Evaluating the Quality of Life in the Suburban Context based on the Environmental Indicators: A Case Study of Southwest Elevations of Mashhad city

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ABSTRACT
In recent years, the concept of quality of life has attracted the attention of many urban planners and managers, as nowadays a low quality of life is observed in many cities in Iran, especially in the suburbs. Sociologists explain the definition of people living on the periphery of cities as follows: Peripheral residents generally include those who live in the city but do not use the city's facilities and services as citizens. Although these people live in the heart or on the outskirts of the city, they retain their rural culture while considering themselves urban dwellers. Quality of life is one of the most fundamental areas of urban research around the world and includes components such as social, environmental and economic components. The category of quality of life is of great importance, especially in marginalized communities living in unstable physical and environmental conditions due to lack of facilities, economic poverty and many constraints on the outskirts of big cities. Since the quality of life is closely related to the environment and people's lives, and the deterioration of environmental quality directly affects the quality of life, this study aims to assess the quality of life through environmental indicators in the marginalized areas in the south-western highlands of Mashhad City and make suggestions to improve the quality of life in this marginal neighborhood near the metropolis of Mashhad by assessing the influential indicators in the environmental system. It is an applied research and a quantitative and documentary research method has been employed. The research data is collected through field methods (observation and questionnaire), and the questionnaire was analyzed by factor analysis and one-sample T test which were performed by SPSS software environment. It should be noted that the research strategies were formulated based on the matrix of internal and external factors. The results show that conservative strategies are the best alternative to improve the quality of life in worn-out marginalized areas, because the application of these strategies protects the marginalized community from risky situations, so the greatest strengths are in the area of maximum efficiency.

Keywords: *Southwest elevations of Mashhad City, suburban context, environmental indicators, quality of life*

1. Introduction

Quality of life has been discussed in recent decades in a number of disciplines such as psychology, sociology, medicine, economics and environmental science. Quality of life can be interpreted according to human needs and elements of the environment in which a person lives, such as air and cleanliness, as well as individual elements such as health and education [16]. Quality of life encompasses environmental, social, physical, economic and psychological well-being. Quality of life focuses on social indicators, civic quality of life, quality of communication and psychological indicators, as well as all subcategories of health care in urban planning [24]. Quality of life is inextricably linked to the concept of sustainability, as sustainable development is a prerequisite for good living conditions for current and future generations [7]. The quality of life and sustainable development of urban areas and informal

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settlements depend on their successful management, as both are common goals in cities around the world. Quality of life is a broad concept assessed through a variety of factors, from living conditions to employment to life experience, and is usually represented by a range of indicators such as income, deprivation, education, employment rate, life expectancy, air quality, etc. [28]. The quality of the urban environment is one of the most important dimensions of quality of life, which focuses more on the physical and natural environment [18]. The quality of urban environment is a complex and multidimensional concept that depends on human and some natural factors. This concept consists of the influence of various and interrelated factors, including heat islands, the distribution of vegetation, the density of buildings and their form, air pollution and social conditions [23]. The study of the quality of life and environment in worn-out urban structures is of great importance. This is because these neighbourhoods have fallen behind in the flow of development compared to other neighbourhoods, have become disconnected from the evolutionary cycle of life and have become the focus of problems and inadequacies [26] Population density and spatial-physical growth in informal settlements from different economic and social backgrounds make living conditions in this part of the city difficult [27]. The areas have suffered from physical and functional fatigue and lack of attention and maintenance over time. Socio-cultural, economic, physical and environmental issues are among the problems in these areas [30]. The city of Mashhad in Iran, like other metropolitan cities in the country, encompasses a large population living in informal settlements. These areas are physically and functionally depleted and have low quality of life and environment. The main problem of this study is that the quality of life in informal settlements, often located on the outskirts of the city, has declined due to lack of attention to environmental and other issues. This leads to many problems in the not too distant future due to physical fatigue [10], pollution [23], lack of some services per capita, low permeability, presence of incompatible uses [1], reduction in social security [20], etc. Based on the above reasons, the aim of the study is to assess the quality of life in informal settlements using environmental indicators in a case study in the southwestern heights of Mashhad city.

2. Literature Review

So far, various studies have been conducted on the quality of life in worn-out and informal settlements, which are briefly discussed below.

[10], in their study titled "Analysis and evaluation of the quality of life in urban's dilapidated housing (Case study: District 15 of Tehran)", used the descriptive-analytical method and a survey to investigate the quality of life in the 15th district of Tehran. The results of the study show that in today's world, quality of life has become a well-known criterion for measuring the status and ranking of cities, as well as for recognising the best cities in the world, both in terms of publicity and in practical terms (for investors, immigrants, etc.).

[2] in their article titled "Investigating the Effect of Improving the Urban Fabric Texture on the Quality of Urban Life in Naranjbagh Neighbourhood of Nek City in Mazanderan Province" investigated the effect of improving the worn-out urban fabric on urban life by ranking the influencing factors using fuzzy dimensional and fuzzy Victor techniques. The results of the study show that the improvement of the worn-out urban fabric is directly related to and affects the quality of urban life of the citizens.

[19] in their study "Evaluation of quality of city life because of citizen (Case study: Amol city)" examined the indicators of quality of life in the dilapidated fabric of Amol city and compared the results with each other and analysed the socio-economic factors on the quality of life of citizens using T-test in SPSS software. The results of this research showed that the most helpful solution to increase the quality of life in Amol town is to renovate and improve the old building fabric which is regarded as the cultural and economic heart of the town.

[20] in their study titled "Investigation about the Factors of Life Quality Affecting Resident's Satisfaction in Informal Settlements (Case Study: Farahzad-Tehran, North Farahzad)" examined the effective indicators in this regard. Among the methods used in this study, multiple regression was employed ranging from Cronbach's alpha to determining validity via eye validity. The results showed that some disturbances in the physical, social, economic and environmental dimensions reduced the standard of living of the residents.

The word "quality" stands for the conditions and the way of living. On the one hand, quality of life is a multi-faceted and relative concept, influenced

by time, place and individual and social values, and has objective and external dimensions. On the other hand, it is also influenced by mental and internal dimensions [10]. The concept of quality of life refers either to the environmental conditions in which people live (e.g. air and water pollution or inadequate housing) or to certain characteristics of people (e.g. health or level of education). However, the subjective dimension of people's evaluation of life or its specific aspects should be added to this theme [12]. The importance of the quality of urban life is to take into account social, cultural, environmental and psychological indicators, both objectively and subjectively, when planning the quality of urban life. In addition to the clear and objective measurement of the indicators, the mentality and the way citizens view these indicators should also be taken into account. The essence of the quality of urban life is the simultaneous satisfaction of people's material and spiritual needs. Planning for housing, work and employment is incomplete if the psychological, emotional and social needs of citizens, such as the need for security, peace of mind, beauty, social belonging, happiness, recreation, etc., are not also taken into account [31].

Environmental, economic, social, political, health, personal safety, educational, transport, housing and other urban services are the most important factors. When these criteria are adequately addressed in the structure of city management, a healthy and quality city can be provided for citizens [3]. The environment is the space that surrounds and interacts with the living process. The environment is created by nature and human societies. Spaces created by human thought and human hands cover the entire living space on the planet. [6]. The environment refers to a space on which human beings and their lives and activities are directly and indirectly dependent on each other. Therefore, the man-made environment, including buildings, historical monuments, landscapes and perspectives, must be protected from harm as a part of the environment [4]. On the other hand, quality of life is a complex and multidimensional concept that includes social, economic, environmental and physical dimensions. The quality of the urban environment is one of the most important dimensions of quality of life, which focuses more on the physical and natural environment [18].

