Analysis and Ranking of Urban Quality of Life in Districts 11 and 12 of Tehran: An Approach Based on Multi-Criteria Decision Making (AHP and ANP) and GIS

Mohammad Rahmani [1]* **Komeil Abdi [2]**

[1] Department of Environmental Sciences, University of Mazandaran, Iran.

[2] Faculty of Geography and Urban Planning, University of Mazandaran, Babolsar, Iran

* Correspondence: m.rahmani@umz.ac.ir

Abstract: Urban quality of life has become a central focus in sustainable urban development and policymaking. This research was conducted to rank the quality of urban life in the neighborhoods of districts 11 and 12 in Tehran. The research method utilized multi-criteria decision-making methods (AHP and ANP) and GIS analysis. First, the factors affecting quality of life were identified, and the relevant spatial layers were prepared. Then, using AHP and ANP methods, the weights of the criteria were calculated, and these weights were used in GIS to combine the layers and create the final maps. Unlike previous studies, this research integrates two decision-making models with spatial analysis to provide a comparative and location-specific understanding of urban quality of life, offering targeted insights for Tehran's historical and densely populated districts. The findings showed that the deteriorated urban fabric and air pollution have the greatest impact on quality of life (in AHP, 19.53 and 18.506; in ANP, 19.56 and 18.731), while green spaces and gender ratio (in AHP, 2.206 and 2.39; in ANP, 2.197 and 2.342) had the least impact. Ultimately, the study highlights how spatial decision-making tools can effectively guide interventions toward equitable and sustainable urban improvements.

Keywords: Quality of life, Urban management, Urban development, Districts 11 and 12 of Tehran.

1. Introduction

Urban centers play a vital role in social, economic, and cultural life, serving as the primary engines of community growth and development. With the rapid increase in urban populations, urban planning has become an essential tool for sustainably managing these changes. Urban planning, especially in central city areas, involves decision-making processes aimed at improving infrastructure efficiency, enhancing access to public services, and promoting overall quality of life [1]. Urban development requires a systematic approach that considers all aspects of the city, including housing, transportation, the environment, and public space [2].

Given the complexity and diversity of modern urban needs, effective urban planning increasingly relies on advanced technologies and analytical methods to support strategic decision-making and enhance livability [3]. Urban Quality of Life (UQoL) is a key concept in urban studies that assesses social, economic, and environmental well-being in urban environments. It is regarded as a comprehensive measure of citizen satisfaction and serves

Received: 06 June 2025
Revised: 15 July 2025
Accepted: 21 July 2025
Published: 29 July 2025

as a tool for urban decision-makers and planners to identify and address the essential needs of city residents [4].

In large, complex urban settings such as Tehran, evaluating UQoL based on indicators like safety, access to public services, environmental quality, adequate housing, and job opportunities is critical. Quality of life not only affects individual well-being but also influences urban sustainability and social cohesion, gaining increasing attention in urban policy-making [5].

The central part of the city, due to its geographic location and its core role in economic, social, and cultural networks, holds particular significance [6]. This area typically represents the historical and developmental nucleus of the city, hosting a concentration of commercial, cultural, and public service activities [7]. Therefore, UQoL in central neighborhoods plays a crucial role in determining citizen satisfaction and promoting sustainable development [8]. Improving UQoL in these areas can attract more residents and activities while reducing suburban migration. However, challenges such as high population density, traffic congestion, air and noise pollution, and a lack of green space are common issues that negatively affect quality of life in these districts [9].

The following section briefly reviews relevant research conducted both within Iran and internationally. The findings of this and other studies all highlight the importance of targeted planning to improve urban quality of life and support more effective urban management. The distinguishing factors among the studies lie in their study areas, research methods, and the variables used. Jafari et al. (2022) assessed quality of life across Tehran using MCDM and GIS methods [10]. Their analysis, based on indicators such as safety, public infrastructure, and access to healthcare, identified areas with lower quality of life. Their study emphasized the role of advanced technologies in enhancing urban decision-making processes. Kim et al. (2021), in a comparative study on urban quality of life in South Korean cities, applied AHP and GIS methods to analyze various indicators [11]. Their results showed that combined spatial evaluations can effectively identify regional differences in UQoL and support improved urban planning.

Proper management of these challenges and optimal planning for the utilization of urban infrastructure, ensuring access to public services, and improving environmental conditions can enhance the quality of life in central neighborhoods. The use of Multi-Criteria Decision-Making (MCDM) methods and Geographic Information Systems (GIS) to evaluate and rank central neighborhoods in terms of quality of life provides an effective tool for urban planners and policymakers. These tools enable evidence-based and scientific decision-making aimed at improving neighborhood conditions [12, 13].

Due to their advanced analytical capabilities, MCDM and GIS have attracted significant attention for assessing urban quality of life. GIS, by offering detailed maps and spatial analyses, facilitates the identification of areas with low quality of life. MCDM allows for the comparison and prioritization of indicators based on local needs and the perspectives of various stakeholders [14].

The integration of these two methods in urban quality of life studies can help identify and analyze areas in need of improvement and develop effective strategies to increase residents' satisfaction [15]. The Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) are two popular MCDM approaches widely used in urban quality of life assessments [16]. AHP is a hierarchy-based method known for its simplicity and structured format, making it suitable for many evaluations [17]. ANP, as a more complex method, enables the analysis of interdependencies and mutual influences among criteria, which is crucial in complex and interdisciplinary issues such as urban quality of life [18]. A comparison between these two methods can lead to an optimal choice for a more accurate evaluation of indicators.

Aksu & Küçük applied the AHP and GIS methods to study urban quality of life in Istanbul. They evaluated indicators such as access to public services, transportation, and green spaces, identifying areas with low quality of life [19]. Similarly, Kim and colleagues conducted a comparative study on urban quality of life in South Korean cities using AHP and GIS methods. Their findings demonstrated that combining evaluative and spatial analysis of indicators helps identify regional differences in quality of life and enhances urban planning [20].

