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Assessment of the Capacity of Organizational Resilience in Controlling Secondary Drought Crisis Emphasizing Organizational Learning as a Mediator: A Case Study of Municipalities in Isfahan, Iran

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Abstract

INTRODUCTION: Environmental hazards caused by climate change and urban life prevailing practices have had a much greater impact in recent years than in the past. Aquatic ecosystems are not immune to such threats and their consequences, such as droughts and the emergence of interconnected crises. Since crisis studies are interdisciplinary, the organizational capacity of decision-making entities in urban areas plays a vital role in controlling these complex environmental changes. Therefore, this study aims to investigate organizational resilience as a guiding perspective in the crisis management process emphasizing organizational learning from crisis experience. The objective is to assess the organizational resilience capacity of public and official organizations in Isfahan, Iran, regarding the risks of the drought crisis.

METHODS: This study proposes applying the Delphi method, the Bulls-eye method, and Gray relational analysis based on previous theoretical studies. The analysis begins by entering the initial weight of the Delphi method into the algorithm of this integrated method of weighing the values of uncertain indicators, followed by Gray relational analysis to describe the classification of official and public organizations in Isfahan, Iran. The statistical population consists of experts and professionals active in crisis management in the municipalities of Isfahan. The data of the Gray relational analysis decision matrix were obtained from a valid and structured questionnaire (Cronbach's alpha=0.79) administered to a sample of 70 individuals with the Delphi method examining the quality of decisions by municipal experts from the 15 districts of Isfahan, who were purposefully selected for sampling. The municipalities were prioritized based on relative organizational resilience capacity.

FINDINGS: The three indicators of investment, specification of roles, and organizational stability showed the highest weight, while the indicators of learning from previous crisis experiences, reconstruction planning, emergency services, and risk insurance coverage had in order the lowest weights. Organizational resilience of studied districts can be defined in three levels: 1) municipalities of districts 6, 5, 8, and 12 had the highest capacity; districts 2, 11, 9, 14, 15, and 4 showed weaknesses in their organizational indicators; and 3) districts 1, 3, 7, 10, and 13 were intermediate between the previous two levels.

CONCLUSION: Considering that a larger number of areas in Isfahan showed low levels of organizational resilience, the status of organizational resilience in public and formal organizations in Isfahan does not report favorable conditions among the research indicators. Therefore, more attention is required to improve the aforementioned organizational indicators to achieve organizational learning from crisis conditions. Awareness of the level of organizational resilience helps to promote organizational learning, improves the crisis management process, and helps planners and managers to perform better in critical situations.

Keywords: Bulls-eye method, Gray relational analysis, Isfahan municipality, Organizational learning, Organizational resilience, Secondary drought crises

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Introduction

Global population growth, the effects of climate change, and lifestyle change have put increasing pressure on vital water sources, threatening the survival and continuity of human societies. With a rise in population and economic growth, the demand for fresh water worldwide is rapidly increasing, which amplifies the need to divert attention to the proper management of crises ahead. In emphasizing the significance of fresh water as a fundamental need, we can point to certain characteristics, such as its scarcity and limitedness due to high demand, necessity and vitality for human sustenance, irreplaceability, spatial constraints in distribution, high transportation costs, non-homogeneous market of various qualities required in agriculture, drinking, and industry, as well as its intrinsic values in health, beauty, and culture (1).

The frequency and variety of natural crises are exponentially increasing at present. Studies by the United Nations (UN) conducted in 2015 show that 367 natural crises occurred between 2005 and 2014, while 346 occurred in 2015 alone. Among various natural crises, such as floods, earthquakes, droughts, hurricanes, tsunamis, volcanic eruptions, avalanches, and landslides, which were discussed in the UN report, floods, droughts, and earthquakes were, in order, the most frequently occurring. As stated in the report, the first two major crises are due to changes in aquatic ecosystems, as well as the inability to control and restrain natural environmental stresses.

