

Urban Livability-Oriented Regeneration Analysis in Historical Contexts: A Case Study of District 1 of Semnan

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Abstract

This study aimed to identify the key factors of urban livability and analyze their interrelationships in improving the quality of life in District 1 of Semnan. The research adopted a descriptive–analytical design, applying the Delphi approach and fuzzy MICMAC analysis to 49 variables derived from literature and expert opinions of 50 urban specialists. Findings revealed that urban regeneration, social security, service accessibility, urban aesthetics, civic participation, and architectural identity are the most influential factors. Moreover, urban branding, tourism, and cultural heritage were identified as dependent variables requiring policy support. Scenario analysis using Scenario Wizard identified one desirable, two neutral, and three critical scenarios. The desirable scenario emphasized enhanced security monitoring, full regeneration of the historical fabric, and strengthened neighborhood identity as drivers of sustainable livability. The results provide a strategic basis for urban policy and planning in similar historical urban contexts.

Keywords: Regeneration, urban livability, historical textures, Semnan Region One, structural equations.

1- Introduction

Urban regeneration policy represents a new approach in the evolution of urban renewal, particularly within historical urban fabrics. Emerging in the late twentieth and early twenty-first centuries, it has gained considerable attention in academic and policy circles (Loffel & Walls, 2020). Unlike earlier redevelopment and reconstruction strategies that focused primarily on physical and economic dimensions, the regeneration approach adopts a community-oriented perspective (Karimi & Ghanbari, 2023; Ghahremani et al., 2024), integrating social, cultural, and economic factors alongside physical revitalization (Khazrloo & Abedini, 2021). This holistic vision recognizes that community development requires empowerment as a strategic tool, wherein local authorities and the private sector play crucial roles in enabling citizens to make informed choices about their urban future (Karimi & Ghanbari, 2023; Yang, 2022).

When the historic cores of cities grow in harmony with their tangible and intangible heritage, they yield sustainable benefits rather than being subjected to destructive redevelopment pressures (Khamsabadi et al.,

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2022). Consequently, attention to the local economy, investment attraction, and cultural heritage preservation are among the key priorities of contemporary regeneration programs (Baye et al., 2020).

In the case of deteriorated historical districts, such concerns become even more critical, as their structural and functional systems often face severe dysfunction (Mohammadi et al., 2023). Once vital and adaptive to residents' needs, these areas have lost their dynamism under the pressures of urban expansion and socio-economic transformation (Anjomshoa et al., 2022; Bayramzadeh et al., 2021). As a result, they suffer from declining quality of life, loss of vitality, and reduced livability (Ghazimirsaeed et al., 2022; Nozari et al., 2023).

These decayed urban fabrics, characterized by vulnerable infrastructure and spatial instability, require the establishment of livability standards (Davoodi & Farrokhi, 2024). The challenges they face, including spatial obsolescence and inefficient land use, have hindered balanced urban growth (Khazrloo & Abedini, 2021). Meanwhile, the importance of livability in urban planning has intensified in response to growing societal needs for well-being, equality, and sustainable lifestyles (Saraei, 2022; Babaei et al., 2021). Numerous studies identify threats to urban quality of life such as overcrowding, lack of open spaces, housing shortages, social inequality, and the loss of urban identity and sense of place (Soltanifar et al., 2022).

The historical city of Semnan exemplifies these challenges. Increasing awareness of unsustainable urban lifestyles underscores the urgency of creating resilient and livable environments (Liang et al., 2020). The physical deterioration and socio-cultural vulnerability of historic districts, exacerbated by one-dimensional conservation or development efforts, have led to depopulation and social fragmentation (Appleyard et al., 2019; Khamsabadi et al., 2022; Haqi, 2022). Consequently, original residents have migrated, replaced by low-income groups lacking attachment to place or appreciation of its heritage values (Park et al., 2019).

Therefore, urban regeneration in such contexts must aim to revive both the physical and the spiritual-historical authenticity of these neighborhoods. District 1 of Semnan, which encompasses significant portions of the historic core, faces multiple socio-spatial challenges yet holds substantial potential for sustainable revitalization. Enhancing livability in this area not only mitigates unplanned urban sprawl but also fosters vitality and identity restoration.

Given the absence of comprehensive studies on livability in historic urban contexts in Iran, this research seeks to bridge that gap by examining the impact of spatial organization and regeneration strategies on urban livability in Semnan. The central objective is to analyze how urban regeneration, through livability-oriented indicators, can improve the quality of life in District 1 and provide a foundation for sustainable urban planning and policy development.

2- Literature and research background

2-1 Theoretical foundations

Livability is the Persian equivalent of the English term *livability*, and the livable city is the equivalent of *livable city* (Habibi & Maqsoodi, 2023: 15). *Webster's Dictionary* defines a livable place as a space suitable for human habitation (Park et al., 2019: 12). Livability is also defined as the quality of life, living standards, or the general happiness of a population living in a place such as a city (Rabbiosi, Coletti & Saloone, 2020). In the *Oxford English Dictionary*, livability is defined as having the value of life and being suitable for living, and vitality means being active and energetic (Hataminejad et al., 2021). Cowan, in the *Dictionary of Urban Planning Terms*, defines the term livable as "suitable for living" and "providing a good quality of life." The livable city is an abstract concept; therefore, individuals have different opinions about a livable city (Asghari et al., 2021). Shortell (2005) believes that what gives meaning to a livable city is the level of

development of the country. This approach to a livable city corresponds to the definition by Timer et al. (2005), who define livability as the quality of life experienced by the residents of a city (Khaksar & Mahdavi, 2023). These conditions, which some authors consider synonymous with livability or suitable living conditions, generally refer to a set of objective characteristics that make a place one where people wish to live both in the present and in the future (Hataminejad et al., 2023).

