ASSESSMENT OF URBAN RESILIENCE TO NATURAL DISASTERS: LOCATION OF THE STUDY NOWSHAHR

AVALIAÇÃO DA RESILIÊNCIA URBANA A DESASTRES NATURAIS: LOCAL DO ESTUDO NOWSHAHR

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Abstract: One of the main problems facing most cities in the world is natural disasters. Natural disasters always threaten human settlements and human lives, and they can cause extensive losses and damages in a short time. Therefore, the main objective of this study is to assess the resilience of the city of Nowshahr in the face of natural disasters. Data were collected through the development of various questionnaires, field studies and documents from 90 managers and specialists from the city of Nowshahr. Using a descriptive-analytic and field survey methodology, the collected data were analyzed using One-Sample t-test. The results show that resilience to natural disasters for some of the indicators is less than moderate, indicating inadequate resilience of the region under study against natural disasters.
Keywords: Resiliency. Natural disasters. Nowshahr.

Resumo: Um dos principais problemas enfrentados pela maioria das cidades no mundo são os desastres naturais. Os desastres naturais sempre ameaçam os assentamentos humanos e vidas humanas, e podem causar grandes perdas e danos em um curto espaço de tempo. Portanto, o objetivo principal deste estudo é avaliar a resiliência da cidade de Nowshahr diante de desastres naturais. Os dados foram coletados por meio do desenvolvimento de diversos questionários, estudos de campo e documentos de 90 gestores e especialistas da cidade de Nowshahr. Usando uma metodologia descritivo-analítica e de pesquisa de campo, os dados coletados foram analisados por meio do teste t de uma amostra. Os resultados mostram que a resiliência a desastres naturais para alguns dos indicadores é inferior a moderada, indicando resiliência inadequada da região em estudo contra desastres naturais.
Palavras-chave: Resiliência. Desastres naturais. Nowshahr.

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Introduction

Natural disasters have long existed in nature, but they are the focus of attention today more than ever. This is due to a variety of reasons, because the risk of the occurrence disasters has not changed, but what has made disasters in the focus of attention is destruction and damage caused by them to human settlements, including cities (Moazam et al., 2014). Disasters that have happened in recent years suggest that societies and individuals are increasingly vulnerable and risks have also increased. However, the ways to reduce risks and vulnerability are often neglected until the occurrence of disasters (Mayunga, 2007: 1). Natural disasters in the world have always provided a major challenge to sustainable development, thus findings ways to achieve such development by reducing vulnerability patterns is essential. Therefore, reducing the risk of disasters is of particular importance and should be considered in the national policies of each country in order to create favorable conditions for effective risk reduction at different levels (Ostowar Izadkhah, 2012). In a situation where risks and uncertainty are growing, the concept of resilience which refers to confrontation with disturbances, unexpected events, and changes have been introduced (Mitchell, 2012: 2). The city of Nowshahr has many capabilities for regional planning and development in terms of environmental, socio-cultural, and economic dimensions. However, in recent years it has been damaged many times because of natural disasters, which, in economic terms, have caused damages to farms and houses in the urban and rural communities. Such disasters have resulted in a sense of insecurity in terms of socio-cultural dimension and in undesirable changes in the landscape, the destruction of trees, and the destruction of public infrastructure from an environmental perspective. Therefore, some measures must be taken in order to make urban settlements at risk more resilient. Resilience is the degree of adaptability of settlements to hazards and disasters, which includes the perception and behavior of residents in relation to natural disasters. In order to enhance the resilience, many variables and indicators should be taken into account individual economic dimensions, social capital, infrastructures, services, and managerial dimensions. The latest findings on natural disasters show that Nowshahr residents do not need Resilience to natural disasters and need assistance from relevant government officials. Management weakness has also made the return to initial conditions takes a long time and this resulted in the residents' dissatisfaction. Therefore, some efforts have been made to strengthen most important factors affecting resilience. Therefore, the study of the condition of the city of Nowshahr in terms of physical and geographical characteristics affecting the occurrence of disasters seems to be necessary. Therefore, this study aims to indentify the indicators and factors that affect the urban Resilience to natural disasters in Nowshahr and provides a framework for measuring structural resilience in cities to provide answers to questions about factors and parameters that affect the resilience of the city of Nowshahr. Over the past decades, numerous studies have been carried out to measure urban resilience to natural disasters. The theoretical literature and studies from 2004 to 2018 on factors affecting confrontation with natural disasters have been reviewed, some of which are summarized as follows for the purpose of this study:

