Measuring the Resilience of Gardens in Yazd

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Abstract

Over the past decades, the horizontal growth of cities has led to the integration of rural-garden areas within the parent city. This phenomenon is more serious in the arid areas of Iran because of the limited networks of water supply (Qanat) and the proximity of settlements around this network and has caused the destruction of the gardens of these urban textures that are rural-based. This research seeks to measure the resilience of urban gardens in the arid climate of Iran with a scientific, comprehensive and spatial model and has developed a conceptual model based on the literature of the concepts of resilience, garden and development. Moreover, from the theoretical frameworks, methods and techniques of resilience topics, indicators appropriate to the resilience of gardens are listed and compiled under the Framework of Studies on the Resilience of Gardens. This framework, which has five dimensions, including ecological, social and cultural, economic, physical and institutional, has been used to understand the typology of gardens. Moreover, to calculate the coefficient of the importance of different layers, Super Decision software was used. The results of the primary scoring of Delphi method based on Thomas L. Saaty binary comparison are the input data of the software to determine the weight of layers. The results were analyzed to measure the resilience of gardens using ArcGIS software, for spatial analysis, and SPSS software, to conduct F test on the results. The entire process of identifying the data and finally identifying the resilience and prioritization method of the gardens is presented in a model for measuring the resilience of gardens. The developed model has three important capabilities. In the first place, it has the power to measure the resilience of gardens from all aspects affecting a garden. Secondly, based on this measurement, gardens may be prioritized according to resilience and information may be provided in a spatial manner. This model is implemented on the gardens of Yazd city as a case study, and the resilience of the gardens of Yazd city is determined and prioritized based on it.

Keywords: Demolition of gardens, resilience assessment, resilience models and frameworks, prioritization of protection, Yazd city.

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Introduction

The Persian garden in ancient times is an allegory of the universe, in the post-Islamic period is an allegory of the garden of the Qur'anic paradise and in the mystical world is an allegory of the esoteric aspect of creation (Shahcheraghi, 2015: 111). Gardens, which are the manifestation of nature in the city and a green and relaxing space, as well as a good place for recreation and leisure, have been destroyed by humans in recent decades (Soltanzadeh, 2003: 92). This is partly because of land exchange and short-term profits. The history book of Yazd, written by Jafari in 1964), describes Yazd as a city with a pleasant climate and prosperity. In this book, gardens and orchards of Yazd is rich and famous, houses are a place of comfort and tranquility, and alleys and the bazaar are adorned and clean like Beit al-Ma'mour. In the last century, however, according to Behravan (2008) research, the horizontal expansion of the city of Yazd has destructed the gardens. In the city of Yazd, due to the hot and dry climate, the formation of green spaces is slow. Therefore, in the one hand, Yazd is one of the cities with low green space per capita –3.5 square meters per person (Armanshahr Consulting Engineers, 2017: 93). This way, the proposed green spaces in the comprehensive and detailed plan have low feasibility due to this long process of formation. But on the other hand, in the city of Yazd, there are still lush gardens and farms reminiscent of previous generations that can be used to prevent the destruction and criticality of their situation. By analyzing and evaluating the trend of garden destruction in the last four decades (98-52); this process of destruction has happened so fast that if it continues in the near future, it will lead to the complete destruction of the gardens.

For any planning and action to prevent this process of demolition, it must first be determined to what extent the remaining orchards in the cities can withstand urban change and what is the so-called "resilience" of these orchards in the continuation of the city development path and human intervention? Therefore, by measuring the resilience of the remaining orchards in cities, it is necessary to prioritize measures to increase the resilience of orchards.

According to the process followed in this research; first, the resilience of gardens is measured based on all aspects that affect gardens, and based on that, the resilience of gardens based on resilience is evaluated and all this information is presented using spatial analysis. However, in comparison with the models and frameworks in the field of resilience that are examined in this study, these three capabilities cannot be observed simultaneously, as in Mayanga 1 (2007), a model based on social, economic, physical, human and capital investments is provided naturally and assessed society's resilience to disasters (Mayunga, 2007: 6). Another spatial model is provided by Cutter (2008) in his research. In the first step he presents a proposed set of ecological, social, economic and institutional variables and in the next step operationalizes and creates a set of indicators and then examine them in the real world (Cutter, et al., 2008: 6). The last one is Benchmarking Baseline Conditions, which uses three dimensions of time, space and money to accommodate the location (Paton & Johnston, 2017: 65).

Research questions

- What is the comprehensive scientific model and framework for measuring and prioritizing garden resilience?
- According to the developed model, what is the amount and priority of gardening in Yazd?