Despite numerous studies on Urban Quality of Life (UQoL), many lack spatial specificity and fail to consider the localized socio-environmental complexities of historical urban cores. In Tehran, districts 11 and 12 represent some of the city's oldest and most densely populated areas, facing critical challenges such as deteriorated infrastructure, environmental degradation, and social inequality. However, limited research has focused on systematically ranking the quality of life at the neighborhood level in these districts using integrated spatial and decision-making models. This study addresses this gap by applying AHP and ANP within a GIS framework to provide a data-driven, location-specific assessment that supports targeted urban interventions.

Accordingly, this study aims to evaluate and rank the quality of urban life in the neighborhoods of Districts 11 and 12 in Tehran. The primary research questions are: Which district has a higher quality of life? And which factors have the greatest impact on quality of life in different neighborhoods?

2. Study Area

Districts 11 and 12 of Tehran, located in the historical and central core of the city, hold significant importance within the urban structure but face numerous challenges [21]. District 11 is confronted with issues such as deteriorated urban fabric, a shortage of public spaces, and inadequate transportation infrastructure, all of which negatively affect its livability [22]. District 12, in addition to experiencing a concentration of crime, contains a historically valuable yet deteriorating urban fabric that requires revitalization and infrastructural reinforcement [8, 23]. Urban regeneration programs in these districts emphasize improving quality of life, reducing social vulnerabilities, and promoting spatial justice [24]. Enhancing urban governance, strengthening public participation, and preserving natural resources are among the key strategies for sustainable development in these areas.

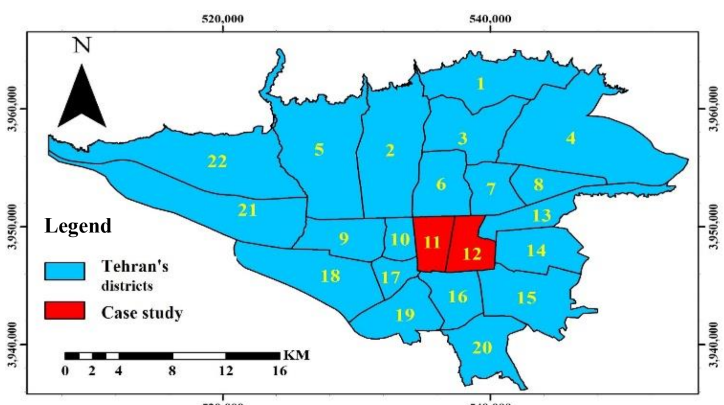

Figure 1: Map of the study area

3. Research Methodology

This study was conducted to rank the quality of urban life in the neighborhoods of Tehran, specifically in Districts 11 and 12. To achieve this, a comparative approach using the

Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) was employed. These methods were used to determine the weights (importance) of each criterion. The spatial data were then integrated with the calculated weights in a Geographic Information System (GIS), and the results revealed the rankings of urban life quality across the neighborhoods. The selected criteria, the methods for preparing their spatial layers, and how they influence urban quality of life are presented in Table 1. These criteria were selected by reviewing scientific articles.

Table 1: Selected criteria, rationale for selection, method of spatial layer construction, and their impact on urban quality of life.

Criteria	Description	Formula	Impact	Sources
Building age (C1)	Given that the study area is situated within the deteriorated urban fabric of Tehran, the rehabilitated (new) neighborhoods demonstrate a superior quality of life compared to the degraded fabric, which is characterized by multiple socio-economic and infrastructural challenges. Structural aging negatively affects the quality of urban life by exacerbating these issues.		-	
Population density (C2)	Population density shapes urban life and impacts resources, infrastructure, the environment, overall welfare, and the dynamism of the community. Population density is calculated by dividing the population by the area (measured in hectares, square kilometers, etc.).	$Pop_{density} = \frac{Pop_{tot}}{Area_{(ha)}}$	-	[25]
Proximity to tourist area (C3)	Proximity to tourist areas affects urban life by influencing the economy, cultural richness, and overall vitality of the community. Euclidean distance was used to measure this proximity.	$dist(p,q) = \sqrt{(x_p - x_q)^2 + (y_p - y_q)^2}$	+/-	[26]
Gender (C5) **composition**	The presence of a balanced gender ratio is essential for the development of a dynamic city with a high quality of life. Therefore, any disproportionate increase or decrease in this criterion disrupts the balance of urban quality of life.	$Gen_{compo}=\frac{Men}{Women}$	+/-	[27]
Street density (C6)	Street density shapes urban life by influencing mobility and accessibility on one hand, and traffic flow and related issues on the other.	$\int_{-\infty}^{\omega} f(t)dt = \frac{1}{n}\sum_{j=1}^{x} \int_{-\infty}^{\omega} K(x_j,t)dt = 1$	+/-	[28]
Distance to fire station (C7)	An increased distance from fire stations indicates a higher level of potential hazard uncontrollability. Therefore, greater distance is considered a negative factor.	$dist(p,q) = \sqrt{(x_p - x_q)^2 + (y_p - y_q)^2}$	-	
Air pollution (C8)	Air pollution affects urban life by impacting health, environmental quality, and overall well-being in urban settings. Saraswat et al. (2017) employed a specific algorithm to measure this effect.	Saraswat et al., 2017	-	[29]