Since improving the environmental conditions of urban life is one of the most important goals of any society, many studies have been conducted in this field. In some of them, one or more parameters have been discussed to assess the quality of urban environment, e.g. studies on urban green spaces [14], air quality [8] and noise pollution [17]. To inspect the environment, it is necessary to pay attention to its quality. The quality of the urban environment is complex and multidimensional. It consists of the influence of various and interrelated factors, including heat islands, the distribution of vegetation, the density of buildings and their shape, air pollution and social conditions [23]. The quality of the environment is synonymous with basic human needs, and there is a close relationship between quality of life and the environment. The quality of the environment has a direct impact on health and well-being, and people's lives are strongly influenced by their environment [5].

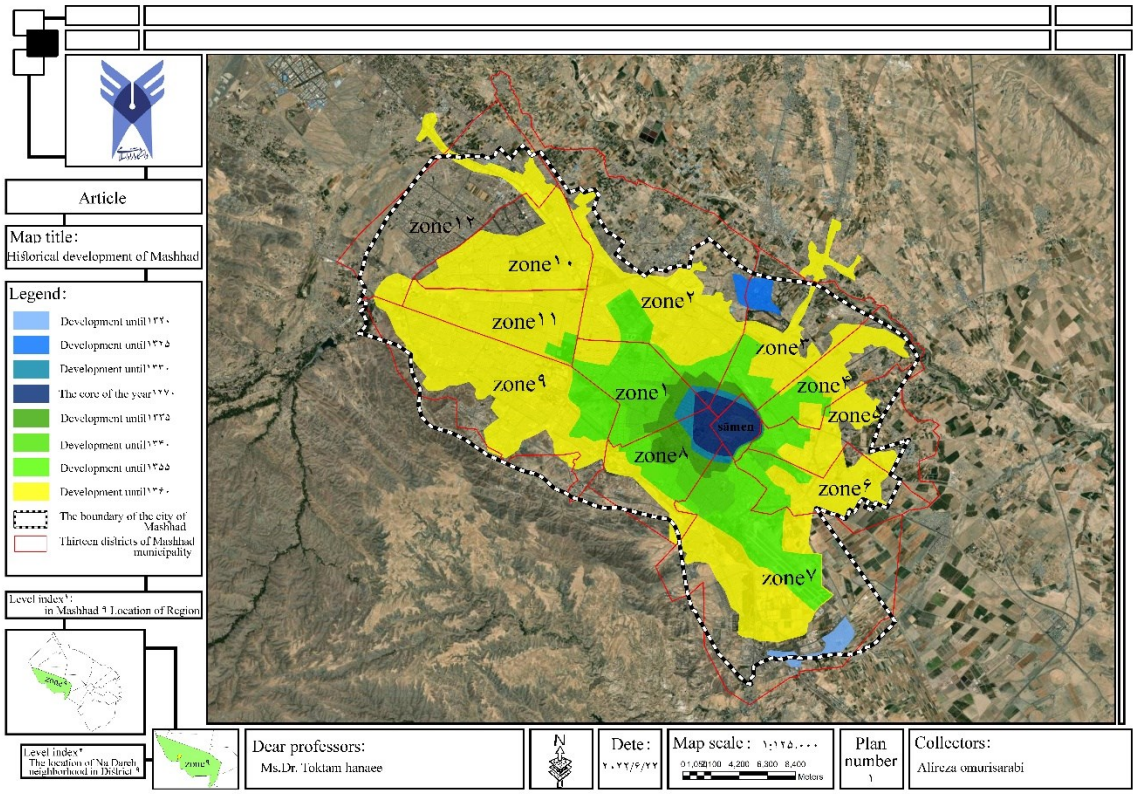
Table 1 presents the definitions of quality of life and its indicators in different dimensions, especially the environment, from different perspectives:

Table 1. Definitions of Quality of Life in Terms of Different Perspectives and Indicators Affecting It (Source: Author, 2022)

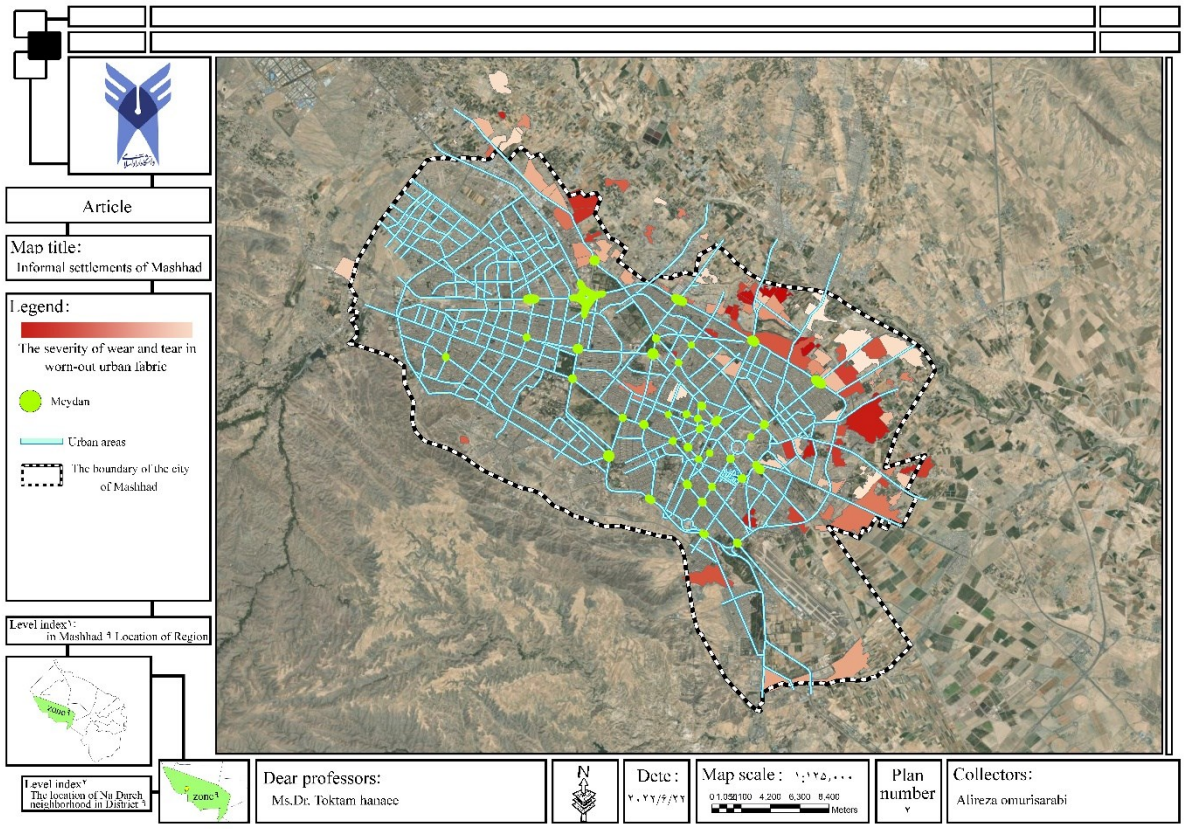
Author	Viewpoint	Indicators
Hassan et al. (2022)	Quality of life can be defined according to human needs and the environmental elements in which a person lives, such as air pollution, health, housing, etc.	Reduction of pollution, protection of water and soil resources, social participation, cultural and social life, recycling
Boraita et al. (2022)	Quality of life is influenced by physical factors such as pollution, environmental conditions, limited access to nature, public spaces and population density, as well as social factors such as fast pace of life, stress and social isolation.	Economic status, leisure activities, health, participation and social support
Goerlich and Reig (2021)	Quality of life is often combined with the terms well-being, personal life satisfaction, housing satisfaction, urban sustainability and happiness.	Employment rate, safety, participation rate, access to services, green and open spaces and health
Wiesli et al. (2021)	Quality of life is associated with concepts such as life satisfaction, happiness, health and sustainable well-being.	Social relations, social justice, healthy environment, health, leisure activities, sustainable job security
Mouratidis (2021)	Mental health is a reliable and scientific way to measure quality of life trends.	Recreational activities, social participation, job security, public health
Battis-Schinker et al. (2021)	Quality of life is linked to the concept of sustainability, because sustainable development is a prerequisite for achieving good living conditions for current and future generations	Job security, urban living conditions, favorable environment, transportation services and infrastructure
Nikoofam and Mobaraki (2020)	Quality of life encompasses environmental, social, physical and economic well-being. This refers to social indicators, civic quality of life and all subcategories of health in urban planning.	Job security, social health, environmental quality, social participation, social relations, liveliness
Shaterian et al. (2020)	Social dimensions of quality of life: satisfaction, happiness and security. Ecological dimensions: Housing, access to services and ecological security.	Social trust, social satisfaction, physical quality, environmental quality, and health
Aghili et al. (2019)	Five main areas of quality of life: general well-being, interpersonal relationships, organisational activities, occupational activities and leisure and recreational activities	Social relations, social participation, job security, health and hygiene, and recreational activities
Veysi Nab and Babaei aghdam (2018)	Failure to identify the factors that affect people's quality of life in various spheres has led to a decline in individual life satisfaction and, in the next step, society loses its productive and capable human resources over time.	Social trust, social participation, security, recreational opportunities and a favourable environment
Khademi and Jokar Sarhangi (2018)	The quality of urban life is the social, physical, spatial and economic condition of the urban environment, which shows the degree of satisfaction or dissatisfaction of citizens with the urban environment.	Social quality (civic and social participation, safety), environmental quality (access to services, state of the environment)