Literature Review

The location of the garden in the cities of Iran

The pattern of the Persian garden in ancient times is an allegory of the universe - in the post-Islamic period, it is an allegory of the garden of the Qur'anic paradise and in the mystical world, it is an allegory of the esoteric aspect of creation (Shahcheraghi, 1394: 111). The association of the Iranian city with the garden has a historical background and is a phenomenon resulting from the experience of living in the land of Iran, based on the beliefs of the people of Iran. The fact that “city is like a harden” and "garden is like a city", that “the garden and city are allegorized as heaven or a celestial phenomenon", that "the city is like a world

garden" and finally that the thought process of "Iran as a city" exist; all show the truth that is manifested in various forms. The complete form of this idea has created capitals and cities in the form of "garden within garden" and like heaven and like "city of the world". From *Varjamkard* to *Safavid Esfahan*, cities used to have a garden structure. However, not all Iranian cities have necessarily evolved in this way. This indicates the presence of two general forms in the Iranian city, one is merely the coexistence of the city and the garden and the other is the more complete form of the city with the structure of the garden (Etezadi, 2016: 84).

The design of the Iranian garden, which in the past was the basis of the design of cities or part of cities, has been recreated from the architectural scale to the urban scale in such a way that "garden as the forerunner of the city", and the structural relationship between the garden and the city is such that on the one hand the garden can be called the city and the city the garden and on the other hand the garden can be considered as the world (Mirfanderski, 1374: 124). Nevertheless, superficiality today has caused the destruction of gardens with their lush trees in the city due to the exogenous development of the city, and the sanctity and respect for nature has given way to profit (Rafiepour et al., 2016).

Review of the experiences of garden conservation

While reviewing research related to the protection of gardens, the factors that change the use of gardens and occur as a result of urban development is as follows. In the studies of Pourmohammadi and Ghorbani (2004), the causes of garden destruction are: severe water and soil constraints, lack of complementary mechanisms in urban management (property and tax support), lack of comprehensive approach to the garden issue and reliance on outdated passive attitudes, lack of sustainable development in the body of urban management and the manner of acquiring and locating land preparation projects (Pourmohammadi and Ghorbani, 2004). According to Rahnama and Rousta's studies (2013), the economic factor (mainly the added value of land and housing) with the greatest impact (70%), has been the main and most important factor affecting the change of the land use in green spaces and gardens. Then the factor of "water shortage", with 17.6%, and the inclusion of gardens in urban areas, with 11.8%, were the factors that changed the use of green spaces and gardens. The inclusion of gardens into the urban area is a change in giving false value to the land, and therefore, a great difference is created for them with lands outside the urban area and intensifies the possibility of changing the use. Also, the high cost of maintaining gardens, reducing the price of garden products and the lack of government support for gardeners are among the most important issues and problems in maintaining green space and gardens in Jahrom (Rahnama and Rousta, 2013). In the studies of Rafipour et al. (2016), the causes of the destruction of gardens in the city of Tehran are listed under the following three conditions. Underlying conditions include causal conditions (Instrumental and profiteering attitude towards gardens) and interventional conditions include changing living standards, poor oversight and lack of sensitivity to law enforcement, crisis of environmental ethics in society, disappearance of the ugliness of violation of environmental laws in society, disorder and discredit Law on Preservation and Development of Urban Green Space, and the uncertainty of judicial-punitive institutions (Rafiepour et al., 2016). In the studies of Sarafi and Alimoradi (2008) the causes and factors of destruction or alteration of gardens in Jiroft city is considered. In this study it is believed that changes and destructions are affected by natural (water), social (migration of garden owners and migration to the city), economic (unaffordable gardening in the city, unsustainable income) and physical (existence of barriers to urban development, the need for housing and related uses) factors (Sarafi and Alimoradi, 2008).

According to the researches in the field of garden protection, the causes and factors of garden destruction can be summarized according to Table 1 below.

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Dimension	The causes and factors of garden destruction
Ecological	- Shortage of resources needed for the garden (soil and water)
Social and cultural	- Instrumental and profiteering attitude towards gardens - Elimination of the ugliness of violating environmental laws in society - Changing living standards - Migration of garden owners - Immigration to the city
Economic	- Value-added price of land and housing - Unaffordable gardening in the city - Reduce the price of garden products - Commercial Urban Economy - Unstable municipal revenue - The preference of other economical methods of cultivation compared to horticulture
Physical	- How to acquire and locate land preparation projects - Inclusion of gardens in the urban area - Need for housing and related uses - Existence of obstacles to urban development
Institutional	- Lack of complementary mechanisms in urban management (property and tax protection) - Lack of a comprehensive approach to the garden issue and reliance on outdated and passive attitudes - Lack of sustainable development thinking - Lack of government support for gardeners - Mismanagement and giving preference to the city administration over the authority of the law on preservation and expansion of urban green space - Weak oversight and lack of sensitivity to law enforcement - Disorder and invalidity of the law on preservation and expansion of urban green space - Uncertainty of judicial-punitive institutions

T1. Causes and factors of garden destruction

In order to prevent this process of destruction of gardens and their protection, it should be determined to what extent the remaining gardens in cities can withstand these changes and the causes and factors of destruction and the so-called "resilience" of these gardens in the development of the city; and to what extent are there human interventions?