The importance of livability arises from the growing awareness of unsustainable patterns of life and urban consumption that are unhealthy and unsustainable, and in the long term lead to the reduction of environmental resources' capacity to support the earth's population (Zhang, Li & Chen, 2020). Experts have different views regarding the importance of a livable city, and the most important ones are mentioned below: From one viewpoint, a livable city creates a complete range of activities with a combination of social spaces in cities and residential areas in an attractive and meaningful way. Such a city is a desirable place to work, live, interact, and love (Wang & Miao, 2022). It is difficult to imagine a sustainable city without it being favored by its citizens. From another viewpoint, a livable city creates for us the perception that the world is more beautiful than the one we live in (Wong & Yuen, 2018). In addition, it creates favorable social interactions in the urban environment, contributes to strengthening the social life of its residents, and provides the basis for citizens to build a desirable urban life (Khamis Abadi et al., 2022).

A livable city has the ability to meet the different needs of citizens for interaction (Farrokhi, 2024). It provides opportunities for meetings and daily activities in the public spaces of the city with residential areas and opportunities to see, hear, and experience the performance of people in different situations (Farrokhi, 2024). Such a city is a capable city that is both desirable for residents and tourists and enjoyable to live in, and its essence is a good city and a good society. Veenhoven believes that people are happier and more satisfied in communities where their needs are better met (Radcliff, 2021). As Flower and Christakis (2008) concluded, happy citizens make others happy. Livability is also important for the economy (happy people are better human resources). Livability is also important for urban governance (Davoodi & Mohammadi, 2023) because a livable city attracts good workers and investors, and the development of economic activity is key to urban development (Bandarabadi, 2023).

The word *Regeneration* literally means “natural reproduction or restoration of a part of a living entity that has been exposed to destruction” (Nasiri Hendkhaleh et al., 2023). Regarding phenomena related to human and social affairs, this regeneration may be accompanied by sudden and abrupt changes or may occur slowly and gradually. Therefore, urban restoration and conservation that have fallen behind social conditions and the spirit of the times will never be able to overcome the problems ahead (Blassingame, 2019). In the field of urban restoration and conservation, the term *Regeneration* was first used as a new equivalent for *Renewal* and did not itself have a new meaning; however, gradually this term gained a positive connotation compared to the negative implications of “urban renewal” (Blassingame, 2019). The term *urban regeneration* carries a special meaning in the literature of urban development, which entered the field of urban restoration in the late 1970s and early 1980s (Safari Yazd et al., 2023). Reviewing the writings of experts in this field shows the use of expressions such as modernization, recovery, regeneration, re-emergence, and revitalization. Linguistically, this term means “regeneration and re-emergence,” which in its function means renewal and modernization (Mirkotoli & Jafari, 2023). Although this action may include the apparent similarities of the contemporary spatial organization with the ancient one, the organizational behaviors of contemporary space and the norms derived from them bear no resemblance to the past and have their own independent identity (Hankins, 2019).

Roberts and Sykes define regeneration as “a comprehensive and integrated vision and action that identifies and analyzes urban issues and seeks solutions to improve the economic, social, physical, and environmental conditions of areas that are under threat and change” (Zhang, Li & Chen, 2020). Flamaki also refers to the term *urban revitalization*. According to him, this refers to actions that can breathe life into the atmosphere

of the city, bring the roots of territorial and internal urban life into balance, and make its sustainability possible. Urban revitalization is not based on the continuation of the past and everyday life in the city, but rather on a set of conditions that inject new blood into the old or worn-out urban arteries (Dowlatshahi, 2023).

In general, the definition of the term *urban regeneration* depends on the level of development and progress of countries and can represent a comprehensive and integrated action and image to solve urban problems and seek to improve the sustainability of environmental, social, economic, and physical conditions of the concerned area (Martínez-Bravo et al., 2019: 54).

It is important to note that improving the quality of life and livability are fundamentally among the most important indicators of sustainable urban regeneration. Therefore, when sustainable urban regeneration is well achieved, it must contribute to improving the quality of life (Fasihi, 2023: 42). Ng evaluates the process of sustainable urban regeneration based on five dimensions: “comprehensive participation by various stakeholders,” “creating communities with characteristics and identity that respect historical heritage,” “equal and fair distribution of benefits and costs for all stakeholders,” “improving environmental quality,” and “strengthening economic growth” (Radcliff, 2021). Figure (1) shows the division of the capabilities of livable urban communities.



Figure 1. Segmentation of capabilities of livable urban communities

Tavakolinia et al. (2025) in an article entitled Analysis of the Characteristics of the Iranian-Islamic City Based on Urban Livability Indicators, found that urban livability and the Iranian-Islamic city have many commonalities and are aligned with each other. Therefore, the indicators of urban livability can be applied to improve the quality of life and living in Iranian-Islamic cities. Saghafi Asl et al. (2025) in an article entitled Analysis of the Interactions between Various Types of Urban Public Spaces and Livability in the Central Area of Tehran Metropolis, emphasized the necessity of human-centered design of public spaces

with an emphasis on the interconnection between physical and non-physical components in urban planning processes. This research, as a scientific reference, provides practical strategies for policymakers and urban designers to optimize public spaces in metropolises and enhance environmental-social sustainability.

Nazari et al. (2025) in an article entitled *Evaluation of the Urban Management System with a Good Urban Governance Approach*, found that among the indicators of good urban governance in the city of Semnan, the participation, responsiveness, and justice indicators require regeneration and more attention; however, with recent actions, relative progress has been observed toward achieving transparency, effectiveness, and efficiency indicators. Akbari et al. (2024) in an article entitled *Analysis of Factors Affecting the Livability of Informal Settlements: Structural Equation Modeling*, found that the level of livability in the Hakim Nezami neighborhood of Urmia is low.