Cost of living (C9)	This criterion was developed through surveys of neighborhood residents, who consider rising living costs as a negative factor affecting urban quality of life.		-	
Accessibility to healthcare facilities	Access to medical centers shapes urban life and influences the health, well-being, resilience, and overall support of the community. Euclidean distance was used to measure this accessibility.	$dist(p,q) = \sqrt{(x_p - x_q)^2 + (y_p - y_q)^2}$	+/-	[30]
Per capita green space (C11)	Access to per capita green space enhances urban quality of life by promoting well-being, social interaction, and environmental balance.		+	[31]
Household density (C12)	Household density impacts urban life by shaping community dynamics, resource allocation, welfare, and the overall functioning of the neighborhood.	$Hou_{density} = \frac{Hou_{tot}}{Area_{(ha)}}$	-	[32]
Density of educational centers (C13)	The density of educational centers shapes urban life by influencing accessibility, knowledge development, and the overall vitality of the community.	$\int_{-\infty}^{\omega} \dot{f}(t)dt = \frac{1}{n}\sum_{j=1}^{x} \int_{-\infty}^{\omega} K(x_j, t)dt = 1$	+/-	[33]
LST (C14)	Land Surface Temperature (LST) affects urban life by impacting comfort, health, and overall well-being in the environment. This criterion was derived through Landsat image analysis using the algorithm developed by Qin et al. (2001).	See Qin et al., 2001	-	[34]

3.1 Steps of the AHP Method

- Problem Definition and Criteria Identification:

The first step involves identifying the key criteria affecting the assessment of urban quality of life. In this study, the criteria included building age, population density, accessibility to tourist attractions, and others.

- Construction of Pairwise Comparison Matrix:

Each pair of criteria is compared to determine their relative importance. These comparisons are conducted using a scale from 1 to 9, as proposed in the standard AHP methodology.

- Calculation of Criteria Weights:

After completing the pairwise comparison matrix, the weight of each criterion is calculated using mathematical methods such as eigenvalue analysis or matrix decomposition [35].

- Integration of Criteria with GIS Data:

Once the weights are calculated, they are integrated into a Geographic Information System (GIS) environment. The spatial data are combined based on the weighted values assigned to each criterion, resulting in a composite urban quality of life map.

- Interpretation and Analysis of Results:

The final quality of life map for Districts 11 and 12 of Tehran is analyzed. Based on the calculated weights and selected criteria, neighborhoods are ranked accordingly.

2.3 Steps of the ANP Method

- Problem Definition and Criteria Identification:

Similar to the AHP approach, the first step involves identifying the criteria for assessing quality of life. In this study, criteria such as population density, air quality, access to educational facilities, and others were considered.

- Identification of Interdependencies among Criteria:

Unlike AHP, which only performs direct pairwise comparisons, the ANP method identifies interdependencies and interactions among criteria (e.g., the effect of population density on air quality).

- Construction of the Dependency Network and Pairwise Comparisons:

In this stage, pairwise comparisons are conducted (see Table 2), but this time not only between criteria themselves, but also considering their mutual influences. A scale of 1 to 9 is used to evaluate the relative importance of these interrelationships.

- Model Solution and Weight Calculation:

Network analysis software, such as Super Decisions, is used to analyze the dependency model and compute the final weights. These weights reflect the relative importance of each criterion within the network of relationships [36].

- Integration of Criteria into GIS:

The calculated weights are integrated with spatial data in the GIS environment. Based on these weighted values, final quality of life maps are produced.

Table 2: Pairwise Comparison Matrix

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**	**C10**	**C11**	**C12**	**C13**	**C14**
C1	1	3	2	7	8	2	3	1	6	4	9	2	5	6
C2	--	1	0/5	2	3	0/5	1	0/333	2	2	3	1	2	2
C3	--	--	1	4	4	1	2	0/5	3	2	5	2	3	3
C4	--	--	--	1	2	0/333	0/333	0/143	1	0/5	2	0/5	0/5	1
C5	--	--	--		1	0/25	0/333	0/125	1	0/5	1	0/5	0/5	1
C6	--	--	--	--	--	1	2	0/5	3	2	5	2	2	3
C7	--	--	--	--	--	--	1	0/333	2	1	3	1	2	2
C8	--	--	--	--	--	--	--	1	5	4	7	4	4	6
C9	--	--	--	--	--	--	--	--	1	0/5	2	0/5	1	1
C10	--	--	--	--	--	--	--	--	--	1	2	1	1	2
C11	--	--	--	--	--	--	--	--	--	--	1	0/5	05/5	1
C12	--	--	--	--	--	--	--	--	--	--	--	1	1	2
C13	--	--	--	--	--	--	--	--	--	--	--	--	1	1
C14	--	--	--	--	--	--	--	--	--	--	--	--	--	1

3.3 Spatial Analysis in GIS

After calculating the criteria weights using AHP and ANP methods, these weights were applied within the GIS environment to combine various data layers. Each layer was integrated and evaluated according to its corresponding criterion weight in the quality of life analysis. The final results were presented as composite maps in GIS, where areas were ranked based on the higher or lower quality of life.

The layer integration was performed using the Weighted Overlay method. In this step, the weights derived from AHP and ANP were applied to each layer, resulting in two separate maps reflecting the outcomes of AHP and ANP, respectively. Subsequently, these maps and final results were analyzed to identify priorities and provide recommendations for improving the quality of life in Districts 11 and 12 of Tehran.

3. Research Findings

Figure 2 (a) shows the first part of the map depicting the criteria used in the study. According to Figure 2 (a), a large portion of the area, especially the southern part, has a more deteriorated urban fabric compared to the northern part. Based on the population density map, District 11 has a higher population density than District 12, where some areas show a population density below 100 people. Tourist attractions are primarily located in District 11, and according to the available data, there are no significant tourist destinations attracting visitors in District 12. Large parts of District 11 have a high or very high age ratio, whereas District 12 shows two distinctly different areas with very low and very high gender ratios. In many parts of the study area, the gender ratio is moderate. Notably, one part of District 12 exhibits a very low gender ratio; interestingly, this area also has a very low age ratio and very low population density. District 12 is better positioned in terms of proximity to fire stations, with a green zone (within 1000 meters) located at the center of the study area. Air pollution levels are distributed almost uniformly across the study area, with variations appearing only in small localized regions. Areas shown in green on the map represent low to very low air pollution, while areas marked in orange and red indicate high to very high pollution levels.