Models and frameworks for measuring and evaluating resilience

The word resilience is often used to mean "return to equilibrium" and is derived from the Latin root "resilio" meaning "return to equilibrium" (Klein et al, 2003). Resilience often refers to the extent to which a given system is able to withstand a variety of changes before reorganizing itself into a new set of structures and processes. According to many researchers, resilience is one of the most important issues to achieve sustainability (Karrholm, 2014: 121). Urban resilience refers to the ability of an urban system and its entire ecological-social and technical-social network to build on a temporal and spatial scale that, in times of disruption, maintains desirable functions or returns to them quickly. When a system is adaptable to change, and if the system limits its capacity to adapt to current or future changes, it is rapidly changed and transformed by the nature of resilience (2016 Meerow, Newell, & Stults, 2016). Global study methods, models, and frameworks are used to create the equation. Most of the models and frameworks presented are based on similar factors (such as economic resources, capital, skills, information, knowledge, support and support networks, access to services, and values) that can reduce vulnerability and increase the resilience of society in times of crisis such as natural disasters. (Rafieian et al., 2010: 32).

From the proposed models and frameworks in relation to resilience, we can name models such as capital-based approach. It is a framework for assessing the resilience of society against accidents based on various types of social, economic, physical, human and natural capital (Mayunga, 2007: 6). However, the Spatial Model (DROP[1]) is designed to elucidate the relationship between resilience and vulnerability and provides a comparative assessment of disaster resilience at the local and community levels (Cutter, et al., 2008: 6); and the Linear Index Model (BRIC[2]) provides a set of indicators to measure the existing conditions affecting disaster resilience in communities. In order to determine the indicators, the DROP spatial model was used, in which the relationship between vulnerability and resilience is clear and focuses on the previous conditions. Based on the resilience dimensions, the desired indicators were formed from these dimensions and used for analysis (Cutter, et al, 2008: 7). In the framework of resilience to assess the basic conditions, variables affecting resilience have been identified and classified into five groups of social, economic, institutional, infrastructure and social capital resilience (Cutter, et al., 2010: 9). While FEMA[3] consists of four main categories of adaptive capacities of economic development, social capital, information and communication and community competence (O'SULLIVAN, et

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al, 2013: 245). In the damages-spatial response model, three dimensions are considered: Time, which can be divided into three phases before, during and after the accident or more intervals. Space can include different spatial scales from village to country. Aspect or dimension that can contain environmental, social, economic and institutional characteristics (Paton & Johnston, 2017: 65). The models in the field of resilience can be summarized according to Table 2.

In order to develop a comprehensive model based on the reviewed models, to measure the resilience of orchards, this model should have a multidimensional nature of resilience (social, economic, institutional and physical-environmental) and also the ability to measure the types of hazards that threaten or make gardens vulnerable. This model, should allow the use of quantitative and qualitative indicators simultaneously by ranking the indicators based on the degree of effectiveness.

Model	Summary	Objective	Capacity	Shortcoming
Capital-based approach	A framework based on social, economic, physical, human and natural capital	Evaluation of liquidity based on types of capital	Measuring various factors to assess capital-based resilience for the development of gardens and green spaces	A purely economic look to reduce the effects of risk
Spatial Model (DROP)	A framework based on ecological, social, economic and institutional variables	Clarify the relationship between resilience and vulnerability	- A comparative evaluation of the resilience of gardens at the local and community level - Operate and create a set of indicators and then review it in the real world	This model is specifically designed for natural events, is not applicable at the national level, and focuses on the social resilience of the place.
Linear Index Model (BRIC)	A framework based on social, economic, institutional and physical interventions	Determining the type of social, economic, institutional, and physical interventions improves overall urban systems	By illustrating the final results, it determines which of the methods and dimensions is more important.	Adjusted for natural hazards only.
Resilience indicators to assess baseline conditions	A framework based on five groups of social, economic, institutional, infrastructural and social capitalization	Determine the degree of resilience of the system spatially	Divide the resilience into five groups and identify and categorize the variables, weight each and determine the final resilience on the map.	Lack of prioritization of resilience between different regions and systems.
Risk Resilience Framework (FEMA)	A framework based on the four main categories of adaptive capacities of economic development, social capital, information and communication and community competence	Understanding and characteristics of social institutions and the built environment and how the social institutions of societies and the built environment relate	Helping to understand the characteristics of social institutions and the built environment and how the social institutions of communities and the built environment relate, and providing a framework for measuring resilience	Lack of community prioritization based on measured resilience and failure to display results as a map
Damage model - spatial accountability	Framework based on three dimensions of time (before, during and after the accident), space (different spatial scales) face (environmental, social, economic and institutional characteristics)	Determining the capacity of the damaged structure to withstand damage and post-disaster reorganization at a specific time and place	Considering the three dimensions and specifying the exact geographical characteristics and forecasting actions at three different times and combining it with rescue measures.	This model is mostly considered for the capacity of the accident structure to withstand the damage and reorganize after the accident at a specific time and place.

