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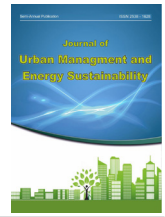

CASE STUDY RESEARCH PAPER

The role of social resilience in reducing damages caused by natural factors influenced by desert areas (Case study: land subsidence in Semnan County)

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ABSTRACT

Today, natural hazards are a reality that has affected a significant part of the southern regions of Semnan. It is of great importance to study the level of resilience against natural hazards due to the fact that it is not possible to prevent the occurrence of these natural hazards in some cases. The present study has been conducted with the aim of investigating the role of social resilience in reducing damages caused by natural factors affecting the desert areas of Semnan City. This study, using the fuzzy model and one-sample t-test, seeks to evaluate the resilience of the southern residents of Semnan County, in this regard, 40 questionnaires (With the snowball sampling method) are available to experts and specialists that the reliability of the questionnaire was confirmed by Cronbach's alpha and its validity was confirmed by specialists in geography, urban planning and social sciences. The questions included four dimensions which were answered by experts and stakeholders. According to the results, the Second question of the research has been rejected at a significant level and the maximum amount of resilience in the social, economic and institutional dimensions, the amount of resilience is significantly greater than the hypothetical average, and three questions of the research were confirmed and there is no significant relationship between resilience and physical, social, economic and institutional components. Also, the values of resilience of Semnan City are far from the standards. The results of studies show that long-term droughts play an important role in creating land subsidence.

Running Title: The role of social resilience in reducing damages caused by natural factors influenced by desert areas

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34	13	07

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INTRODUCTION

Natural hazards have always occurred suddenly. Human societies have always suffered a lot from these dangers. Increasing the resilience of communities in the face of these risks is one of the ways to deal with these risks. Urban settlements have complications that make urban systems that are made up of sub-systems such as urban structure, transportation, energy circulation, materials and aspects complex social and economic issues. The occurrence of natural hazards in some cases, faces basic challenges to urban infrastructures and sometimes the entire urban system. Understanding the upcoming challenges of natural hazards and planning to return to the initial conditions, natural hazards are one of the most important management principles. Today, the occurrence of natural hazards, is a repeatable phenomenon that is accompanied by severe material-spiritual damages in some cases;

In this process, the category of resilience seeks to understand and identify harmful factors and obstacles to the stability of the urban system, and it is necessary to know the level of resilience of the local community in order to prevent the increase in vulnerability. The city of Semnan as a subset of the country and on a smaller scale as a local community faces deficiencies in the field of resilience against natural hazards. According to the results of research and studies of geophysics institutes of Tehran University, the city of Semnan is in a relatively dangerous situation with the location of the desert plain in its vicinity.

Proposal and stating its necessity

Urban development and planning activities have increased the pressure on nature and weakened its resilience, which has often resulted in destructive consequences for cities and their residents. There is an urgent need for effective action due to recent storms and floods in different parts of the world, warming, air pollution, as well as increasing energy costs, reducing water and food reserves.

For this reason, many cities have taken measures in the field of nature restoration, and have supported sustainable activities. Meanwhile, resilience and sustainability will be the main goals of future cities. The irreparable consequences of natural disasters and social, economic and environmental damages of contemporary cities have caused the concepts of sustainability and resilience to be linked to a great extent"(Hosseinzadeh Dalir et al.: 2019).

Resilience has become an important concern for cities these days; so that it is important to pay attention and deal with it in especially Belakhiz cities. Despite the importance of this issue; but urban management is weak in dealing with it and sometimes cities suffer more losses when accidents occur. Urban resilience is a point of view that has gained increasing importance in today's developing and evolving world. This point of view, along with sustainable development, is at the top of the agenda of international and national development and design programs around the world. The unfavorable condition of the texture of some old localities and inadequate access to facilities and services are among the issues that have affected the resilience of the people of Semnan County, and it is estimated that the examination of the sub-indices at the level of some localities will show that according to the physical conditions, Socially, economically and institutionally, they have less resilience compared to the north of the city, which, if proven, requires a serious look at the physical and environmental aspect of the city.

The main purpose of this study is:

Investigating the role of resilience of desert areas in reducing damage caused by natural factors in the physical, social, economic, and institutional dimensions of Semnan County. For this reason, the upcoming research has investigated how to reduce the vulnerability and resilience of Semnan County against natural hazards (land subsidence) in the above four dimensions.

Research assumptions

1. It seems that there is a significant relationship between the level of resilience and the reduction of vulnerability from risks in socio-cultural dimensions.

2. It seems that the desert areas and especially the Semnan County have different resilience compared to other areas due to the heterogeneity in having urban services and facilities in physical dimensions.
3. It seems that there is a significant relationship between the level of resilience and the reduction of vulnerability from risks in economic dimensions.
4. It seems that there is a direct relationship between Semnan County's level of institutional resilience components.

MATERIALS AND METHODS

Methodology

The present study is considered as an applied study in terms of purpose, descriptive and analytical in terms of the method of data collection and analysis method, which is done to collect information with a documentary survey approach using questionnaire tools and field visits. The sample size of the research will be identified and selected by people who are experts in urban management and people who have the necessary knowledge from the city of Semnan. Indexes and criteria were weighted and ranked by data collection and data analysis using the central indicators of descriptive statistics, and in order to use the weighting method, a land subsidence potential map was prepared on the level of Semnan Plain. And finally, the findings of the research have been investigated based on resilience in physical, economic, social and institutional dimensions in a region of the southeast of Semnan County between A'la village, Afaghaneh town, south of the industrial town and east of the piezometer of the research station, and the railway and Airport .

Theoretical foundations and research background

A review of the history of the earth shows that mankind has always been exposed to all kinds of natural hazards, hazard refers to an event, physical phenomenon or human action that can be potentially harmful, and with death or injury, damage to assets, social disruption and economic or destroy the environment.