Many of these crises occur in developing countries with limited capacity and infrastructure to deal with and cope with these changes. Iran's status as an arid and semi-arid country, alongside population growth, urbanization, and development of the economic sector (specifically agriculture and industrialization), causes a rising water demand. Macro- and micro-environmental changes in the central region of Iran have severely threatened water sources and caused shortages in water supplies, which was confirmed by management and research experts. According to the reports by the Islamic Parliament Research Center of Iran, the drought crisis in the central region of Iran has been proven in the long run. Among the findings of these reports, we can note the reduction of average per capita renewable water from 7,000 cubic meters in 1961 to 2,100 in 1997 and less than 1,300 per person in 2021. These reports also mention the serious entry of Iran into a severe water crisis. Isfahan province, situated at the heart of these environmental changes, and the city of Isfahan specifically, with regards to its historical identity and the associated importance to preserve it for future generations, is exposed to the serious threat of environmental disasters and their associated crises. According to the reports of the Sixth Strategic Development Plan of Isfahan province presented in 2021, the most critical environmental problems of Isfahan province can be air pollution in its major cities, soil erosion, haze, a severe decline in groundwater levels and associated subsidence, reduction of surface water resources, a decline in water quality, soil pollution, and the destruction of ecosystems, especially aquatic ecosystems. Of these, the issue of water in Isfahan has reached the brink of crisis with social and economic consequences in the form of secondary disasters. Risk assessment in Isfahan province also indicates that 35.8% of the province's surface is at high and very high risk of drought. Fluctuations in the degree of activity and efficiency of farmers in the region and instabilities in the Zayanderud riverbed are objective manifestations of this risk. Economic crises caused by water shortages in rural areas have led to a 40% increase in migration to the city of Isfahan (2). The aforementioned primary and secondary crises caused by changes in aquatic ecosystems and their social and economic consequences indicate an urgent need for high managerial and organizational capacity to control them at various levels.

Organizational structures are essential in crisis management due to their ability to rapidly recover and improve conditions of crisis (3). The cause or intensity of many crises is undoubtedly due to managerial shortcomings at various levels and a lack of inter-organizational cohesion in the face of crises (4). The main goal of crisis management must be protecting the city through a rational response to crises. Currently, this managerial process with sustainable perspectives seeks to create resilient communities in the face of natural crises. Moreover, the dominant approach has shifted from reducing vulnerability to increasing resilience. The resilience approach inspires holistic management through a sustainable perspective and bridges the gap between urban planning and crisis management (5).

Since organizational learning has a positive effect on and a mediating role in organizational resilience (6), more attention should be paid to the inside of the organization for better resilience in the face of crisis (7). Therefore, organizations should cultivate organizational resilience for better management in crises (8). However, crisis management activists and planners have ignored organizational learning from crisis and not much has been learned from such situations, while organizational learning is the main task for every organization (9)

This study aims to emphasize organizational learning from crisis with the organizational dimension of resilience as a guiding perspective in the crisis management process. So far, no research has specifically evaluated organizational resilience to promote organizational learning from the crisis. Organizational learning from the crisis is one of the most challenging organizational activities, and considering its positive impact on organizational resilience, measuring organizational resilience can help planners and managers to take appropriate actions and promote organizational learning from the crisis. Considering the water crises of the last decades in the water basin of the Zayanderud river and the secondary consequences of the drought in the city of Isfahan, which was mentioned earlier, this study attempts to evaluate the resilience of the official, public, and executive organizations of Isfahan city (specifically the municipalities of the city's regions). After this assessment, the organizations can find their position for the necessary measures for better crisis management and learning more from the crisis.

An event or crisis initiates a series of targeted efforts that are included in the definition of crisis-induced learning. This learning is practiced by the members and elements of an organization and leads to a new understanding that guides future behaviors (10). The purpose is to identify problems and errors by conducting analytical consultations and correcting errors; therefore, an organizational unit needs acceptance, adaptability, and organizational resilience to implement this process (11).

According to the Hugo document in 2015, planning and management in resilient cities ensures that human casualties, as well as natural and economic damages imposed on the city, are minimal and the livelihood and health of citizens are protected and supported. Collective identity, security, and social stability in such cities provide more opportunities for interaction between citizens. In addition, those active in managerial and planning positions can significantly reduce the potential effects of crises by providing opportunities for promoting urban resilience. Based on contingency planning approaches, accessing financial and credit resources during emergencies has enabled the sustainability and stability of public services and crisis management. Its expenditure in the pre-crisis phase will also lead to social, physical, and economic empowerment in the city. In the planning dimension, integration in policy-making and city development allows planners to take action against crises as defined by the principles of city resilience.