T2. Models and frameworks of resilience studies

Research Method

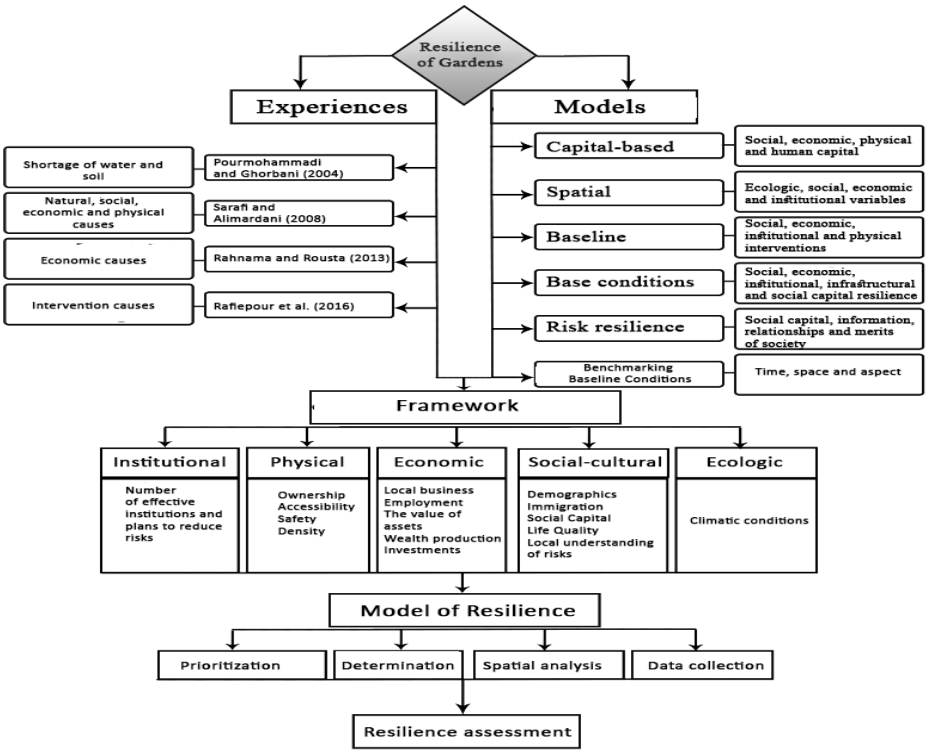
Develop a theoretical framework

According to the conceptual model of this research, which is obtained from summarizing and inferring from the theoretical foundations (Chart 1), first the study framework of garden resilience is determined according to the theoretical foundations and then a model that estimates the resilience of gardens is developed. Finally, using this framework and model, the gardens of Yazd are evaluated and prioritized.

In order to measure the resilience of orchards, measurable values are needed, which are derived from the study of theoretical frameworks, methods and techniques in the discussion of resilience of indicators appropriate to the resilience of orchards. This is presented in Table 3 under the title of Garden Resilience Study Framework. This framework has five dimensions: ecological, social and cultural, economic, physical and institutional dimension.