Hazards can have different origins and be caused by human processes (environmental destruction and risks related to technology) or have natural origins, such as (geological, meteorological and biological) which can cause damage in different scales. Acceptance of cities will lead.

For this reason, thinkers, academic experts and planners are trying to take steps towards reducing natural disaster damages based on different approaches and models and preparing appropriate plans.

In the hydrological basin, Allen (1984), Gabrysch (1984), Leak (2001) has introduced subsidence caused by excessive withdrawal of water from underground water tables, pressure reduction in artesian wells and compaction of sediments.

In the field of geomorphology and tectonics, Edelman (1954), Jennings (1966), Cook and Dorncomp (1990) have attributed subsidence to man-made factors and natural factors. Below, we briefly describe some of the researches that have been conducted in this field.

Momeni et al. (2021) during a study entitled "Evaluation of resilience and its components against natural hazards" (Case study: Ilam city) have stated that natural hazards repeatedly expose human societies, including cities, to vulnerability. Therefore, resilience is proposed with the approach of community strengthening and vulnerability analysis. According to the results of the t-test of the questionnaire based on experts' opinions, international resilience strategies, if implemented, are effective in strengthening the resilience of local communities (Ilam), which is the use of global experiences and the need to review practical strategies in the field of urban resilience are reminded.

Rezaei Eshaq Vandi al (2019) in their study entitled "Measuring and analyzing the spatial and physical components of urban resilience (case example: Izeh city)" stated that urban resilience is proposed as a way to strengthen societies by using their capacities, the results

show that the majority of the area has very low resilience, which does not correspond to the desired criteria of urban planning.

Gambulati et al. (2006) studied the impact of human activities on land subsidence in residential areas and concluded that the illegal extraction of underground resources and accumulation of structures is the most important cause of subsidence in residential areas.

Akbari Erimi, et al (2019) during a study entitled: Investigating the subsidence of the Semnan plain caused by the extraction of underground water, have concluded that the land subsidence is one of the natural hazards that many plains of Iran are facing and it has caused the destruction of residential areas. roads, bridges, power transmission lines, agricultural lands, wells, and piezometers. In general, the subsidence of an area is affected by human activities such as the excessive extraction of water from underground aquifers and geological conditions, which in case of occurrence cause serious damage to the economic infrastructure of a region.

Ghasemi et al (2020) during a study entitled: Identifying livelihood resilience strategies against the risk of drought from the perspective of rural households (case of study: Gulmekan village, Chenaran city) concluded that: Today, resilience is considered as one of the effective criteria in the crisis management process, a community-oriented approach to improve preparedness in facing environmental hazards. Therefore, societies are trying to reduce vulnerability by increasing resilience in the face of crisis. The results of the research showed that it is necessary to form the foundations of development in drought-prone areas in accordance with water scarcity and non-agricultural economy in order to increase livelihood resilience of villagers facing drought.

Azizi et al (2012) studied the satellite images and concluded that the main origin of the phenomenon of dust entering Iran is in the border region between Syria and Iraq, and the northwest-southeast route is considered as the main route for transmission. dust to the western half of the country (Azizi, et al. 2011)

Goudie AS, Middleton, NJ. 1992 studied North African storms (desert) and determined that the phenomenon of dust due to suspended particles is able to affect the distant regions of their origin, so that the extent of the impact caused by these storms can also be seen in the African desert. to the central regions of Europe and even England.

Resilience

Holling introduced the term resilience as an ecological concept for the first time in 2008. The word resilience is derived from the Latin word "resilio" which means "suddenly jumpback "; Although there is a difference of opinion about the root of this word still. Some say ecology, others say physics. In the field of ecology, this word became popular after the publication of Hallowing's original work called Resilience and Sustainability of the First Person of Ecological Systems in 8379. Timerman proposed resilience in the field of natural hazards (Mayunga 2007:28). This concept has been introduced in other scientific fields and includes several definitions. Many of the existing contradictions on the meaning of resilience arise from cognitive tendencies, methodological methods, fundamental conceptual differences, and of course, the root of many of these existing contradictions stems from the fact that individuals, groups and societies may each have different degrees of resilience. Resilience (Rafiian et al 2010, 28:).

One of the advantages of planning for the resilience of cities is that there is no need to focus on a specific model. Resilience in the form of development flexibility allows it to respond and adapt according to the unique conditions of cities and development plans. This issue causes intellectual creativity to be created to think about different ways of gaining endurance without being limited in a specific framework (Behtash et al. 2012, 115).

The aforementioned dimensions of resilience include social resilience, economic resilience, institutional resilience and physical resilience,

which resilience in social, economic, institutional and physical dimensions is as follows:

1. The social dimension is the first component of resilience, which is obtained from the difference in social capacity among societies; In this context, major forms of capital, especially social capital, have been recognized as important and useful concepts in the fields of risk and disaster. » In terms of community resilience, social capital indicates the quantity and quality of social cooperation; because people will be able to reduce anxiety during accidents through these social resources (Mayunga, 2007).
2. The economic dimension is the second component, in economics, resilience is defined as the reaction and adaptation of individuals and societies against risks in a way that enables them to reduce the potential losses caused by risks.
3. The institutional dimension is the third component, which contains features related to risk reduction, planning and previous high experience. Here, resilience is affected by the capacity of communities to reduce risk, the employment of local people in reducing risk, creating organizational links and improving and protecting social systems in a society.
4. The physical-environmental dimension (infrastructure) is the fourth component, which basically evaluates the society's response and recovery capacity after the disaster, such as shelters, vacant or rented residential units, and health facilities:)Rezaei, 2013 (10).

Land subsidence

Land subsidence is a general term that refers to the vertical and downward movement of the earth's surface and can occur by natural processes and human activities or both. The difference between land subsidence and mass movements is that little horizontal movement occurs in ground subsidence or no horizontal movement occurs on the surface of the earth.

