**Technical Strategies in Water Systems**
https://sanad.iau.ir/journal/tsws
ISSN (Online): 2981-1449
Winter 2024: Vol 1, Issue 3,194-207
https://doi.org/10.30486/TSWS.2024.783556

**Research Article**

# Management and disposal of surface runoff using geographic information system and fuzzy method (Case study: Bandar Imam Khomeini)

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Received: 22 Nov 2023 Accepted: 14 Feb 2024 Published: 09 Mar 2024

## Abstract

### Introduction
Urban flooding has become a significant challenge in many cities worldwide, exacerbated by climate change and rapid urbanization. The lack of adequate drainage systems often leads to severe waterlogging, causing substantial damage to infrastructure and posing risks to public health and safety. Bandar Imam Khomeini, a major port city in Iran, has frequently experienced severe flooding due to the absence of proper surface water drainage channels. This study aims to address the issue of urban runoff management in Bandar Imam Khomeini using Geographic Information Systems (GIS) and fuzzy logic to identify optimal drainage pathways and mitigate flood risks.

### Materials and Method
The study utilized GIS to analyze various spatial layers, including elevation, slope, slope direction, and drainage networks. Data sources included topographic maps, geological maps, Landsat satellite imagery (2021), and urban land-use maps. A digital elevation model (DEM) was used to generate elevation, slope, and drainage network layers. Fuzzy logic was employed to identify areas with high potential for runoff accumulation. Expert opinions were gathered through questionnaires to weight the factors influencing runoff accumulation, such as elevation, slope, and slope direction. The RiverTools technique was then applied to propose optimal routes for drainage channels based on the natural drainage network and runoff accumulation zones.

### Results and Discussion
The analysis revealed that areas in the east, center, northeast, and southeast of Bandar Imam Khomeini are most prone to runoff accumulation due to their low elevation and gentle slopes. The integration of GIS and fuzzy logic allowed for the identification of these high-risk zones. Using RiverTools, optimal routes for primary, secondary, and tertiary drainage channels were proposed. The primary channel collects water from secondary and tertiary channels, effectively managing runoff and reducing flood risks. The study also highlighted the importance of considering natural drainage pathways and urban land-use patterns in designing effective drainage systems.

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## Conclusion

This study demonstrates the effectiveness of GIS and fuzzy logic in urban runoff management, particularly in flood-prone areas like Bandar Imam Khomeini. By identifying high-risk zones and proposing optimal drainage routes, the research provides a practical framework for mitigating flood risks and improving urban resilience. The findings underscore the need for integrated urban planning that incorporates environmental and hydrological factors. Future studies should focus on implementing the proposed drainage systems and evaluating their performance during actual flood events. Additionally, involving urban planning experts and GIS specialists in the decision-making process can enhance the effectiveness of flood management strategies.

## Conflict of Interest

The author declares no conflict of interest regarding the authorship or publication of this article.

## Data availability statement

The data and results used in this research will be available through correspondence with the author.