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Ch1 . Research process

Dimension	Factor	Data collection method	Scoring method	Source
Economic	Employment status	General Census of Population and Housing in 2016	By examining the employment rate of neighborhoods, the gardens of each neighborhood are given a score of 1-5.	Mayunga, 2007: 6 Cutter, et al., 2008: 6 Cutter, et al, 2010:7 O'SULLIVAN, et al, 2013: 245 Paton & Johnston, 2017: 65
	Type of local business		Depending on the employment rate of the people in the neighborhood, agriculture is given to the gardens of each neighborhood from 1-5 points.	
	Value of assets	Interview	Based on the difference between the price of garden land and residential land, the gardens of each neighborhood are given 1-5 points.	
	Wealth production	Statistical yearbook of Yazd province	Depending on the amount of crop production, the gardens of each neighborhood are given 1-5 points.	
	Investments	Statistical yearbook of Yazd province and interviews with officials	Depending on the amount of investment in the agricultural sector of the neighborhoods, the gardens of each neighborhood will be given 1-5 points.	
Physical	Ownership	Detailed plan studies of Yazd	Depending on the ownership of each garden, parcels are scored from 1-5 points.	Mayunga, 2007: 6 Cutter, et al., 2008: 6 Cutter, et al, 2010:7 Paton & Johnston, 2017: 65
	Access to communication networks	Network analysis in Arc GIS software	Depending on the access of each of the gardens to the main path, points are scored from 1-5.	
	Quality	Physical harvest	Based on the amount of green trees in the gardens, the parcels are scored from 1-5.	
	Density of built-in environment	Density analysis in Arc GIS software	Based on the density of gardens, parcels are scored from 1-5	
Institutional	Number of influential organizations	Superior documents and existing rules	Gardens are given a score of 1-5 based on the degree of integration of the organizations involved.	Cutter, et al., 2008: 6 Cutter, et al, 2010:7 O'SULLIVAN, et al, 2013: 245 Paton & Johnston, 2017: 65
	Relations and performance of institutions*	Questionnaire	Based on the answers of the respondents, the effectiveness of the activities of the relevant institution is measured.	
	Risk reduction programs	Interview	Based on the existence of garden protection plans at the level of neighborhoods, the gardens of each neighborhood are given a score of 1-5.	
	Terms and Conditions	Superior documents	Gardens are given a score of 1-5 based on the effectiveness of the rules	
	Local institutions	Interview	Based on the amount of active herbs in the field of gardens, gardens are given points from 1-5.	

T3. Dimensions, factors and assessment of resilience

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The obtained factors through the study frameworks of resilience are given in Table 3 and the method of data collection, scoring and source of each of these factors are specified. These factors used a model developed to measure the resilience of gardens in Yazd.

Data Collection

The data required for the research, as mentioned in the theoretical framework, can be provided in two main ways:

A. The data (unstarred in Table 3) can be accessed by referring to the sources and documents mentioned above. The method of data collection is in the form of content analysis of documents and books. These documents are reliable and accessible through specialized studies in various fields and can be used to obtain a wide range of data.

B. Factors (that are starred in Table 3) cannot be obtained in a documentary manner. They are obtained by survey method and using a questionnaire and interview. In relation to personal, emotional, psychological characteristics and features that are completely dependent on the personal traits and that are not possible to comment definitively on their existence, lack or absence, the surest way is to ask the people themselves (Rafiepour, 2008: 297). The questionnaire was developed using the Likert scale. Cochran's formula was used to determine the statistical sample size and the reliability of the data obtained was evaluated by Cronbach's alpha.

Spatial data analysis

In order to measure the data locally, ArcGIS software has been used with the ability to perform many spatial analyzes in urban environments through the capabilities of analyzing and combining spatial and descriptive data. Spatial Analyst is a tool used for data analysis and raster modeling. In order to overlap the layers, the indicators must first be connected to the spatial information and the corresponding spatial layer must be obtained. In the step of overlaying the obtained layers, the weight of each data is obtained using SuperDecisions software. This software is able to obtain the weight of each layer by implementing the Analytic Hierarchy Process (AHP) model. The initial weighting of the hierarchical analysis model is possible with the Delphi method. Since the number of people required to form a Delphi group is usually 10-15 people (Shieh et al., 2013: 121), based on the opinion of 15 experts, the importance of the indicators in relation to each other is determined. The Delphi method is a process of group communication with a relatively strong structure and the judgment of experts on topics that naturally do not have enough knowledge about it, when there is an uncertain atmosphere (Pashaeizadeh, 2007: 67).

Assessing the resilience of gardens,

For this purpose, the layers corresponding to the indexes are first rasterized with the same pixel size, then scaled in a 5-variable spectrum using the Rescale by Function, and weighted using the Map Algebra function. The weight of each layer is obtained from the hierarchical analysis model in SuperDecisions software. In order to get the final score of each plate (each plate corresponds to a garden), which is actually the degree of resilience, the score of each plate is a 5-variable spectrum. "1" indicates the lowest degree of resilience and "5" indicates the highest degree of resilience. Finally, using the kernel density estimation model, the resilience of the orchards is obtained.

Prioritizing the neighborhoods concerning the resilience of gardens

Assessing resilience in the city and neighborhoods including gardens, uses one-way analysis of variance (F test). This can assess the presence or absence of significant differences between different neighborhoods. ANOVA or one-way analysis of variance is used to compare the mean of a quantitative variable between more than two independent groups (Bryce et al., 2003: 36). In this article, the tested variable is the resilience of city gardens and independent groups of neighborhoods include gardens. Based on these data and using SPSS software, we can determine the difference between these neighborhoods and rank the neighborhoods based on the resilience of the gardens in them.