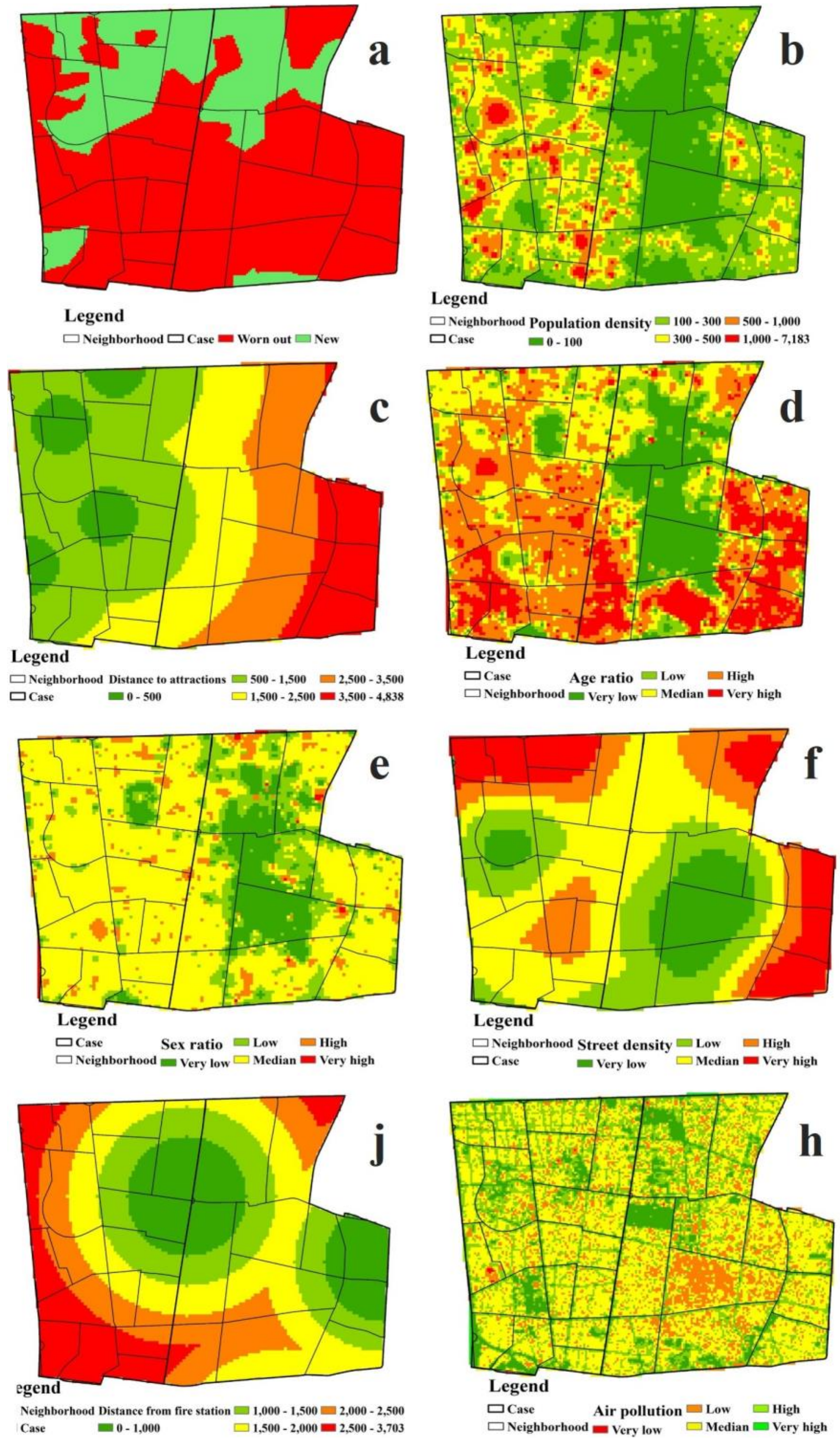

Figure 2: The first part of the criteria used: a (age of the building), b (population density), c (distance from attractions), d (age ratio), e (sex ratio), f (street density), g (distance from the fire station), h (air quality)

Figure 3 illustrates the spatial distribution of the selected criteria. According to the cost of living map, many neighborhoods offer moderate to low living expenses (compared to other parts of Tehran). The northern neighborhoods generally have higher living costs than those in the southern parts. The density of medical centers is higher in District 12 than in District 11, with the lowest concentration observed in the western part of District 11. Household density in District 12 is significantly lower than in District 11. The area with low population density, low gender ratio, and low age ratio also has the lowest household density. According to the green space map, only two neighborhoods have high green space coverage, and seven have a moderate level; the remaining 20 neighborhoods have low green space availability. Overall, green space conditions in District 12 are better than in District 11. Based on the map of educational center density, most educational facilities are located in District 11, while District 12 shows weaker performance in terms of access to educational institutions. The Land Surface Temperature (LST) map indicates that most of the area experiences temperatures between 38–40°C, although some parts reach between 42–49°C.

