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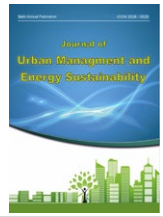

ORIGINAL RESEARCH PAPER

Urban Resilience Analysis against Flood (Case Study: Sari Region 2)

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ABSTRACT

Natural disasters, as a part of the human life process increasing in number and variety every day, are presented as a fundamental challenge to achieve the sustainable development of human societies. Therefore, at present, the dominant view has changed from concentrating on decreasing vulnerability to increasing resilience against disasters. The purpose of this research is to analyze urban resilience against floods in region 2 of Sari. The current research is descriptive-analytical in terms of method and practical in terms of purpose. Research data has been collected through library studies and field observations with observation tools and questionnaires. The statistical population of the research, experts and specialists of Sari city, in relation to resilience and sample size, has been calculated by cluster sampling method to be 30 people. To analyze the information, a multi-indicator decision-making method (TOPSIS) was used and the areas were ranked. The findings of the research indicate that region 2 of Sari is weak in terms of resilience, because the area 2-2 in terms of economic and institutional dimensions, area 3-2 in terms of physical-environmental dimensions have a low resilience status. Area 4-2 is weak in terms of all dimensions of resilience. The results have shown that the factors causing worn-out tissue, impermeability, poor management, unemployment and low level critical uses and a large number of vulnerable people have caused the low level of resilience in this area, and it is necessary to consider strategies such as increasing people's participation in district management and increasing the coordination and integration of district management with the guidance of urban management in order to improve these factors and promote resilience.

Running Title: Urban Resilience Analysis against Flood...

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1. Introduction

At the global level, prominent changes are seen in the attitude towards risks (Cutter et al, 2010:86) so that several parallel measures have been taken to create a framework to reduce the risk of crisis at the international level. On January 22, 2005, a bill under the title of strengthening the resilience of nations and societies against disasters in the framework of the Hugo Plan for Action in the years 2005 to 2015 was approved by the United Nations International Crisis Reduction Strategy, which is considered as a positive move in the field of resilience. Since the approval of this legal bill, the main goal of planning for risk and reducing the risk of crisis has been clearly focused on creating resilience in communities, not reducing vulnerability. This issue calls attention to the creation of changes in the work culture of risk reduction, emphasizing resilience instead of vulnerability (Mayunga: 2007: 98) in this context, the need to create resilience through methods such as creating integration and vulnerability reduction perspectives, increasing local capacity for resilience, integrating risk reduction with the design and implementation of emergency preparedness, response, rehabilitation, and reconstruction programs in communities has been identified (Marshall et al., 2013: 798). Cities are the most complex man-made structures, with extensive risks due to a wide range of disasters, are facing multiple vulnerabilities (asdafrooz et al., 2019: 57).

If the city is considered as a living organism, and if we consider the growth, change and dynamics of cities and citizens, finding or building a city in the whole world that has all components and indicators of resilience is rarely impossible. But what is important is the will of these cities and their urban management and moving towards cities getting closer to resilient cities (Farzad Behtash et al., 2013:34).

Therefore, in order to prevent vulnerability, it is necessary to identify local resilience and what strengths exist in a society that is subject to an accident, which can be used to build a safe path in the future (Rezaei et al., 2015). Therefore, in order to achieve this goal, programs to increase the resilience and vulnerability of citizens and society that are exposed to risks and accidents are needed in urban development plans (Ramzanzadeh Lesboi et al., 2013: 36). In recent years, institutions and agencies that were active in the field of disasters have focused most of their activities on achieving a resilient society against disasters, in which, due to the large damages and social anomalies, floods, along with earthquakes, are a high priority in efforts to strengthen the resilience of societies against natural disasters. By placing the concept of resilience in the center of attention, and considering its interrelationship with development, this research studies and investigates the relationship between the urban resilience and the risks of floods by emphasizing the dimensions of resilience (Sharifinia, 2018: 4)

Urban floods are mainly caused by the negative impact of urbanization on the river ecosystem. Rivers in urban environments, as a natural element, not only play an effective role in landscaping and aesthetics of spaces, but due to the destruction caused by the development of urbanization, they are known as serious consequences such as floods, many life and financial damages for cities

(Olazabal & Chelleri, 2012: 43). Urbanization has three major effects on the urban stream ecosystem. 1-Creating impermeable surfaces so that runoff is formed with torrential rain and a small flood may become ten times more intense due to the impact of urbanization. 2-Urbanization reduces the drainage capacity of the river and leads to urban flooding.

3- The streets in the form of a network have caused the water to drain faster in the local canals, this leads to a reduction in the delay time between the initial rainfall and flooding. In addition, most of the rivers are narrowed by bridges or supporting structures, as a result, the carrying capacity of the flow is reduced and as the process continues and the speed increases, the flow overflows the river walls. A combination of these factors maximizes the spread of erosion and destruction and leads to the accumulation of sediments in urban rivers (Mousavi and Saadatmand, 2016: 3).