Examples of processes that lead to land subsidence:

1. Solvent coating of underground carbonate rock by underground water
2. Compaction reduction due to the sub-process in the lithification1 process in which the sediment periodically loses its porosity due to the pressure of the upper layers.
3. The jumpbacking of liquid lava from under the solidified stone crust and solidification of the earth
4. Mine construction
5. Pumping underground fluids (such as underground water and crude oil).
6. Disruption of the crust by tectonic forces.
7. Earthquake.

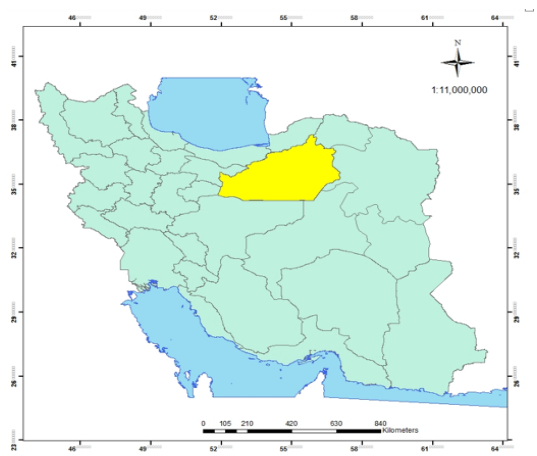
Land subsidence causes the creation of deep cracks on the surface of the earth, the bending of well pipes, the destruction of buildings and the formation of pipes in wells (Alizadeh, 2002:87).

DISCUSSION AND FINDINGS

Study area

Semnan province

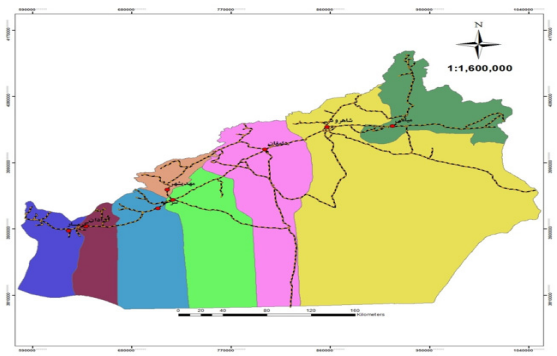
Semnan Province, with an area of 97491 square kilometers, occupies 6% of the total area of the country, which is considered as the seventh largest province in the country. Semnan Province is located at the longitude of 51 degrees and 58 seconds to 57 degrees and 58 seconds. Eastern longitude and geographical latitude from 34 degrees and 17 minutes to 37 degrees and 30 minutes north. (Taleb Safa, 2021: 48)



Map 1: The location of Semnan Province in the country (Mousavi, Semnan Islamic Azad University, 2022)

1. Lithification is the process in which sediments compact under pressure, expel connate fluids, and gradually become solid rock.

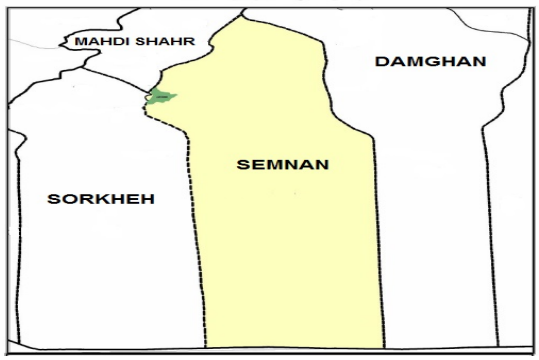
This province is centered on Semnan, which is limited from the north to Mazandaran and Golestan provinces, from the northwest and west to Tehran and Qom provinces, from the south to Isfahan province, and from the east to the three provinces of North Khorasan, Razavi Khorasan and South Khorasan.



Map 2: Location of Semnan province
(Mousavi, Semnan Islamic Azad University, 2022)

Semnan county

Semnan county, centered in Semnan province, with an area of about 11017 square kilometers. Semnan county is located at a distance of 245 kilometers east of Tehran and is limited from west to Sorkheh city and Firouzkoh district, from east to Damghan city and from south to the central desert of Iran, which finally ends in Nain city and Isfahan province and from the north to Mahdishahr city. The geographical longitude of this city is between 52 degrees and 15 minutes to 54 degrees and 42 minutes and its geographic latitude is between 34 degrees and 50 minutes to 37 degrees and 30 minutes. It is 1127 meters above the sea level and its time difference with Tehran is 7 minutes and 40 seconds. This city, centered in Semnan County, is one of the 8 cities in Semnan province.The climate of Semnan County is a dry region with little rain in the summer and moderate in the rest of the year. The most important prevailing winds of this city are Torane, which blows from the north of Semnan to the south in spring and autumn, and causes dryness of the air. The south of this city is exposed to the desert winds and also the city is under the influence of the high-pressure mass of the subtropical region, which brings an increase in temperature and dryness to the city for six months of the year. (Semnan province history: 2021, 11).



Map 3: Location of Semnan County
(Statistical Yearbook of Semnan Province, 2019)

Study area

The study area of Semnan alluvial plain is in the geographical location of ‘53000 to ‘53040 longitude and 35022 to 35039’ latitude.

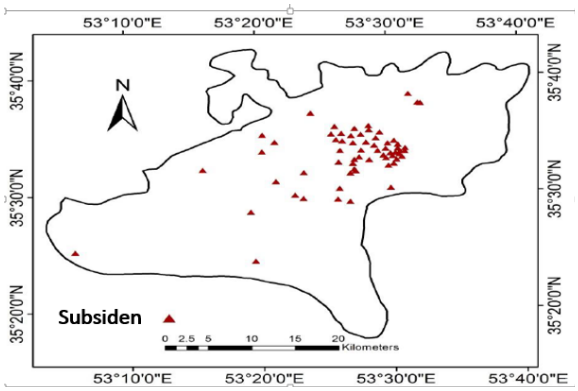
Land subsidence in Semnan county

In the last few decades, many alluvial plains of the country have faced the withdrawal of underground water resources. The decrease in the volume of underground water reservoirs in some alluvial aquifers such as Rafsanjan, Neishabour and Mashhad has been so great that most of them have been depleted of underground water. One of the consequences of a sharp decrease in the level of underground water in fine-grained soils is the formation of the regional subsidence phenomenon. Among the surface effects of this phenomenon, the tube remains outside the wall of the wells and the formation of cracks in the ground. The alluvial plain of Semnan has also been reported. One of the most important of these complications is the formation of a wide network of cracks in the southeast of Semnan County and in the vicinity of the railway line, and the protrusion of the wall pipe of some wells, such as the observation well in Upper East.The investigation of the underground water of this plain in a period of 20 years (water year 75-76 to 96-95)