The concept of "organizational resilience" has been used by authors (12, 13) to reflect the level of readiness an organization has to face JWL threats and/or hardships (14). Organizational capacity for resilience indicates governmental and non-governmental, formal and informal, and public or private systems in urban communities. The private sector, civil society organizations, and various government departments at national, regional, and local levels can play a role in organizational resilience according to their duties and missions (15). The organizational dimension encompasses aspects related to risk reduction, planning, and experience based on previous crises, while resilience uses communities' capacity and the employment of local people to reduce risk through creating organizational links, as well as improving and protecting social systems (16).

To create organizational links and improve and protect social systems in the dimension of organizational resilience, the social capacities of communities and employment of local people are also used. However, since this study aims to analyze the resilience capacity of public and official organizations in the context of water crises threatening the city of Isfahan, we can refer to the following studies and previous research as the most important in the context of the power and capacity of these organizations:

The effect of organizational learning on the level of organizational resilience of academics (17), Investigate the mediating effect of employee resilience on the relationship between learning organization and work engagement analysis (6), The role of Organizational learning from crisis with emphasis on the importance of leadership (9), Organizational resilience structure for transition from crisis management to urban management resilience against earthquakes (15), Organizational and Physical-Environmental Resiliency of Urban Communities to Reduce Natural Disasters and Earthquake (18), Continuity and Change in Social-Ecological Systems: the Role of Organizational Resilience (19), Assessment of Organizational Social Learning Capacity with a Reference to Learning Loops in the Level of Agricultural Water Users (20), Social network analysis of local stakeholders in governance of water resources (21) The role of governance modes and meta-governance in the transformation towards sustainable water governance (19), The role of good urban governance in the realization of the resilient city (22), Developing a Model for Social Capacity Building and Water Crisis Socialization (23), Evaluation and determination of urban land use resilience based on sustainable development approach (24).

By reviewing previous literature, we can emphasize the necessity to study the organizational capacities of urban resilience in water crises. The main purpose of this study is thus to prioritize the organizational capacity of resilience in public and official organizations in Isfahan in the face of secondary drought crises. To achieve this goal, measurable indicators will be identified, the organizational capacity of resilience will be evaluated, and the status of these capacities at the level of public and official organizations (among Isfahan municipalities) will be analyzed. The theoretical foundations and previous research conducted to measure the resilience of organizations and institutions for better management of environmental hazards in the context of aquatic ecosystems lead this study to the following indicators. These measurable research indicators are shown in Table 1.

Table 1. Final theoretical framework of research

Indicator	Theorist
Learning from past experiences	NOAA (National Centers for Environmental Information), 2007
Organizational stability	NOAA, World Bank, 2012; United Nations, 2014; CSIRO (The Commonwealth Scientific and Industrial Research Organization is an Australian Government agency responsible for scientific research), 2007; Noris, 2008 (25)
Awareness of responsibilities and specification of roles	NOAA, World Bank, 2012; United Nations, 2014; Mayunga, 2007 (26); Noris, 2008
Development of preventive and emergency plans	NOAA, ADPC (Asian Disaster Preparedness Center), 2004; Cutter, 2008 (27); Behtash et al., 2013 (28)
Investment and financial support	NOAA, United Nations, 2014; Noris, 2008
Risk insurance coverage	NOAA, Behtash et al., 2013

