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Development of Quality of Life model with Emphasis on Landscape Ecology Approach

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ABSTRACT

The objective of this study is to design and present a conceptual model of quality of life with an emphasis on landscape ecology and urban ecology approaches. This research adopted a qualitative methodology using grounded theory within an interpretive paradigm. Data collection combined extensive literature review with semi-structured interviews. Twenty participants—including city officials, university professors, and community leaders with expertise in urban ecology and quality of life—were selected through purposive sampling. Interviews, conducted via phone and email due to COVID-19 restrictions, lasted 20–30 minutes each and continued until theoretical saturation was reached. Responses were transcribed and analyzed using Atlas.ti software, following the coding sequence of open, axial, and selective coding. The study sought to identify causal conditions, contextual and intervening conditions, strategies, and consequences for integrating green infrastructure into urban ecology frameworks to improve life quality. The results highlighted the central role of green infrastructure as the main phenomenon influencing urban quality of life. Participants emphasized ecological corridors, green patches, green roofs, and connected ecological networks as crucial components for enhancing social, environmental, and economic well-being. The model demonstrated that causal conditions such as urban expansion pressures, biodiversity loss, and socio-economic challenges necessitate ecological approaches. Intervening conditions included transportation networks, cultural background, and citizen participation, while contextual conditions involved natural and man-made urban elements. Strategies proposed include reforming ecological structures, improving ecological knowledge, promoting sustainable land-use planning, and strengthening cultural and social infrastructure. The consequences identified include low-impact development, protection of ecosystem services, healthier human-ecological zones, social safety and equality, and the creation of green economic infrastructure with job opportunities. This study presents a comprehensive conceptual model that integrates quality of life indicators with urban ecology principles through green infrastructure. By recognizing ecological knowledge, cultural values, and structural planning, the model provides a pathway toward eco-centered social and economic development, sustainability, and enhanced human well-being in cities.

Keywords: Quality of life; landscape ecology; urban ecology; green infrastructure; grounded theory; sustainability

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Introduction

The concept of quality of life (QoL) has emerged as one of the most important and multifaceted indicators of human well-being, encompassing economic, social, environmental, cultural, and psychological dimensions. In urban studies, QoL is increasingly viewed not only as an individual aspiration but also as a central framework for evaluating the sustainability, resilience, and inclusivity of cities. Scholars agree that the rapid expansion of urbanization has brought both opportunities and challenges: while cities often provide better infrastructure, services, and economic prospects, they also concentrate environmental degradation, social inequalities, and health disparities (1, 2). This duality has necessitated a comprehensive exploration of how different determinants—ranging from ecological sustainability to technological integration—affect the lived experiences of urban populations.

Urban QoL is frequently defined as the degree to which the urban environment enables individuals to achieve personal goals, maintain health and well-being, and participate in community and cultural life (3). The multidimensionality of QoL reflects its dependence on a wide range of indicators: environmental quality, economic vitality, social equity, psychological health, and governance. International organizations, including the OECD, have emphasized that QoL must incorporate subjective as well as objective measures, recognizing the importance of individual perceptions alongside measurable data (4). At the same time, local cultural, political, and ecological contexts significantly shape what constitutes a "good life," underscoring the importance of contextualized frameworks (5).

Over the past decade, urban ecology has become an essential lens for analyzing QoL in cities. Ecological approaches emphasize the interdependence of human systems and natural systems, advocating for the integration of green infrastructure (GI) as a mechanism for enhancing both environmental sustainability and social well-being (6, 7). GI refers to strategically planned networks of natural and semi-natural areas—such as parks, green roofs, urban forests, and ecological corridors—that deliver a wide range of ecosystem services. These services include climate regulation, biodiversity conservation, noise reduction, recreational opportunities, and mental health benefits (8, 9). The urban ecology perspective therefore provides a comprehensive framework for connecting environmental health with human satisfaction and equity.

Several empirical studies underscore the ecological dimension of QoL. For example, research in East Asia has shown that ecological urbanism strategies—such as compact eco-cities and green design—are essential for balancing economic growth with environmental protection (10). Similarly, in industrial regions transitioning from "grey to green," the introduction of ecological restoration projects has been linked to measurable improvements in urban resilience and resident satisfaction (11). Assessments of ecological structures in cities like Tehran confirm that landscape-based planning enhances ecological integrity while providing cultural and recreational benefits, thereby contributing to better living conditions (12). These findings align with broader sustainability frameworks, which emphasize the need for integrated, multifunctional green networks that provide both ecological and social services (13).