Seyyed Ain al-Din and Janet Kumar Roteri (2004) conducted a study on risk of earthquakes and resilient communities in Balochistan Region in Pakistan by using various measures and they chose the mean distance from the optimal level of the numerical value of the measures in Japan as the optimal resilience rate, and concluded that there are some areas in the region under study that are more resilient in terms of socioeconomic factors (Kimhi & Shamai, 2004: 439).

Jones et al. (2011) explored the regional planning and the future of resilience using the destination model and tourism development in the coastal coral region of Ningaloo in Australia. The authors investigated the correlation between resilience indicators and tourist attraction using indicators such as employment, environmental factors, infrastructure and variety of choices among different modes of transport. The results of this study indicated a correlation between resilience and tourist attraction in the study area (Jones et al., 2011: 394).

Khabaz et al. (2011) explored the way social support and coping styles are correlated with resilience in teenage boys in the suburbs of Tehran, and found that increased social support and the provision of city services by relevant institutions as well as basic skills training

in terms of coping with problems can play an important role in increasing resilience in adolescents.

In a case study of the earthquake in Tehran's neighborhoods, Rezaei (2014) assessed economic and institutional resilience of urban communities against natural disasters. The results showed that the neighborhoods of Gheytariye, Sattarkhan, Narmak and Qala Moghii are ranked first to four, respectively, in terms of economic and institutional resilience.

Dadashpour et al. (2014) measured the resilience capacities in the Qazvin urban complex. The results show that the Qazvin urban complex is suffering from more inappropriate conditions in terms of institutional dimensions (with a 48% distance from the optimal situation) and physical-spatial dimensions (with a 48% distance from the optimal situation). Except the two indicators of the physical-spatial dimension, the other indicators such as "the area of employment centers in the industrial and agricultural sectors" (social dimension), "population over 65 and under 6 years old" (social capital dimension), and "the ratio of hospital beds to the population" (physical-spatial resilience) were lower than the optimal level. However, "institutional performance" as an institutional resilience indicator and "the area of large business centers" as an indicator of economic resilience were found in more inappropriate positions and they should be given priority when making plans.

Fani et al. (2016) evaluated the impact of lifestyle on the amount of urban resilience using a comparative analysis of north and northwestern neighborhoods in the first and second districts of Tehran. The results of this study indicated that given the differences in lifestyle between the two districts, the level of resilience in Qaytrieh neighborhood is higher than that of Northern Shekoufeh neighborhood. It was also found that economic and institutional resilience is higher in Qaytrieh neighborhood and social resilience is greater in the other one. Generally, it can be suggested that given the lower level of resilience in Northern Shekoufeh neighborhood it is more vulnerable than Qaytrieh neighborhood.

Partovi et al. (2016) studied urban design and social resilience of Jolfa neighborhood of Isfahan. The results of the study showed that attention to components such as qualitative promotion of the environment, identity, flexibility, inclusiveness, educational spaces, and social interactions in neighborhood design promote social resilience.