Jahan Shakib and Kiani (2024) in an article entitled *The Concept of Livability in the System of Sustainable Urban Development*, concluded that among the livability indicators, two (social cohesion and security) have higher rankings. The reason is the direct dependence of these concepts on spatial, temporal, and, more importantly, socio-economic and managerial contexts of the target society. Ghasempour et al. (2024) in an article entitled *Spatial Analysis of Livability in District 22 of Tehran Metropolis*, found that according to the results, the environmental dimension of livability in District 22 of Tehran Metropolis is at a moderate level, with uniform distribution across the area under average conditions.

Nazari, Kamyabi, and Varghan (2024) in an article entitled *Pathology of Urban Sprawl and Horizontal Expansion of Ahvaz City*, concluded that considering the negative consequences of urban sprawl and in order to achieve sustainable development and a sustainable urban form, the compact growth pattern is proposed as the future development model of Ahvaz City. Among the studies by foreign researchers related to urban regeneration and livability, Martínez-Bravo et al. (2023) conducted a study aimed at examining the interaction between urban sustainability, pollution, and livability in European cities. The results of this study showed a positive relationship between urban economic sustainability and urban pollution.

Wang and Miao (2022) analyzed urban livability in China concerning spatio-temporal changes, and the results showed that the livability of 40 major Chinese cities during the period 2005–2019 has shown an increasing trend. Al-Thani et al. (2019) conducted a study aimed at investigating urban sustainability and livability in the city of Doha, Qatar, and the results showed that this city, in terms of livability indicators, is not among the sustainable international cities and does not have a high position. Zhang et al. (2018) in evaluating and determining satisfaction with urban livability in China concluded that six dimensions of urban livability have positive and significant effects on overall satisfaction with urban quality of life, among which the natural environment, proper transportation, and health are influential factors. Also, socio-economic characteristics such as geographical location, type of housing, education, family size, age, and place identity affect satisfaction with urban quality of life. Sofska (2017) examined the livability of a city using smart solutions and urban planning to create a livable future in Skopje, North Macedonia. The results indicate that undoubtedly the city must change in order to achieve sustainability, resilience, and above all, livability.

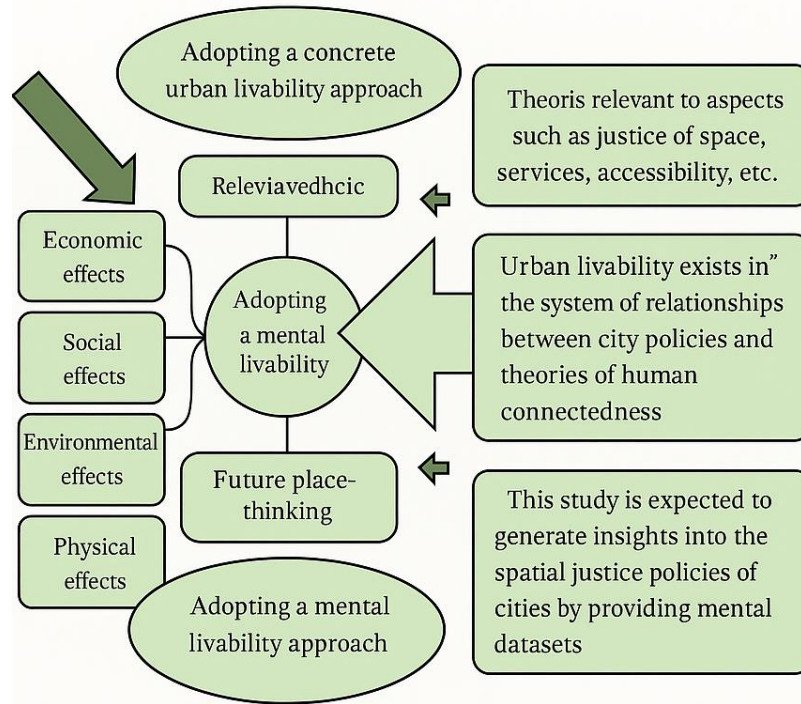


Figure 3. Conceptual research model

3- Research Methodology

The present research method is descriptive–analytical and applied in nature. The effective indicators of livability in District 1 of Semnan City were extracted from available information and documents. The analysis of the impact of each of these indicators was carried out using a foresight approach and the Cross-Impact Analysis (CIA) method.

The cross-impact analysis method is one of the foresight techniques that seeks, through identifying causal relationships among the influencing factors of a subject, to derive possible and probable future scenarios for that subject. In this study, after extracting some indicators using the Delphi method in three stages, experts were first asked to complete and validate the indicators and influencing factors. In the second stage, the mentioned indicators were categorized and finalized, and in the third stage, scores were assigned to each factor, ranging from 0 to 3, and entered into the MICMAC software.

Accordingly, 50 questionnaires were completed by experts to determine the scores of the factors. Using the cross-impact analysis method, which is one of the accepted and common foresight approaches, the influential components related to the livability of District 1 of Semnan City were analyzed. A total of 49 factors associated with livability were examined, and finally, the analysis of these factors was conducted using tables and charts generated by the software.

The output of this method classifies the factors affecting livability and illustrates the pattern of their stability and instability. At the end, following the completion of the MICMAC analysis and identification of key system factors, scenario-building was performed using the Scenario Wizard 3 software. This software helps in constructing various scenarios aimed at enhancing and developing the components of urban livability and quality of life to predict the system’s future. In the present study, two software tools Linguistic Fuzzy MICMAC and Scenario Wizard were used for foresight analysis.

4- Findings

In order to better understand the nature of the society that was studied in the study and to become more familiar with the research variables, descriptive analyses were conducted before analyzing the statistical and inferential data. Accordingly, in the present study, 50 urban planning experts and experts who were familiar with the concepts of quality of life and urban livability and familiar with the city of Semnan were used. Given the sensitivity of the subject in the present study, three types of experts were used in relation to public spaces (12 people), social equality (20 people) and environmental quality (18 people) in the city. The average age of the experts participating in the study was 42 years, and in terms of gender, 33 were men and 17 were women. In terms of education, 37 people had a doctorate degree and 13 other respondents had a master's degree.