Source: Authors

Methods

The general methodology employed within the present study is descriptive and analytical, while the purpose is structural and applied. The study used an adaptable method that considers the high level of uncertainty in the input parameters to the algorithm and its analytic tools. For this purpose, it employed a combination of the Delphi method with the Bulls-eye weighing method and the multi-criteria Gray relational analysis method of decision-making (29). In the definition of the Delphi method, the first step is finding and selecting experts in the desired field. After providing information to the experts, they are asked to participate in this judgment. Questions are followed up by experts in two consecutive stages. Afterward, primary data are prepared for analysis and placement in primary matrices, and their strength will be studied until reaching theoretical saturation. The Bulls-eye method and the Gray relational analysis, both of which are widely used in the field of management, were utilized to measure and prioritize the municipalities of the 15 districts of Isfahan as formal and public organizations at the city level. According to the methodological steps and the Delphi method, the statistical population of experts, elites, and managers in urban planning and urban crisis management in the municipalities of 15 districts of Isfahan was selected (the exact number is not available) to determine the external weight and form a decision matrix. Studies based on multi-criteria decision-making or qualitative studies dealing with a limited number of elites use purposive sampling (30). In this study, all experts have more than five years of relevant experience and are over 30 years. Due to the expert-oriented and limited statistical population, the purposeful sampling method was used until reaching theoretical saturation, and 70 people were selected as a group of experts according to the characteristics shown in Table 2. The goal is to select an experienced sample that will properly answer the research needs. To ensure the validity of the questionnaire, an attempt was made to indicate the content and quality of the questions in each section. The reliability of the questionnaire was assessed using Cronbach's alpha, which was determined as 0.79, indicating acceptable reliability. The values of the aforementioned indicators were expressed qualitatively on a five-point Likert Scale. In converting these values into three-parameter interval gray numbers, they took on a quantitative form and thus were expressible in the decision matrix.

First, the final weight of each indicator was calculated using the Bulls-eye algorithm, as shown in Table 3. The Gray relational analysis is a multi-criteria decision-making method that has been widely used in recent years in combination with the analytical hierarchy process in management field studies, including (29 & 31-33). In the analytical hierarchy process, the internal relations of the indicators are not considered, and since the measurement of organizational indicators of resilience is under analysis in this study, we are faced with a form of qualitative measurement. These two factors, alongside the overall uncertainty of measurement, necessitate the use of a method that considers the internal relations of the variables and their quality, covers the uncertainty of these variables, and is capable of providing a clearer description of the relative weight and importance of each indicator for decision making. After analyzing the nature of various weighing methods, such as the analytical hierarchy process, least squares method, logarithmic least squares method, the eigenvector method, approximate methods, CRITIC method, Analytic network process, SWARW, Best Worst Method, and Shannon's entropy method, this study proposes and applies the so-called Bulls-eye method. The Bulls-eye method is compatible with the high uncertainty of its algorithm data because it considers the uncertainties in the input parameters of the algorithm and its method of analysis.

In this method, the final weight of each indicator is obtained through a three-step process: the expert weight, the weight of the analytical hierarchy process, and the final weight

Table 2. Demographic characteristics of experts participating in the expert questionnaire (Source: Authors)

Respondent Details		Number	Percentage
Gender	Male	31	44.28
	Female	39	55.7
Age group	30-45 years	47	67.1
	45-60 years	23	32.8
Education	Bachelor's Degree	5	7.1
	Master's Degree	50	71.3
	Ph.D.	15	21.6
Work experience	5-15years	47	67.1
	More than 15 years	23	32.8

Table 3. Introduction of linguistic variables and their equivalent three-parameter interval gray numbers

Linguistic Variable	Gray Interval
Very low (VL)	[0.0,0.05,0.1]
Low (L)	[0.1,0.2,0.3]
Medium-low (ML)	[0.3,0.35,0.4]
Medium (M)	[0.4,0.45,0.5]
Medium-high (MH)	[0.5,0.55,0.6]
High (H)	[0.6,0.75,0.9]
Very high (VH)	[0.9,0.95,1.0]

of that indicator. Each indicator has an external weight, and these numbers in the algorithm are in the form of three-parameter interval gray numbers describing a range of linguistic variables ranging from very high to very low. The final weight obtained from this algorithm enters the initial matrix of gray relational analysis. Three-parameter interval gray numbers can be represented by $a(\otimes) \in [\underline{a}.\tilde{a}.\bar{a}]$, with $\underline{a}$ representing the lower bound, $.\tilde{a}$ being the mean or center of gravity (the number that has the highest probability), and $.\bar{a}$ representing the upper bound. Table 3 is used to convert linguistic variables to three-parameter interval gray numbers. In the case that the center of gravity (mean) is not clear, the three-parameter interval gray number becomes a normal gray number.