shows the drop of the underground water level in most of its surface. The amount of this drop reaches more than 20 to even 25 meters in the areas where the mentioned complications have been observed. The log of the observation wells and the results of geoelectrical studies show the presence of layers of fine-grained alluvium with a large thickness in the area of the mentioned complications, which have high compressibility due to the drop in the underground water level. Considering the potential of subsidence phenomenon and also the possibility of problematic soils from a geotechnical point of view, the reason for the formation of land cracks in this area was not definitely known.Considering that providing any practical solution to control or deal with the mentioned side effects requires knowing the mechanism of their formation; In the above research, all possible factors have been examined. Also, in it, the amount of displacement of the earth's surface in different periods of time has been identified using the method of interpretation of satellite images of the radar (InSAR) of the area and the rate of subsidence of the earth in this area. The analysis of radar satellite images shows that since at least 20 years ago, areas from the southeast to the south of Semnan have been subject to land subsidence at a maximum rate of 5.2 cm per year.Some of the direct factors affecting the phenomenon of land subsidence are the condition of the land in terms of texture and type of soil, soil moisture, vegetation cover, the effect of mountains, land destruction, unsustainable development, containment of surface water and excessive extraction of it, creation of dams and diversion. The course of the river, lack of rain and drought, and even wars in some areas. But some experts believe that the unkindness of man to nature and the resulting climate changes, the speed of desert drying and the change in wind direction are other factors of increasing pollution in Semnan County. In most of the plains of the province, the phenomenon of desertification has been reported, and in the past few years, desertification and Land subsidence has occurred in the southern lands of "Wadi Al-Salam" in Semnan, in the direction of Sorkhe and Sofiabad cities, on the military road and Aala village, and on the railway and airport. But in the conditions in desert areas and salt marshes, due to the drop in the level of underground water and the decrease in rainfall, the problem of land subsidence has been created, and due to the high salinity of the soil in these areas, it is not possible to carry out any biological operations and create plant cover, and carrying out non-biological operations also requires a very high cost, and it is necessary to

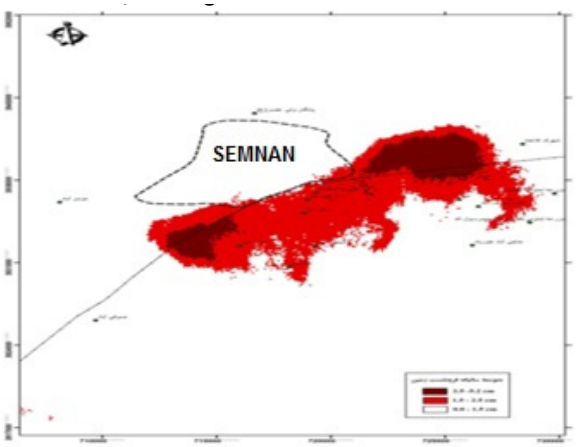
Map 4: Geographical location of the study area
(Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)

pay attention to the use of research results and achievements of knowledge bases in this field. (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)



Map 4: Distribution map of subsidence in Semnan Plain (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)

The land subsidence rate map from 2005 to 2011 (map no. 5) shows that there is a subsidence zone from east to southwest of Semnan County. In the mentioned period, the maximum and average rate of land subsidence was about 5.2 and 2.3 cm per year, respectively. The largest amount of land subsidence occurred in an area located in the west and southwest of Afaghaneh town and also in an area located in the south to southwest of Semnan County (west of Hasan Abad village).The total area of the subsided area is about 90 square kilometers. This area corresponds to the end of the alluvial cone in the northeast and north of the plain, as well as the clayey area, which mainly includes fine-grained deposits. Furthermore, in a large part of this area, the groundwater level has dropped significantly (about 10 to more than 25 meters) in a period of 20 years. It is found that feeding the underground water table from the return water of sewage absorption wells has played a key role in preventing the spread of land subsidence into the urban area of Semnan. There are also some very small areas, especially around the village of Biyabank and to some extent Sufi Abad, which have a very little rate (less than 2.3 cm per year). (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)



Map 5: Land subsidence rate from 2005 to 2011 (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)

The land subsidence rate map from 2018 to 2019 shows that the subsidence area located in the east to the southwest of Semnan still exists. Although there has been a slight subsidence in the rate and extent of this period, these changes are not significant. Just as the drop in the underground water level has been relatively constant over the past 20 years, the annual rate of land subsidence has not changed much except in the southwestern region of the subsidence zone. From this article, it can be concluded that the type of alluvial sediments did not differ much in the range of changes in the groundwater level. The total area of the subsidence area based on this map is about 96 square kilometers, which is not much different from the previous map. The maximum and average rate of land subsidence in Semnan plain is about 5.2 and 0.2 cm per year, respectively. In this map, the area located in the east of Semnan (around Afaghaneh town to Ala village) still has the highest subsidence rate. But in the southwest of the subsidence zone (near Hasan Abad village), this rate has decreased to about 2 cm per year, which has caused a decrease of a few millimeters in the average rate of land subsidence. (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)

Damages caused by land subsidence

As mentioned earlier, it may be possible to summarize the damages caused by the subsid-

ence event and the subsequent phenomena as follows:

1. Uneven change in the height and slope of rivers, waterways and water transfer structures
2. The failure or protrusion of the pipe wall of the wells as a result of compressive stresses caused by the density of aquifers and
3. Creating disturbances in the use of underground water resources
4. Irreversible reduction of all or part of the underground water reservoir as a result of the loss of the useful compaction of the deposits
5. The reduction of surface permeability and the subsequent expansion of desert areas
6. Reducing efficiency or creating destruction in vital arteries and important structures (Mohammadi et al. 2021).