Table 1: The Most Influential and Most Affected Variables in the Direct System of Livability Development in District 1 of Semnan City

Variable Name	Direct Influence Rank	Direct Influence Value	Direct Dependence Rank	Direct Dependence Value
1. Access to important land uses affecting urban livability	3	234	5	221
2. Quality of urban services, facilities, and infrastructure	11	211	3	240
3. Urban image, landscape, and aesthetic quality	4	229	4	238
4. Access to shopping centers, essential goods, and medical facilities	49	158	14	211
5. Access to pedestrian and bicycle paths (pedestrian- and cyclist-oriented)	30	199	6	221
6. Suitable access to public transportation and urban parking	28	201	7	221
7. Quality of streets and housing in neighborhoods in relation to safety	40	190	33	197
8. Satisfaction with access to recreational–tourism spaces and leisure quality	18	205	22	205

9. Structural strength of new residential buildings and retrofitting of old ones for resilience	19	205	43	182
10. Satisfaction with spatial distribution and quality of services across the city	17	207	34	195
11. Quality of essential facilities and infrastructures affecting livability and urban prosperity	24	203	42	184
12. Quality of intercity transportation and access routes to the city	48	178	28	201
13. Citizen participation and neighborhood solidarity in local affairs	5	225	29	199
14. Satisfaction with public education and civic–civil rights training	20	205	30	199
15. Satisfaction with quality of health services and citizens' well-being	38	193	23	205
16. Level of interaction between residents of District 1 and city officials	25	203	12	213
17. Population density in neighborhoods of District 1 of Semnan City	31	199	9	219
18. Level of citizens' presence in urban/neighborhood public spaces	12	211	36	199

19. Satisfaction with socio-cultural relations among citizens in neighborhoods	8	217	11	215
20. Respect for urban culture and neighborly rights in neighborhoods	45	184	31	199
21. Individual and social security of citizens (local community) and tourists	2	238	44	180
22. Rights and safety of the disabled and elderly in neighborhood spaces	21	205	37	193
23. Rights, safety, and needs of children toward a child-friendly city	32	199	15	209
24. Sense of attachment to place, environment, and cultural heritage	33	199	18	207
25. Desire for residence, permanence, and hope for life	10	215	38	193
26. Availability of suitable and desirable employment aligned with quality of life	39	193	39	188
27. Adequate household income consistent with quality of life	37	195	1	260
28. Number of job and entrepreneurial opportunities and resulting income	41	190	45	180
29. Rights, safety, participation, and empowerment of women and girls	44	186	19	207

30. Satisfaction with land, housing, mortgage, and rental costs	13	211	13	213
31. Satisfaction with inflation, high prices, and citizens' daily expenses	26	203	16	209
32. Satisfaction with costs of access and public transportation	34	199	10	219
33. Willingness for public and private sector investment in urban development	22	205	23	186
34. Availability and quality of sewage and stormwater drainage infrastructure	42	190	27	201
35. Citizens' participation in studying and intervening in urban plans	27	203	35	195
36. Citizens' participation in cultural heritage protection and urban regeneration	29	201	47	172
37. Citizens' satisfaction with environmental conditions and quality (water, air, etc.)	14	211	24	205
38. Satisfaction with cleanliness services and neighborhood landscape	16	209	24	209
39. Extent and quality of green spaces, gardens, and passive defense	47	182	8	221

40. Appropriate architectural vision of neighborhoods and buildings	6	223	33	199
41. Importance and position of tourism and cultural heritage sectors	9	217	20	207
42. Destruction and land-use changes of valuable heritage and historical sites	46	184	48	170
43. Urban branding with emphasis on Special District (1) of Semnan City	7	221	46	176
44. Quality of urban governance (executive management)	15	211	21	186
45. Position of trade and economic (marketing) activities	35	199	26	203
46. Role of NGOs and community-based organizations in neighborhood development	43	188	2	256
47. Position of historical textures and valuable heritage buildings in spatial organization	23	205	25	205
48. Regeneration of worn-out urban fabrics and relocation of incompatible land uses	1	242	21	207
49. Role and importance of university research projects in regional and urban development	36	197	49	168

The results obtained from the analyses conducted using the MICMAC software indicate that some factors within the livability development system of Semnan City have greater influence and dependence compared to other factors (Table 2). These analyses help identify the key variables that can play an effective role in planning and policymaking processes. In the following section, the most influential direct factors and the most affected indirect factors of the system are examined.

Table 2. The Most Influential and Most Affected Direct Factors in the Livability Development System of District 1 of Semnan City (Based on Matrix Results)

Most Influential Direct Factors of the System	Most Affected Direct Factors of the System
- Regeneration of worn-out urban fabrics and relocation of incompatible land uses	- Adequate and desirable household income consistent with quality of life
- Individual and social security of citizens (local community) and tourists	- Importance of NGOs and community associations in neighborhood development
- Access to important land uses affecting urban livability	- Quality of urban services, facilities, and infrastructure
- Enjoyment of urban image, landscape, and aesthetic beauty	- Urban image, landscape, and aesthetic beauty
- Citizen participation and neighborhood solidarity in local affairs	- Access to important land uses affecting urban livability
- Appropriate architectural vision of neighborhoods and buildings	- Access to pedestrian and bicycle paths
- Urban branding with emphasis on the Special District (1) of Semnan City	- Suitable access to public transportation and urban parking
- Satisfaction with citizens' socio-cultural relations in neighborhoods	- Extent and quality of green spaces, preservation of gardens, and passive defense
- Importance and position of tourism and cultural heritage sectors	- Population density in neighborhoods of District 1 of Semnan City
- Desire for residence, permanence, and hope for life	- Satisfaction with costs of access and public transportation in the city

The relationships between influential and affected factors illustrate the complexity and interactivity of the urban livability system. Factors such as urban regeneration and social security act as key influential variables in improving the livability of the area, while affected factors such as urban services and access to facilities require more precise policymaking to enhance their conditions. In the following discussion, the researcher examines the results obtained from the highly influential and highly affected indirect key variables of the system, which are presented in Table (3).