The social dimension of QoL has also been widely examined. Scholars argue that the presence of strong community ties, opportunities for social participation, and cultural vitality are central to perceived well-being (14). For instance, neighborhoods with vibrant social interactions tend to report higher satisfaction levels, even when material resources are scarce. Livable mixed-use urban designs, which blend residential, commercial, and cultural functions, are increasingly recognized as contributing to QoL by fostering

inclusivity and social cohesion (15). Furthermore, grounded theory studies reveal that pro-nature behaviors, motivated by moral concern and sustained through cultural norms, can reinforce both ecological stewardship and community identity (16).

From a health perspective, QoL is shaped by both environmental exposures and lifestyle behaviors. The health-related quality of life framework highlights disparities between urban and rural populations, with city residents often experiencing unique risks due to pollution, stress, and congestion (17). At the same time, urban living can promote access to healthcare and social services, underscoring the complexity of the urban health–QoL nexus. Lifestyle factors such as physical activity, diet, and stress management also play an essential role. For example, evidence from India demonstrates how health-promoting and health-abusive behaviors significantly affect youth well-being in urban areas (18). These findings resonate with broader discussions about balancing technological change and human welfare in modern societies, where the proliferation of artificial intelligence (AI) in the workplace, while increasing efficiency, raises concerns about worker satisfaction and well-being (19).

Economic dimensions remain fundamental to QoL. Income levels, employment opportunities, and perceptions of financial security directly influence well-being, though not always in linear ways. Economic development, if not carefully managed, can erode ecological carrying capacity and undermine long-term sustainability, as observed in Beijing (20). Conversely, approaches emphasizing the green economy have demonstrated that ecological investments can create jobs, reduce costs, and improve long-term sustainability, as illustrated in the Baikal region of Russia (21). Similarly, analyses of Spanish cities show that QoL rankings depend not only on economic performance but also on social and environmental balance (22). This highlights the importance of adopting non-compensatory approaches that treat each dimension of QoL as indispensable, rather than assuming that economic prosperity can substitute for environmental or social deficits.

Environmental indicators are particularly salient in urban QoL assessments. The OECD framework emphasizes air quality, access to green spaces, and noise reduction as critical indicators (4). The importance of nature-based solutions (NBS) is increasingly recognized in policy and research. Studies demonstrate that urban green vegetation, quantified through indices such as the Green View Index, significantly affects residents' perceptions of beauty, safety, and health (23). The planning and implementation of green infrastructure in peri-urban areas have been shown to enhance subjective well-being, illustrating the value of citizen-centered planning approaches (24, 25). Methodologies for retrofitting urban spaces with multifunctional green infrastructure, especially in the Global South, further expand the potential of GI to reduce inequities in access to ecological benefits (26).

At the governance and policy level, researchers highlight the need for localized indicators and participatory approaches to QoL measurement. Delphi consensus procedures have been employed to identify context-specific urban QoL indicators, ensuring that assessments align with cultural and social realities (3). Comparative research confirms that generic models often fail to capture the diversity of urban experiences, reinforcing the necessity of bottom-up, citizen-informed frameworks (27). Moreover, studies from Iran show that enhancing environmental quality of life components directly supports sustainable development, underscoring the interdependence of ecological planning and governance (28).

The intersection of urban ecology and sustainable development is thus central to contemporary QoL debates. Research increasingly stresses that cities must be designed as socio-ecological systems, where human well-being is interwoven with ecological resilience (7). For example, compact eco-cities that combine economic opportunities, environmental stewardship, and cultural heritage preservation are seen as models for achieving balanced urban development (10). Rurbanization trends, driven by young citizens' preference for greener living environments, further reflect the desire for lifestyles that integrate natural and urban benefits (29). Long-term city innovation trajectories confirm that integrating ecological considerations into urban planning enhances resilience and supports diverse pathways to sustainable QoL (1).