Worn-out urban fabric is one of the various types of vulnerable urban areas that has low environmental and economic value due to physical fatigue, inadequate vehicular access and service facilities, and inefficient urban infrastructure [2]. Nowadays, worn-out urban fabrics, which are outside urban life and have become problematic parts of cities due to specific problems, form significant parts of cities in Iran [25]. One of the most critical problems related to urban spaces is fatigue, which causes disorganisation, imbalance and disproportionality. This lays the foundation for the erasure of collective memories, the decline of eventful urban life and the shaping of daily urban life [15]. Dilapidated urban areas are the places that have lagged behind the flow of development, have been disconnected from the evolutionary cycle of life, and have become the focus of problems and inadequacies compared to other urban areas [26]. The areas have suffered from physical and functional fatigue and lack of attention and maintenance over time. Socio-cultural, economic, physical and environmental issues are among the problems in these areas [30]. Meanwhile, with the growth of urbanisation, new neighbourhoods with modern indicators have emerged. The significance of this issue is that with the change in lifestyle, the presence of modern elements and urban lifestyle has increased [22]. The characteristics of informal settlements can be studied in various dimensions, one of which is the socio-cultural dimension, including unauthorised residence, high rents, unconventional composition, prevalence of addiction and various behavioural anomalies, crime and insecurity, especially for children and women [30]. One or more methods can be used as an intervention strategy to address urban decay, at the outset and after the problems and causes have been identified. For example, as part of the organised approach to managing and controlling development, it is necessary to produce guidance documents [11].

Maps 1 and 2 show the historical development of Mashhad and the informal settlements of the city.



Map 1. Historical Development of Mashhad (Source: Author, 2022)



Map 2. Informal Settlements of Mashhad (Source: Author, 2022)

By taking into account the questions raised about quality of life, the environment and informal settlements, the theoretical framework of the study is presented in Figure 1:

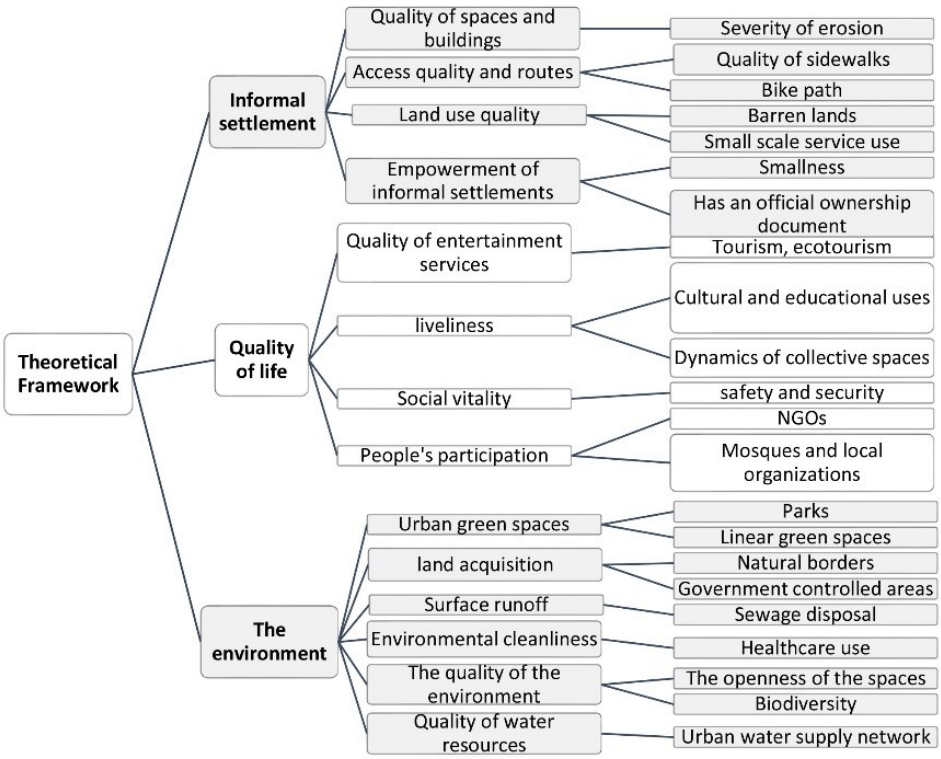


Figure 1. Theoretical Framework (Source: Author, 2022)

Methodology

The research is an applied research with quantitative, documentary and library-based methods. Data collection is done through field methods including observation and questionnaire. The questionnaire consists of Likert-type questions with five choices based on the indicators from the theoretical framework. To measure the validity and reliability of the questions in the questionnaire, the Cronbach's alpha was measured. To analyse the questions of the questionnaire with SPSS software, factor analysis and one-sample T test method are used. In the following, the research strategies and their prioritisation are presented by the matrix of internal and external factors (IE) and the quantitative strategic planning matrix (QSPM). The instrument used to collect the research indicators is shown in Table 2.

Table 2. Indicators Compiling Tools

Criteria	Indicators	Data collection tools
Informal settlements	Quality of spaces and buildings, quality of paths, quality of land use, strengthening informal settlements	Library documents, ArcGIS software, field observations and questionnaires
Quality of life	Quality of entertainment, liveliness, social vitality, citizen participation	Field observations and questionnaires
The environment	Urban green spaces, land acquisition, Surface drainage, environmental cleanliness, environmental quality, quality of water resources	Library documents, ArcGIS software, field observations and questionnaires

One of the methods of measuring reliability in structural equation modelling is the internal consistency of the measurement models, which indicates the degree of correlation between the structure and the associated indicators. A high internal consistency results from the high value of the variance expressed between the structure and its indicators compared to the measurement error of the individual indicators. A value of Cronbach's alpha greater than 0.7 is an acceptable indicator of reliability. In the case of variables with a small number of questions, some researchers have adopted the value 0.6 as the cut-off value for the Cronbach's alpha coefficient.