This weighing method was used by Lu and Wang for weighing three-parameter gray decision matrices. The algorithm of that method in a step-by-step approach is as follows:

Step 1. Normalization: Suppose our decision matrix is as follows:

$$S = \{u_{ij}(\otimes) | u_{ij}(\otimes) \in (\underline{u}_{ij}.\tilde{u}_{ij}.\bar{u}_{ij}).0 \le \underline{u}_{ij} \le \tilde{u}_{ij} \le \bar{u}_{ij}.i = 1.2.\ldots.n.j = 1.2.\ldots.m\}$$

We use the following method to scale the matrix:

Equation 8: Scaling the matrix with positive data

$$\tilde{x}_{ij} = \frac{\tilde{u}_{ij} - \underline{u}_j^{\nabla}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}} \quad \overline{x}_{ij} = \frac{\bar{u}_{ij} - \underline{u}_j^{\nabla}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}} \quad \overline{x}_{ij} = \frac{\underline{u}_{ij} - \underline{u}_j^{\nabla}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}}$$

Equation 9: Scaling the matrix with negative data

$$\tilde{x}_{ij} = \frac{\overline{u}_j^{*} - \tilde{u}_{ij}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}} \quad \overline{x}_{ij} = \frac{\overline{u}_j^{*} - \underline{u}_{ij}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}} \quad \underline{x}_{ij} = \frac{\overline{u}_j^{*} - \bar{u}_{ij}}{\overline{u}_j^{*} - \underline{u}_j^{\nabla}}$$

Step 2. Obtainment of the positive Bulls-eye number. For this purpose, we use the following equation:

Equation 10: Obtainment of the positive Bulls-eye

$$Z^{+} = (z_1^{+}.z_2^{+}.\ldots z_n^{+})$$

$$z_j^{+} \in (\underline{x}_j^{+}.\tilde{x}_j^{+}.\overline{x}_j^{+}) | \underline{x}_j^{+} = max_{1\le j\le m}\{\underline{x}_{ij}\}.\tilde{x}_j^{+} = max_{1\le j\le m}\{\tilde{x}_{ij}\}.\overline{x}_j^{+} = max_{1\le j\le m}\{\overline{x}_{ij}\}$$

Step 3. Obtainment of the weight of indicators using the following formula:

Equation 11: Obtainment of the Bulls-eye weight

$$w_j^{*} = b_j \left[\alpha w_j^0 - \left(\sum_{i=1}^{n} \alpha w_j^0 b_j - 1 \right) / \sum_{j=1}^{n} b_j \right]$$

$$b_j = \frac{1}{\alpha + \beta \sum_{i=1}^{m} \left[(\underline{x}_{ij} - \underline{x}_{ij}^{+})^2 + (\tilde{x}_{ij} - \tilde{x}_{ij}^{+})^2 + (\overline{x}_{ij} - \overline{x}_{ij}^{+})^2 \right]}$$

Alpha (α) and beta (β) determine the importance of external and internal weights. The sum of these two equals one, and both are non-negative.

$$W^0 = (w_1^0 | .w_2^0.\ldots.w_n^0)$$

In the above formula, the external weight is adopted by the decision maker and defined using the analytical hierarchy process.

When introducing the Gray relational analysis method of decision-making, it can be stated that the use of statistical methods is justified when the number of data within the sample is large enough and their distribution is normal. However, the Gray relational analysis is also used in certain studies where most data is rare, and the distribution is unknown. This mode of analysis compensates for some of the weaknesses of regression analysis, such as requiring large sample sizes, normal distribution of data, and small variable factors (34). Gray system theory was first proposed by Deng (1989), stating that if black represents completely unknown information and white completely clear information, gray signifies information that is partly known and partly unknown. A system that contains gray information is called a gray system (34). This theory is a highly effective way of dealing with problems of high uncertainty and unknown information. Generally, information about the preferences of decision-makers regarding criteria is expressed based on a variety of reasons founded on their qualitative judgments. In practice, the judgments of decision-makers are often uncertain and cannot be expressed by exact numerical values. Gray system theory is one of the methods that can be used to study circumstances of uncertainty and incompleteness of information, and its use in the mathematical analysis of systems with incomplete information has been growing. On the one hand, this mode of decision-making makes it possible to consider all types of indicators, including positive, negative, and optimal, and on the other hand, makes it possible to consider both qualitative and quantitative indicators by using gray numbers, along with definite numbers in the decision matrix.