At the theoretical level, researchers have emphasized the importance of multi-criteria approaches for assessing QoL. Methods such as multiple criteria analysis allow the simultaneous evaluation of environmental, social, cultural, and economic dimensions (30). Case studies in rural regions demonstrate how inhabitants conceptualize sustainable QoL as a balance between current satisfaction and responsibility to future generations (5). In line with this, studies of pro-nature behavior emphasize the role of ecological culture and moral values in shaping sustainable practices (16). These insights highlight the need for frameworks that are both integrative and adaptive.

Ultimately, the growing body of research indicates that the integration of green infrastructure, ecological knowledge, and social participation is essential for enhancing QoL in cities. Evidence from Uruguay, Portugal, and other international case studies demonstrates that GI not only sustains ecological services but also creates spaces for recreation, inclusion, and innovation (8, 31). This reinforces the argument that sustainability-oriented urban planning must focus not merely on environmental outcomes but on the holistic improvement of life quality, taking into account cultural, psychological, and governance dimensions (32, 33).

In sum, QoL is a multidimensional and context-dependent construct shaped by the interplay of social, economic, environmental, cultural, and technological factors. The literature clearly demonstrates that sustainable improvement of QoL in urban settings cannot be achieved through isolated interventions; rather, it requires integrated approaches that recognize the synergies between ecological infrastructure, social participation, economic equity, and technological innovation. Urban ecology, with its focus on green infrastructure and ecosystem services, provides a powerful conceptual framework for advancing this agenda. The present study contributes to this growing field by proposing and testing a conceptual model that integrates QoL indicators with landscape ecology and urban ecology approaches, thereby addressing one of the most pressing challenges of contemporary urbanization: how to design cities that are ecologically sustainable, socially inclusive, and conducive to human well-being.

Methods and Materials

This study adopted an interpretive and qualitative paradigm based on grounded theory, employing a systematic approach. A comprehensive literature review of journal articles and other academic sources was conducted, focusing on three main keywords: *quality of life*, *urban ecology*, and *green infrastructure*. Following established qualitative methodological protocols, the study aimed to develop a conceptual model integrating these domains.

Data Collection

Semi-structured interviews (SSIs), based on open-ended questions, were used to allow participants to elaborate on their responses. The flexibility of SSIs, combined with their structured framework, made them particularly suitable for this research. A script containing open-ended questions and potential discussion topics guided the interviews.

Participants were selected through purposive sampling from diverse sectors, including city officials, city council members, leaders of non-profit organizations, university professors, business executives, and community leaders—all with extensive experience in urban ecology and quality of life studies. Interviews shorter than 10 minutes were excluded, as they were deemed insufficient to provide meaningful data, consistent with the literature.

Due to COVID-19 restrictions, most interviews were conducted by phone, while some participants preferred to provide written responses via email. Sessions lasted between 20 and 30 minutes and were carried out over three months, from July to September 2020. Interviews were scheduled through phone calls or email correspondence, and participants were asked to reflect on their personal and professional experiences regarding quality of life within the framework of urban ecology. In total, 20 participants were interviewed. Additional data were gathered from secondary sources, including newspaper reports, books, company records, and official documents.

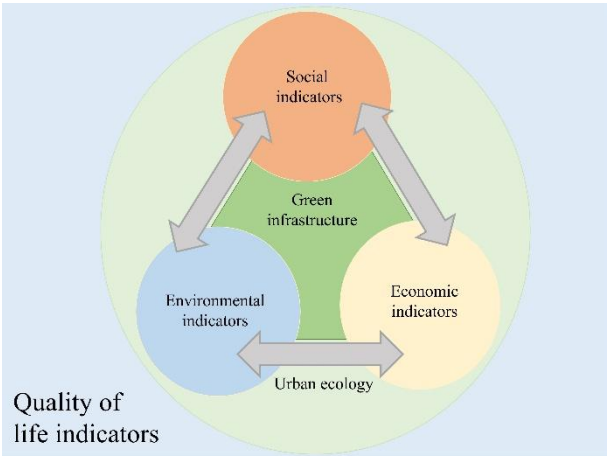

Figure 1. Relationship between indicators of life quality, urban ecology, and green infrastructure

Data Analysis

Upon completion of the interviews, all recordings and notes were reviewed. Data collection continued until theoretical saturation was achieved. The analysis followed an inductive procedure using *Atlas.ti* software, which enabled the organization of codes, themes, and categories related to the natural environment, social dynamics, economic structures, and urban systems.