Table (3): The Most Influential and Most Affected Variables in the Indirect Method of Livability Development in District 1 of Semnan City

Variable Name	Indirect Influence (Inf)	Indirect Dependence (Dep)	Influence Rank	Influence Value
1. Access to major land uses affecting urban livability	3	234	5	221
2. Quality of urban services, facilities, and infrastructure	11	211	3	240
3. Enjoyment of urban landscape and aesthetic beauty	4	229	4	238
4. Access to shopping centers, essential goods, and medical facilities	49	158	14	211
5. Access to pedestrian and bicycle paths (walkable and bikeable areas)	30	199	6	221
6. Adequate access to public transport and urban parking	28	201	7	221
7. Quality and safety of streets and residential areas	40	190	33	197
8. Satisfaction with access to recreational–tourism and leisure areas	18	205	22	205

9. Structural integrity of new buildings and reinforcement of old ones (resilience)	19	205	43	182
10. Satisfaction with spatial distribution and quality of urban services	17	207	34	195
11. Quality of key infrastructures contributing to livability and urban prosperity	24	203	42	184
12. Quality of intercity transportation and access roads	48	178	28	201
13. Citizen participation and neighborhood solidarity	5	225	29	199
14. Satisfaction with public and civil education and citizen rights	20	205	30	199
15. Satisfaction with healthcare and public health services	38	193	23	205
16. Interaction between citizens and urban managers in District 1	25	203	12	213

17. Population density in neighborhoods of District 1	31	199	9	219
18. Citizen presence in public and community spaces	12	211	36	199
19. Satisfaction with socio-cultural relations in neighborhoods	8	217	11	215
20. Citizen satisfaction with urban culture and neighborhood rights	45	184	31	199
21. Personal and social security of citizens and tourists	2	238	44	180
22. Rights and safety of the elderly and disabled in neighborhood spaces	21	205	37	193
23. Rights, safety, and needs of children (child-friendly city)	32	199	15	209
24. Sense of belonging to place, environment, and cultural heritage	33	199	18	207
25. Desire for residence, permanence, and life satisfaction	10	215	38	193

26. Having suitable employment compatible with quality of life	39	193	39	188
27. Adequate household income consistent with quality of life	37	195	1	260
28. Employment and entrepreneurial opportunities and resulting income	41	190	45	180
29. Rights, safety, and empowerment of women and girls	44	186	19	207
30. Satisfaction with land, housing, and rental costs	13	211	13	213
31. Satisfaction with inflation, rising costs, and daily expenses	26	203	16	209
32. Satisfaction with access costs and public transportation expenses	34	199	10	219
33. Tendency toward public and private investment in urban development	22	205	23	186

34. Quality of sewage and stormwater drainage infrastructure	42	190	27	201
35. Citizen participation in urban studies and planning	27	203	35	195
36. Citizen participation in cultural heritage protection and urban regeneration	29	201	47	172
37. Satisfaction with environmental conditions (water, air, etc.)	14	211	24	205
38. Satisfaction with cleanliness and neighborhood aesthetics	16	209	24	209
39. Extent and quality of green spaces, preservation of gardens, and passive defense	47	182	8	221
40. Appropriate architectural vision of neighborhoods and buildings	6	223	33	199
41. Importance of tourism and cultural heritage sectors	9	217	20	207

42. Destruction and land-use change of valuable heritage sites	46	184	48	170
43. Urban branding with emphasis on Semnan Special District (1)	7	221	46	176
44. Quality of urban governance and executive management	15	211	21	186
45. Trade position and economic activity (marketing)	35	199	26	203
46. Importance of NGOs and civil organizations in neighborhood development	43	188	2	256
47. Role of historical and heritage buildings in spatial organization	23	205	25	205
48. Regeneration of deteriorated urban areas and relocation of incompatible land uses	1	242	21	207
49. Role of university research projects in regional and urban development	36	197	49	168

Based on the calculations performed using the Linguistic Fuzzy MICMAC software, the most influential and most affected indirect factors were identified, as shown in Table (2) in order of rank. Accordingly, the selected factors are identical to the direct factors in the livability development system of District 1 of Semnan City.

The MICMAC software classifies the indicators into four categories within a coordinate system (Figure). The analysis of direct effects can explain the future characteristics of each factor within the environment formed by all other factors. Ultimately, to analyze the most influential factor, it is necessary to compare the results of both direct and indirect analyses. The distribution pattern of variables in the diagram reflects the degree of stability or instability of the system.

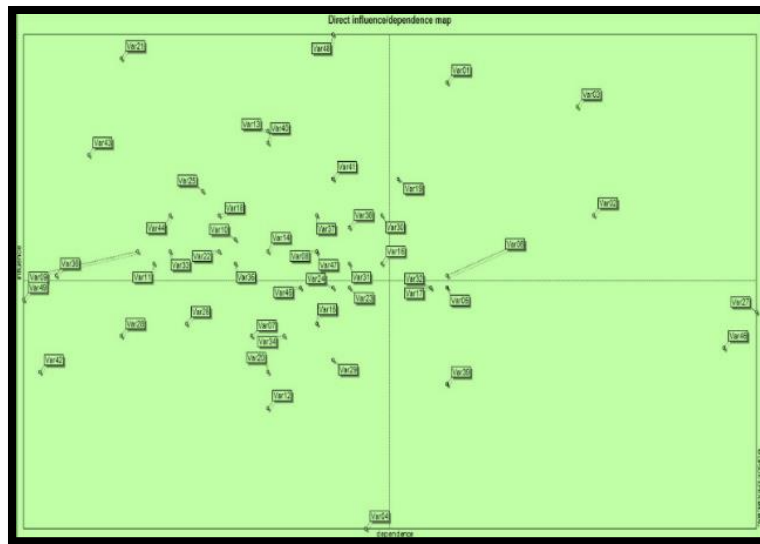


Figure 3. Distribution map of factors and their position in the direct impact-impact axis of livability development in Semnan City Region 1

In analyzing the overall influence of variables within the system, the indicators located in the northwestern and southeastern areas of the scatter diagram typically exhibit a moderate to weak impact on the system. These indicators generally play a smaller role in influencing or being influenced within the system and therefore hold less strategic significance in decision-making processes. In contrast, variables positioned in the northeastern and southwestern regions of the diagram, due to their placement, represent moderate to strong influence and dependence within the system. These variables play a key and decisive role in the system's performance and dynamics and are considered core factors in the analytical framework. Each number displayed in the diagram corresponds to the role and degree of influence or dependence of a variable within the system.