One of the basic indicators in the study of land subsidence changes is the use of the standard distribution index, the calculation of which requires the long-term mean and standard deviation of rainfall values for the studied periods. (Source: Shameshki, investigation of subsidence in Semnan Plain, 2019)

As we know, one of the reasons for the subsidence of the earth is the decrease in the level of underground water, and one of the reasons for the decrease in the level of the water level is the increase in the amount of withdrawal from these waters, which is also due to the occurrence of long-term droughts, so the author of this article using The SPEI method for a period of 30 years (1992-2022) determined that Semnan County has experienced a climatic drought, which will be mentioned in the following.

Positive 2 and more extreme fear
Positive 1.5 to positive 1.99 extreme fear
Positive 1 to positive 1.49 average fear
Positive 0.5 to positive 0.99 weak fear
Negative 0.49 to positive 0.49 is normal
minus 0.5 to minus 0.99 weak drought
minus 1 to minus 1.49 moderate drought
Negative 1.5 to negative 1.99 severe drought
minus 2 and less severe drought

The latest status of Semnan County in the drought index based on the standardized SPEI table and based on the periods divided in the above diagram

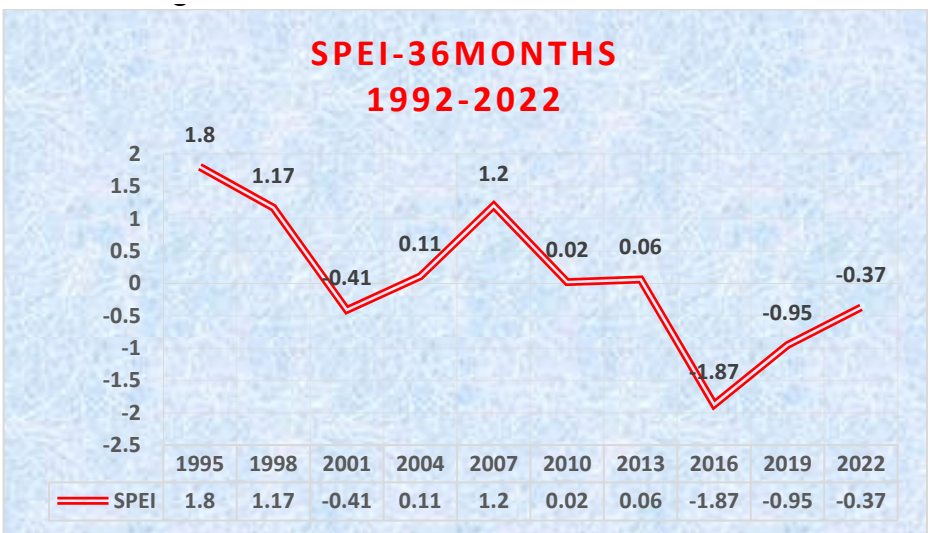


Diagram 1 of Semnan drought in the statistical period of 1991-2022 for 10 periods of 36 months (Source: Author)

Positive 2 and more extreme fear
Positive 1.5 to positive 1.99 extreme fear
Positive 1 to positive 1.49 average fear
Positive 0.5 to positive 0.99 weak fear
Negative 0.49 to positive 0.49 is normal
minus 0.5 to minus 0.99 weak drought
minus 1 to minus 1.49 moderate drought
Negative 1.5 to negative 1.99 severe drought
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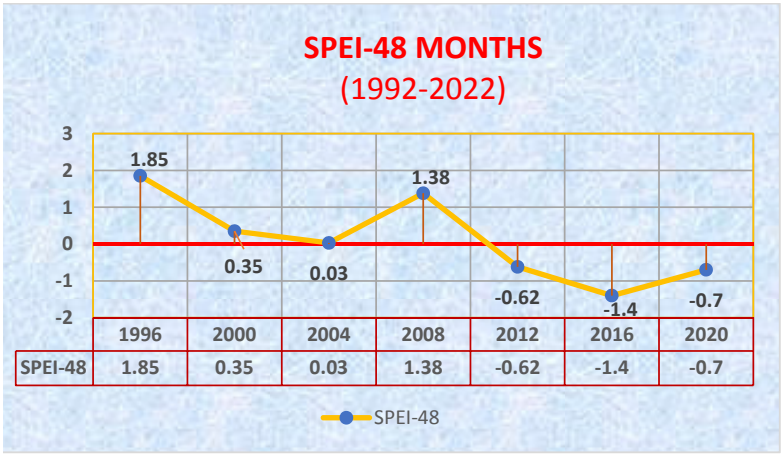

Diagram 2 of Semnan drought in the statistical period of 1991-2022 for 7 periods of 48 months
(Source: Author)

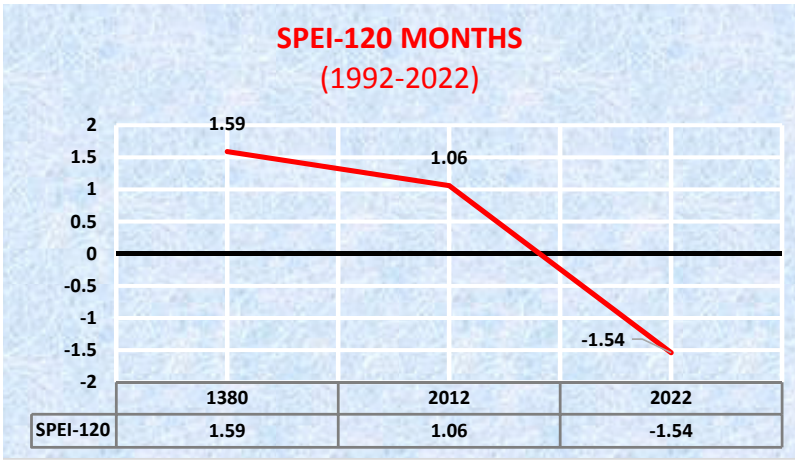

Diagram 3 of Semnan drought in the statistical period of 1991-2022 for 3 periods of 120 months
(Source: Author)