Theoretical background

The term resilience in Oxford dictionary means the ability of (of a person or animal) to withstand or recover quickly from difficult conditions such as shock, damage, and also the ability of objects to return to their original state after bending, stretching, or compression (Oxford Dictionary, 2005: 1300). Resilience can be is the translation of or a derivation from the Latin word *resalire*, which means movement or a sudden change. In this way, the concept of resilience in many fields indicates the capacity to return back the original state and conditions or recover after a shock or an event and often implies the return to the past (Gunderson, 2010: 2). This concept was introduced by Hooling in the 1970s by publishing an article entitled *Resilience and Resistance in Ecological Systems*. He described resilience in an ecosystem as a measure of the ecosystem's ability to absorb changes with preservation of previous resistance (Rezaei, 2013: 28). Today, this term expands its application range in various sciences and human-nature interaction issues such as vulnerability and reduction of disasters. The Risk Reduction Organization sees resilience as a way of strengthening communities by using their capacities (Karrholm, 2014: 121). Currently, there are several definitions of this term, all of which emphasize the difference between resilience and resistance. Resistance in mathematics and engineering is interpreted as the force required to not put the system out of equilibrium, while resilience it refers to the time needed to return to equilibrium, and in these definitions, two important points are common: First, resilience is presented as process-oriented idea that is superior to a product-oriented idea, and second, is resilience is introduced as a concept in the sense of compatibility that is preferable to stability and constancy (resistance) (Norris, 2008: 129). The idea of resilience has a long history in ecology and engineering, but its application is relatively new in the management of natural disasters (Liao, 2012: 1). Resilience is rooted in natural studies of the environment. According to Hulling, the extent to which an environment is resilient de-

pends on how much the environment can slowly transfer into a new environment and become a perpetual environment (Petak, 2002: 25). Resilience can also be normative and descriptive concept, while sustainability is a normative concept that actually emanates from the basic idea of intra- and intergeneration justice (Speranza et al., 2014: 114). Urban resilience emerged in the 1990s, about Two decades after the appearance of resilience. However, urban resilience still lacks a clear definition, and it is raised in the face of economic, globalization, technological, and cultural changes and, generally, all the crises that the city faces (Partovi et al. 2016: 104). Some believe that access to a resilient city is a utopia but in practice there are some differen-ces in degrees of cities' resilience to change. Generally, the concept of the resilient city can be considered a relative concept, as all cities are changing, but some changes are gradual and some occur suddenly. Early detection of changes and their effects on the city, and planning and design based on such detection can greatly enhance the city's resilience to change (Desouza & Flanery, 2013: 93). There is still not specific set of organized indicators or structures for quan-tification of resilience to disasters. Nevertheless, there is a consensus among the academic community that resilience is multidimensional concept with social, economic, institutional and physical dimensions.

Resilient societies

A resilient society is one that, in addition to its ability to withstand shocks and risks and their impacts in such a way that those risks do not turn into a disaster, has the ability or capaci-ty to return to normal conditions during and after the disaster, as well as has the possibility and opportunity of change and adaptation after disaster (Izadkhah et al. 2006: 12). Given that the concept of resilience should be associated with all stages of disaster management, the resilient society needs to have the characteristics that can cover all stages before, during and after the disaster. According to the findings of Gardezalk (2003) and other scholars such as Comforte (1999) Tirni (2002), the characteristics of resilient communities can be summarized as follows:

Frequency: Having a large number of components with similar functionality, so that when a component is disrupted, the entire system does not stop working.

Diversity: With a large number of components with different performances, the system is protected against various threats.

Efficiency: It refers to the ratio of the positive energy generated to the energy delivered through a dynamic system.

Internal independence: The system is able to work independently of external control.

Strength: Having the power to confront other attacks or other external forces.

Interdependence: The system components are interrelated so that they support each other.

Compatibility: Having the capacity to learn from experience and flexibility against chan-ges.

Collaboration: Having many opportunities and motivations for beneficiaries' engage-ment.

Mayunga (2007) also defines the concept of community resilience against disasters as the ability or capability of a society to predict, prepare, respond, and quickly recover from disasters. This suggests that in addition to the speed of community recovery from disaster, the ability to train, confront, and adapt to disasters are considered as the characteristics of a resilient community. Therefore, a resilient community must be organized in such a way that the effects of the disaster are low and the process of recovery is rapid.