Table 3 shows the Cronbach's alpha coefficients for the research components.

Table 3. Cronbach's Alpha Coefficients and Composite Reliability of Research Components (Source: Author, 2022)

Composite Reliability		Cronbachs Alpha	
0.862032	Informal settlement	0.785636	Informal settlement
0.822913	The environment	0.740225	The environment
0.828013	Quality of life	0.723007	Quality of life

Since Cronbach's alpha is a traditional criterion for determining the reliability of structures, the PLS method is a more modern criterion than alpha, which is used under the name of composite reliability. The superiority of the PLS method over Cronbach's alpha lies in the fact that the reliability of the structures is not calculated in absolute terms, but on the basis of the correlation of the structures with each other. To measure the reliability of the PLS method, both criteria are therefore used. The combined reliability value of the structure is derived from a ratio. This derivation is the variance between a structure and its indicators plus the amount of measurement error. If the value of CR for any construct is higher than 0.7, this indicates internal stability appropriate for the measurement model. A value of less than 0.6 means that reliability is not present. Table 3 shows the composite reliability of the research components.

Research Findings

The aim of the study is to assess the quality of life in informal settlements using environmental indicators in a case study in the southwestern heights of Mashhad city. First, the theoretical literature was compiled in accordance with the key words of the research (informal settlements, quality of life and environment). After presenting the theoretical framework, the research indicators were studied using a questionnaire. Data analysis was based on factor analysis techniques and T-tests in SPSS software. After investigation and measurement of the research components in a standardised and meaningful way, this section, using the method SWOT to survey the status quo, creates the QSPM matrix to prioritise the strategies.

By determining the effective indicators for improving the quality of life of the residents of Noh Dareh neighbourhood by studying the strengths, weaknesses, opportunities and threats, the best strategic option resulting from the QSPM matrix is presented to implement these indicators in the area. In this case, the strengths, weaknesses, threats and opportunities were examined in the area under study. The assessment of the internal and external components affecting the quality of life in the worn-out city was based on environmental indicators. The corresponding calculations helped to identify the most important and effective strategies in the study.

When examining the internal factors (strength-weakness), a number between zero and one should be assigned in the weighting column, and finally the sum of these weights should be one. In the second column of the table, a range between 3 and 4 is considered depending on the role of the object and its location in the current state of the building. In addition, the numbers 1 and 2 are given for strengths and weaknesses, respectively. In the last column, a weighted score is determined by multiplying the weights of the elements in that role. If the final score is more than 2.5, the strengths have overcome the weaknesses, and if it is less than 2.5, the weaknesses have overcome the strengths. Table 4-2 shows this.

Table 4. Representation of the Research Strategies Using the SWOT Matrix

Threats (T)	**Opportunities (O)**	**Informal settlement**
T1. Inhomogeneity of facade materials in neighboring residential areas T2. Extensive destruction in the event of an earthquake due to the neighborhood's location in an area of high seismic risk T3. The misfortune of accepting most of the extent of illegal construction in the foothills	O1. The presence of open and large plots of land in the neighborhood O2. An opportunity for new development through the use of dilapidated and unsustainable buildings O3. Utilizing the slope of the site to create sidewalks that are attractive to tourists	
Conservative adaptive strategy (ST)	**Offensive strategy (SO)**	**Strengths (S)**
S1.T1. Establishment of building standards for residential facades S2.T2.T3. Compilation of building standards for the surroundings of elevated sites	S1.O2. Creation of new constructions in dilapidated buildings S2.O1. Creation of green and open spaces in conjunction with the natural elements of the area S2.O3. Creation of hiking trails in the elevated areas	S1. Predominance of the residential area over other areas S2. Overview of heights and natural elements
Defensive strategy (WT)	**Opportunistic strategy (WO)**	**Weaknesses (W)**

T1.W7. Establishment of building standards for residential facades T3.W6. Increased safety in fabric	O 1.W2.W3.W5 Reinforcement of footpaths O1.W9. Merging barren parts to create activity sites O2.O3.W8. Facilitate the acquisition of property and strengthen the building fabric	W1. Presence of aimless and irregular enclosures W2. Unfavourable condition of the sidewalks W3. Dominance of horse and foot W4. Small width of the passages W5. Discontinuity of the sidewalks in some areas W6. The presence of blind corners and hidden corners in wastelands W7. Inconsistency of facade materials in public areas W8. The fact that most of the land is promise W9. Relatively extreme smallness of the boards

Threats (T)	**Opportunities (O)**	**Quality of life**
T1. The increase in the number of criminals due to the number of unsafe places in the neighborhood (the place behind the school) T2. The risk of reducing the presence of people at night, because half of the windows are inactive at night	O1. The potential of high dwell time to increase feelings of participation and promote social interactions O2. Strengthening commercial uses on Shaghaig Street to increase vitality O3. Creating social activities to increase presence and vibrancy O4. Wide view of the city from the heights of Khurshid Park as a tourist attraction O5. The possibility of creating recreational spaces in barren lands O6. The possibility of improving the presence of citizens in Haft Tir through better access O7. Utilising and strengthening view corridors to increase visitation	
Conservative adaptive strategy (ST)	**Offensive strategy (SO)**	**Strengths (S)**
S1.T1.T2. Strengthening safety and security in the area S3.T2. Strengthening social trust	S1.O2.O3.O6. Increase vitality and presence S1.O4. Strengthen the vision of the area S3.O1. Strengthening the sense of belonging and social participation	S1. The existence of such elements as houses, mountains, mosques, schools, etc., as skeletons in the minds of men S2. Absence of class and ideological differences in the general population of the neighborhood S3. Relative knowledge of neighbors due to the long residential history
Defensive strategy (WT)	**Opportunistic strategy (WO)**	**Weaknesses (W)**
T1.W6. Elimination of crime hotspots	O2.W1. Increasing vitality O2.O6.W1. Mixing of uses	W1. Lack of diversity of use in the neighborhood W2. Decreased security at night, as some windows

T1.T2.W2.W4. Creation of a life around the clock	O2.O3.W3.W5. Creating gathering places for activities to increase social participation	are inactive W3. Low social participation W4. Lack of security in some places due to lack of lighting W5. The absence of numerous and diverse social groups and the lack of formation of diverse communities within the neighborhood W6. Presence of bitter memories of some places in the minds of residents (places where drug addicts, unscrupulous people, thugs, and hoodlums gather)

Threats (T)	**Opportunities (O)**	**The environment**
T1. Threat of loss of natural identity if buildings are not controlled T2. The threat to pedestrians from the dominance of vehicles	O1. Establishing building rules and regulations and apply them to improve the appearance of the neighborhood O2. Promoting social activities by strengthening green spaces O3. Reducing aristocracy through greening	
Conservative adaptive strategy(ST)	**Offensive strategy (SO)**	**Strengths (S)**
S1.S4.T1. Elaboration of building regulations in the highlands S2.T1. Elimination of illegally developed land in the privacy of natural elements S5.T2. Reinforcement of pedestrian accesses	S1.S2.S4.S5.O2. Creation of green and open spaces near heights S1.S2.S4.O1. Strengthening the view and vista of the heights S4.O1. Establishment of building regulations in the heights	S1. The presence of a prominent element, such as a mountain, in the background of the neighborhood S2. The presence of an unforgettable view of nature S3. Adaptation to the natural environment S4. The presence of the natural element of the southern highlands as a sign S5. Quick and easy access to the highlands
Defensive strategy (WT)	**Opportunistic strategy (WO)**	**Weaknesses (W)**
T1.W5.W6. Creating construction rules in the privacy of natural elements T1.W2.W3. Strengthening the natural elements in the neighbourhood	O1.W5.W6. Creating construction rules in the privacy of natural elements O2.W3. Creating green and open spaces	W1. Location of the neighborhood in an area of high risk for natural hazards W2. Lack of maintenance of plantings by residents W3. Lack of targeted use of vegetation as an indicator of strategic vantage points W4. Improper condition of surface water disposal and problems related to wastes W5. Non-compliance with regulations and construction works in Harim Kal W6. Non-compliance with data protection and construction regulations on the fault

Selection of Acceptable Research Strategies

The following tables list the strategies selected for the research components based on the analysis of SWOT.

