



Applying the principles of designing sponge greenways in the management of water resources in desert cities (Case study: Maddis of Isfahan)

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Extended Abstract

Introduction

The concept of "Sponge Cities" is emerging as a sustainable solution for water resource recovery, particularly in arid regions such as Isfahan, Iran. Urban areas in Iran, especially in desert climates, face significant challenges including water scarcity, pollution, climate change effects like heat islands and air inversion, and prolonged droughts. These issues threaten the livelihoods and well-being of residents, highlighting the urgent need for approaches that mitigate these impacts and restore natural elements. The traditional water distribution system, known as "Madi," in Isfahan not only facilitates the distribution of water from the Zayandeh Rud River but also plays a crucial role in drainage and groundwater preservation. The innovative design of sponge cities focuses on capturing and retaining rainwater while integrating green urban pathways, which can enhance the functionality of these natural linear elements. This research employs an analytical-descriptive method, reviewing existing literature on sponge cities and green pathways, to extract principles and assess their compatibility for the revitalization of Isfahan's Madi system. The findings indicate that the concept of sponge greenways represents a novel approach to restoring ancient Madi systems, potentially enhancing environmental, social, economic, and health outcomes through strategic design interventions.

Materials and Method

This study utilizes a review approach to evaluate the concept of sponge cities as a sustainable solution for water resource management. The research encompasses three main stages: a comprehensive literature review, empirical analysis, and design strategies for Madi systems. The first stage involved gathering existing knowledge on the principles, advantages, and challenges associated with sponge cities through an analysis of scientific articles, government reports, and case studies of successfully implemented sponge city principles. The second stage consisted of a comparative analysis between the concepts of sponge cities and green infrastructure, highlighting their interconnectedness in enhancing urban resilience and water management. The final stage presented design strategies for the Madi systems in Isfahan, derived from sponge city principles to effectively manage water resources and mitigate drought impacts.



Results and Discussion

The findings reveal that the Madi systems in Isfahan can serve as vital components of a sponge city framework. These systems, characterized by their linear structure, offer significant potential for creating a cohesive network within the urban fabric. Despite the challenges posed by urban development and the presence of highways, reestablishing these waterways can facilitate connectivity and enhance the sponge city's role in urban water management. The study identifies several design strategies for integrating sponge pathways into the Madi systems, focusing on elements such as green roofs, permeable materials, and effective water management practices. These strategies aim to improve urban environmental quality, enhance social dynamics, and promote economic viability while ensuring public health. The proposed design interventions emphasize the need for sustainable practices, including the use of native vegetation, water-efficient irrigation systems, and community engagement in maintaining green spaces.

Conclusion

The concept of sponge cities presents a promising approach to addressing water management challenges, particularly in arid urban areas like Isfahan. By integrating green infrastructure and sponge pathways into the existing Madi systems, cities can enhance their resilience against climate impacts while improving the quality of life for residents. The proposed design strategies provide a framework for urban planners and architects to create sustainable urban environments that effectively manage water resources. Implementing these strategies requires supportive policies from local governments and active community participation to ensure long-term success. The insights gained from this research can serve as a model for other arid cities facing similar environmental challenges, fostering a shift towards sustainable urban development and improved water resource management.

Keywords: Sponge city, Sponge greenway, Urban design guideline, Maddies of Isfahan