The development of urbanization always affects the river system by creating changes in the morphological characteristics from the perspective of variables such as sediment production, impermeability, hydrological,

morphological and physical and biological degradation. The increase in sediment reduces the drainage capacity of the river and causes erosion and morphological changes. Moreover, by increasing the impermeability of the hydrological effects, it leads to changes in the morphology of the channel and biological destruction in the stream (Khirfan & Dhar, 2017: 90). Mazandaran province is very rich in terms of water resources due to favorable weather conditions and sufficient rainfall. Then, the reason for this is the existence of many rivers and the abundance of surface water. In terms of surface water resources, this province includes a series of rivers that originate from Ramsar to the end of Miankala Bay and from the northern heights of Alborz and flow into the Mazandaran Sea, most of them are permanent and most of them are full of water.

The rivers in the province flow in the plains and pass through the cities to the Caspian Sea. One of these rivers is Tajen, which by passing through the city of Sari, affects the spaces of the city, and on the other hand, it affects the urban spaces and their development from the aspect of changing the morphological characteristics. On the other hand, following the development of the city in recent years, the population of the city has increased more than 5 times and its area has increased 10 times leading to the construction of agricultural lands around the city, connecting the surrounding villages to the urban body (Yaser et al., 2018: 143). Rapid urbanization has caused a series of changes in river systems and led to disasters such as floods and other environmental problems. In recent years, the problems mentioned above, have become more serious with the recurrence of urban floods and the increase in damage and the reduction of the return period, and the continuation of this trend will cause increasing instability and out of control serious damage to the city. Based on the natural characteristics, the southern part of Sari is located in the foothills, which has caused a problem in surface water disposal. The lack of vegetation in the highlands, the steepness of the mountain slopes, the short distance between the watershed (mountains and highlands) and the catchment (the bottom of the river), the high level of underground water in the city and encroachment on the boundaries of urban rivers are some of the effective factors in flooding in Sari. There are also factors such as the lack of an efficient system in directing surface water, city development and lack of attention to surface water disposal issues, increasing density of residential areas and increasing the percentage of surface area with low permeability, insufficient flow capacity in construction channels and lack of attention to the boundaries and routes of seasonal waterways in watersheds and their blocking due to non-original constructions is one of the factors aggravating the floods of Sari and its effects. In 2017, heavy rains in Sari led to flooding and inundation of agricultural lands. At that time, the most rainfall was from the city with more than 70 mm. The heavy rain blocked the road connecting Kiasar to Semnan and led to the rise of the Tajen river so that Melal Park in Sari was flooded. The heavy rain also led to the flooding of three residential settlements of Sari like Farhangian and it caused power outages in some villages around Sari including "Sarkat". Considering the importance of the issue in Sari, the need for a proper planning to reduce the effects of natural disasters such as floods seems necessary. As such studies have their own necessity, high value and special status, this research seeks to analyze urban resilience against floods in region 2 of Sari city.

1.1. Theoretical foundations and research background

In the literature of risks and disaster management, resilience is used in many ways, such as economic, organizational, ecological, social, construction, engineering resilience; vital infrastructure and communication system. The common aspect of which is the ability to stand, resist and respond positively to pressure or change. Nevertheless, and according to Berneo (Balbo, 2012: 34), four dimensions can be considered for resilience: the technical dimension, which consists of the ability of physical systems (including components, their interactions, mutual relationships and internal systems), in functioning at acceptable levels when facing the consequences of hazards and accidents. The organizational dimension refers to the capacity of organizations that manage critical facilities

and their responsibility is to carry out operations during the disaster in order to make decisions and take action to achieve the conditions of resilience as described above (Kartez & Olshansky, 2018: 23). The social dimension consists of criteria specifically designed to minimize the negative consequences of the interruption of vital services due to an earthquake for communities affected by hazards and accidents. The economic dimension is interpreted as the capacity to reduce direct and indirect economic losses caused by risks and accidents (Cutter et al, 2008).

Karami et al., (2022) in their article titled "Investigation of the Resilience of Peri-urban Rural Areas against Floods (Case Study: Some Villages of Maidan Chai District"), they have shown that one of the natural hazards that affects rural areas around the world is floods. Since East Azarbaijan province is one of the flood prone provinces of Iran, and the city of Tabriz and its surrounding villages have been at risk of flooding since ancient times. In terms of purpose, it is of applied type and in terms of research method, it is descriptive-analytical. The required data were collected using questionnaires at the household level. Questionnaires were determined by using the opinions of experts in rural and natural areas, and their reliability was obtained by calculating Cronbach's alpha coefficient, 86.0.