This section examines the variables identified as the most determining and influential factors of the system. These variables, located in the northwestern zone of the diagram, have the highest level of influence and the lowest level of dependence. Such characteristics indicate their strong ability to shape other variables and the overall structure of the system. The presence of these variables in the northwestern region highlights their vital role in shaping and directing the system. The high number of such variables in this area confirms

the precision of the indicator selection and emphasizes their importance in policy-making and strategic planning.

This region contains the largest number of components, which reflects the intelligent design and accurate selection of indicators in the analysis, reinforcing their capability to shape the behavior and performance of the entire system. Such characteristics ensure that these variables play a key role in the system's stability or instability, directly influencing final outcomes and overall system behavior.

Variables related to urban fabric and architecture represent the direct impact of physical and spatial structures on the city's identity. Urban regeneration and strengthening of infrastructure enhance the resilience of the city against various challenges and improve the quality of life. Social and participatory variables highlight the importance of social interaction, citizen participation in decision-making, and cultural heritage preservation. Increasing public participation strengthens the sense of belonging and social sustainability. Environmental and infrastructural indicators emphasize the importance of environmental conservation, efficient infrastructure management, and enhancement of urban services — all contributing to public health and satisfaction.

Security and civil rights variables reflect the significance of protecting vulnerable groups and ensuring safety as essential components of livability. A secure environment and respect for social rights enhance citizen satisfaction. Economic and developmental indicators emphasize the role of urban economy in population retention and attracting investments, reinforcing urban vitality and prosperity.

In analyzing dual-role variables in the livability development system of District 1 of Semnan City, these variables reveal a close interconnection between urban services, the social environment, and transport infrastructure, functioning as an integrated and complex network. Any modification or reform in these variables can result in significant improvements in the livability of the area.

The dependent variables, located in the southeastern region of the diagram, can also be referred to as result variables. These variables exhibit high dependence on the system while having limited influence on other elements. In other words, these factors are highly affected by others without exerting much impact in return. In the direct analysis, the researcher can observe the output of variables located in the northwestern and southeastern areas (with weak to moderate levels of influence and dependence), whereas those in the northeastern and southwestern quadrants possess moderate to strong degrees of influence and dependence, playing a major role in the system.

- At the 10% level, only the strongest influences between variables are visible, emphasizing the system's direct and dominant relationships.
- At the 50% level, the diagram becomes more complex, showing medium-level effects and providing a comprehensive view of system interactions.
- At the 100% level, all connections among variables are displayed, including both strong and weak effects, revealing the complexity and interdependence of variables within the system.

This diagram helps researchers identify the main driving forces and secondary effects, providing a deeper understanding of the system's complexity and dynamic structure.

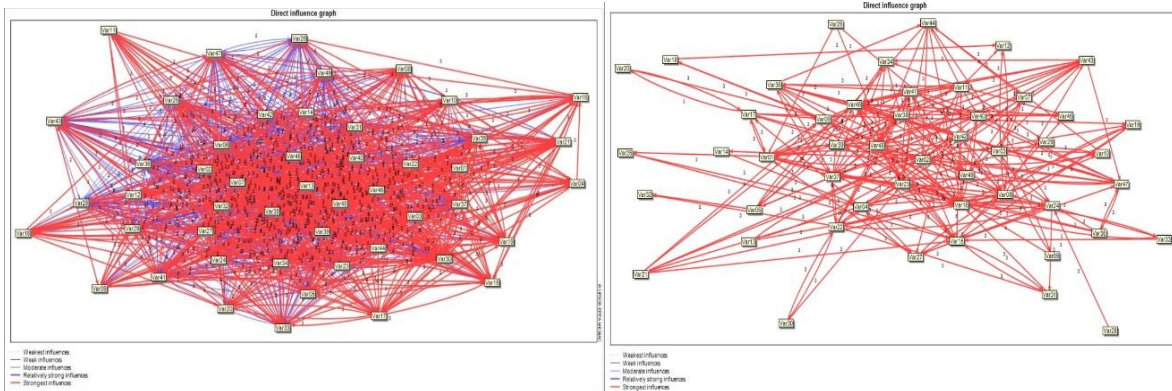


Figure 4. Right: Schematic diagram of interactions of urban livability factors in region one of Semnan city in the range of 10 percent (weak) and left in the range of 50 percent (strong)

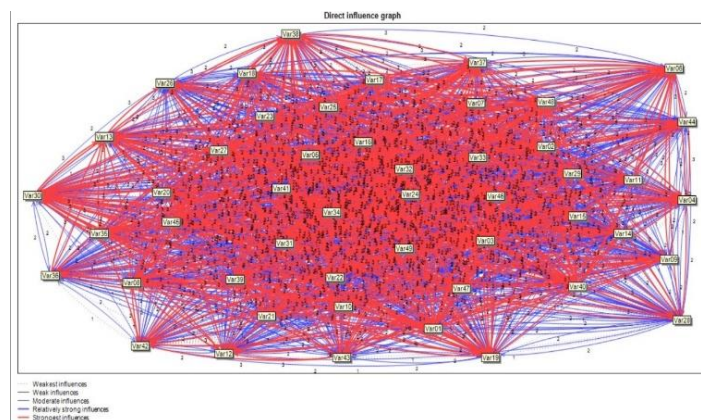


Figure 5. Schematic diagram of interactions of urban livability factors in a region of Semnan city in the range of 100 percent (relatively strong)

In this research, after analyzing the factors influencing the urban livability of Semnan City, ten key variables were identified as the most significant factors affecting the system. These variables were selected due to their high level of influence and vital role in shaping the overall structure of the system, serving as determinant indicators for future urban policymaking.

