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Research Paper

Evaluating the role of urban planning components in determining the pattern of water consumption in the neighborhood scale The case study a Al-Ghadir neighborhood, kerman

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ABSTRACT

Clean fresh water is essential to support the human population. Urban planners must create good places for people physically, socially, economically, and environmentally. Traditionally, urban planners have not played a role in city water management. However, planners influence how water is used in cities by shaping the built environment through land use regulations. This study aims to show a significant relationship between urban environment indicators and water consumption to improve urban water protection. Based on this, the influencing factors in water consumption were identified and after forming the equations and optimization in MATLAB software, they were coded and implemented using the method of the crow search algorithm. And for each subcategory, the optimal consumption coefficients were recorded as output. By obtaining the optimal consumption coefficients for each of the indicators, including age, literacy, area, occupation, type of residential use, materials, and block form, it was determined that each of the factors with higher optimal coefficients is closer to the optimal consumption. The results show that urban planners, using planning and design strategies at the neighborhood level and by shaping the built environment and regulating land use, promote the protection of the city's water and affect the way water is consumed in cities. A comprehensive approach to all these categories and the logical connection between them, as well as their comprehensive development is the only reasonable way to deal with water management in cities.

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Extended Abstract

Introduction

Clean freshwater is critical to supporting human populations and economic development. Urban planners must create good places for people physically, socially, economically, and environmentally. Traditionally, urban planners have not played a role in city water management. However, planners influence how water is used in cities by shaping the built environment through land use regulations. Since there is a relationship between the built environment and water use, the urban planner has an effective role in water consumption and supply. Many cities are located in arid regions and are exposed to water depletion the increase in population, especially the increase in urbanization and the decrease in rainfall in dry provinces such as Kerman province, where almost 100% of its water needs are dependent on water resources within the province. From reserves, the underground water table provides that the current consumption trend will face a severe water crisis. This research aims to show the significant relationship between the indicators of the urban environment and the amount of water consumption to improve urban water protection.

Methodology

Based on this, the influencing factors in water consumption were identified and after forming the equations and optimization in MATLAB software, they were coded and implemented using the method of the crow search algorithm. For each subcategory, optimal consumption coefficients were recorded as output. By obtaining the optimal consumption coefficients for each of the indicators, including age, literacy, area, occupation, type of residential use, materials, and block form, it was determined that each of the factors with higher optimal coefficients is closer to the optimal consumption.

Results and discussion

In order to obtain the optimal coefficients of urban water consumption, various social and physical factors have been involved in consumption. For this purpose, a residential area of Kerman city was first selected as a study case. After dividing this area into 114 blocks, equivalent to 4965 plots, the total amount of water consumption as well as the average consumption in each block based on the measured flow was considered as a database reference. In order to create a detailed view of all the social factors and the spatial area of each block that affect water consumption, the factors of gender, age, occupation, literacy level, area, type of residential use, materials and form of each block were selected in general. After this stage, each of these factors was divided into subgroups in smaller intervals based on the number of people in each category. The available data determined that the characteristics of the form, function, and community of the built environment affect the amount of water consumption.

Evidence suggests that the buildings and neighborhoods that are being created are less efficient than in the past. Almost all models suggest that new settlements would use more water if only the factors that cause high water use were reduced. A huge amount of water will be available to all other users. The highest water users should be the first target for water conservation strategies and water use restrictions. Instead of building more efficient homes and neighborhoods, we are making less progress in water use. The way we are building cities emphasizes water supply rather than water resource conservation, which must go hand in hand.

Conclusion

The research results show that the compact and fine-grained urban development model with a 4-story density and mixed land use is the most optimal for water consumption. Also, the coefficients obtained for the built environment indicators can be generalized

in similar conditions. Therefore, by using planning and design strategies at the neighborhood level, shaping the built environment, and regulating land use, urban planners can improve the city's water protection and influence the way water is consumed in cities. A comprehensive approach to all these categories and the logical connection between them as well as their comprehensive development, is the only reasonable way to deal with water management in cities. The results of this research can be used as a resource and an efficient method to study and measure the impact of urban planning factors and the role of urban planners in the amount of water consumption in other cases. Also, the unique methods used in this research can be used as an efficient method not only to measure urban physical factors, but it can also be used to measure the effect of each factor on the amount of urban water consumption; therefore, this requires developing a theoretical framework related to that particular factor.

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Conflict of Interest
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