The step-by-step approach to the gray

relational analysis method of decision-making is as follows:

To evaluate quantitative indicators, definite numbers in a set of real numbers are used, while gray numbers are used to evaluate qualitative indicators or those that need to be measured in uncertain conditions. This is defined based on the following steps:

Step 1. Formation of a decision matrix

Equation 12: Decision matrix

$$D = \overset{\xleftrightarrow{\text{Non-deterministic attributes}}\quad\xleftrightarrow{\text{deterministic attributes}}}{\begin{bmatrix} \otimes G_{11} & \otimes G_{12} \cdots & \otimes G_{1k} & R_{1,k+1} & R_{1,k+2} \cdots & R_{1n} \\ \otimes G_{21} & \otimes G_{22} \cdots & \otimes G_{2k} & R_{2,k+1} & R_{2,k+2} \cdots & R_{2n} \\ \vdots & \vdots \quad \ddots & \vdots & \vdots & \vdots \quad \ddots & \vdots \\ \otimes G_{m1} & \otimes G_{m2} \cdots & \otimes G_{mk} & R_{m,k+1} & R_{m,k+2} \cdots & R_{mn} \end{bmatrix}} \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_m \end{matrix}$$

Step 2. Normalization of the decision matrix

Considering the heterogeneity of the type and nature of the indicators following the formation of the decision matrix, it should be nondimensionalized to allow evaluation and comparison from the perspective of all indicators. Providing a comprehensive method requires the expression of relationships that can nondimensionalize the values of the matrix by considering various types of relevant indicators, including positive, negative, optimal, quantitative, and qualitative. For this purpose, using the set of inserted relationships, the normalized decision matrix is calculated using equation 13.

Equation 13: Normalization of the decision matrix

$$A_0 = \left\{ \left[\max_{1 \le i \le m} \underline{G}^*_{i1} \cdot \max_{1 \le i \le m} \overline{G}^*_{i1} \right] \cdot \ldots \cdot \left[\max_{1 \le i \le m} \underline{G}^*_{ik} \cdot \max_{1 \le i \le m} \overline{G}^*_{ik} \right] \cdot \max_{1 \le i \le m} R^*_{i,k+1} \cdot \ldots \cdot \max_{1 \le i \le m} R^*_{in} \right.$$

Steps 3 and 4. Calculation of the Gray relational coefficient

Equation 14: The Gray relational coefficient

$$\xi_{0i(j)} = \frac{\min_i \min_j \{d_{0i(j)}\} + \rho \max_i \max_j \{d_{0i(j)}\}}{d_{0i(j)} + \rho \max_i \max_j \{d_{0i(j)}\}} \quad 1 \le i \le m . 1 \le j \le n.$$

Step 5. Calculation of the Gray relational score

The Gray relational score is an indication of the degree of similarity between each option and the reference (ideal) option. Therefore, the higher the calculated Gray relational score, the better the option.

Equation 15: Calculation of the final rank of the gray numbers

$$\gamma_{0i} = \sum_{i=1}^{n} w_j . \xi_{0i(j)} \quad .i = 1.2. \ldots .m.$$

$$\sum_{j=1}^{n} w_j = 1 . w_j > 0$$

Findings

The study of environmental uncertainties is defined as part of the identification of critical issues in crisis planning and management. In addition to this, the dimensions of environmental risk management and environmental recovery capacity in the city of Isfahan are analyzed according to the aforementioned indicators. These indicators include the degree of organizational stability, lessons learned from past experiences, risk insurance coverage, awareness of organizational responsibilities, ongoing risk reduction planning, and the amount of investment. For this purpose, the first steps included studying the sources, interviewing the experts, and reviewing international reports (such as the Japan Sendai Framework for Disaster Risk Reduction and Hyogo Framework for Action) to extract measurable indicators. Based on the measurable indicators extracted from the sources, a questionnaire was distributed among the experts, and feedback was received.

