

The Classification of Risks of Drinking Water Resources in Rural Mountains Using TOPSIS and AHP Models (Case Study: Barroud Dehestan of Kashmar County)

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Extended Abstract

1. INTRODUCTION

World Bank, in a report on our country, has named the following factors as the water challenges facing the country: decrease in per capita recoverable water, loss of water quality, inefficient use of effective consumption monitoring in industry and agriculture, soil salinity, the poor quality of maintenance and preservation of reservoirs, restrictions on the recoverable cost and lack of coordination among relevant agencies. According to the United Nations Report on Iran, because of the lack of drinking and healthy water in Iran, a large population in the villages are at risk of various diseases such as infectious ones and diarrhea. So paying attention to supplying safe water and resolving the problems of rural water supply is important. However, providing the safe and clean water requires managing and maintaining reservoirs and controlling the quality of drinking water in rural areas. Water management involves balancing the quality and quantity of demanded water, quantity and quality of supplied water, water pollution, recycling and reusing water along with the impact of public policies on all of these intertwined components. In each area, water management will change over time and may assume various forms. Managing the interaction between the mentioned elements in any area affects the economic structure and development of agriculture, technology and industry. Careful choice of water resources and their conservation in developing countries, particularly in rural areas, is the most important measure to prevent the spread of intestinal diseases caused by water, and in these countries drinking water cannot be provided merely through treatment processes, since water resources are inadequate and the efficacy of water treatment plants in these countries are very low.

2. METHODOLOGY

In this study, in order to investigate the effective factors and to rank and categorize the rural centers, hybrid model of TOPSIS technique and analytic hierarchy process were used. Combining these two methods, in addition to increasing the accuracy of the analysis is considered a new approach. AHP technique, introduced by Saaty for the first time, has the ability of combining quality standards and turning them into quantity ones. In this study, a questionnaire was designed and completed in terms of Paired comparisons and, by combining expert comments and utilizing Expert Choice software, the final weight of indicators and key metrics of risk in water sources were determined. The variables and Indicators related to risks of drinking water were classified into eight groups: risks related to management factors, participation factors, environmental factors, locating the source and the reservoir, source and reservoir characteristics and those related to physical quality of water, together with the ones related to chemical quality and finally bacteriological risks. AHP method has been used to form the Matrix and determine the index weight, with the help of Expert Choice software, and grading and ranking the rural centers was done using TOPSIS model. As we knew, the metrics and indexes are not of equal important or priority relative to one another, a deficiency which has been solved in this algorithm through the table of indicators' weights. In other words, the measurements used in the TOPSIS method can be introduced in both quantitative and qualitative measures and the qualitative indicators should be converted to quantitative ones.

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3. DISCUSSION

The results show that the number of users of drinking water in rural areas under study was estimated to be 1898, of which 6 villages were supplied by rural Water and Wastewater and the villages of Kharv and Calate Timoor were supplied by their Islamic Councils. Well was the main sources of water supply for the villages and only in villages of Tajrood, Kharv and Calate Timoor the drinking water was provided through spring. The water delivery system in the mentioned villages was gravity and in other villages pumps were used for water delivery. Calculating the weight of the main parameters affecting the risks of sources of drinking water in the studied villages revealed that the weight of the factors related to bacteriologic characteristics is 0.197, that of Managing factors is 0.160, the physical quality factors of water is calculated to be 0.156, and the weight of factors of chemical quality of water and location of water sources are 0.117 and 0.112 respectively.

4- CONCLUSION

Accordingly, with respect to the weight of obtained parameters in each of the villages, the villages under study were rated using the ideal or TOPSIS model, the results of which revealed that the village of Qharache and Kharv have the highest and lowest ranking in terms of risks of drinking water sources, respectively. Tajrood and Torogh villages were ranked third and fourth, respectively. Moreover, according to rankings, the studied rural centers were divided into five levels in terms of risks related to reservoir and drinking water distribution network. The villages of Tajrood and Qharache were placed in the first level, with a low risk, Torogh was placed in the second level with a low risk, Paeen Darre and Banad Ghara villages were in the third level with medium risk, Calate Timoor in the fourth level with high risk, and in the fifth level Creeze and Kharv are placed both with very high risk levels.

Key words: Water Resource- Risk Management- TOPSIS Technique- Analytical Hierarchy Process- Barrood District.

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