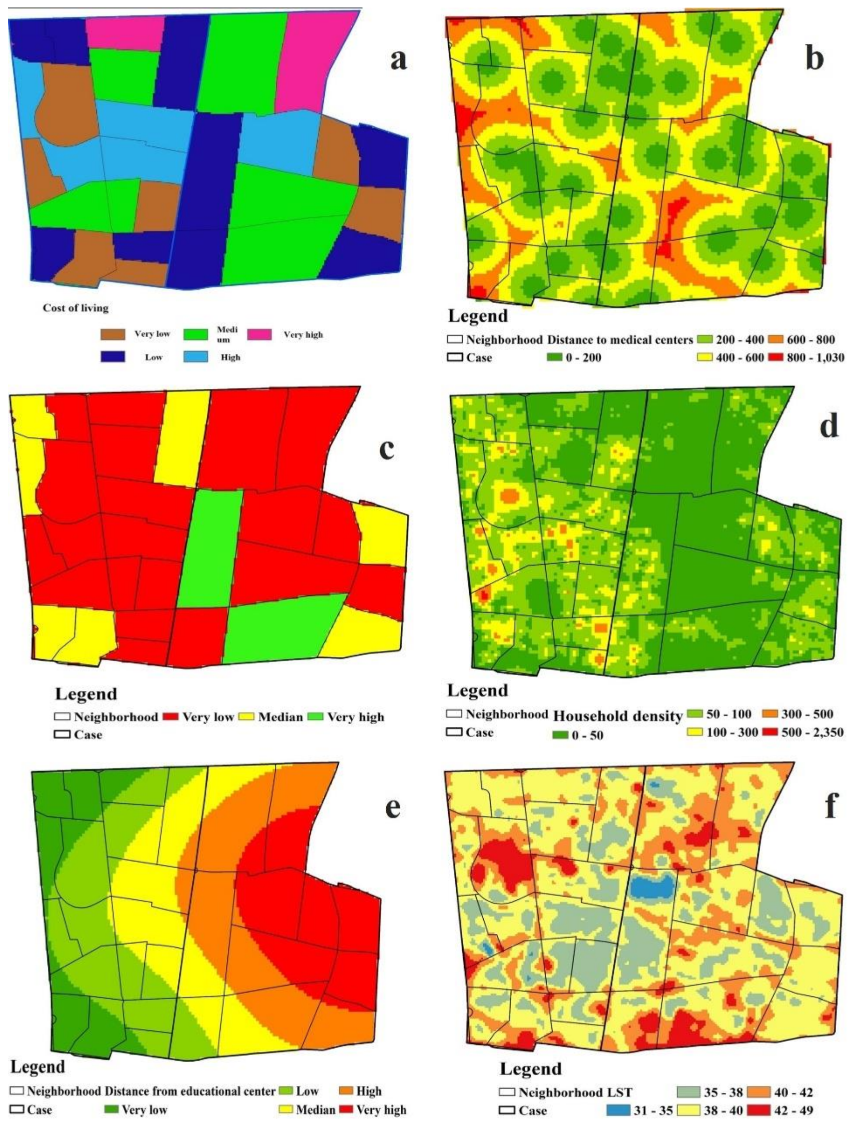

Figure 3: Second part of the used criteria; a) Cost of Living; b) Distance to Medical Centers; c) Green Space; d) Household Density; e) Distance to Educational Centers; f) Land Surface Temperature (LST)

Figure 4 shows the weight chart of the criteria obtained using the AHP method. As expected, based on the results of this method, dilapidated urban fabric and air pollution had the most significant impact on the quality of life in Tehran, with weights of 19.53 and

18.506, respectively. Additionally, the two criteria with the lowest weights were green space and gender ratio, with relative importance (weights) of 2.206 and 2.39, respectively.

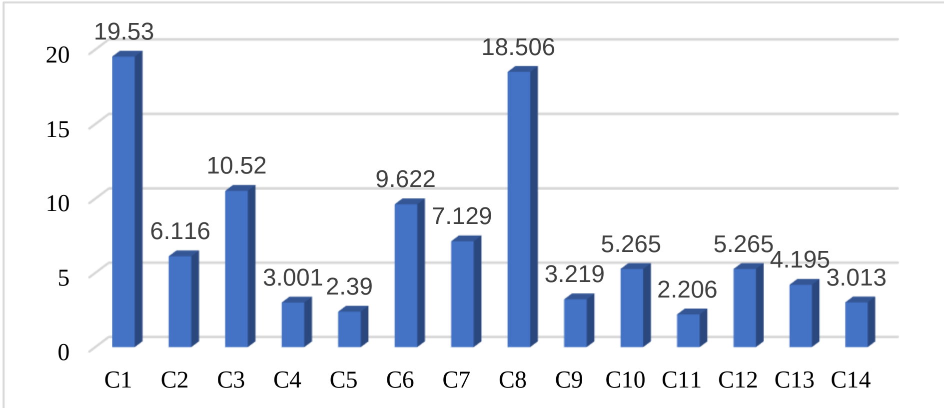

Figure 4: Weight chart of criteria used using the AHP method

Figure 5 shows the weight chart of the criteria obtained using the ANP method. As expected, based on the results of this method, dilapidated urban fabric and air pollution had the most significant impact on the quality of life in Tehran, with weights of 19.56 and 18.731, respectively. Additionally, the two criteria with the lowest weights were green space and gender ratio, with relative importance (weights) of 2.197 and 2.342, respectively.

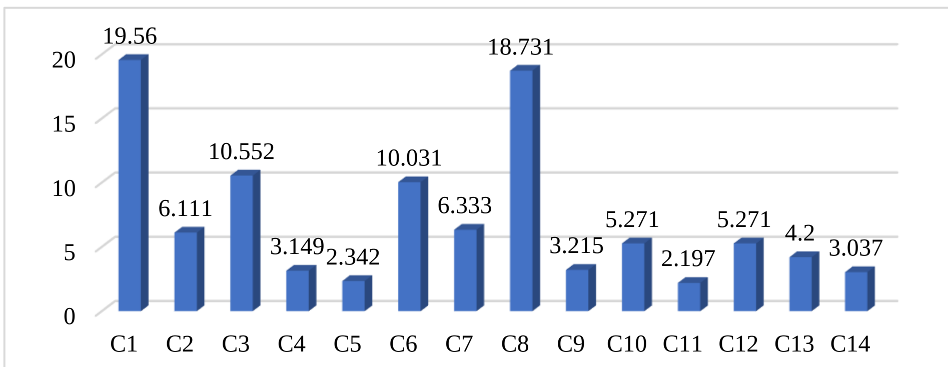

Figure 5: Weight chart of criteria used in the ANP method

Figure 6 illustrates the quality-of-life map of Tehran using a combination of the AHP and G methods. According to this figure, five neighborhoods in the study area exhibit a very high quality of life, while two neighborhoods have a very low quality of life. Based on the map, the quality of life in District 11 of Tehran is higher than that in District 12.