The results of applying the Bulls-eye weight in the Gray relational analysis decision matrix for the 15 districts of Isfahan were obtained and are illustrated by the division of district organization and the indicator type (output of the fifth step of the matrix) in Figure 1. The degree of difference for each indicator at its level of regional organization is observable. Furthermore, Table 5 shows the ranking results, separated by each indicator. Finally, at the output of the sixth step of the matrix, the districts were classified according to their respective indicator weights as shown in Table 6.

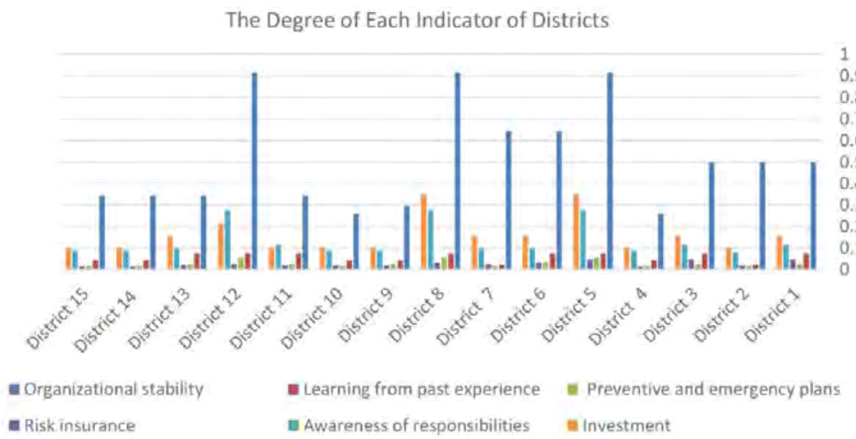

Figure 1. Output of the fifth step of the matrix

Table 4. Weighing calculations of the Bulls-eye method in the dimension of environmental risk management

Ranking of criteria	Bulls-eye final weight	Mean of three-parameter gray numbers	External weight (Analytical hierarchy process)	Experts Risk management dimension					Indicators
				D5	D4	D3	D2	D1	
1	0.351	[0.90,0.95,1]	0.408	VH	VH	VH	VH	VH	Investment
2	0.275	[0.84,0.91,0.98]	0.189	H	VH	VH	VH	VH	Awareness of responsibilities
3	0.195	[0.76,0.83,0.9]	0.231	VH	MH	VH	H	VH	Organizational stability
4	0.075	[0.89,0.87,0.96]	0.11	H	VH	H	VH	VH	Learning from past experience
5	0.056	[0.89,0.87,0.96]	0.039	H	H	VH	VH	VH	Preventive and emergency plans
6	0.047	[0.66,0.96,0.76]	0.4	VH	MH	MH	MH	VH	Risk insurance

Source: Author's calculations

Table 5. Weighing calculations of each indicator in districts

Impact of coefficient	Organizational stability	Learning from past experience	Preventive and emergency plans	Risk insurance	Awareness of responsibilities	Investment
District 1	0.499091	0.075	0.024889	0.047	0.113235	0.156
District 2	0.499091	0.021429	0.016	0.017625	0.078571	0.100286
District 3	0.499091	0.075	0.024889	0.047	0.113235	0.156
District 4	0.261429	0.040909	0.016	0.013429	0.0875	0.100286
District 5	0.915	0.075	0.056	0.047	0.275	0.351
District 6	0.645882	0.075	0.034462	0.033176	0.098718	0.156
District 7	0.645882	0.021429	0.016	0.025636	0.098718	0.156
District 8	0.915	0.075	0.056	0.033176	0.275	0.351
District 9	0.296757	0.040909	0.024889	0.017625	0.0875	0.100286
District 10	0.261429	0.040909	0.016	0.017625	0.0875	0.100286
District 11	0.343125	0.075	0.024889	0.017625	0.113235	0.100286
District 12	0.915	0.075	0.056	0.025636	0.275	0.216
District 13	0.343125	0.075	0.024889	0.020889	0.098718	0.156
District 14	0.343125	0.040909	0.016	0.013429	0.0875	0.100286
District 15	0.375	0.545455	0.285714	0.285714	0.318182	0.285714

Table 6. Final score of the 15 districts of Isfahan based on their Gray relational ranking