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Discussion and Analysis

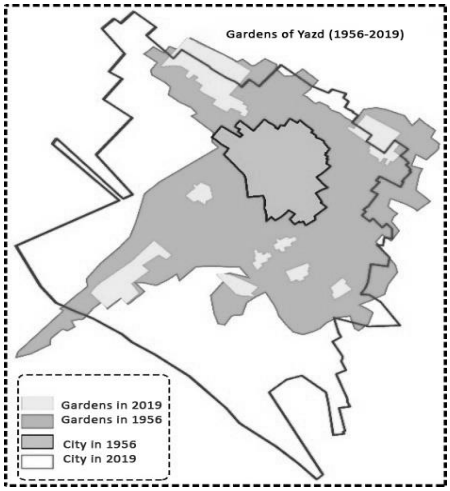
Introduction of the Case Study

The city of Yazd has gone through rapid growth between the years 1956 to 2019. In 63 years, this area has increased from 710 hectares to 11,000 hectares, which is almost 15 times bigger. Most of this increase occurred between 1971 to 1992 (Shamaei, 2001: 240). After 2001, the area of the city has reached 14,000 hectares (Armanshahr Consulting Engineers, 2017: 1). With the analysis and evaluation that has been done in the last four decades (1973-2019) in relation to gardens, parks and green space in Yazd city, it becomes clear that in 1973, 60% of the current city was allocated to gardens (including the surrounding gardens). In ten years, (1973-1983) the area of the city has more than doubled and with the annexation of the villages around the city, all of which had very large gardens, the area of the city gardens has tripled. The annexation of the area around the city and the integration of villages doubled the area of gardens once again. In 1992, ten years later, studies of the third comprehensive plan show that the growth of Yazd city has decreased. The gardens that in the past decades were integrated in the city have been reduced by half due to horizontal development (Behravan, 2008: 60). In the following decades, with the cessation of the horizontal development of the city, the process of destruction has accelerated to the point that according to the current maps of land use, gardens constitute only 5% of the city area (Armanshahr Consulting Engineers, 2017: 35). The evolution of gardens in Yazd is shown in Figure 1 below.

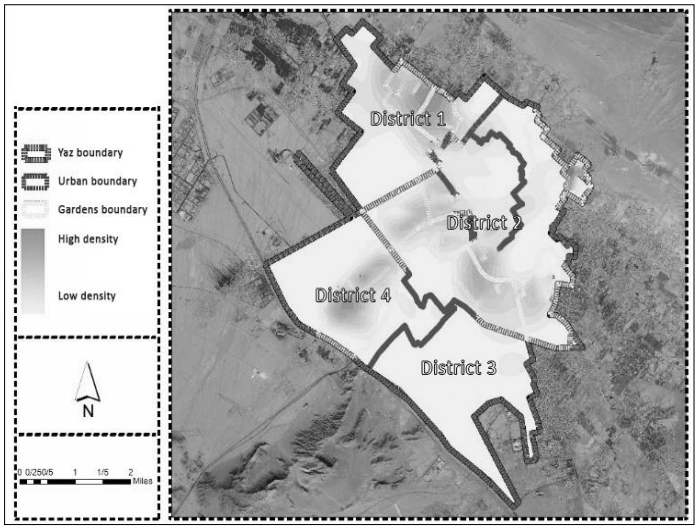
Yazd city has 42 neighborhoods in 5 urban areas according to the detailed plan of the city. Out of 42 neighborhoods of Yazd, 12 neighborhoods include gardens (Armanshahr, 2017: 20). Figure 2 shows the status of neighborhoods including gardens and their location.

Measuring the resilience of gardens in Yazd

The resilience of Yazd gardens has been calculated according to the model described and based on the corresponding maps that have been prepared. After obtaining the data according to what was mentioned, the data analysis was performed according to the following steps.



F1. Development of Gardens in Yazd (1956-2019)



F2. The location of neighborhoods with gardens in Yazd

Spatial analysis of data

For this purpose, using SuperDecisions software, a hierarchical analysis model was used to determine the weight of GIS layers, and for the initial scoring of layers in hierarchical analysis, the Delphi method was used and the opinion of 15 experts on the importance of each factor based on Thomas