To formulate local policy scenarios, and considering the limitations of the Scenario Wizard software, experts and specialists were asked to select eight factors out of these ten indicators—those deemed most important for enhancing urban livability and practically implementable at the local level.

The selected factors are as follows:

- Regeneration of deteriorated urban fabrics and relocation of incompatible land uses (an actionable measure with a profound impact on improving the urban environment and enhancing livability in the city's old districts);
- Individual and social security of citizens and tourists (a fundamental requirement for increasing public satisfaction and attracting visitors);
- Access to major land uses affecting urban livability (improving access to services and infrastructure as one of the key determinants of citizens' welfare);
- Enjoyment of urban image, landscape, and aesthetic beauty (enhancing the city's appearance to strengthen citizens' sense of belonging and satisfaction while attracting visitors);
- Citizen participation and social cohesion in neighborhood affairs (promoting social solidarity and encouraging citizens' active involvement in urban management and decision-making);
- Appropriate architectural vision of urban neighborhoods and buildings (preserving and improving urban identity through context-sensitive architectural design and renovation);
- Urban branding with an emphasis on District 1 of Semnan (enhancing the city's identity and reputation to attract investors and tourists);
- Importance and position of tourism and cultural heritage sectors (strengthening local tourism as a source of income and employment creation).

These selections were based on expert surveys and specialized interviews, prioritizing factors that not only had high influence but also aligned closely with local needs and contextual conditions. The final selection reflects a focus on feasibility, resource constraints, and forward-looking policymaking for the sustainable development of District 1 in Semnan City.

After identifying the eight key components for scenario building, three possible states were defined for each component, resulting in a total of 24 potential scenarios. These states represented a spectrum of favorable, neutral, and critical conditions. Analysis of the scenario document using the Scenario Wizard software—based on spatial modeling of the possible futures of District 1's livability—showed that, out of 24 potential states, the software could identify high-consistency scenarios by reducing the overall complexity. Ultimately, six key scenarios were selected, including one favorable, two neutral, and three critical scenarios.

These scenarios reflect the realistic livability conditions in District 1 of Semnan and indicate what strategic measures are needed both to strengthen favorable conditions and to prevent the occurrence of critical situations.

The results also revealed that urban infrastructure development, enhancement of social participation, and improvement of public services are among the most crucial factors for promoting livability in District 1. Subsequently, a 24×24 scenario matrix was designed and analyzed to evaluate the interrelationships among these conditions. Experts were asked: *“If each of the 24 possible states occurs, what impact would it have on the occurrence or non-occurrence of the other states?”*

The collected data were entered into the Scenario Wizard software, which, through complex calculations, identified scenarios with high, medium, and low probabilities of occurrence. The main objective was to reduce millions of possible combinations into a manageable set of key, analyzable scenarios. Through its initial analysis, the software identified 260 strong, moderate, and weak scenarios. Following further evaluation, six highly consistent scenarios (compatibility score = 5) were selected as the most significant and representative.

These six scenarios collectively provide a comprehensive overview of the favorable, neutral, and critical livability conditions of District 1 in Semnan City, serving as a strategic framework for future urban planning and sustainable policy design.

Table 4. Analysis of Future Scenarios of Livability in District 1 of Semnan City Based on Spatial Patterns

Favorable Scenario	Neutral Scenarios	Critical Scenarios
<p>One Favorable Scenario: This scenario represents a condition in which all key factors are improved to an optimal level. In this state, monitoring and security technologies are enhanced, the city’s landscape and visual quality are revitalized, citizen participation reaches a desirable level, deteriorated urban fabrics are completely regenerated, access to urban services becomes equitable, the city is effectively branded, and tourism and cultural heritage flourish. Furthermore, the architectural identity of neighborhoods is strengthened with local and cultural characteristics. This favorable condition reflects an ideal and livable city for District 1 of Semnan.</p>	<p>Two Neutral Scenarios: These scenarios describe conditions in which some key factors have improved, but others have not experienced significant change. For instance, limited beautification efforts might be carried out in the urban landscape, or public services may only expand in specific areas. These conditions can indicate slow progress or partially successful policies.</p>	<p>Three Critical Scenarios: These scenarios represent situations in which key factors deteriorate into a critical state. For example, public surveillance and social security may decline while crime rates increase, deteriorated urban areas may be demolished, and access to public services may become severely restricted. The architectural identity of neighborhoods may also be lost, and visual disharmony may spread across the city. These scenarios call for urgent and strategic actions to prevent the emergence of crises. This analysis provides a foundation for strategic planning and urban management in District 1 of Semnan City.</p>

Based on the scenarios defined for the livability of Semnan city, the results of the interaction matrix analysis show that the component of recreating worn-out urban textures has the highest factor sum (influence) and the component of tourism and cultural heritage has the highest passive sum (influence). This analysis indicates the strategic importance of recreating worn-out textures as well as the sensitivity of tourism and cultural heritage to changes in other key factors. In addition to identifying compatible scenarios, the Scenario Wizard software also analyzed the role of assumptions (descriptors) in terms of the effectiveness or effectiveness of an assumption in the payment system and studied a network of the system under the title (Analyze-System-Grid). The key results of the analysis of the future livability of Semnan City Region 1 based on spatial patterns include the highest impact (active): Recreating worn-out textures, the highest impact (passive): Tourism and cultural heritage, the lowest impact (active): Cityscape and landscape, and the lowest impact (passive): Architectural landscape of neighborhoods.