Rank	District	Final Score	Rank	District	Final Score	Rank	District	Final Score
1	District 5	1.719	6	District 1	0.915215	11	District 14	0.6012
2	District 8	1.705176	7	District 3	0.915215	12	District 15	0.6012
3	District 12	1.5626	8	District 10	0.733002	13	District 9	0.567965
4	District 6	1.043238	9	District 13	0.718621	14	District 2	0.523748
5	District 7	0.963665	10	District 11	0.6741	15	District 4	0.519522

Source: Author's calculations

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Discussion and Conclusion

The present study was conducted to prioritize and classify the municipalities of Isfahan as public and official organizations regarding their organizational resilience capacity. This article contributes to the knowledge to compare the level of organizational resilience in the face of urban crises with a new lens. The study began its path by extracting indicators of the resilience approach within organizational dimensions. In terms of methodology, the aforementioned analytical tools were used to measure the capacity of organizational resilience within public and official organizations in Isfahan in the context of preparing for and dealing with secondary water crises. According to the results, it was found that of the organizational indicators measured, the most important indicators were, in order, investment, awareness of responsibilities, specification of roles, organizational stability, learning from past experiences, development of preventive and emergency plans, and risk insurance coverage. The ranking of municipalities in the districts under study showed that districts 6, 5, 8, and 12 had the highest relative level of organizational capacity, while districts 2, 11, 9, 14, 15, and 4 had the lowest level. Districts 1, 3, 7, 10, and 13 lay intermediately between these two levels. The investment indicator for district 8 had the highest value, and the investment indicator for districts 14 and 15 had the lowest. District 12 showed a high value for specification of roles, while the risk insurance coverage indicator had the lowest value across all districts compared to other indicators, despite the high importance it can have in returning communities to pre-crisis conditions. The results of the research are in line with those reported by Shahivandi's study (37), which dealt with sorting the urban areas of Isfahan from the perspective of social resilience. Organizational and social resilience have common and interdependent aspects (18), and the results of these two analyses emphasize the results of this study. Structural analysis of organizational resilience shows that the indicator of awareness of responsibilities and proper division of tasks in working groups plays a vital role in the organizational structure of an organization, which also ranked as the second most important among the indicators evaluated in this study (15). A section of the aforementioned article also emphasized optimization programs, which were similarly measured in the present study in the form of preventive programs and emergency plans. Their impact on emergency and crisis management was highlighted as well, which was also mentioned in Davoodpour's study. One of the limitations of this study was the lack of official statistics on the number of activists in the field of urban crisis management. If there is a coherent organizational structure with the aim of urban crisis management at the level of the sample study, more accurate statistics can be obtained and management processes can be better defined.

Considering the serious threats to aquatic ecosystems at the macro-level of the Isfahan region, it is particularly important to pay attention to managerial dimensions to control and curb secondary threats. Being aware of the level of organizational resilience with an emphasis on organizational learning in urban executive organizations is an action that has received less attention despite its high importance. Based on the analysis conducted in this study, the first step in promoting organizational resilience is the comparison of the capacity of resilience in controlling urban crises at the level of the executive organization of the municipality. The status of organizational resilience in Isfahan's public and formal organizations does not report favorable conditions since areas with low levels of organizational resilience account for a larger number, and these organizations require more attention in promoting structural indicators. Therefore, more attention is required to improve organizational indicators. Comparing the importance of indicators and the ranking of regions emphasizes the importance of investment as the highest weight in crisis control, and most of the regions that were reported at a high level of organizational resilience had a higher level of investment. In the future, this study can be used similarly in other organizations that directly and indirectly affect natural crises management. Therefore, considering the increasing importance of organizational resilience and organizational capacities in crisis control, suggestions for improving the managerial capacity of organizations are presented as follows: Inter-sectorial cooperation and integrated management, participatory management mechanism, scientific management and use of local knowledge, diversifying investment and equipment of financial resources, risk-based land use planning, preparation and presentation of crisis management systems, effective participation of communities, organizations and stakeholders, improved methods of data collection, analysis, and utilization, efficient management of various urban ecosystems, and methods of risk allocation and financing.

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Conflict of Interests

Authors declared no conflict of interests regarding the publication of the present study.

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