The latest drought situation in Semnan County based on the calculations of the Meteorological Organization of Semnan Province using the SPEI method in a ten-year period until 2022 is as follows:

94.4% of the city is experiencing drought (85.2% very severe drought - 3.6% severe drought - 3.6% moderate drought - 2% mild drought - 5.6% normal drought)

Discussion and findings

Descriptive statistics and statistical population include 40 crisis management experts in the questionnaire. Therefore, this questionnaire was distributed among managers and related experts in Semnan County, and it was collected after answering the questionnaire. Among the 40 answered questionnaires, a sample population was selected and data analysis was done based on it. First, the demographic characteristics of the statistical sample were explained, the descriptive statistics of the demographic information (age, gender, level of education, length of stay in Semnan County) are presented in Table No. 2.

Profile of The Respondents According to Age:

The frequency distribution of the variable age of people in the studied sample is presented. As shown in chart 7: 20 to 30 years old (1%) and 31 to 40 years old (11%) and 41 to 50 years old (17%) and age over 50 years (11%). Both diagrams are given below.

Table 2: Demographic characteristics of the statistical sample (related experts)

%	Frequency	Characteristics	
2.5 % 27.5 % 47.5 % 27.5 %	1 11 17 11	20-30 years old 31-40 years old 41-50 years old 50 years old and above	Age
35 % 65 %	14 26	Female Man	gender
0 % 12.5 % 72.5 % 15 %	0 5 29 6	Diploma and higher Bachelor's degree Master's degree PhD	education
20 % 5 % 10 % 65 %	8 2 4 26	10 to 15 years 16 to 20 years 21 to 25 years 26 years and above	Duration of stay in Semnan County

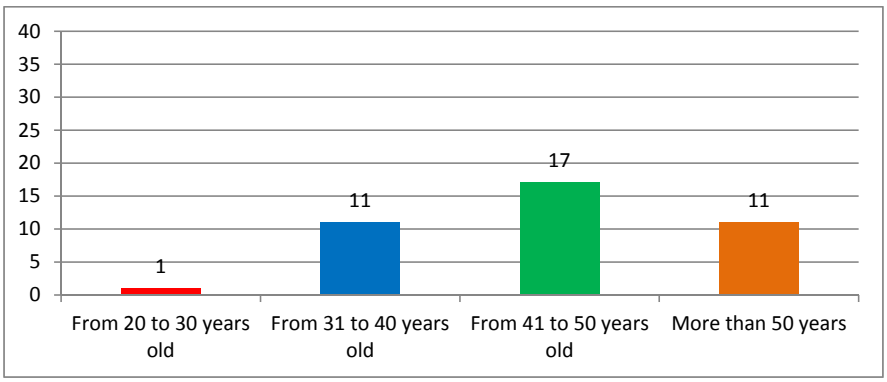

Chart 3: Frequency chart related to the age status of respondents in terms of age

Status of the respondents in terms of gender

The frequency distribution of the gender variable of the respondents of the questionnaire is listed in the studied sample. According to these statistics and chart 8, the number of male respondents is (21%) and the number of female respondents is (80%). Both diagrams are given below.

Frequency of subjects based on educational qualification

The frequency distribution of the respondents' education variable in the studied sample is given. According to these statistics, chart number 9. The number of people with a diploma is 0%, and people with a bachelor's degree (5%), people with a master's degree (29%), and people with a doctorate (6%).

The frequency of subjects based on the duration of stay in Semnan County

The frequency distribution of the variable duration of stay in Semnan County of the respondents in the studied sample is given.

According to these statistics shown in chart 10, the period of residence of respondents between 10-15 years is (8%) and the period of residence of respondents between 16-20 years (2%) and the period of residence of respondents between 21-25 years (4%) the period of residence of the respondents above 26 years is (26%).