The statistical population of the research includes 5 villages in the southeast suburbs of Tabriz city (from the villages of Maidan Chai village) and the sample size was estimated to be 370 households according to the Kochran formula. To investigate the extent of resilience dimensions (economic, physical, institutional, social and environmental) in the studied villages considering the normality of research variables, one-sample t-test, regression and one-way analysis of variance (ANOVA) were used.

The results of the one-sample t -test showed that among the studied dimensions, the social dimension with an average of 50.3, the economic dimension with an average of 33.3, the physical dimension with an average of 10.3, the institutional dimension with an average of 45.2, and the environmental dimension with an average of 98.1, respectively have the greatest impact on village resilience. The results of the analysis of variance (ANOVA) showed that there is a statistically significant difference between the surveyed villages in the field of flood resilience. The level of resilience compared to Sialeb is higher in Laili Khan village with an average of 548.1 and lower in Chavan village with an average of 373.1.

Nahid et al., (2018) have done their article titled "Measuring and evaluating the resilience of urban areas against urban floods (case study: region 4 of Tehran)". The purpose of their study in the first part is to quantitatively simulate floods caused by rainfall for the 4th district of Tehran for the years 1969_2015 using the SWMM model. The simulation was carried out for six-hour rainstorms with return periods of 2, 5 and 10 years and for a period of 12 hours. In this research, two plans of the best management solutions (BMP) under the atmospheric scenario of Baghcheh and Bam Sabz and the combination of both scenarios has been carried out in order to control the maximum runoff from a quantitative point of view, and finally, their effectiveness in reducing the total volume of runoff from the basin has been investigated. In the second part; the evaluation and analysis of resilience caused by urban flooding in 9 areas of the region 4 of Tehran in four dimensions: social-cultural, economic, managerial-institutional and physical. This part is practical in terms of purpose and descriptive-analytical in terms of method. The statistical population of the research is all the citizens of Region 4, among whom the sample size was calculated using Cochran's formula of 384 people. According to the results, the third scenario (a combination of the first and second scenarios) will have the greatest effect in reducing the flow depth and flow rate in the entire surface water collection network. The research findings in the resilience evaluation and analysis section showed that area 5 of region 4 of Tehran is the most favorable area and areas 1 and 8 in district 4 of Tehran are the least favorable in terms of resilience against urban flooding.

Rana et al., (2021) in their article entitled "An Approach to Understanding the Intrinsic Complexity of Flood Resilience: Evidence from Three Urban Communities of Pakistan", they have shown that to effectively increase resilience at the community level, one must first understand its components and indicators. This

study proposed and tested a method to assess community resilience against urban flooding. In this test, 57 resilience indicators were identified, classified into six domains: social, economic, infrastructural, institutional, natural and psychological. The data was collected through a questionnaire survey in three communities of the cities of Rawalpindi, Sialkot and Muzaffargarh in the Punjab province. The data of the resilience indicators were standardized and the index-based approach was used to evaluate the resilience of society in six areas. The relative importance of each domain was assessed through input from field experts, which were translated into weights through the Analytical Hierarchy Process method. After that, the overall resilience of the society was built and statistical methods were used to compare resilience and its domains. A significant difference in resilience was observed among the selected communities. Recommendations based on urgency, complexity and relative impact were developed to help institutions make informed decisions to improve community resilience to floods. Zhang et al., (2019), did research titled "Analysis of spatial distribution characteristics of urban resilience and its influencing factors: a case study of 56 cities in China".

The healthy development of the city has received wide attention in the world, and urban resilience is an important issue in the study of urban development. To prepare a useful reference in a better way for the resilience and development of urban health, this article considers 56 Chinese cities as the research target and selects 29 indicators from urban infrastructure, economy, environment and society. The combined weight method, exploratory spatial data analysis (ESDA) and spatial measurement model have been used to explore the spatial distribution of urban resilience and its effective factors. From 2006 to 2017, the urban resilience of cities including districts in four provinces showed a wave-like increase. During the study period, the values of urban resilience, measured as Moran, were more than 0.0033 and in terms of their spatial distribution, they have a significant relationship with a positive correlation. Bertilson et al., (2018) in an article titled "Urban Flood Resilience - Multiple Indicators for Integrating Flood Resilience" deals with urban planning, such as:

1- Measuring the ability of a drainage system to resist and provide its services continuously and during time

2- The ability of an urban area to recover after flood damage

3-As well as the ability of urban systems to discharge runoff caused by floods. As a result, this article shows how flood resilience can be modeled and that model can be achieved by using a multi-criteria index called urban flood resilience spatial index. This index was tested and researched with consistent results on the banks of the Doña River in Rio de Janeiro. Four different scenarios have been prepared:

1- The current situation (now)
2- The current situation with regard to sustainable flood control measures
3- The future situation with the same infrastructure as today
4- The future situation with flood control measures considered

2. Research Method

The present research is descriptive-analytical and field in terms of method, and field; and it is practical in terms of purpose. In the research, library and documentary methods were used to collect information, and the data collection tool was a questionnaire. The statistical population of this research is experts in the field of urban resilience in the city of Sari, and the sample size for this research is calculated to be 30 people using the cluster sampling method. To analyze the findings, spatial analysis and multi-criteria decision-making technique (TOPSIS) which was first presented in 1981 by Huang and Yun have been used.