Interview transcripts were imported into *Atlas.ti* as separate files. Coding was performed by assigning "nodes"—representing themes, concepts, ideas, or experiences—to relevant text segments. Codes were developed inductively, emerging from both the literature review and participant responses.

Following the grounded theory approach of Strauss and Corbin (1990), coding proceeded through three stages: open coding, where objective and subjective indicators of quality of life and urban ecology were identified across social, environmental, economic, structural, physical, and cultural categories; axial coding, where major and minor categories were organized, with green infrastructure emerging as the central phenomenon due to its frequent recurrence; and selective coding, which integrated the central category with other categories to form a coherent theoretical narrative.

At this stage, causal, contextual, and intervening conditions—as well as strategies and consequences—were systematically identified. Validation was ensured through triangulation of data sources, participant feedback, researcher engagement with the phenomenon, and the construction of a transparent and comprehensible paradigm model.

Findings and Results

This section presents the characterization of the study setting, a description of fieldwork, and the subsequent analysis of interviews, highlighting differences across methods and areas of inquiry. A total of 18 semi-structured interviews were conducted, of which 7 took place by phone. Five interviews were held on weekdays, while the remainder were completed via email.

Across all interviews, more than half of the respondents spontaneously emphasized that family, friends, the surrounding natural environment, and the opportunity to live in a greener city were the most important contributors to their quality of life. One participant explained:

"Probably quality of life for me is my parents and friends. Because if there is anything you need help with, you know where you can go. And then to be here in nature also provides a quality of life that might be a little less available in the city. I prefer a greener city, green streets, neighborhoods, and homes."

This response underscores the centrality of nature. The urban landscape was consistently associated with social relationships. Participants described natural spaces as sites for hiking, cycling, skiing, or visiting with family and friends. Leisure and recreation were viewed as enabling factors in forming social ties, and proximity to green spaces was often cited as a criterion when choosing a place of residence.

Several participants stressed that beyond social indicators, healthy natural environments and mental and physical well-being are the strongest determinants of happiness and quality of life. As one respondent stated:

"Humans will have a healthy and happy life in connection with healthy nature, so considering the importance of the health index, a healthy environment is of great importance. Connectivity of green spaces creates an endless trail for walking and exercise. Spatial equality of green spaces in the physical body of the city creates equality for people."

This perspective illustrates the significance of landscape ecology as a planning approach for connected urban green spaces with multifunctional uses. Green infrastructure—composed of ecological corridors, green roofs, and green patches—was frequently emphasized as both environmentally beneficial and essential for human well-being. Participants consistently noted that residents of greener environments report higher levels of happiness than those living in highly urbanized, built environments.

When specifically asked about quality of life indicators, respondents largely agreed that green infrastructure is fundamental. Many stressed that equitable distribution of green spaces is a key factor for livable, human-centered cities. They highlighted urban ecology as a scientific approach that explores the

relationship between human activities and natural systems. Accordingly, ecological green paths, green roofs, ecological corridors, recovery of ecological networks, and ecosystem-based planning were described as effective strategies for sustainable urban development.

The COVID-19 pandemic further reinforced the perceived importance of green infrastructure. One participant reflected:

"Although our cities are hot and crowded, there is little chance to spend time in nature. After the COVID-19 pandemic we had to stay at home. I have two children, and our home is too small. I would prefer to live in a green neighborhood with plenty of open space—yards, gardens, or parks for walking and playing."

Respondents also associated quality of life with the ability to enjoy private gardens or access surrounding landscapes. Green roofs and walls were cited as important innovations, offering benefits such as thermal insulation, noise reduction, biodiversity conservation, and mitigation of the urban heat island effect.

When discussing broader life quality components, participants agreed that environmental, social, and economic indicators were all critical. Some argued that education in sustainability and ecological behavior should be integrated into daily life. One participant remarked:

"I think better life quality strongly depends on environmental quality. If you live in a safe, quiet, and beautiful place surrounded by trees, you feel safe and healthy and enjoy spending time there. We should educate people to understand the importance of ecological knowledge and correct behavior in cities."

Economic constraints were also emphasized. As one respondent explained:

"Today not all people have enough money to have fun after work hours. Living in a green city gives everyone the opportunity to walk for long hours or bike. No matter if you are poor or rich, you can enjoy fresh air and beautiful scenery."