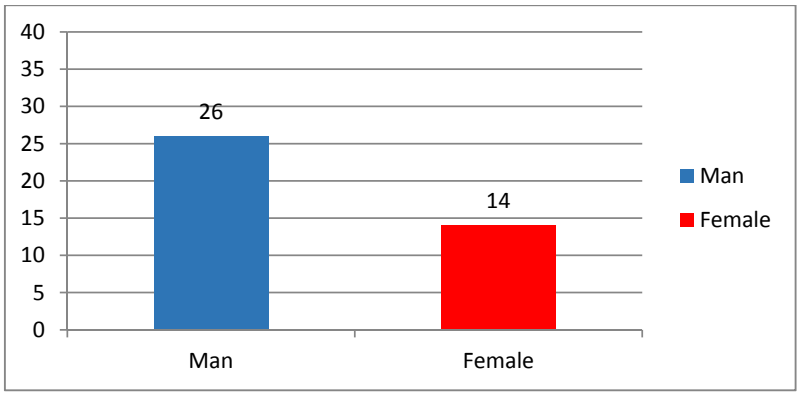

Chart 4: Frequency chart related to the status of respondents in terms of gender

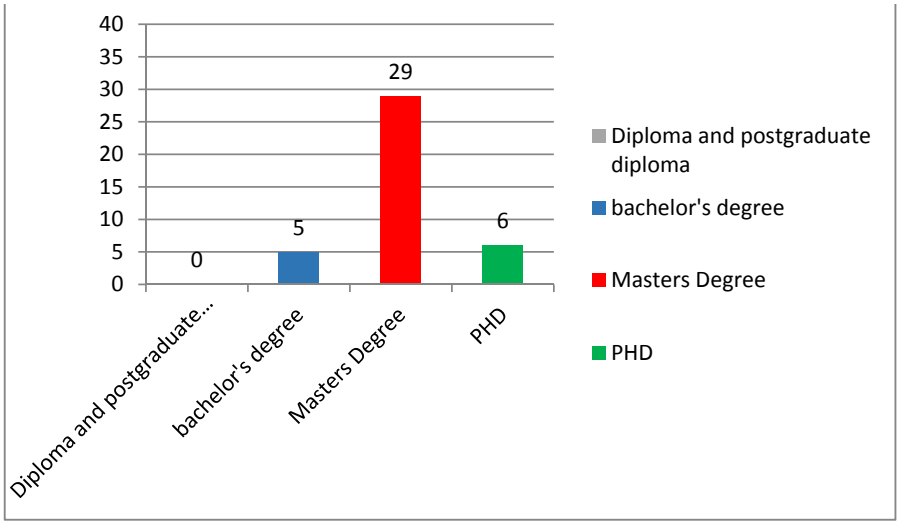

Chart 5: Frequency distribution chart related to the status of respondents in terms of educational qualifications

According to the table 4, all the effective criteria in evaluating the social resilience of each of Semnan's areas have a normal distribution. The KS value calculated at the confidence level of 38%, ($\alpha = 0.05$), is smaller than the KS value of the critical table, and ($0.05 \leq Sig$), so the null hypothesis is confirmed by the observations, and we conclude that the variables have a normal distribution.

Inferential statistics and data analysis

The findings of the first hypothesis test are presented in Table No. 5. There is a significant difference between the hypothetical mean (18) and the mean of the subjects' opinions about the relationship of social resilience of desert areas against natural damages (21.15) ($P<0.001$). And the average of the subjects' opinions about the

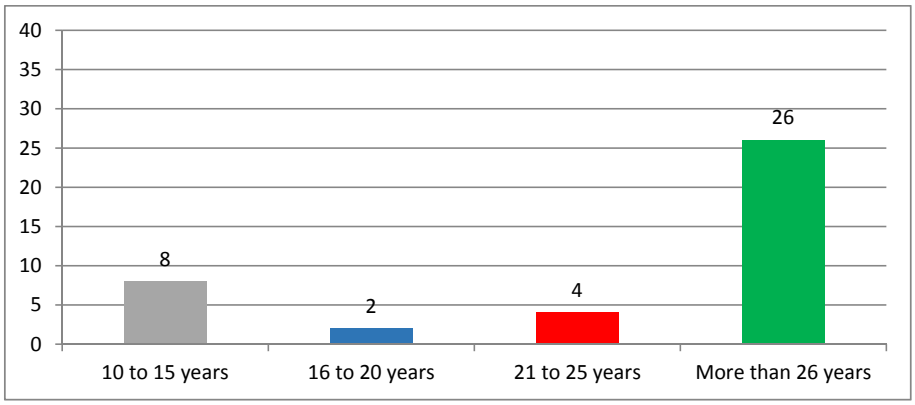

Chart 6: Frequency distribution related to the status of respondents in terms of duration of stay in Semnan County

Table 3: Descriptive statistics related to research questions

Research questions	Number	Mean	Standard deviation	Min	Max
The first sub-question	40	3.8537	0.38408	3	4.44
The main question	40	3.6838	0.21317	3.26	4.21
The second sub-question	40	3.6782	0.29951	3	4.17
The third sub-question	40	3.6732	0.21451	3.48	4.48

Table 4: Normality test of the questions (Kolmogorov-Smirnov test)

		The main question	The first sub-question	The second sub-question	The third sub-question
Number		40	40	40	40
Normal parametersa	Mean	3.8537	3.6838	3.6782	3.6732
	Std. Deviation	0.38408	0.21317	0.29951	0.21451
Most extreme Difference	Absolute	0.131	0.058	0.141	0.11
	Positive	0.098	0.058	0.141	0.058
	Negative	0.131-	0.045-	0.093-	0.076-
Kolmogorov – smirnov Z		1.017	0.45	1.09	0.48
Asymp. Sig. (2-taild)		0.252	0.987	0.186	0.943

relationship of social resilience of desert areas against natural damages is significantly larger than the hypothetical average. Therefore, the first hypothesis is confirmed. In other words, the first hypothesis of the research, which is "There is a significant relationship between the level of resilience and the reduction of vulnerability from risks in socio-cultural dimensions", is confirmed.

The findings of the Second hypothesis test are presented in Table 6. According to the table, the value of (p-value =0.000) is smaller than 0.05 and the test of equality of the mean with the number 3 at the significance level of 0.05 has been rejected. The positive sign of t shows that the average is less than 3, so we conclude that the Second hypothesis is rejected and the role of physical resilience of the infrastructure cannot be evaluated in reducing damages caused by natural factors in desert areas.

The findings of the third hypothesis test are listed in Table 7. According to the table, there is a significant difference between the hypothetical mean (6) and the mean of the subjects' opinions regarding the relationship between the status of the regions of Semnan County in terms of economic resilience components (7.29) (0.001<P). And the average of the subjects' opinions about the relationship between the status of the regions of Semnan County in terms of having economic resilience components is significantly larger than the hypothetical average. Therefore, the third hypothesis is also confirmed. In other words, the third hypothesis of the research "there is a significant relationship between the level of resilience and the reduction of vulnerability from risks in economic dimensions" is confirmed

In the economic dimension, resilience is defined as "the reaction and the inherent adaptability of individuals and societies against risks. It enables them to reduce the potential losses caused by risks". In economic activities, resilience deals with the need of the economic system for a support system to maintain stability and balance after the occurrence of accidents and crises, and its indicators are the capacity to compensate for damages, the ability to return to suitable employment and income conditions, and the severity of damages.

Table 5: One-sample T-test to compare the average opinions of subjects regarding the relationship of social resilience of desert areas against natural damages with the hypothetical average.