2.1. The area of research

The area studied in the current research is Sari city, the center of Mazandaran province which is the most populated city of Mazandaran province. This city is located in the east of Mazandaran province.

Map No. 1 shows the location of the city of Sari in the hierarchy of country divisions.

2.2. Discussion and findings

2.2.1. Evaluation of the resilience of the areas located in region 2 of Sari in terms of resilience indicators

The dimensions and indicators extracted from the researches and researches related to urban resilience to rank the four areas of the two cities of Sari based on the "TOPSIS" model which consists of: social index, economic index, institutional index, Physiological-environmental index, have been identified.

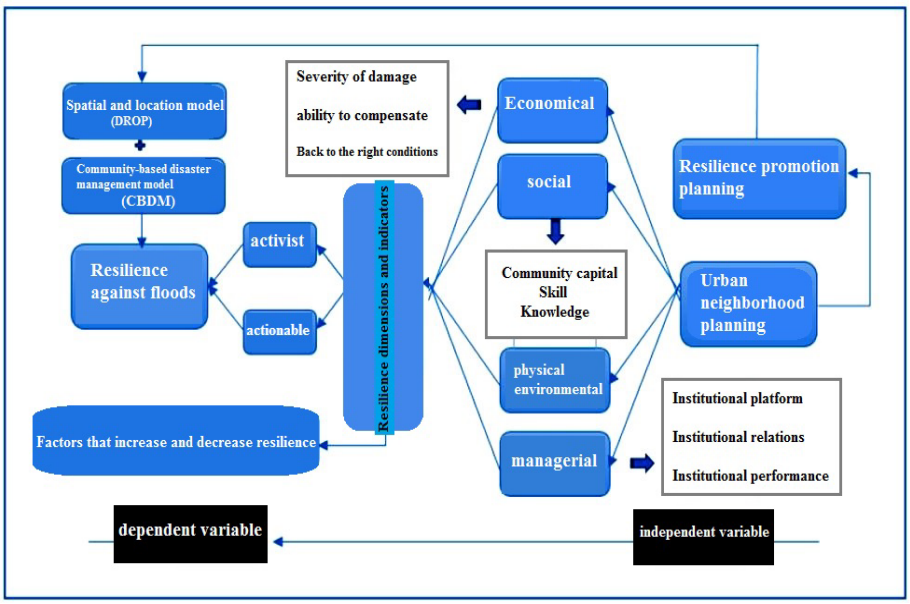
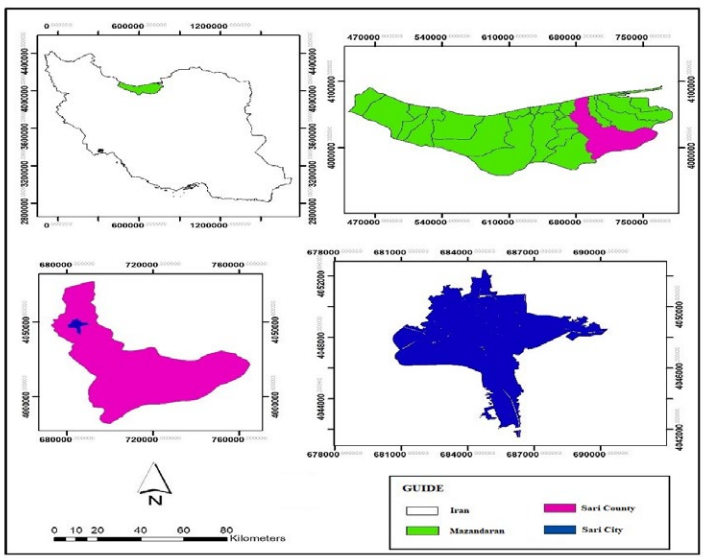


Fig. 1: Research conceptual model
Drawing: The Authors, 2022



Map 1: The location of the whole city and the county of Sari in the hierarchy of national divisions.
Drawing: The Authors, 2022