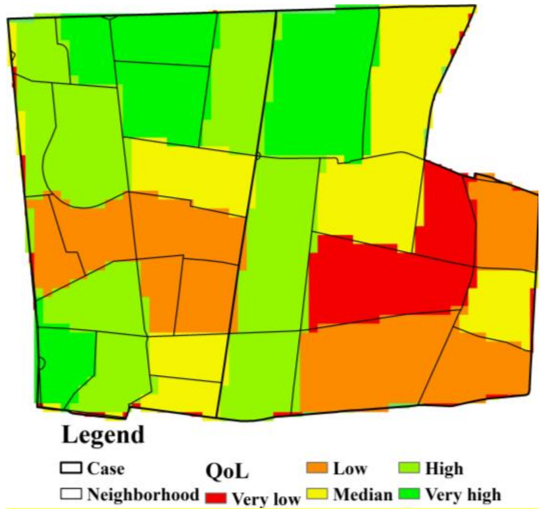

Figure 6: Tehran City Quality of Life Map Using AHP and GIS Combination

Figure 7 presents the urban quality of life map of Tehran using a combination of the ANP and GIS methods. The initial structure of this map is similar to that of Figure 6; however, the main difference is that, according to this map, 9 out of 29 neighborhoods exhibit very high quality of life, while two neighborhoods still show very low quality of life. Moreover, this map also indicates that District 11 demonstrates a higher urban quality of life compared to District 12.

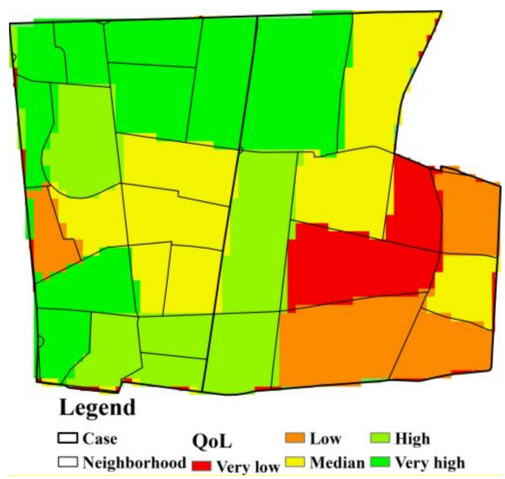

Figure 7: Tehran City Quality of Life Map Using ANP and GIS Combination

Table 3 shows the ranking of neighborhoods in terms of quality of life using AHP. According to this table, the five neighborhoods of Hilal-e-Ahmar, Enghelab, Azarbaijan, Abbasi, and Eskandari, respectively, had the highest quality of life, and on the other hand, the five neighborhoods of Bazar, Imamzadeh Yahya, Shahid Harandi, Khorramshahr, and Abshar, respectively, offered the lowest quality of urban life for their residents.

Table 3: Ranking of neighborhoods in terms of quality of life using AHP

Rank	Neighborhood	Rank	Neighborhood	Rank	Neighborhood
1	Helal Ahmar	--	--	**25**	Abshar
2	Enghelab	--	--	**26**	Khorramshahr
3	Azerbaijan	--	--	**27**	Shahid Harandi

4	Abbasi	--	--	**28**	Emamzadeh Yahya
5	Eskandari	--	--	**29**	Bazar

Table 4 shows the ranking of neighborhoods in terms of quality of life using the ANP method. According to this table, the five neighborhoods of Enghelab, Ferdowsi, Azerbaijan, Jamalzadeh, and Abbasi had the highest quality of life, respectively. Conversely, the five neighborhoods of Bazar, Emamzadeh Yahya, Khorramshahr, Abshar, and Kosar offered the lowest urban quality of life for their residents, respectively.

Table 4: Ranking of Neighborhoods in Terms of Quality of Life Using ANP

Rank	Neighborhood	Rank	Neighborhood	Rank	Neighborhood
1	Enghelab	--	--	**25**	Kausar
2	Ferdowsi	--	--	**26**	Abshar
3	Azerbaijan	--	--	**27**	Khorramshahr
4	Jamalzadeh	--	--	**28**	Emamzadeh Yahya
5	Abbasi	--	--	**29**	Bazar

4. Conclusion

This study examined the urban quality of life in Districts 11 and 12 of Tehran from various criteria perspectives, employing two multi-criteria decision-making approaches (AHP and ANP) combined with GIS analyses. The results provided a comprehensive and multidimensional overview of the quality-of-life status in these areas and emphasized the importance of key criteria in urban management.

Findings from both AHP and ANP methods showed that dilapidated urban fabric and air pollution have the greatest impact on quality of life. This highlights the critical need for infrastructure management and air pollution reduction in urban development plans. Conversely, criteria such as green space and gender ratio received the lowest weights in both methods, indicating the necessity to focus more on green space development in these districts.

The combined quality of life maps revealed that District 11 performs better than District 12 on many indicators. Specifically, neighborhoods like Helal Ahmar, Enghelab, Azerbaijan, and Abbasi rank higher in terms of quality of life, whereas areas such as Bazar, Emamzadeh Yahya, Khorramshahr, and Abshar exhibit the lowest quality of life. These differences may stem from unequal resource distribution, insufficient infrastructure, and population density disparities.

Comparing the two methods showed that ANP, due to its ability to consider interdependencies among criteria, provides a more comprehensive perspective. For instance, ANP identified more neighborhoods as having high-quality life zones. This suggests that ANP is a more suitable tool for analyses involving complex interactions between criteria.

The study offers practical recommendations for improving quality of life in these areas:

1. Reconstruction of dilapidated structures in critical areas of District 12: Urban regeneration should focus on areas in the south and east of District 12, where, according to

urban data, more than 50% of their structures are dilapidated, have high population density, and low emergency access.

