COP and PaPRIKa methods. The COP method is multi-attribute method of vulnerability mapping which takes into account hydrogeological, geomorphological and geological condition of the system through three "C, O and P" factors. The COP vulnerability map of the study area scores vary between 0.77 to 5.58 and it is classified as very low to high vulnerability classes. The PaPRIKa vulnerability assessment method consists of four factors "P, R, I and Ka" which its scores vary between 1.2 to 3.3 and it is classified as very low to very high vulnerability classes. Sensitivity analyses have shown that C parameter in COP method and Ka parameter in PaPRIKa method have the highest influence on vulnerability final scores. Finally, the COP and PaPRIKa vulnerability maps have been validated by the spatial distribution of NO_3^- concentration and drinking water index DWQI in 12 springs in the study region. The spatial distribution of NO_3^- concentration and DWQI index demonstrated good correlation with developed vulnerability maps.

Keywords: Vulnerability assessment, Pollution, COP and PaPRIKa methods, Kharket region, NO_3^- and DWQI index

Research Highlights

- Kharket is an important karstic region provides notable part of Mashhad metropolition water supply.
- COP and Paprika karst vulnerability assessment methods have been applied simulaniously for the first time in Iran to evaluate Kharket region vulnerability.
- COP and Paprika methods demonstrated moderate to high karst vulerable zones in Kharket region.

1. Introduction

Iran with 1648195 km² area is located in south west Asia and represents 0.32 percent of the earth surface extends from 25⁰ to 40⁰ N and 44⁰ to 64⁰ E. Khorasan Razavi the second most populated province located north eastern Iran having borders with Afghanistan and Turkmenistan. Khorsan Razavi is arid and semi-arid region with average annual precipitation of 227 mm. Khorasan Razavi consists of two large boundary basins Atrak and Ghareh Ghom