



## Explaining the relationship between water stress and social resilience in Khuzestan Province

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### Abstract

**Background and Objective:** Khuzestan Province has always faced numerous challenges in the field of water resources due to its climatic and geographical conditions. These challenges, known as water stresses, can have widespread impacts on various aspects of social life and reduce the resilience of society to crises. The aim of this study is to investigate the relationship between water stresses and social resilience in Khuzestan Province using the structural equation modeling (SEM) method.

**Methodology:** The present study, with a statistical population of 4,710,509 citizens of Khuzestan Province, selected and examined a sample of 386 people using the Cochran formula. The research instrument was a researcher-made questionnaire with confirmed content (face) and construct validity and acceptable composite reliability. The data were analyzed using correlation analysis and structural equation modeling methods using SPSS and Smart PLS software.

**Results and Findings:** The results of structural equation modeling indicate a strong and significant relationship ( $p < 0.05$ ) between water stress indices and social resilience. In other words, these findings show that with increasing water stress, social resilience in the studied community decreases. In addition, the model fit indices also show that the data are well consistent with the conceptual model of the research and the model has the necessary fit. This strengthens the validity and reliability of the modeling results and confirms that the proposed model is able to correctly explain the relationship between the variables under study. Finally, comparing the correlation coefficients shows that the environmental index and then the institutional index have the strongest relationship with the social resilience index and water stress. Also, the results of the PLS test showed that among the water stress indicators, the environmental indicators with a score of 24.828, the economic indicators with a score of 21.762, and then among the social resilience indicators, the institutional index with a score of 21.677 and the social index with a score of 20.145 ranked first to fourth, respectively, and this indicates the impact of water stress indicators on social resilience in Khuzestan Province.

**Keywords:** water stress, social resilience, SmartPls, Khuzestan Province.

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## **EXTENDED ABSTRACT**

### **Introduction:**

Today, the water crisis has transformed from a mere environmental issue into a fundamental challenge in the field of human rights and national capital. As an irreplaceable resource, water plays a vital role in shaping civilization, culture and technological development, and is inextricably linked to food security, public health and ecological balance. However, unsustainable exploitation of water resources, especially groundwater, has led to a situation of “tragedy of the commons”, in which the gradual degradation of this valuable resource poses a serious threat to human life. Global projections indicate a worrying decline in access to clean water in the coming decades, which makes the need to review water governance patterns more evident than ever. Efficient management of water resources requires a comprehensive approach that balances supply management (infrastructure development) and demand management (modifying consumption patterns). The lack of proper management in this area leads to water tensions, the consequences of which are not limited to hydrological aspects but take on complex social, economic and political dimensions. In fact, the inability to allocate water resources fairly and wisely creates the basis for conflicts and conflicts that can disrupt the stability of societies; therefore, the transition towards sustainable management is considered a major prerequisite for reducing poverty and establishing justice in modern societies.

In the face of these environmental disruptions, the global paradigm has shifted from focusing on reducing vulnerability to promoting “resilience.” Urban and social resilience refers to the capacity of a system to absorb stresses, reduce the consequences of failure, and quickly return to normal levels of performance after a crisis. In sustainable water systems, resilience is defined as a mechanism for coping with climate uncertainties and economic shocks. Communities that are more mentally prepared and have higher adaptive capacities experience the least amount of disruption and disorder during water crises and can maintain their ecosystem and social sustainability against future threats. Explaining the relationship between water stresses and social resilience is of particular importance in regions such as Khuzestan Province, as this region is at the forefront of drought-related damage due to its specific climatic conditions and strong dependence on water for livelihoods. Water stress in this region can directly erode social resilience and make society more vulnerable to crises. A deep understanding of this relationship will help policymakers identify social and adaptive components and develop strategies that not only lead to physical water management, but also to strengthening social bonds and empowering local communities. Ultimately, Khuzestan’s sustainability depends on linking smart water resource management with social capacity-building programs.

### **Methodology:**

This research is applied in terms of purpose and descriptive-correlational in terms of nature and method, focusing on the statistical population of citizens of Khuzestan province and with a sample size of 386 people (Cochran formula) using a random classification method. The data collection tool is a researcher-made questionnaire whose validity and reliability have been confirmed through formal, convergent, Cronbach's alpha and composite reliability indices; also, structural equation modeling using the partial least squares (PLS) method and SPSS and SmartPLS software were used to analyze the data. The final research indicators in 2 main dimensions (water stress and social resilience) include 10 indicators and 38 sub-indices that have been extracted and localized by combining library studies and the Delphi method of experts.

## **Results and Discussion:**

In order to analyze the data in the first stage, the external model (measurement) was examined to ensure the validity of the research tool. The results showed that the Cronbach's alpha and composite reliability (CR) values for all dimensions of water stress and social resilience were above the standard limit (0.7), which indicates the appropriate internal consistency of the questionnaire. Also, the AVE index was obtained in most of the constructs above 0.5, which confirmed the convergent validity of the model, and the divergent validity was also confirmed based on the Fresnel and Locker criteria, although 13 items were removed due to weak factor loading to optimize the model. After confirming the tool, the relationships between latent variables were tested in the form of an internal model, and the evaluation of the overall fit indices of the model, including SRMR and goodness of fit index, indicated an acceptable fit of the data with the conceptual model, and the correlation test also confirmed the existence of a positive and significant relationship between water stress and social resilience. This finding means that in the studied communities, exposure to more severe water stress was associated with the enhancement of resilience mechanisms, and among them, environmental and institutional indicators showed the strongest relationship with the main variables. Finally, the results of the one-sample t-test and structural equation modeling showed that all indicators have a significant impact on the research situation, so that in the field of water stress, environmental and economic indicators had the highest impact weight, and in the discussion of social resilience, institutional and social indicators played the most vital role in strengthening the capacity of the community, while the lowest impact was related to economic sub-indicators in the resilience dimension.

## **Conclusion:**

The results of structural equation modeling showed that, according to the conceptual model, the test shows that a strong and significant relationship has been observed between water stress indicators and social resilience ( $p < 0.05$ ) and the model fit indices also indicate the fitness and proportionality of the data with the conceptual model and, as a result, the model is confirmed. Finally, the comparison of correlation coefficients shows that there is a significant relationship between the social resilience index and the water stress index. In particular, the social resilience index has the greatest impact on social, psychological and institutional indicators, while the water stress index has the greatest impact on economic and environmental indicators. Also, the overall results of the interpretive structural equation testing showed that among the water stress indicators, the environmental indicators with a score of 24.828, the economic indicators with a score of 21.762, and then among the social resilience indicators, the institutional index with a score of 21.677 and the social index with a score of 20.145 have ranked first to fourth, and this indicates the impact of water stress indicators on social resilience in Khuzestan Province. Among the sub-indicators, the economic sub-indicator had the least impact on social resilience, and the social index, on the contrary, had the least impact on water stress in Khuzestan Province, despite its importance in social resilience. Finally, it can be said that this study shows that social resilience in Khuzestan Province is affected by various factors, the most important of which are water stress indicators and institutional and social indicators. In order to improve social resilience in this province, it is necessary to pay attention to these factors and take appropriate measures to improve them.

## Declarations

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•**Conflict of Interest:** The authors declare no conflict of interest.

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