2. Creating green spaces in the southern part of District 11: It is necessary to develop green spaces in areas such as Qalamestan neighborhood and Anbar Naft in the south of District 11, where, according to LST data, the land surface temperature is high and the NDVI index shows the lowest amount of vegetation cover. It is recommended to use abandoned lands and along railway lines to create strip parks.

3. Reducing air pollution in high-traffic nodes of District 12: In areas such as Molavi Crossroads and Rey Street, which have high traffic and poor ventilation, it is necessary to implement projects such as traffic restrictions, planting resistant trees in the streets, and increasing clean public transportation stations.

4. Increasing access to education and health services in District 11: The west of District 11 (e.g., around Shahid Rezaei and South Navab Streets) has less than 30% access to health and education services within a 500-meter radius. Establishing neighborhood-based health centers and small schools in these areas should be a priority.

5. Planning for equitable distribution of intra-district services: By creating a spatial equity index in Districts 11 and 12, it is possible to identify less-privileged areas such as Harandi or Abbasi neighborhoods and allocate resources to them in a targeted manner, including the development of public transportation, cultural and recreational spaces.

This research demonstrated that combining multi-criteria decision-making methods with GIS analysis is an effective tool for assessing urban quality of life and identifying strengths and weaknesses of different areas. The findings underline the importance of targeted planning to enhance quality of life, especially for neighborhoods with lower rankings that need focused attention and effective policy implementation. This study can serve as a useful model for quality-of-life analysis in other urban areas across Iran and worldwide.

References

[1] Chang, S., & Smith, M. K. (2023). Residents' quality of life in smart cities: A systematic literature review. *Land, 12*(4), 1-17. https://doi.org/10.3390/land12040876

[2] Jones, C. (2025). Changing shape of sustainable urban form with technological progress. *Planning Practice & Research, 40*(2), 244-262. https://doi.org/10.1080/02697459.2025.2452755

[3] Mansourihanis, O., Maghsoodi Tilaki, M. J., Yousefian, S., & Zaroujtaghi, A. (2023). A computational geospatial approach to assessing land-use compatibility in urban planning. *Land, 12*(11), 2083. https://doi.org/10.3390/land12112083

[4] Turkoglu, H. (2015). Sustainable urban development and quality of life. *Procedia - Social and Behavioral Sciences, 202*, 10-14. https://doi.org/10.1016/j.sbspro.2015.08.203

[5] Wilson, W. J. (2011). Reflections on a sociological career that integrates social science with social policy. *Annual Review of Sociology, 37*, 1-18. https://doi.org/10.1146/annurev.soc.012809.102510

[6] Foster, K. A. (1993). Exploring the links between political structure and metropolitan growth. *Political Geography, 12*(6), 523-547. https://doi.org/10.1016/0962-6298(93)90003-P

[7] Bevilacqua, C., Sohrabi, P., & Hamdy, N. (2022). Spatializing social networking analysis to capture local innovation flows towards inclusive transition. *Sustainability, 14*(5), 3000. https://doi.org/10.3390/su14053000

[8] Salehi Mava, F., Khatami, S. M., & Ranjbar, E. (2022). An analysis on the factors affecting the creation of event-oriented urban public spaces case study: Central part of Tehran (District 12). *The Monthly Scientific Journal of Bagh-e Nazar, 19*(106), 85-98. https://doi.org/10.22034/bagh.2021.269717.4780 [In Persian]

[9] Takano, T., Morita, H., Nakamura, S., Togawa, T., Kachi, N., Kato, H., & Hayashi, Y. (2023). Evaluating the quality of life for sustainable urban development. *Cities, 142*, 104561. https://doi.org/10.1016/j.cities.2023.104561

[10] Jafari-Sirizi, R., Oshnooei-Nooshabadi, A., Khabbazi-Kenari, Z., & Sadeghi, A. (2022). Determination of the quality of life using hybrid BWM-TOPSIS analysis: Case study of Tabriz (Districts 1, 2, 3 and 8), Iran. *Turkish Journal of Remote Sensing*, *4*(1), 7-17.

[11] Kim, S. K., Bennett, M. M., van Gevelt, T., & Joosse, P. (2021). Urban agglomeration worsens spatial disparities in climate adaptation. *Scientific Reports, 11*(1), 8446. https://doi.org/10.1038/s41598-021-87845-2

[12] Ebrahimi Sirizi, M., Taghavi Zirvani, E., Esmailzadeh, A., Khosravian, J., Ahmadi, R., Mijani, N., Soltannia, R., & Jokar Arsanjani, J. (2023). A scenario-based multi-criteria decision-making approach for allocation of pistachio processing facilities: A case study of Zarand, Iran. *Sustainability*, *15*(20), 15054. https://doi.org/10.3390/su152015054

[13] Khosravian, J., Qureshi, S., Rostamzadeh, S., Moradi, B., Derakhshesh, P., Yousefi, S., Jamali, K., Ahmadi, R., & Nickravesh, F. (2024). Evaluating the feasibility of constructing shopping centers on urban vacant land through a spatial multi-criteria decision-making model. *Frontiers in Sustainable Cities, 6*, 1373331. https://doi.org/10.3389/frsc.2024.1373331

[14] Barańska, A. M., & Eckes, K. (2022). Application of GIS to assess the quality of life of inhabitants in urbanized areas. *Geoinformatica Polonica, 21*, 113-120. https://doi.org/10.4467/21995923GP.22.009.17087

[15] Mohimi, A., & Esmaeily, A. (2024). Spatiotemporal analysis of urban sprawl using a multi-technique approach and remote sensing satellite imagery from 1990 to 2020: Kerman/Iran. *Environment, Development and Sustainability, 26*, 1803-18068. https://doi.org/10.1007/s10668-023-03378-8

[16] Hemmati, M., Messadi, T., Gu, H., Seddelmeyer, J., & Hemmati, M. (2024). Comparison of embodied carbon footprint of a mass timber building structure with a steel equivalent. *Buildings, 14*(5), 1276. https://doi.org/10.3390/buildings14051276