Economic resilience

Resilience in economics is a response to the inherent reaction and adaptability of indi-viduals and societies against risks, so that they are able to reduce potential damages caused by disasters. Because of the wide-ranging macroeconomic linkage, economic resilience not only depends on the capacities of individuals but also on the capacity of all institutions (Rose, 2004: 307). Economic resilience is also defined a community's ability for social and economic adap-

tation to natural disasters it is exposed to. Such resilience has two components: The community's capacity to return to pre-disaster economic conditions and, secondly, the community's capacity to reduce the risk of future disasters and hazards, whether in response to a disaster experienced by the community or in predicting a disaster that has not yet been experienced (Forgette, 2009: 45). Accordingly, economic resilience is measured in terms of the intensity of damages incurred, the capacity or ability to compensate for damages, and the ability to return to appropriate working and income conditions, the size of the household's capital, revenues convertible into capital and employment, housing conditions, access to financial services, insurance, allowances, and the ability to revive the economic activities of households after a disaster (Rezaei, 2013: 27).

Institutional resilience

Institutional resilience is defined as the capacity of communities to mitigate risk and establish organizational links within the society, in a way that includes features associated with risk reduction, planning, and experience of previous disasters (Norris, et al., 2008). Institutional resilience assesses the physical characteristics of organizations including the number of local institutions, access to information, trained and voluntary forces and individuals, adherence to crisis management guidelines, timeliness of laws and regulations, deterrent and incentive rules particularly in the field of housing construction, the interaction of local institutions with people and government institutions, the satisfaction with the functioning of institutions, the accountability of institutions, and the quality management or response to disasters, and organizational structure.

Research method

This study is a descriptive-analytical research in terms of its design and methodology used and an applied research in terms of the objectives it follows. The required data were collected using two methods: library (documentary) and survey (field) techniques. In the survey method, the initial data were collected by distributing a questionnaire that was developed based on the research questions. Table 1 shows the criteria for urban resilience as evaluated from the viewpoint of experts. The sample of crisis management experts was chosen from the experts working in the Municipality and the Crisis Management Organization of Mazandaran Province and the city of Nowshahr. As the number of the experts was not known, the researchers tried to have all experts fill out the questionnaire. Finally, 90 questionnaires were collected using purposeful sampling (The reason for the use of experts in this study was the specialty of the topic of urban resilience and the good familiarity of experts with this issue). It should be noted the questionnaire items were designed based on a five-point Likert scale. The collected data through the questionnaire were analyzed using path analysis, one-sample t-test, and Friedman test by SPSS Software.

Location of the study: Nowshahr is a city in northern Iran and Mazandaran province in the south of the Caspian Sea with the coordinates of 36.6494° N, 51.4887° E and is about -2.9 meters below Free world water level. Nowshahr leads to the Caspian Sea from the north, the Alborz mountains from the south, Noor County from the east, and the city of Chalus from the west. The population of the city in 2016 was 16287 households and 49403 persons (Iranian Statistics Center, 2016).

Figure 1. Geographical location of Nowshahr
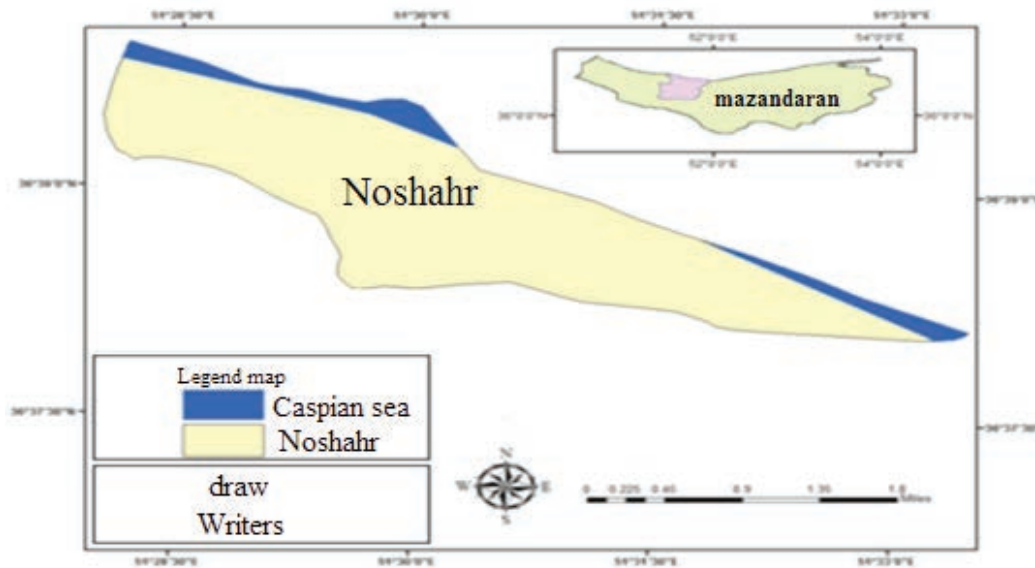
Results