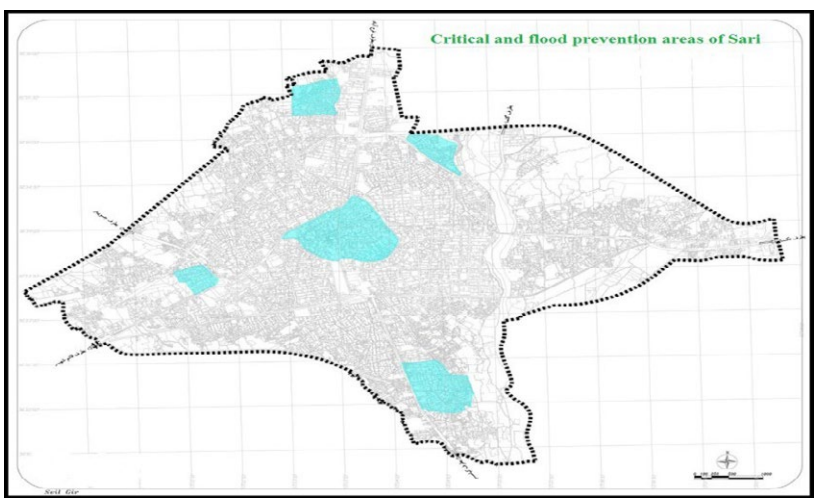
2.3. Social resilience

Social resilience is the ability of a community to return to balance by responding positively to adversity. In a place where crime, poverty and illiteracy are visible, it is no longer possible to attach great importance to the issues of prevention. Social resilience includes indicators of social capital, skills, knowledge and attitude. The research conducted on the indicators of this dimension in the areas of region 2 shows that the area 4 of region 2 has a low level of social capital due to the low share of residential use and social services and population density compared to other regions, the lack of access to social services in the above-mentioned region. It causes lack of attention to the crisis and lack of preparation to face it, which increases the vulnerability of this area before, during and after the crisis. The poor condition of the area mentioned in this index and the continuation of this trend will cause a crisis. Area 4 of region 2 at a low level of knowledge due to the low level of literacy compared to other regions, with lack of knowledge and awareness of the type of risk and the necessary information in the field of preparedness against the crisis that threatens the residents of the region and causes increased damage and the vulnerability of the area, as well as the lack of knowledge and awareness, is also effective in creating unsustainable buildings in this field. Knowledge also causes lack of awareness of people's rights; this issue causes these areas to be ignored by the city management and the lack of services in the above-mentioned areas by this institution. Besides, in area 4 of region 2, attitudes and skills are more unfavorable compared to other areas, which is due to the high percentage of female heads of households, the disabled and the elderly, as well as the high share of the female population, increasing the high share of the disabled population in the neighborhood vulnerable to disasters and has made this area lack resilience.

The general review and evaluation of all social indicators with TOPSIS software indicates that the area 2-4 with the lowest coefficient of proximity among other areas is the most unsuitable area, which can be considered due to the high proportion of the disabled population, the high proportion of the elderly population, etc. Table 2 shows the proximity coefficient of the social dimension of each of the areas.

2.4. Economic Resilience

Resilience in the economy is regarded as the response and adaptation of individuals and societies against the dangers so that it enables them to reduce potential damages and losses caused by hazards and leads to the economic



Map 2: Critical and flood-prone areas of Sari city
Source: Road and Urban Development of Mazandaran Province, 2018.

resistance of the regions in times of crisis. Economic resilience includes the damage severity index, the ability to compensate and the ability to return to suitable conditions. Examining the level of resilience of the areas of region 2 of Sari in economic indicators shows the difference of the areas in the resilience indicators. Map number 3 shows the areas located in region 2 of Sari in terms of economic indicators. According to the evaluation of these indicators at the regional level, the area 2 of region 2 has lower resilience than other areas in terms of the severity of damage during the crisis.

Given that each of the areas has unfavorable conditions in one of the economic indicators, the direction in the general analysis of the economic dimension, the multi-indicator decision-making method (TOPSIS), has been used, and in this method, the area 2 of region 2 has more unfavorable conditions in the indicators of damage severity, the ability to compensate, and the ability to return to suitable conditions, compared to other areas, which is due to the, unemployment and lack of access to insurance, the bank, which causes the non-use of its facilities, and has made the area unsuitable for economic resilience. Table 4 shows the proximity coefficient of the areas in the economic dimension with TOPSIS software.

Table 1: Determining the size of the distance from the positive and negative ideal solution (social dimension)

Distance size	+	-
Area 1-2	0/2482	0/1736
Area 2-2	0/3564	0/0051
Area 3-2	0/0183	0/3538
Area 4-2	0/2352	0/1583

Source: Research findings, 2022

Table 2: Ranking of the areas of region 2 of Sari in terms of social resilience with multi-indicator decision-making method (TAPSIS)

2-4	2-3	2-2	1-2	Area
0/0141	0/4115	0/4007	0/9507	Social dimension closeness coefficient