Table 4-1. Selection of Acceptable Research Strategies (Source: Author, 2022)

Component	Strategy
Informal settlement	Reinforcement of the footpaths Creation of new constructions in dilapidated buildings
Quality of life	Increased security in the fabric Increasing vitality and presence

The environment	Strengthening the sense of belonging and sociability Mixing of uses and design of daily life Creation of green and open spaces near heights Strengthening views and vistas of the heights Establishing building regulations in the highlands

Table 4-2. Analysis of Internal and External Factors (Source: Author, 2022)

Informal settlement			
Internal strategic factors (strengths and weaknesses)	**Importance factor**	**Rank**	**Score**
S1. Predominance of the residential area over other areas	0.08	4	0.32
S2. Overlooking the heights and natural elements	0.02	3	0.06
W1. Irregular spatial confinement	0.09	2	0.18
W2. Unfavorability of the sidewalks	0.18	2	0.36
W3. Dominance of vehicles over pedestrians	0.09	2	0.18
W4. Low width of passages	0.15	2	0.3
W5. Discontinuity of sidewalks in some areas	0.08	2	0.16
W6. Blind spots and hidden corners in vacant lands	0.08	2	0.16
W7. Inconsistency of facade materials in public spaces	0.07	1	0.07
W8. Promissory note of most of the lands	0.06	2	0.12
W9. Relatively extreme smallness of the buildings of the neighborhood	0.1	2	0.2
Total	**1**		**2.11**
External strategic factors (opportunities and threats)	**Importance factor**	**Rank**	**Score**
O1. Open and large lands in the neighborhood	0.19	3	0.57
O2. An opportunity for new development by changes in dilapidated and unsustainable buildings	0.23	4	0.92
O3. Using the slope in the neighborhood to create tourist-attractive sidewalks	0.22	4	0.88
T1. Heterogeneity in facade materials in neighboring residential areas	0.12	2	0.24
T2. Extensive destruction in the event of an earthquake due to the location of the neighborhood in the area of high earthquake risk	0.13	2	0.26
T3. The risk of increasing accidents in the area with illegal constructions in the foothills	0.11	2	0.22
Total	**1**		**3.09**
Quality of life			
Internal strategic factors (strengths and weaknesses)	**Importance factor**	**Rank**	**Score**
S1. The presence of elements such as mountains, mosques, schools, etc. as signs in people's minds	0.31	4	1.24
S2. The lack of class and ideological differences among the general population of the neighborhood	0.19	3	0.57

S3. Relative familiarity with the neighbors due to the long history of residence	0.16	3	0.48
W1. The lack of variety of uses throughout the neighborhood	0.08	2	0.16
W2. Reduced security at night due to some windows being inactive	0.06	2	0.12
W3. Low social participation	0.04	2	0.08
W4. Lack of security in some places due to lack of lighting	0.08	2	0.16
W5. The absence of multiple social groups and the lack of formation of diverse communities within the neighborhood	0.05	1	0.05
W6. Unpleasant memories of some places in the residents' mind (the gathering place of drug addicts and thiefs)	0.03	1	0.03
Total	**1**		**2.89**
External strategic factors (opportunities and threats)	**Importance factor**	**Rank**	**Score**
O1. The potential of high dwell time to enhance sense of participation and social interactions	0.15	4	0.6
O2. Strengthening commercial uses on the side of Shaghayegh Street, an opportunity to increase vitality	0.14	4	0.56
O3. Creating social activities and competitions in order to increase attendance and vitality	0.14	4	0.56
O4. A wide view of the city landscape from the heights of Khurshid Park as a tourist attraction	0.1	4	0.4
O5. The possibility of creating recreational spaces in barren lands	0.14	4	0.56
O6. The opportunity to improve the presence of citizens on Hafte-Tir Street by strengthening accesses	0.09	3	0.27
O7. Using visual corridors and strengthening them to increase attendance	0.13	4	0.52
T1. The increase in the number of criminals due to the number of unsafe spaces in the neighborhood (the space behind the school)	0.05	1	0.05
T2. The threat of reducing the presence of people at night due to the lack of daily life	0.06	2	0.12
Total	**1**		**3.64**
The environment			
Internal strategic factors (strengths and weaknesses)	**Importance factor**	**Rank**	**Score**
S1. The presence of a prominent element such as a mountain in the background of the neighborhood	0.14	4	0.56
S2. The existence of lasting perspectives to nature	0.15	4	0.6
S3. Adaptation to the natural environment	0.11	3	0.33
S4. The presence of the natural element of the southern mountains as a sign	0.1	3	0.3
S5. Quick and easy access to heights	0.16	4	0.64
W1. Placement of the neighborhood in the high risk area toward natural hazards	0.07	2	0.14
W2. Damage and lack of proper care of neighborhood plants by residents	0.06	2	0.12
W3. Lack of purposeful use of vegetation to indicate strategic viewpoints	0.07	2	0.14

W4. Improper condition of surface water disposal and problems related to waste	0.04	1	0.04
W5. Failure to comply with construction regulations	0.07	2	0.14
W6. Failure to comply with construction regulations in earthquake-prone areas	0.03	1	0.03
Total	**1**		**3.04**
External strategic factors (opportunities and threats)	**Importance factor**	**Rank**	**Score**
O1. Providing construction rules and applying them to improve the appearance of the neighborhood	0.37	4	1.48
O2. Encouraging social activities through strengthening green spaces	0.23	3	0.69
O3. Reducing visibility by using vegetation	0.22	3	0.66
T1. The threat of loss of natural identity due to the lack of construction control	0.09	2	0.18
T2. The threat of reducing pedestrians due to the dominance of vehicles	0.09	2	0.18
Total	**1**		**3.19**

When checking and completing the external factors (opportunity-threat), a number between zero and one should be assigned in the weighting column, and finally the sum of these weightings should add up to one. In the second column of the table, the range between 3 and 4 is considered depending on the role of the property and its situation in the current state of the building. In addition, numbers 1 and 2 are given for the opportunity and threat, respectively. In the last column, a weighted score is determined by multiplying the weights of the elements in that role. If the final score is more than 2.5, the opportunities have overcome the threats, and if it is less than 2.5, this characteristic is the opposite. According to Table 4, the score of the internal factors is 2.35, which indicates the superiority of weaknesses over strengths; for the external factors, the number 2.86 indicates the superiority of threats over opportunities. Figure 2 shows this.