The study of strong scenarios shows that there are 6 scenarios with very high scores and higher probability of occurrence, among which one scenario is favorable and promising conditions, another scenario is neutral conditions and the status quo, and the last scenario is related to critical conditions.

Table .5 Analysis of Strong Scenarios in Scenario Wizard Software (Scenario 1) for the Future Livability of District 1 of Semnan City Based on Spatial Patterns

Scenario 1: Key Factors	Possible Scenarios
A: Personal and Social Security	A1: Enhancement of monitoring systems and security technologies
B: Urban Landscape and Visual Image	B1: Beautification and development of green spaces
C: Citizen Participation	C1: Establishment of local councils and active participation
D: Regeneration of Deteriorated Urban Fabrics	D1: Complete rehabilitation and improved livability
E: Access to Major Land Uses	E1: Equitable access to urban services
F: Urban Branding	F1: Promoting district identity and attracting investment
G: Tourism and Cultural Heritage	G1: Constructive, deep, and multidimensional engagement between citizens and officials
H: Neighborhood Architectural Vision	H1: Architecture aligned with local identity

According to the strong scenarios, in the first scenario, all situations are desirable, in the second scenario, all possible situations are neutral with an emphasis on the continuation of the current trend, and the third scenario emphasizes the deterioration of social security conditions and critical conditions. Figure 6 shows a schematic image of the top scenarios based on desirability, neutrality, and criticality.

Scenario No. 1	Scenario No. 2	Scenario No. 3	Scenario No. 4	Scenario No. 5	Scenario No. 6
A1	A2	A3		A2	A3
B1	B2		B3		
C1	C2			C3	
D1	D2			D3	
E1	E2				E3
F1	F2				F3
G1	G2		G3		
H1	H		H		

Figure 6. Color spectrum and desirability of scenarios with high compatibility (credible) in the future livability of Semnan City Region 1 based on spatial patterns

5- Discussion and Conclusion

This study aimed to identify and analyze the key factors influencing urban livability in District 1 of Semnan City and to propose strategies for its improvement. The content analysis approach revealed that livability, as a multidimensional concept, encompasses aspects such as social equity, environmental sustainability, social cohesion, and spatial design. The results of structural analyses conducted using the MICMAC software confirmed that these dimensions can directly or indirectly affect citizens' quality of life.

The findings clearly demonstrated that elements of social sustainability, including citizen participation and equitable access to urban services, have a direct impact on enhancing livability. For example, urban regeneration, neighborhood infrastructure renewal, citizen participation, and urban branding, identified as key influential factors in this study, align with the principles of urban sustainability by reducing spatial inequalities and improving the quality of the urban environment. These factors foster new urban spaces and enhance environmental quality, contributing to spatial equity and social justice. Such results are consistent with the school of sustainable urban development theory, which emphasizes justice, equality, and environmental balance.

Regarding cultural cohesion, the results underscored that tourism and cultural heritage, in relation to urban aesthetics and architectural vision, help preserve cultural identity and strengthen social interactions. These findings correspond to the culture-based theoretical perspective, which stresses the significance of cultural identity and local heritage in livability enhancement.

The study further found that key factors such as urban branding and visual character are strongly influenced by managerial decisions and economic investments. This relationship highlights the role of macro-level policies and governance decisions in shaping urban livability. For instance, regeneration policies implemented in urban neighborhoods have aimed to reduce spatial disparities, aligning with the political economy of space theory, which explains how economic and political structures influence the configuration and livability of urban spaces.

MICMAC interaction analysis revealed that urban livability constitutes a complex and dynamic system in which various factors interact both directly and indirectly. For example, urban regeneration not only enhances social security but also indirectly improves neighborhood architectural quality and tourism attractiveness. This finding aligns with the systems theory approach, which views cities as interconnected and adaptive systems.

Across the main dimensions of livability, including environmental sustainability, social equity, economic quality, and cultural cohesion, the results indicated differentiated influences within District 1 of Semnan. Specifically, social equity was linked to citizen participation and access to services, highlighting the importance of distributive policies for improving livability. The study found that the local culture and social structures of the region facilitate citizen participation and strengthen social cohesion through community engagement and place attachment. These findings are in harmony with the social justice school of thought.

In the environmental sustainability dimension, results indicated that urban regeneration and visual aesthetics can substantially improve the urban environment, consistent with the environmental justice perspective, which emphasizes ecological harmony and sustainable urban design. For example, creating

green spaces and designing architectural landscapes consistent with local identity can significantly enhance livability.

The findings also showed that economic policies, particularly those related to investment attraction and city branding, play a crucial role in improving livability. Urban branding, for instance, can elevate the economic position of District 1 and stimulate local development, a result aligned with urban economic theory. The influence of national policies on the livability of the district should also be acknowledged. National programs such as public housing initiatives and public transportation development directly affect resource distribution and livability improvement. For example, housing and neighborhood regeneration programs demonstrate the interaction between national and local policy frameworks, reflecting the political economy of space and the National Urban Regeneration Strategy.

Access to urban services, directly linked to social justice, emerged as another critical factor. The study revealed that inequitable distribution of urban services in District 1 has led to citizen dissatisfaction, particularly in neighborhoods with limited access to health and educational facilities. This supports the spatial justice perspective, emphasizing equal access to resources as a fundamental element of livability. Establishing health and educational infrastructure in underserved areas can help reduce inequalities and improve quality of life, aligning with both the social justice and sustainable development theories.

Finally, the study highlighted the potential of digital technologies, including artificial intelligence (AI), metaverse applications, and geographic information systems (GIS), to enable precise data collection and evidence-based decision-making. These technologies can play a transformative role in managing urban regeneration, improving service delivery, and enhancing citizen participation. This aligns with the smart urbanism paradigm, which emphasizes the importance of technological infrastructure for improving livability and overall quality of life.

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