Source: Research findings, 2022

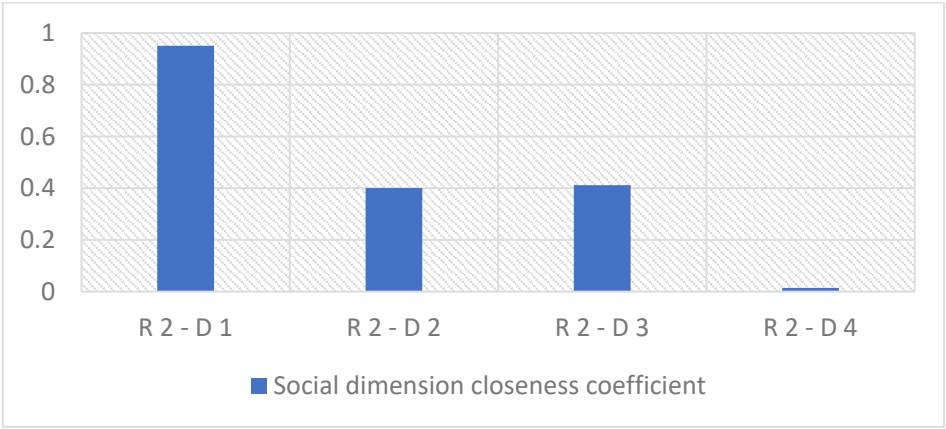


Chart 1: Ranking of the areas of region 2 of Sari in terms of social resilience with multi-indicator decision-making, method (TAPSIS)

Source: Research findings, 2022

2.5. Institutional resilience

Institutional resilience is defined as the capacity of societies to reduce risk and create organizational links within the society, in this dimension, evaluate the physical characteristics of organizations, including the number of local institutions, institutional relations and institutional performance. The index of the institutional framework consists of the number of religious centers, mobilization, NGOs, which create a sense of participation among the residents, and in the case of education, according to the sense Residents' trust in these institutions can provide relief and services in times of crisis, which among the areas of region two, area 2-2 has unfavorable conditions in terms of institutional indicators due to the small number of these centers in the region compared to other regions.

2.6. General conclusion

In the institutional dimension with the multi-indicator decision-making method (TOPSIS), area 2-2 with the lowest coefficient of proximity is the most unsuitable district. Compared to other areas, which can be considered due to the lack of fire stations, police forces, safe evacuation centers, shelters and publications in the area. Table 6 shows the proximity coefficient of the areas in the institutional dimension.

Table 3: Determination the size of the distance from the positive and negative ideal solution (economic dimension)

Distance size	+	-
Area 1-2	0/326	0/2604
Area 2-2	0/2423	0/3315
Area 3-2	0/3351	0/2321
Area 4-2	0/3425	0/2299

Source: Research findings, 2022

Table 4: Ranking of the areas of region 2 of Sari in terms of amount of economic resilience with multi-indicator decision-making method (TOPSIS)

R 2- A 4	R 2- A 3	R 2- A 2	R 2- A 1	Area
0/4093	0/5778	0/4016	0/4440	The proximity factor of the economic dimension

Source: Research findings, 2022

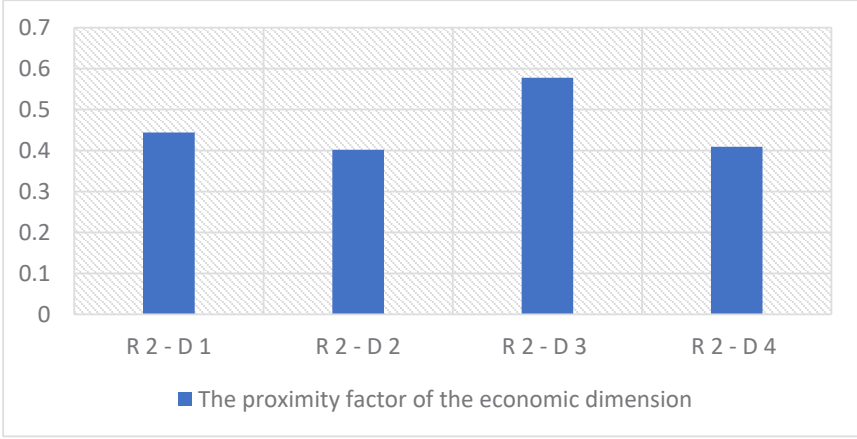


Chart 2: Ranking of the areas of the 2nd region of Sari city in terms of economic resilience with multi-indicator decision-making method (TAPSIS) Source: Research findings, 2022

2.7. The physical-environmental resilience

a resilient city is a stable network of physical systems and human societies. In this dimension, the characteristics of the accesses, weather and physical characteristics of the areas located in area 2 have been investigated. The results of the investigation and evaluation of the physical-environmental dimension of resilience indicate the unfavorable conditions of area 2-3 compared to other areas, which can be caused by the high share of worn-out tissue and the most wells at the level of the district, he realized that it can be dangerous in times of crisis due to the fall and multiply the damage caused by the crisis. Even though the second region is threatened by floods. The impermeable fabric with the narrow width of the roads during the crisis causes the lack of optimal services and it is given to the residents on time and it also reduces the security of the area before the crisis; therefore, urban areas should try to reduce the damages caused by accidents in the field of physical resistance and by removing incompatible uses at the district level.