[17] Abrishami, M., & Chamberlain, B. (2023). Comparing transportation metrics to measure accessibility to community amenities. *Journal of Digital Landscape Architecture, 8*, 342-350. https://doi.org/10.14627/537740037

[18] Ahmadi, R., Asemani, M., Hamidi, N., Rezaei, S. S., Ahmadi, A., Amirahmadi, F., Aghaei, S., & Bayat, F. (2024). Analyzing the relationship between place attachment and residential satisfaction through the mediation of social capital: The case of affordable housing. *Journal of Housing and the Built Environment*, *39*, 1843-1865. https://doi.org/10.1007/s10901-024-10146-1

[19] Aksu, G. A., & Küçük, N. (2020). Evaluation of urban topography–biotope–population density relations for Istanbul–Beşiktaş urban landscape using AHP. *Environment, Development and Sustainability, 22*, 733-758. https://doi.org/10.1007/s10668-018-0217-9

[20] Kim, H. W., McCarty, D. A., & Lee, J. (2020). Enhancing sustainable urban regeneration through smart technologies: An assessment of local urban regeneration strategic plans in Korea. *Sustainability*, *12*(17), 6868. https://doi.org/10.3390/su12176868

[21] Shahraki, S. Z., Arzjani, Z., & Ahmadifard, N. (2009). A systematic study of the impact of urbanization of Tehran city on agricultural and garden land use. [Unpublished manuscript]

[22] Aliakbari, E., & Amini, M. (2010). Urban quality of life in Iran (1986-2006). *Social Welfare Quarterly*, *10*(36), 121-148. http://refahj.uswr.ac.ir/article-1-931-fa.html [In Persian]

[23] Ziari, H., Aliha, M. R. M., Mojaradi, B., & Jebalbarezi Sarbijan, M. (2019). Investigating the effects of loading, mechanical properties and layers geometry on fatigue life of asphalt pavements. *Fatigue & Fracture of Engineering Materials & Structures, 42*(7), 1563-1577.

[24] Lak, A., & Hakimian, P. (2019). Collective memory and urban regeneration in urban spaces: Reproducing memories in Baharestan Square, city of Tehran, Iran. *City, Culture and Society, 18*, 100290. https://doi.org/10.1016/j.ccs.2019.100290

[25] Bardhan, R., Kurisu, K., & Hanaki, K. (2015). Does compact urban forms relate to good quality of life in high density cities of India? Case of Kolkata. *Cities*, *48*, 55-65. https://doi.org/10.1016/j.cities.2015.06.005

[26] Biagi, B., Ladu, M. G., Meleddu, M., & Royuela, V. (2020). Tourism and the city: The impact on residents' quality of life. *International Journal of Tourism Research, 22*(2), 168-181. https://doi.org/10.1002/jtr.2326

[27] Kirsch, A. (2018). The gender composition of corporate boards: A review and research agenda. *The Leadership Quarterly*, *29*(2), 346-364. https://doi.org/10.1016/j.leaqua.2017.06.001

[28] Nguyen, V. T., Duy Dat, N., Vo, T. D. H., Nguyen, D. H., Nguyen, T. B., Nguyen, L. S. P., ... & Bui, X. T. (2021). Characteristics and risk assessment of 16 metals in street dust collected from a highway in a densely populated metropolitan area of Vietnam. *Atmosphere*, *12*(12), 1548. https://doi.org/10.3390/atmos12121548

[29] Saraswat, I., Mishra, R. K., & Kumar, A. (2017). Estimation of PM10 concentration from Landsat 8 OLI satellite imagery over Delhi, India. *Remote Sensing Applications: Society and Environment*, *8*, 251-257. https://doi.org/10.1016/j.rsase.2017.10.006

[30] Vlasov, I., Panteleeva, A., Usenko, T., Nikolaev, M., Izumchenko, A., Gavrilova, E., ... & Slonimsky, P. (2021). Transcriptomic profiles reveal downregulation of low-density lipoprotein particle receptor pathway activity in patients surviving severe COVID-19. *Cells*, *10*(12), 3495. https://doi.org/10.3390/cells10123495

[31] Węziak-Białowolska, D. (2016). Quality of life in cities–empirical evidence in comparative European perspective. *Cities, 58,* 87-96. https://doi.org/10.1016/j.cities.2016.05.016

[32] McCrea, R., Shyy, T. K., & Stimson, R. (2006). What is the strength of the link between objective and subjective indicators of urban quality of life? *Applied Research in Quality of Life*, *1*, 79-96. https://doi.org/10.1007/s11482-006-9002-2

[33] Sapena, M., Wurm, M., Taubenböck, H., Tuia, D., & Ruiz, L. A. (2021). Estimating quality of life dimensions from urban spatial pattern metrics. *Computers, Environment and Urban Systems, 85*, 101549. https://doi.org/10.1016/j.compenvurbsys.2020.101549

[34] Qin, Z., Karnieli, A., & Berliner, P. (2001). A mono-window algorithm for retrieving land surface temperature from Landsat TM data and its application to the Israel-Egypt border region. *International Journal of Remote Sensing*, *22*(18), 3719-3746. https://doi.org/10.1080/01431160010006971

[35] Maleki, M., Rahmati, M., Sadidi, J., & Babaee, E. (2014). Landslide risk zonation using AHP method and GIS in Malaverd catchment, Kermanshah, Iran. In *International Conference on Geospatial Information Research (GI Research 2014)*, Tehran, Iran. https://www.researchgate.net/publication/272748183

[36] Maleki, M., Jozak, A., & Sadidi, J. (2020). Identification of sinkhole prone areas in Biston-Paro karst basin. *Journal of the Geographical Studies of Mountainous Areas, 1*(3), 67-80. http://gsma.lu.ac.ir/article-1-72-fa.html [In Persian]