This highlights the need for economic development to align with ecological carrying capacity. Participants argued that physical planning should not only focus on land use and urban form but also integrate social, economic, and environmental dimensions.

Participants frequently identified economic benefits of green infrastructure, including direct job creation, indirect economic output, cost reduction, and risk management. Access to green spaces was further linked to income and employment patterns, with several participants stating that leisure time in nature was as valuable as income itself. Membership in associations or clubs was also noted as an important contributor to social cohesion, loyalty, and networking opportunities.

Less frequently mentioned but still acknowledged were cultural and physical features such as historic buildings, museums, cultural and artistic activities, public transport, shopping facilities, and public spaces. Environmental attributes such as low pollution, tranquility, cleanliness, and access to natural landscapes were also regarded as significant quality of life indicators.

Eighteen respondents specifically emphasized the importance of accessibility and mobility in relation to green infrastructure, often basing their residential choices on proximity to public transport networks and cultural or recreational amenities.

Overall, the analysis confirmed green infrastructure as the central phenomenon of this study. Participants highlighted ecological routes, green networks, and regional ecosystem-based planning as pathways for improving quality of life. These strategies encompass the use of natural elements in buildings, expansion of clean transportation, multifunctional spaces, and integration of ecological wisdom into planning processes.

The findings also identified causal conditions, such as urban expansion, biodiversity loss, and socio-economic pressures; contextual conditions, including spatial patterns of natural and built environments; and intervening conditions, such as transportation networks, cultural background, citizen participation, and legal frameworks. Barriers were also acknowledged, particularly insufficient ecological knowledge and weak cultural infrastructure.

Strategies included restructuring ecological elements, promoting ecological culture and social systems, enhancing knowledge, and ensuring sustainable land use planning. Consequences included eco-centered social and economic development, environmental sustainability, improved mental health, social safety, equity, and the creation of human-ecological zones and green economies.

In this framework, cities are viewed as ecosystems where human behavior is shaped by ecological infrastructure. The transition to eco-centered development requires cultural change, citizen participation, and responsibility toward future generations. Ultimately, the conceptual model (Figure 2) demonstrates how green infrastructure can provide ecological, social, and economic benefits, protect ecosystem services, reduce pollution, and foster sustainable lifestyles.