Generally, investigation and evaluation of the space in the multi-indicator decision-making method, (Tapsis) at the level of the districts, show the more suitable situation of the district 2-2 and the unfavorable conditions of the district

Table 5: Determination of the distance from the positive ideal solution and negative (institutional dimension)

Distance size	+	-
Area 1-2	0/3962	0/1262
Area 2-2	25/69	0/3268
Area 3-2	0/3407	0/2383
Area 4-2	0/4046	0/0434

Source: Research findings, 2022

Table 6: Ranking of the areas of the region 2 of Sari city in terms of institutional resilience with multi-indicator decision-making method (TOPSIS)

4 A – 2 R	3 A – 2 R	2 A – 2 R	1 A – 2 R	Area
0/2415	0/5598	0/0969	0/4115	Closeness coefficient of the institutional dimension

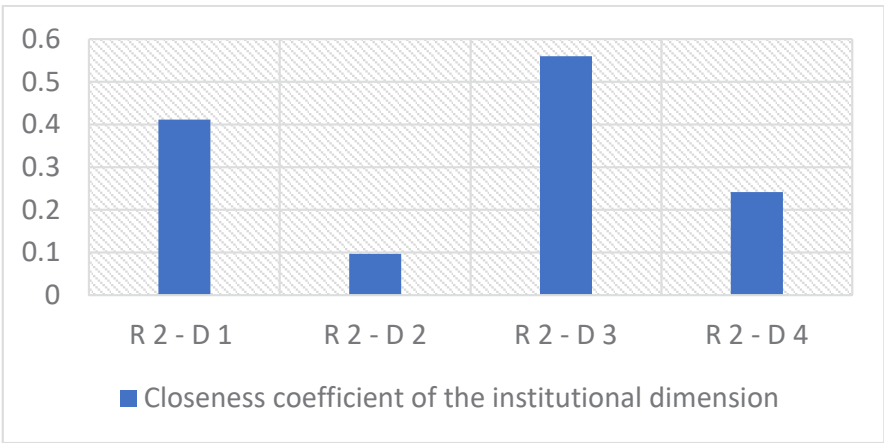


Chart 3: Ranking of districts in region 2 of Sari city in terms of the degree of institutional resilience with the multi-indicator decision-making method (TAPSIS)

Source: Research findings, 2022

Table 7: Determining the size of the distance from the positive and negative ideal solution (institutional dimension)

Matrix weight	+	-
Area 1-2	0/2372	0/3898
Area 2-2	0/3584	0/2822
Area 3-2	0/4409	0/0428
Area 4-2	0/285	0/3508

Source: Research findings, 2022

Table 8: Ranking of the districts of the district 2 of Sari city from the opinion of the level of physical-environmental resilience with the multi-indicator decision-making method (TAPSIS)

R 2- A 4	R 2- A 3	R 2- A 2	R 2- A 1	Area
0/5517	0/0886	0/6218	0/4406	Proximity coefficient of the physical-environmental dimension

Source: Research findings, 2022

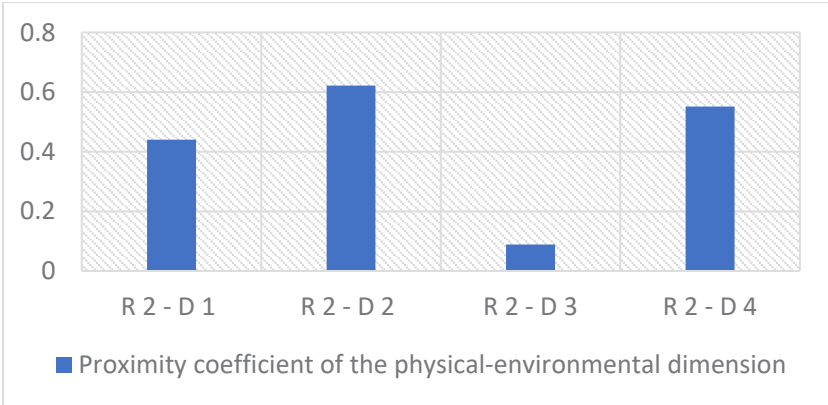


Chart 4: The ranking of the areas of the 2nd district of Sari city in terms of the level of physical-environmental resilience with the multi-indicator decision-making method (TAPSIS)

Source: Research findings, 2022

Table 9: Ranking of the districts of the 2nd region of Sari city in terms of the level of resilience with the multi-indicator decision-making method (TAPSIS)

R 2- A 4	R 2- A 3	R 2- A 2	R 2- A 1	Area
0/2799	0/4595	0/4173	0/7651	Resilience proximity coefficient

Source: Research findings, 2022

2-3, which are shown in Table 8, the coefficient of proximity of the districts in the physical-environmental dimension.