The selection of indicators in resilience studies should be based on two criteria: 1) Justification based on existing literature on their relevance to resilience, and 2) The availability of qualitative data sources. Indicators can act as a set of initial conditions that measure the effectiveness of programs, policies and interventions designed specifically to improve resilience to disasters. In this study, all of the indicators used in foreign studies were first extracted, then they were sorted by frequency and dimensions, and finally, they were selected according to the research problem. In order to determine the resilience of the area under study against earthquake (i.e. to answer the first research question), one-sample t-test was run. Given that a five-point Likert scale was used for measuring resilience, one-sample t-test which is a parametric test was employed. Before runing the test, that the normal distribution of the data must be examined and to this end, the Cronbach alpha test was employed. The results of the Cronbach test show that the data related to the resilient variables have a normal distribution. Resilience was measured using 8 components and 27 items from the expert view. Table 1 shows the Cronbach alpha values for the questionnaire items:

Table 1: Cronbach alpha values for the questionnaire items

Number of items	Cronbach alpha
27	0.893

The results of the study in Table 3 show that the highest score in the economic dimensions and in damage severity component is 2.75 is related to damages caused by the layout of home appliances, and the highest scores concerning the ability to return to suitable job conditions is 2.75 which is related to The ability to return to previous work and income conditions for citizens after earthquake. The results of the study concerning economic dimension, the highest score (2.75) is associated with the citizens' ability to return to suitable work and income conditions for citizens after natural disasters. However, the probable rate of government and local government support for financial compensation in emergency situations gained the lowest score of 1.44. Besides, the results of the study concerning institutional dimension and institutional context indicated that the participation rate of citizens in decision making and planning

had the highest score of 2.56, and our finding concerning institutional relations indicated that the level of citizenship communication with institutions such as municipality gained the highest score of 3.94. Furthermore, concerning structural component, it was found that access to educational centers (schools, kindergartens, universities) scored highest (3.06) and our founding concerning precincts showed that staying away from areas with natural risk (faults, sliding lands, etc.) is considered as the most important factor with a score of 2.94. Besides, our results with regard to building quality and density indicated that the quality of construction materials and buildings gained the higher score of 2.88. Finally, the findings of the study indicated that avoiding human-made hazardous areas (fuel stations, high pressure electric power stations, etc.) gained the lowest score of 2.06.