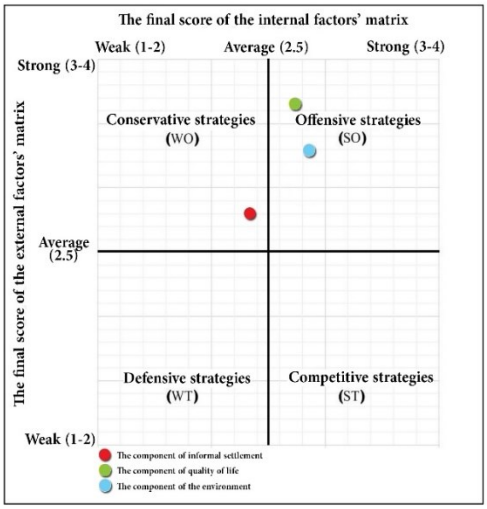


Figure 2. The Final Score Matrix of the Evaluation of Internal and External Research Factors (Source: Author, 2022)

Based on the above matrix and using the final assessment of internal and external factors, it is therefore concluded that the strategic matrix is based on conservative strategies.

Case Study

The case study is located in the Noh Dareh neighbourhood in District 9 of Mashhad in the southwestern highlands of the city. The name of this neighbourhood is derived from the mountains. The mountains in this area and the high altitude of this place have resulted in cold conditions in winter. Figure 3 shows the location of the area under study, and Map 3 shows the spatial analysis of the southwestern mountains of Mashhad city.

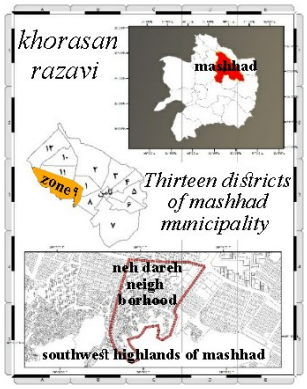
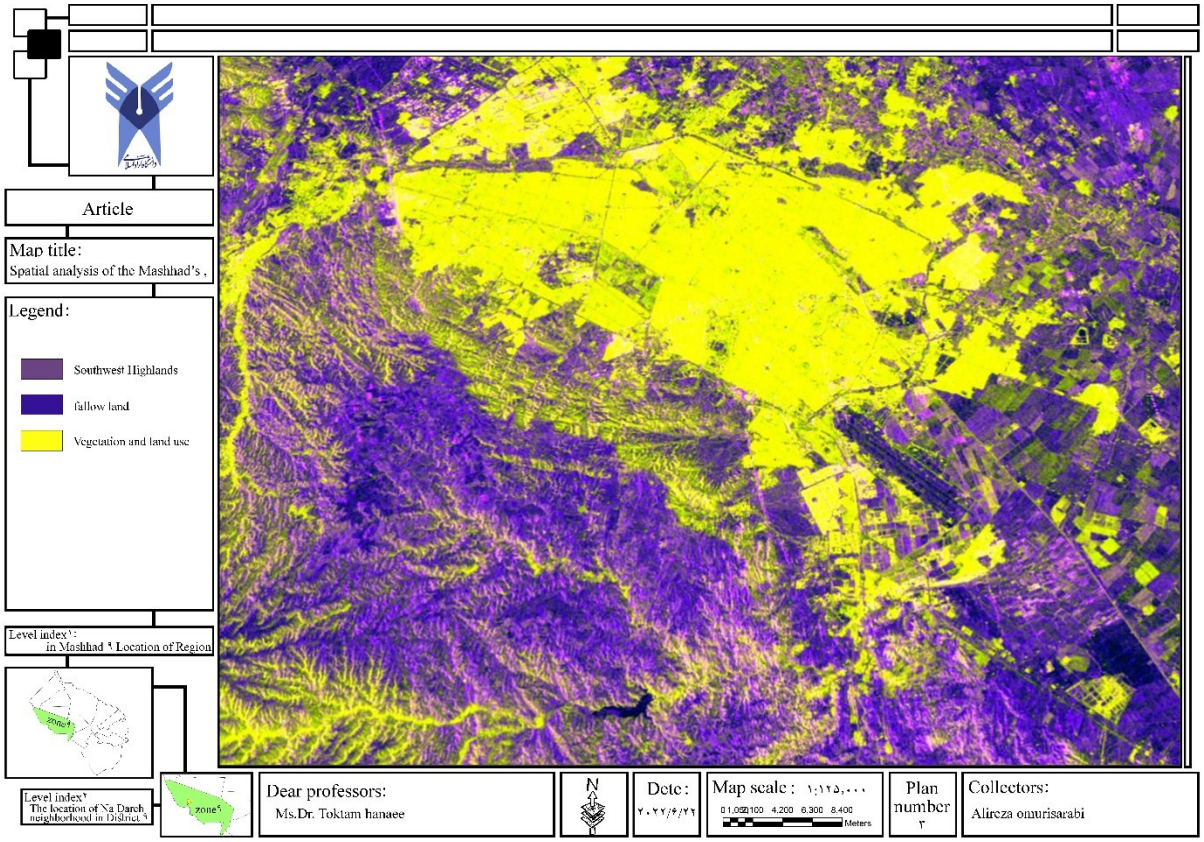


Figure 3. Introduction of the Southwestern Heights, the Area under Study (Source: Author, 2022)



Map 3. Spatial Analysis of of the Southwestern Mountains of Mashhad City (Source: Author, 2022)

The field survey revealed that 18% of Noh Dareh residents were immigrants since 1365. Thus, 45% of the immigrants entered the area between 1375 and the 1980s (most of the

immigrants in this neighbourhood date back to this period). In addition, 90% of residents immigrated to this neighbourhood between 1975and 1395. Between 1350 and the 1960s, 11% of the residents settled in this neighbourhood. If we analyse this point, we can see that 97% of the immigrants were sent to Noh Dareh in the years after the revolution. Only 3% of them migrated to this neighbourhood before the revolution. Therefore, most of the buildings were built illegally with minimal building codes, worn out and inefficient.

To study the indicators and criteria, 300 questionnaires were selected through simple random sampling where each element of the target society has an equal chance of being selected. The participation of men in filling out the questionnaire was greater than that of women, so that the gender distribution of respondents included 70% men and 30% women. Most of the respondents were between 20 and 35 years old, which was the highest percentage of cooperation at 46%. More than half of the respondents, with a frequency of about 53%, have a Bachelor's degree, and 28% with a Master's degree, which is the most common after the Bachelor's degree. We can conclude that the general public has a higher and advanced education. This shows that the higher the level of education and knowledge of the population under study, the higher the awareness of the quality of life, which leads to an improvement in the standard of living. The descriptive statistics of the research indicators and criteria based on the questionnaire are presented in Table 5.