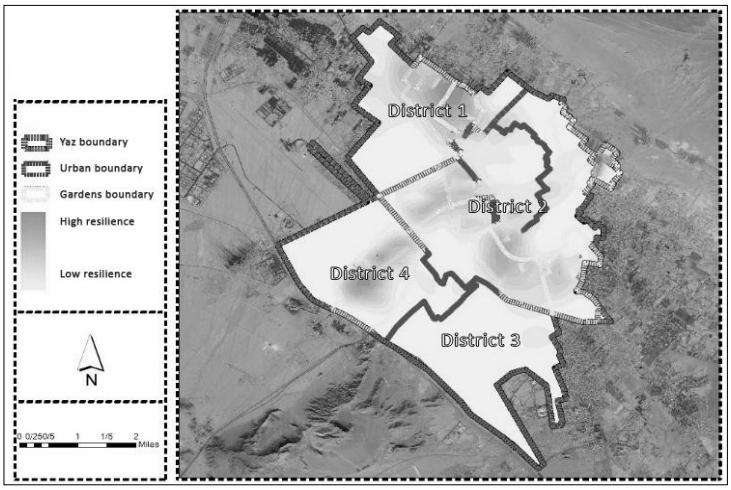
L. Saaty Scale was received. The results are shown in Table 4.

Assessing the resilience of gardens

The scores of each of the orchards were added together using the weights of the factors obtained from the hierarchical analysis (Table 4) and the Map Algebra function in Arc GIS software and then the whole city status was determined by the kernel density estimation model according to the orchards' resilience. According to the map (Figure 3) which shows the resilience of Yazd gardens, the resilience of the gardens is in poor condition. By summing the scores of the garden plates, none of them scored higher than 3, which means average tolerance, and is a sign of severe vulnerability of the gardens.

Dimensions and Factors of Resilience		
Ecologic (0.03)	Climate (0.12)	
	Accessibility to resources needed by gardens (0.88)	
Social and cultural (0.15)	Demographics (0.04)	
	Immigration (0.09)	
	Lifestyle (0.27)	
	Social capital (0.40)	People responsibility in projects (0.34)
		People role in projects (0.66)
	Local understanding of risk (0.20)	Destruction of gardens (0.34)
		Transformation of garden to house (0.66)
Economic (0.26)	Value of assets (0.53)	
	Wealth production (0.15)	
	Investments (0.21)	
	Type of local business (0.07)	
	Employment status (0.04)	
Physical (0.7)	Ownership (0.49)	
	Access to communication networks (0.07)	
	Quality (0.16)	
	Density of built-in environment (0.28)	
Institutional (0.49)	Local institutions (0.03)	
	Risk reduction programs (0.07)	
	Number of influential organizations (0.21)	
	Relations and performance of institutions (0.26)	
	Terms and Conditions (0.51)	

T4. Weigh of dimensions and factors of resilience



F3. The resilience of gardens in Yazd

Prioritizing neighborhoods based on garden resilience

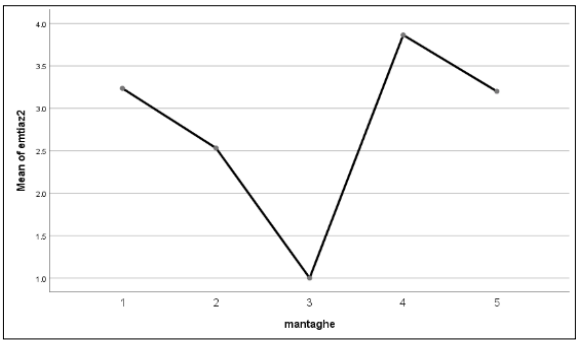
In order to prioritize neighborhoods and areas with gardens in terms of resilience, the F test has been used. In this test, the average resilience score of orchards in each neighborhood and region was compared with others and the existence of significant differences between neighborhoods and regions was investigated. According to Figure 4, Naeemabad (6) and Koynavab (8) neighborhoods have the lowest level of

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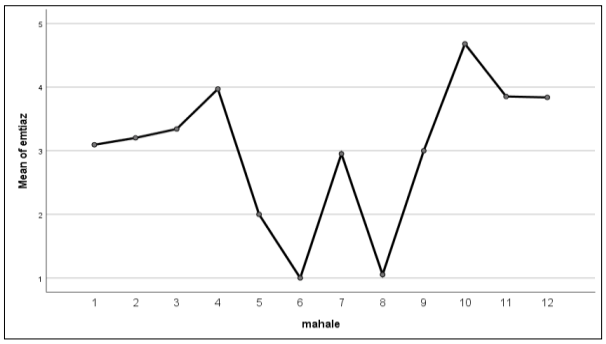
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literacy and have a significant difference with other neighborhoods. Other neighborhoods are at the same level (according to the chart below) in terms of resilience. Based on this, the two neighborhoods that received the lowest scores are in the first priority of conservation and prevention of garden destruction projects, and the two neighborhoods that are more resilient are in the last priority. Among urban areas, District 2 has the lowest rate of resilience and has the highest need for intervention.

According to the above charts, the situation of areas and neighborhoods that have gardens in Yazd can be ranked according to Table 5.