Table 2: The results of one-sample t-test to measure resilience indicators

Dimensions	Components	Items	Likert scale (1 = Very high, 2 = High, 3 = Moderate, 4 = Low, 5 = Very low)					Test values						
								Mean	SD	t	Sig.	Mean difference	Difference in confidence level of 95%	
			1	2	3	4	5						Lower limit	Upper limit
Economic	Damage severity	The safety level of layout of home appliances	5	12	50	10	13	2.75	0.683	4.20-	001.	0.171	-2.625	0.875
		The degree of occupational vulnerability and its loss in the event of natural disasters	13	27	32	7	11	2.25	0.683	2.726	014.	0.171	0.229	1.771
		The city's property safety (shops, houses, etc.) against natural disasters	27	12	25	10	16	1.44	0.629	-9.722	000.	0.157	-4.028	2.597
	Ability to return to suitable job conditions	The safety level of arranging luggage and furniture in the house	8	8	36	10	28	2.75	0.683	1.247	0.007	0.171	2.526	0.474
		The ability to return to previous work and income conditions for citizens after natural disasters	10	17	54	5	4	1.75	0.577	-3.070	002.	0.144	-1.982	0.518
	Ability to compensate	The citizens' vocational and professional skills	23	33	20	9	5	1.44	0.629	2.236	000.	0.157	-2.528	1.097
Institutional input	Institution	The property safety (shops, houses, etc.) against natural disasters in	5	7	47	13	18	2.13	1.408	5.319	001.	0.352	-4.385	1.36-5

	District 22												
	The probable rate of government and local government support for financial compensation in emergency situations	21	11	34	11	13	2.50	0.894	-4	007.	0.224	-2.949	0.551
	The level of awareness of citizens about the existence of organizations related to crisis management or natural disasters	18	11	25	9	27	2.25	0.683	3.06	098.	0.171	-1.2580	0.080
	Availability of volunteer groups and rescuers	17	16	40	9	8	2.56	0.727	-1.897	074.	0.182	1.310	0.435
Institutional relations	The degree of compliance with legal guidelines for the prevention of accidents caused by natural disasters	5	31	38	9	7	3.94	1.652	-1.053	180.	0.413	7.738	0.006
	Participation rate of citizens in decision making and planning	5	25	40	13	7	2.50	1.211	1.396	449.	0.303	3.691	0.071
	The level of citizenship communication with institutions such as municipality	17	15	37	8	13	1.75	0.683	-0.775	014.	0.171	0.953	0342
	Granting credits for building resistant houses to people	8	20	33	20	9	2.25	0.683	-2.726	074.	0.171	0.077	0.758
	Red Crescent Society and	13	30	3	7	5	2.81	0.98	-	730	0.245	1.527	0.23

		The degree of preparedness of service providers such as fire department, hospital, electricity, water and gas departments in the event of natural disasters	5	23	27	12	23	2.56	0.892	-0.351	386.	0.223	0.819	0.337
Structural	Accessibility	The extent to which classes or training courses are held to respond to the natural disasters crisis by institutions	3	19	43	17	8	3.06	0.854	-0.889	497.	0.213	0.455	0.509
		Access to health centers, hospitals, emergency rooms, and pharmacies	5	22	35	18	10	2.25	0.683	0.694	002.	0.171	0.831	0.374
		Access to educational centers (schools, kindergartens, universities)	4	25	40	13	8	2.69	0.957	-0.3646	557.	0.254	1.472	0.241
		Access to relief agencies (crisis management center, Red Crescent Society, etc.)	5	17	35	17	16	2.63	1.014	-0.568	773.	0.202	1.206	0.287
		Access to military-industrial centers and fire department	5	26	30	17	12	2.13	0.806	-0.293	801.	0.239	29.400	0.000
		Access to public transportation	9	33	30	13	5	2.81	0.957	0.256	003.	0.209	-2.702	0.673
		Access to parks and green spaces and evacuation routes (such as the paths	11	26	32	11	10	2.94	0.834	-3.494	057.	0.232	-0.041	2.416

Precincts	spaces and evacuation routes (such as the paths leading to open spaces without construction)		2				4	3.494	.				6
	Access to main road and passageway network	2	17	3 1	26	14	2.06	0.929	2.031	001.	0.295	3.792	1.08 3
	Staying away from areas with natural risk (faults, sliding lands, etc.)	12	11	4 3	13	11	2.88	1.181	-3.78 1	110.	0.386	3.093	0.34 3
Building quality and density	Avoiding human-made hazardous areas (fuel stations, high pressure electric power stations, etc.)	13	14	2 9	17	17	1.94	1.544	-1.68 2	000.	0.111	3.147	1.45 -1
	Construction and human density	32	17	2 0	16	5	2.75	0.683	-4.20 0	001.	0.171	-2.625	0.87 5