Table 5. Descriptive Statistics of the Research Criteria based on the Questionnaire (Source: Author, 2022)

Component	Questions	Very little	Little	Medium	Much	Very much	Average
Informal settlements	1- How do you evaluate the quality of spaces and buildings in this area?	59 19.7	92 30.7	89 29.7	39 13	21 7	2.57
	2- How dilapidated are the buildings in this area?	22 7.3	55 18.3	56 18.7	122 40.7	45 15	3.38
	3- How is the quality of the streets and sidewalks in the area?	24 8	60 20	107 36	51 17	58 19	3.20
	4- How do you evaluate the quality of vehicle routes in this area?	39 12	48 16	55 18	105 35	53 18	3.28
	5- How do you evaluate the quality of cycling routes in the area?	45 15	72 24	87 29	55 18	41 14	2.92
	6- How much is the need to improve the settlements in this area?	27 9	46 15	74 25	106 35	47 16	3.33
	7- To what extent do the buildings in this area have ownership documents?	26 9	55 18	54 18	111 37	54 18	3.37
	8- To what extent do the uses of the area meet the needs of the residents?	22 7	49 16	82 27	91 30	56 19	3.37
	9- To what extent are there barren lands in this area?	21 7	51 17	67 22	117 39	43 14	3.37
	10- How is the quality of recreational services in this area?	48 16	71 24	102 34	59 20	20 7	2.77
Quality of life	11- How touristy is this area?	12 4	54 18	111 37	95 32	28 9	3.24
	12- How lively is this area?	40 13	50 17	113 38	74 25	23 8	2.97
	13- How many cultural and educational spaces are there in this area?	27 9	45 15	84 28	98 33	46 15	3.30
	14- To what extent is the social activity in the public spaces of this area?	24 8	56 19	89 30	85 28	46 15	3.24
	15- How do you evaluate the security	22	91	108	60	19	3.01

Component	Questions	Very little	Little	Medium	Much	Very much	Average
	level of this area?	7.3	30.3	36	20	6	
	16- How is the level of participation of the neighborhood's residents in urban projects?	15 5	90 30	120 40	55 18	20 7	2.92
	17- How is the performance of mosques and local organizations in this area?	18 6	69 23	138 46	55 18	20 7	2.97
	18- How is the performance of NGOs in this area?	15 5	38 13	126 42	95 32	26 9	3.26
	19- What is the amount of green spaces and parks in this area?	48 16	63 21	94 31.3	55 18.3	40 13.3	2.96
	20- What is the level of illegal occupation of land in this area?	11 3.7	44 14.7	69 23	124 41.3	52 17.3	3.02
	21- How do you evaluate the collection of surface runoff in this area?	38 12.7	40 20	98 32.7	73 24.3	31 10.3	2.98
The environment	22- What is the state of health in the area?	46 15	84 29	80 27	57 19	31 10	2.80
	23- What is the variety of healthcare uses in this area?	8 3	48 16	110 37	94 31	40 13	3.37
	24- How do you evaluate the quality of the urban environment along with the cleanliness of the area?	18 6	42 14	107 35.7	77 25.7	56 18.7	2.98
	25- How is the quality of water resources in the area?	18 6	42 14	30 10	135 45	75 25	3.00

According to Table 5, the degree of fatigue of the buildings, the lack of title deeds for buildings and the presence of wasteland are some of the negative points of the area. The data description indicators can be divided into three groups: central indicators, dispersion indicators and distribution shape indicators. Table 6 analyses the distribution of the research variables using the main central indicators (average), the dispersion indicators (variance and standard deviation) and the distribution shape indicators (skewness and kurtosis coefficient).

Table 6. Central Indicators, Dispersion and Distribution of Questions and Variables (Source: Author, 2022)

Components	Kurtosis		Skewness		incompatibility	standard deviation	Average	Number
	Standard error	Statistic	Standard error	Statistic	Statistic	Statistic	Statistic	Statistic
Quality of spaces and buildings	.281	-.769	.141	-.380	1.317	1.14739	3.3433	300
Access and routes quality	.281	-.711	.141	-.474	1.346	1.16015	3.3767	300
Empowerment of informal settlements	.281	920	.141	-.394	1.508	1.22804	3.3833	300
Land use quality	.281	-.957	.141	-.409	1.662	1.28916	3.2833	300
Quality of entertainment services	.281	-.849	.141	-.365	1.476	1.21501	3.3633	300
Liveliness	.281	-.840	.141	-.433	1.486	1.21884	3.3733	300
Social vitality	.281	-.670	.141	-.424	1.387	1.17764	3.3333	300

People's participation	.281	-.521	.141	-.491	1.321	1.14914	3.3567	300
Urban green spaces	.281	-.599	.141	-.486	1.385	1.17705	3.4500	300
land acquisition	.281	-.688	.141	-.418	1.364	1.16802	3.4400	300
Surface runoff	.281	-.264	.141	-.535	1.126	1.06131	3.5267	300
Environmental cleanliness	.281	-.674	.141	.409	1.396	1.18135	3.3200	300
The environment quality	.281	-.617	.141	-.425	1.283	1.13272	3.3233	300
Quality of water resources	.281	.848	.141	-.264	1.411	1.18769	3.2900	300
Informal settlement	.281	-.414	.141	-.440	.883	.93956	3.3467	300
Quality of life	.281	.211	.141	-.456	.774	.87984	3.3567	300
The environment	.281	-.228	.141	-.217	.574	.75773	3.3917	300

After the descriptive analysis of the data, the inferential analysis is performed. Partial Least Squares (PLS) is a software program used to estimate and test structural equation models. Using the correlation and covariance between the measured variables, the software can estimate or infer the factor loadings, variances and errors of the variables. It can be used to perform exploratory factor analysis, second-order factor analysis, confirmatory factor analysis and path analysis (causal modelling with latent variables). The most important reason for using this method is small sample size or abnormal data. In the interpretive structural modelling method using the partial least squares approach, there are two main phases for analysing the models. These include the model fitting stage and the hypothesis testing stage. According to the results obtained in the previous steps, Figures 4 and 5 reflect the results of the hypothesis testing.

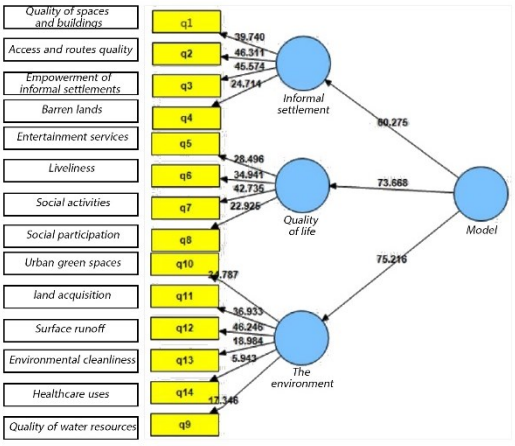


Figure 4. The Components in the Standard Mode (Source: Author, 2022)

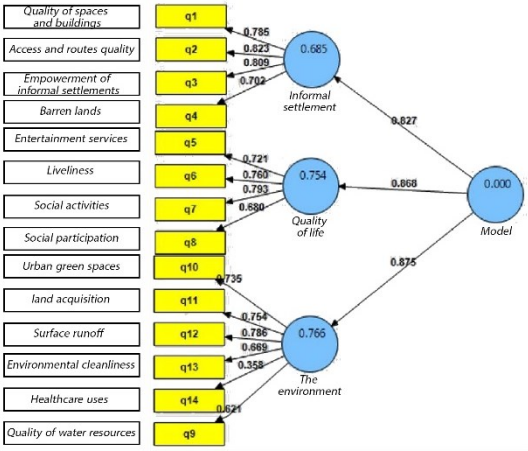


Figure 5. The Components in the Meaningful Mode (Source: Author, 2022)

The value of the T-statistic is the most important criterion for confirming or rejecting hypotheses. If this value is greater than 1.96, the hypothesis is confirmed at the 95% level. Furthermore, if the value of the path coefficient between the independent and dependent variable is positive, it means that the increase in the independent variable increases the dependent variable.

The GOF criterion refers to the general part of structural equation models. Using this criterion, the researcher can check the fit of the general part after checking the fit of the measurement part and the structural part of the general research model.