Ch2. Comparison of urban regions with garden in Yazd



Ch3. Comparison of neighborhoods with garden in Yazd

Urban district	Region ranking	Neighborhoods with garden	Neighborhoods ranking
1	2	Amirabad	7
		Sajadieh	6
		Seyed Sahra	5
2	3	Maryamabad	2
		Mahdiabad	10
		Naeemabad	12
		Akbarabad	9
		Koynavab	11
		Sarvrah	8
		Jahanfar	1
4	1	Kheirabad	4
		Eishabad	3

T5. Ranking of regions and neighborhoods of Yazd

Conclusion

The Persian city garden is the utopia of thinkers living in Iranshahr. It is rooted in their wisdom and thoughts and even their beliefs. While gardens today are less in the form of traditional Iranian gardens and more in the form of imported parks. They act as recreational spaces relying solely on urban management and are sometimes glorified on special occasions like the world day of planting. They are planned with only a few components such as levels and per capita, distribution and dispersion, sphere of influence and radius of access, urban scale to the neighborhood unit, etc. This superficial harvest has caused the destruction of orchards in cities and reduced their "resilience".

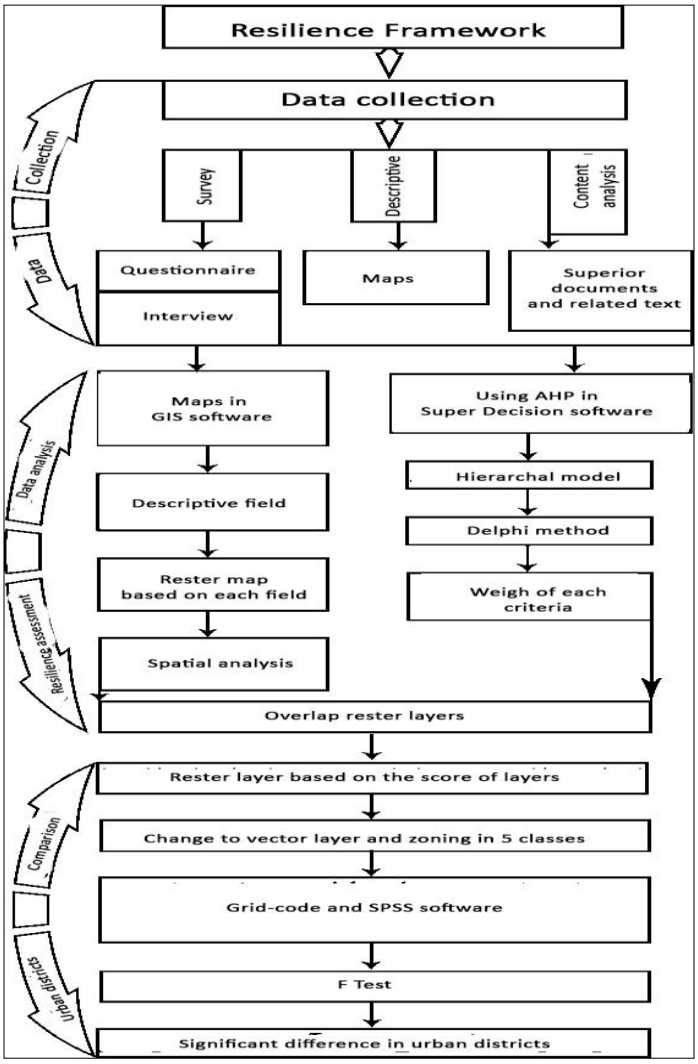
The purpose of this article was to measure and prioritize garden resilience based on a scientific model. The model used has three main capabilities, in the first place, it has the ability to measure the resilience of gardens in all aspects. Secondly, this measurement can prioritize gardens based on resilience, and display all this information spatially. The developed model uses two categories of quantitative and qualitative data and performs a quantitative analysis of the obtained data. The general trend of this model is shown in Chart 4.

This model can be applied to all analyzes that use multi-criteria decision analysis (MCDA) in such a way that it has all the steps which are used in multi-criteria decision-making models and has tried to

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operate more fully and comprehensively. Thus, multi-criteria decision-making models are usually not spatial and only evaluate and decide on a specific issue, while in this model, all indicators are analyzed spatially. On this basis, all urban concepts that can be measured by multi-criteria decision analysis can be measured with this model.

Using the information obtained from this model, the resilience of gardens in the neighborhood and in urban areas has been determined, which can be the basis for action to provide a suitable and appropriate protection solution at any scale. In this way, the city administration can improve the resilience of the gardens and apply proper supervision, control and organization in order to maintain and improve the gardens.



Ch4. Resilience Assessment Model

Endnotes

1. disaster resilience of place-based
2. baseline resilience index conditions
3. Federal Emergency Management Agency

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