Table 3: The results of one-sample t-test to measure resilience indicators

Dimensions	Components	Test values							
		Mean	SD	t	Sig.	Mean difference	Difference in confidence level of 95%		
							Lower limit	Upper limit
Economic	Damage severity	10.125	1.586	5.246-	0.000	4.875-	6.827-	2.922-
	Ability to return to suitable job conditions	7.750	1.612	4.590-	0.000	4-	2.169-	5.831-
	Ability to compensate damages	1.437	0.629	5.319-	0.000	1.812-	1.096-	2.528-
Institutional	Institutional context	6.875	1.962	5.002-	0.000	5.375-	3.117-	7.632-
	Institutional relations	13.250	3.855	0.593-	0.561	1.250-	3.179-	5.679-
Institutional	Precincts	12.687	3.534	0.981-	0.339	1.181-	2.067	5.692-
	Building quality and density	5.750	1.570	0.618-	0.545	0.5-	1.200	2.200-
		10.125	1.586	5.246-	0.000	4.875-	6.827-	2.922-

The normality assumption test was conducted before running ANOVA analysis In order to investigate the effects of resilience to natural disasters in Nowshahr using path analysis model, we first examined significance of regression. The results of ANOVA test used to determine the existence of a linear relationship between dependent variables and direct variables showed that there is a linear relationship between direct variables on the one hand and the dependent variable on the other hand in terms of economic and institutional components as the significance level was smaller than 0.000 (P < 0.001).

Table 4: Results of ANOVA test

Dimensions	Sum of Squares	df	Mean Square	F	Sig.
Economic	332.608	4	83.152	6.563	0.000
Institutional	607.622	4	151.906	9.046	0.000
Institutional	1116.437	4	279.109	4.434	0.000

Conclusion

Natural disasters are part of the process of human life and are increasing in number and diversity each day as a major challenge for sustainable development of human societies. As resilience is multidimensional concept with social, economic, institutional and physical dimensions, the discussion of this approach requires attention to various dimensions affecting it. Therefore, the indicators presented for resilience should be considered comprehensively in resilience studies to address the problem. This study, using the theoretical and empirical literature, examined resilience indicators in terms of economic, institutional and structural dimensions. Considering that natural disasters, due to their severity and quick effect on urban communities and neighborhoods, have become one of the main concerns of urban planners and managers in recent years. Planning at the time of natural disasters and even early minutes after the occurrence is very important, and thus strengthening the community living in an environment can play an effective role in reducing damages and hazards. The concept of resilience is one of the most important urban events that guarantee the survival of urban settlements. This paper assesses the resilience of the city of Nowshahr against natural disasters, and generally our findings indicated that from an institutional perspective, granting credits for construction of resistant houses with mean score of 1.75 was at the lowest level. In addition, concerning the structural aspects, construction and human density was scored 1.94 at the lowest level. It was also found that from an economic perspective, the safety of urban properties (houses, shops, etc.) against natural disasters with a mean score of 1.94 was at the lowest level. The findings of the study also suggested that resilience to natural disasters is lower in terms of some of the indicators and this implies insufficient resilience of the region under study to natural disasters. The following suggestions are provided in order to improve resilience to natural disasters in Nowshahr:

Institutional-management implications:

Providing the context for citizen participation, making efforts to create capacity and resources for urban crisis management and resilience, continuous planning and urban disaster management process, making efforts for making the city smart and improve integrated urban management to deal with the risks of natural disasters, and prepare the city for confrontation during and after natural disasters.

Economic implications:

Making economy-based planning for the city, preventing unstable constructions, providing training before and after natural disasters, occupational restoring, and making the city smart to protect urban assets and properties.

Structural implications:

Making suitable plans for urban land use observing the precincts of risky regions, strengthening buildings, observing architectural and urbanization rules, and using appropriate constructional materials.

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