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Investigating the Qualitative Status of Groundwater in the Plain of Khorasan Razavi Province Using GWQI and AWQI Indexes and Its Zoning with Geographic Information System (GIS)

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Abstract

1-Introduction

Increasing water consumption due to population growth has led to a reduction in the quality and quantity of extracted water. Given this situation, quantitative and qualitative knowledge of suitable sources for drinking and farming is necessary and inevitable. Meanwhile, ground water is considered a safe source for water supply. Today, due to the excessive use of groundwater resources in many plains, water levels have fluctuated and groundwater levels have fallen, and these plains have been hit by decreasing water quality. Therefore, water resources control and optimal use of them are of high priority. Since, groundwater resources are considered as important sources of water supply for various uses. In order to better understand the qualitative status of water resources, water quality indicators are used. To do this, by conducting experiments on water samples and using mathematical relationships defined for each index, a value is obtained that can be used to describe the qualitative state of water based on it and refer to the relevant tables.

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2-Methodology

Based on international standards for drinking and agriculture uses, some of the parameters examined are lower and others are more than global standards. Basically, these differences indicate the presence of pollution in various water sources. The water quality index is, in fact, simply a numerical value that reduces the large amounts of data, including physical, chemical, and biological parameters, and generally indicates the overall quality of water for various uses, especially for drinking. Typically, heavy metals are included in the water quality index to assess overall water contamination. In this study, the quality of groundwater in the Jangal plain in Khorasan Razavi province has been investigated. 10 wells in this plain were analyzed for concentrations of Ca^{2+} , Mg^{2+} , Na^{2+} , HCO_3^- , SO_4^{2-} , Cl^- , pH and TDS with GWQI and AWQI indices in the period 2007-2016. Also, plain zoning was performed using the GWQI index and Arc GIS 10.2 software. In cases where the AWQI value is zero, it means that there is no pollutant in water, and if this value reaches 100, that is, all pollutants have reached their maximum permissible limit. The high level indicates the high level of contamination and the passage of this value from 100 indicates serious contamination.

3-Results

The results showed that most of the Jangal plain wells pollution are less than the contamination level during the statistical period. Fayez Abad, Kheirabad Ali Akbar Rahmani and Bandazik Salehi Wells have passed through the limit of contamination over the years and have serious pollution and are not suitable for drinking and farming. Based on the zoning, the indicator status in all wells (except wells of Fayez Abad (well No. 2), Kheirabad Ali Akbar Rahmani (well No. 9), and Badazaki Salehi Forest (well No. 10) have inappropriate water (red)) and in the whole area of the Jangal zone is poor (orange color), so the pollution of these wells is not serious and is suitable for drinking and farming. The total amount of all parameters except total dissolved solids (TDS) in all wells is standard. The reason for this is the lack of industrial activities

and human communities near these wells. The highest mean total dissolved solids is 5378.49 mg/l. In this study, the least amount of GWQI and AWQI indices for Janet Abad Khordemalkin well were 69.66 and 56.49 (highest quality in 2008) and the highest of these two indicators were 239.12 and 189.48, respectively.

4- Conclusion

According to the results of this study, the GWQI index in the region ranges from 69.66 to 239.12 and the AWQI index is between 56.49 and 189.48, that is, the quality of groundwater in the Jangal area is weak and inappropriate. The cause it is also the high solids content of the total solution of water. In fact, in this region, all of the measured quality parameters, except the total dissolved solid, are at the standard level. According to the results of this study, although the amount of calcium and magnesium is in the standard range but at lower levels, and given the body's need for these micronutrients, it is necessary to plan the provision of these elements through other sources or add them to the water in the refinery.

Keywords: AWQI, GWQI, Groundwater, Forest Plain, GIS

5-References

Author, A. (Publication Year). Article title. *Periodical Title, Volume (Issue)*.

Nevin, A., Smith, B., Yu, J., & Amadi, A. (1990). The changing of teacher education special education. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 13(4)*, 147-148.