To check the fit of a general model, only the GOF criterion is used. Three values of 0.01, 0.25 and 0.36 were introduced as weak, medium and strong for GOF. The criterion is calculated using the following formula, the results of which are shown in Table 7 for the research components:

Table 7. GOF Criteria for Research Components (Source: Author, 2022)

	R Square	Communality
Informal settlement	0.684605	0.610543
The environment	0.765663	0.448019
Quality of life	0.753994	0.547002

The result is equal to 0.80. According to the values in Table 7, is equal to 0.48. The calculated GOF value is therefore as follows:

$$GOF = \sqrt{0.48 \times 0.80} = 0.62$$

Considering the three values of 0.01, 0.25 and 0.36 as weak, medium and strong for GOF, the result of 0.62 shows a strong fit of the model.

Figure 6 shows the conclusion of the quality of life factors in relation to informal settlements and worn-out urban structures.

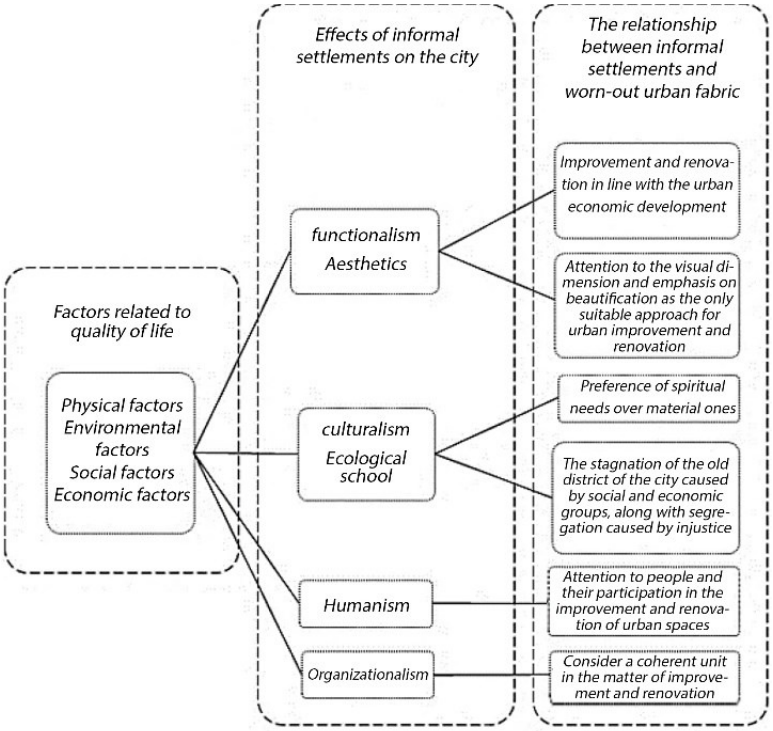


Figure 6. The Conclusion of the Quality of Life Factors in Relation to Informal Settlements and Worn-out Urban Fabric (Source: Author, 2022)

Discussion and Conclusion

Quality of life is one of the basic areas of urban research in the world, which includes some components such as social, environmental and economic components. The study of the quality of life and environment in worn-out urban structures is significant because these are neighbourhoods that have lagged behind in the flow of development compared to other neighbourhoods, have become disconnected from the evolutionary cycle of life and have become the focus of problems and inadequacies.

Since improving the environmental conditions of urban life is one of the most important goals of any society, many studies have been conducted, in this regard. In some of these studies, one or more parameters have been discussed to assess the quality of urban environment, e.g. studies on urban green spaces [14], air quality [8] and noise pollution [17]. It is necessary to pay attention to the

quality of the environment. The quality of the urban environment is complex and multidimensional. It consists of the influence of various and interrelated factors, including heat islands, the distribution of vegetation, the density of buildings and their form, air pollution and social conditions [23]. The quality of the environment is synonymous with basic human needs, and there is a close relationship between the quality of life and the environment. The quality of the environment has some impact on the health and well-being, and people's lives are strongly influenced by their environment [5].

Environmental, economic, social, political, health and personal safety factors and education, transport, housing and other urban services are the most important factors. When these indicators are properly considered in urban governance, it can provide a healthy and quality city for its citizens [3]. Social dimensions of quality of life include satisfaction, happiness and security; environmental dimensions include housing, access to services and environmental safety; and other aspects include paying attention to social opportunities, employment opportunities, well-being and leisure [29]. Quality of life includes environmental, social, physical, economic and psychological well-being. Quality of life focuses on social indicators, civic quality of life, quality of communication and psychological indicators, as well as all subcategories of health care in urban planning [24].

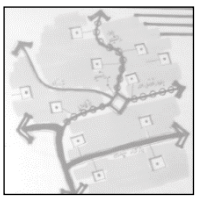
The research results are consistent with the findings of Shatarian and Aghili, because according to the research we found components such as vitality, environmental quality and leisure. Although they do not agree with the research of Bilal and Nicole in terms of not considering pollution and air quality, this research is related to the results of the research of Asadi, Nikofam and Aghili to investigate the components of health and environmental health. From the perspective of the current research, components such as social participation, quality of spaces, quality of access, quality of services and land use are of great importance along with environmental quality and leisure.

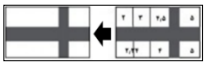
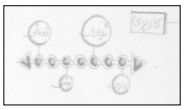
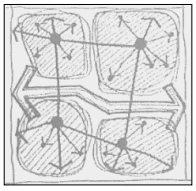
The above components were assessed and studied in the informal settlement of Noh Dareh. The results show that it is important to pay more attention to environmental issues in order to improve the quality of life of Noh Dareh residents.

The Noh Dareh neighbourhood is a hangout for criminals and is known for its condition as a slum for poor people. Changing the procedure of managing this neighbourhood can transform this part of the city into a place with excellent quality of life and at the same time remove the identity of criminals from this neighbourhood. This is because together with the potential of the southern heights of the city near this neighbourhood, it is possible to allow the presence of tourists and residents through the creation of space and physical improvements that will lead to the growth of this neighbourhood.

According to the results of the questionnaire, the quality of spaces and buildings, the quality of cycle paths, the quality of recreational facilities, the level of vitality of the neighbourhood, the level of participation of residents in urban projects, the performance of mosques and local organisations, the number of green spaces and parks, the collection of surface runoff, the state of health, the quality of the urban environment and cleanliness are all in an unfavourable state. Therefore, based on the aim of the study to assess the quality of life in the worn-out city through environmental indicators in the area, some suggestions are presented in Table 8.

Table 8. Suggestions for Increasing the Quality of Life in the Informal Settlement of Noh Dareh

Research components	Policy	Example	Policy	Example
Informal settlements	Improvement and renovation of dilapidated buildings to improve the quality of spaces and buildings, through participation in the		Ecological upgrading of side streets in connection with public spaces to increase the permeability of residential areas	

Research components	Policy	Example	Policy	Example
	construction or provision of facilities			
	Identifying suitable areas for the amalgamation of worn-out land to construct cooperative housing complexes and create a desirable housing model.		Improving bicycle lanes in the neighbourhood by improving or creating safe routes	
	Creation of the required spaces in the neighbourhood based on the use capacity approved in the urban master plan		Increasing neighbourhood vitality by creating recreational and service spaces such as green spaces, shopping centres, sports centres, etc.	
Quality of life	Greater participation of residents in the development of the neighbourhood through more surveys and a different approach by the local council and the city administration		Improving the status and quality of the neighbourhood's environment compared to other neighbourhoods through NGOs, mosques and social centres	
The environment	Improving the condition of parks, green spaces and streets in the neighbourhood		Improving the environment by creating green and open spaces and extensive tree planting in the main and side streets	
	Improving environmental health and cleanliness in the neighbourhood through 24-hour inspections by the municipality			

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