Confidence interval 95%		Sig.	T	Degrees of freedom	Standard error	Standard deviation	Mean	Number	Variable
Upper limit	Lower limit								
3.87	2.43	0.001	8.71	93	0.36	3.50	21.15	40	Social resilience

Table 6: T-test related to the main question of the role of physical infrastructure resilience in reducing damages caused by natural factors

Confidence interval 95%		Two-tailed significance test	T	Degrees of freedom	Mean standard deviation error	Standard deviation	mean difference	Mean	Number	Variable
Upper limit	Lower limit									
0.7389	0.6288	0.00	24.848	59	0.02752	0.21317	0.68382	3.6838	40	Physical infrastructure resilience

The findings of the fourth hypothesis test are listed in table 8. According to the table, there is a significant difference between the hypothetical mean (27) and the mean of the subjects' opinions about the relationship between the status of the regions of Semnan County in terms of having institutional resilience components (31.64) (P>0.001). And the average of the subjects' opinions about the relationship between the institutional resilience of each of Semnan's urban areas is significantly greater than the hypothetical average. Therefore, the fourth hypothesis is also confirmed. In other words, the fourth hypothesis of the research which is "there is a direct relationship between Semnan County's level of institutional resilience components" was also confirmed. The institutional component that contains features related to risk reduction, planning and previous high experience, resilience is influenced by the capacity of communities to reduce risk, the employment of local people in risk reduction, the creation of organizational links and the improvement and protection of social systems in a society.

RESULT AND CONCLUSION

Natural hazards have always threatened human settlements, especially cities and villages, and their prosperity and development, which raises the issue of resilience versus vulnerability. Despite the need to prevent crises, it should be noted that not all crises can be prevented. Therefore, it is necessary to make cities resilient and to recognize its dimensions. According to the findings, climate change and its consequences, especially in the occurrence of land subsidence, is one of the climatic anomalies that has adverse effects on plants, animals, and finally humans and ecological environments. The results of studies have shown that long-term droughts play an important role in creating, intensifying the frequency and severity of land subsidence.

According to the findings of the research in Semnan County, it should be acknowledged that there is the highest amount of resilience in the socio-cultural dimension and the economic and institutional dimensions are in the next ranks. Unfortunately, the most fragile dimension is related to the physical dimension. This physical fragility in resilience causes disturbances in other sectors, especially social-cultural and economic.

Table 7: One-sample T-test for comparing the average of the subjects' opinions about the relationship between the state of the regions of Semnan County in terms of having the components of economic resilience with the hypothetical average

Confidence interval 95%		Sig.	T	Degrees of freedom	Standard error	Standard deviation	Mean	Number	Variable
Upper limit	Lower limit								
1.63	0.96	0.001	7.74	97	0.17	1.65	7.29	40	Economic resilience

Table 4: One-sample T-test for comparing the average of the subjects' opinions regarding the relationship between the institutional resilience of each of Semnan's urban areas and the hypothetical average

Confidence interval 95%		Sig.	T	Degrees of freedom	Standard error	Standard deviation	Mean	Number	Variable
Upper limit	Lower limit								
5.80	3.48	0.001	7.96	92	0.58	5.63	31.64	40	Institutional resilience

It is worth mentioning that drawing and showing the point of view of urban experts in facing the measurement of resilience with regard to the components of the quality of life is the benefits and advantages of the present research for the city of Semnan, which leads to the identification of weak and strong points so that weak conditions can be overcome. towards the desired situation by referring to them. Finally, the results of analyzes and statistical tests show that the resilience of Semnan County is not very favorable, and resilience tends towards vulnerability. The values of resilience in the four investigated dimensions (physical, economic, social, institutional dimensions) of Semnan County are far from the standards of resilience. Different dimensions of resilience are considered as components of the urban system, always as related factors affecting each other. Analysis and evaluation Systems and sub-systems and estimation of the degree of vulnerability and degree of stability of each of them can provide a correct understanding of the resilience and stability of the city against natural hazards to urban planners, which can be considered as an issue in itself. A step towards urban sustainability. Research results based on the measurement of urban resilience based on urban resilience shows that city managers and experts have assessed the level of urban resilience of Semnan County as unfavorable. Therefore, for the resilience of the region, people with knowledge and awareness should increase their adaptability to the occurrence of the mentioned risks in order to reduce the vulnerability of economic, social and environmental issues to these risks.

According to the results of the regression of the factors influencing social, economic, institutional, and physical resilience, as well as the calculations made, it can be acknowledged that future management factors can have the greatest impact in improving the resilience of local communities against have natural hazards.

Recommendations

1. It is recommended that the new technologies of earth sciences be used to reduce the vulnerability of natural hazards, such as satellites, drones, the Internet, public information systems, cloud computing systems, big data analysis, investment in scientific-research fields, and drafting laws. Effective and practical, the use of software to analyze the state of resilience, integration and alignment of all monitoring networks, operationalization of integrated systems for quick warning of natural hazards in accordance with global standards, monitoring, maintenance, restoration of the natural environment and urban ecosystem using software and hardware infrastructure that can be effective in strengthening institutional resilience and reducing vulnerability.
2. Preparing a map of vulnerable points in terms of urban resilience.
3. Identifying the type and form of threats and identifying areas and settlements and explaining the type of dealing with threats.
4. Explaining organizational communication and the type of cooperation in times of crisis and accidents.
5. Developing a comprehensive program for training urban organizations and institutions in response to natural and unnatural hazards.
6. Inclusion of topics related to resilience, crisis management, and non-active defense in documented and approved urban programs.
7. Using participatory capacities such as councils and council assistants in the localities to promote optimal knowledge in relation to resilience against natural hazards.
8. People's participation and interaction between the private and public sectors in the field of social issues
9. Including and identifying types of natural hazards in students' textbooks.
10. Teaching the necessary measures of resilience to confront and prevent young people in schools and local people

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