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**Research Article**

# Analysis and evaluation of key indicators in technical and management strategies in water systems with emphasis on sustainable water resources management

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# Extended Abstract

## Introduction

Water is a vital resource for economic development, particularly in arid and semi-arid regions where its scarcity significantly limits agricultural productivity. In Iran, the agricultural sector is the largest consumer of water, and the increasing competition for this essential resource has raised serious concerns regarding water management. Inefficient water use can lead to substantial economic losses and environmental degradation. Therefore, implementing innovative strategies and effective policies for water conservation and sustainable resource management is crucial. This research aims to identify key factors in the technical strategies of water systems with a focus on optimal water management. By reviewing theoretical foundations and previous studies, the research identifies essential dimensions and components related to water systems. The Best-Worst Method (BWM) was employed, alongside surveys from twenty university professors specializing in civil engineering with a focus on water resources, to weigh and prioritize these components. The results indicate that maintaining water quality, conserving resources, and controlling water pollution are of paramount importance. Water quality is recognized as a critical factor for public health and environmental protection, while resource conservation aids in reducing waste and optimizing water availability. Additionally, preventing pollution is essential for the sustainability of water systems, ensuring their effective operation.

## Materials and Method

The Best-Worst Method (BWM), introduced by Rezaei in 2015, is utilized for decision-making in this study. This method involves identifying the best and worst criteria from the perspective of decision-makers, followed by pairwise comparisons among these criteria. The BWM offers significant advantages over other methods, including fewer comparisons and improved consistency, leading to more reliable decision-making outcomes. The main model of BWM is a nonlinear mathematical programming model that defines the best (most important) and worst (least important) criteria, facilitating the prioritization of these criteria based on expert opinions. In this research, a five-dimensional model was developed to define the weights of factors affecting technical strategies in water systems for optimal water management. Five main criteria were established:

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hydrology, innovative technology, data modeling, environmental sustainability, and crisis control. Each criterion was further broken down into several sub-criteria, creating a coherent structure for evaluating and developing technical strategies in water systems. The evaluation was based on expert opinions and previous research findings, ensuring a comprehensive understanding of the current situation.

**Results and Discussion**

The analysis revealed that the hydrology criterion is considered the most important by experts in determining the effective factors for technical strategies in water systems. Following hydrology, the criteria for environmental sustainability, data modeling, innovative technology, and crisis control were prioritized. Within the hydrology criterion, water quality emerged as the most significant sub-criterion, emphasizing the need for rigorous management to maintain groundwater quality. The findings also highlighted the importance of water conservation as a critical factor for optimal water management, particularly in light of Iran's ongoing water scarcity challenges. The results indicate that implementing efficient irrigation methods and promoting water recycling can significantly mitigate water shortages. Additionally, controlling pollution was identified as a vital component for sustaining groundwater resources, necessitating proactive measures to prevent contamination from human activities.

**Conclusion**

This research underscores the necessity of a comprehensive and integrated approach to water management, particularly in the face of new challenges such as climate change and population growth. The study identifies quality maintenance, resource conservation, and pollution control as key factors in developing effective technical strategies for water systems. By prioritizing these elements, policymakers and water resource managers can enhance decision-making processes and implement sustainable practices that ensure the long-term viability of water resources. Recommendations for improving water management strategies include adopting smart irrigation systems, establishing continuous monitoring of water quality, and promoting community education on water conservation. By taking these steps, it is possible to effectively address the current water crisis and support sustainable development in water-scarce regions.

**Keywords:** Water system management, Strategy, Modelling, Best-worst method