2.8. The ranking of the areas in terms of resilience

Resilience means the area is resilient in terms of all dimensions and can be less damaged in times of crisis and return to its pre-crisis state. Considering all dimensions of resilience, area 4 of region 2 with the lowest proximity coefficient among the areas of area 2, lacks resilience.

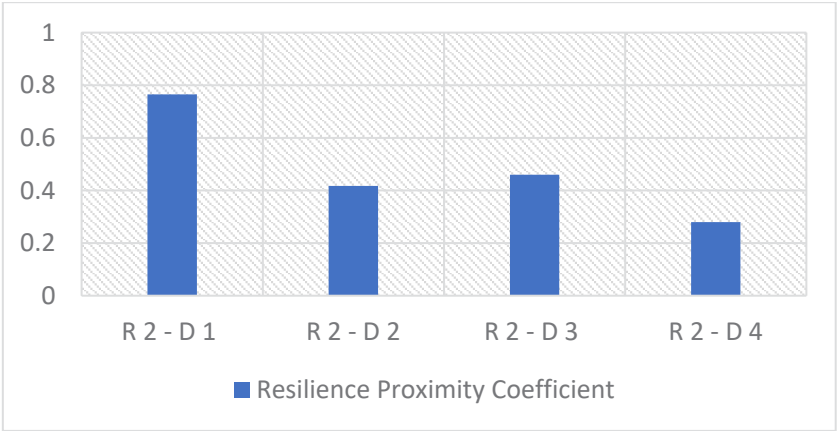


Chart 5: Ranking of areas in region 2 of Sari city in terms of overall resilience with the multi-indicator decision-making method (TAPSIS)

Source: Research findings, 2022

3. Conclusion

Based on the theoretical results of the current research that Karmi et al., (2023); In the article, they investigated the resilience of rural areas of Tabriz city (some of the villages of Maidan Chai village) against Sialeb. In their research, they investigated the economic, physical, institutional, social and environmental dimensions of resilience in the studied villages and showed that which village is weak in resilience, also Nahid et al., (2022) in their article, they investigated the resilience in the 4th region of Tehran. In their research, they evaluated the resilience caused by urban floods in 9 areas of the 4th region of Tehran in four dimensions: social-cultural, economic, managerial-institutional and physical. The results of his research also showed that area 5 of region 4 of Tehran is the most favorable region and area 1 and 8 of region 4 is the most unfavorable in terms of resilience against urban floods. Since the social, economic, institutional, physical-environmental dimensions of resilience have been evaluated in the two cities of Sari, the results of the research by Kerami et al., and Nahid et al., confirm the results of the current research. In foreign studies, Rana et al., (2021), in their article, assessed the level of resilience in the urban communities of Rawalpindi, Sialkot and Muzaffargarh in the Punjab province of Pakistan and showed that a significant difference in resilience was observed among the selected communities. Recommendations based on urgency, complexity and relative impact were developed to help institutions make informed decisions to improve community resilience to floods; in this regard, the present research has investigated and compared the resilience of the areas located in the two cities of Sari, which is in line with the research of Rana et al., and Zhang et al., (2019); They also investigated the characteristics of the spatial distribution of urban resilience in 56 cities in China and, following their research, they have shown that each of the investigated cities has a priority of resilience. In the current study, the priority of the areas located in the two cities of Sari in terms of resilience has been determined, which is in line with the research findings of Zhang et al. Moreover, in the research that Bertilson et al., (2018) examined multiple indicators for integrating flood resilience. Following his research, he arrived at four scenarios against resilience and examined them and showed how flood resilience can be modeled and achieved that model by using a multi-criteria index called the Urban Flood Resilience Spatial Index. In this research, the resilience and prioritization of study samples have been investigated and different dimensions of resilience have been investigated in these researches, and this shows that the results of this research are also in line with the current

research and the results of the current research are confirmed.

The suggestions that can be made to make the areas located in the neighborhood of region 2 of Sari is more resilient are as follows:

- Government investment in the resilience sector by the municipality
- Allocation of a part of the budget for making the region resilient to councilors and local institutions such as Basij, Basij and the neighborhood board of trustees located in the 4th region incentive policy for investors of private companies in the field of resilience
- Training unemployed youth in technical and vocational centers
- Creating support funds to support young job seekers in Basij bases
- Holding appropriate rescue and relief maneuvers with the flood crisis in schools
- Conducting first aid courses for residents in clinics
- Developing health education in schools, mosques and conferences
- Institutionalizing the right model in behavior and ethics in schools
- Teaching citizenship rights and ethics from kindergarten to high school in line with crisis management
- Identification of defenseless spaces in the areas of region 2 of Sari
- Creation of popular crisis management institutions, especially in the 4th area of region 2 of Sari
- Identification of traffic blind spots
- Creation of crisis management in the areas located in region 2 of Sari city

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