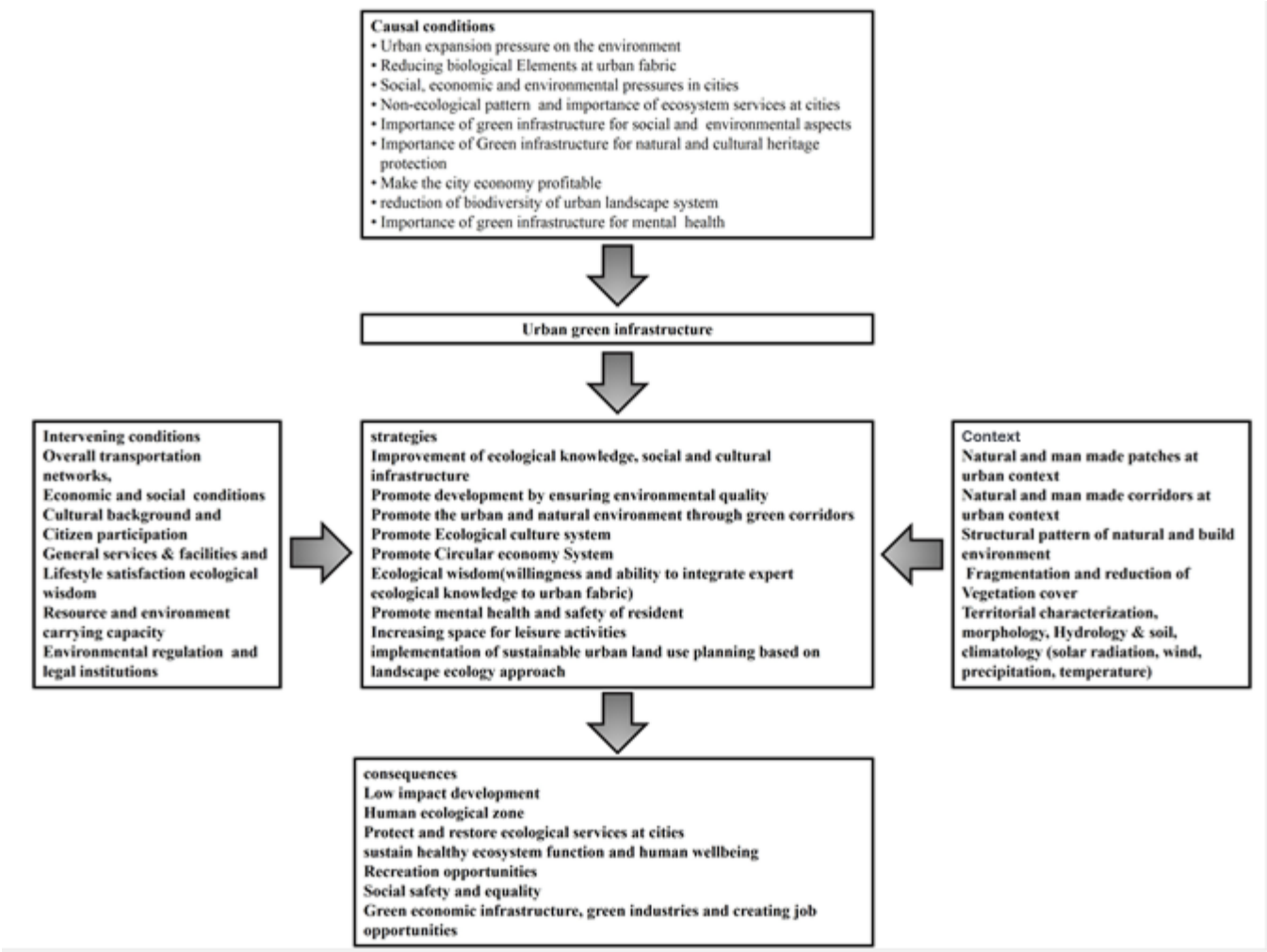

Figure 2: Conceptual model for life quality based on a landscape ecology approach

Discussion and Conclusion

The findings of this study highlight the critical role of urban green infrastructure in improving environmental quality, social well-being, and sustainable urban development. Results demonstrated that urban green infrastructure contributes significantly to enhancing quality of life indicators, ecological balance, and resilience in the face of environmental pressures. By integrating natural systems into the built environment, cities can simultaneously address ecological sustainability and human health. This dual benefit has been a recurrent theme across scholarly discussions. For example, (7) emphasized that ecological concepts like disturbance and resilience maintain high utility in urban social-ecological-technological systems, directly supporting the current study's assertion that ecological frameworks remain vital for urban planning. Similarly, the study aligns with evidence that ecological capacity is directly tied to urban economic growth and development, as demonstrated in research on Beijing where ecological carrying capacity acted as both a constraint and an opportunity for development (20).

A key result of this study was that quality of life is intricately connected to the presence and accessibility of green infrastructure. Respondents underscored the importance of ecological services, such as recreation, air purification, and mental health support, echoing findings in rural and urban contexts. For instance, (33) used multilevel models in rural Iran to show how environmental quality significantly enhances life satisfaction, while (15) demonstrated the importance of livable, mixed-use environments that incorporate greenery in urban settings. Both confirm the essential argument that green infrastructure is not merely a design component but a determinant of human well-being. The findings also reinforce the notion that urban infrastructure cannot be divorced from social and cultural dimensions, a point similarly observed by (16), who showed that pro-nature behaviors are rooted in moral concerns and sustained by positive ecological engagement.

The study also highlighted disparities in perceptions of quality of life between urban and peri-urban populations. This aligns with prior research noting differences between urban and rural quality of life indicators. For example, (17) found significant differences in health-related quality of life among asthma patients living in rural and urban areas in Russia, emphasizing the socio-environmental determinants of well-being. Likewise, (5) stressed the need to integrate inhabitant perspectives in defining sustainable quality of life, particularly in rural and peri-urban regions. These comparisons suggest that while green infrastructure is universally beneficial, its specific contributions vary according to geographic and social context, reaffirming the necessity of context-sensitive urban policies.

Another central result concerned the link between urban ecological planning and sustainable economic opportunities. The study demonstrated that green industries and ecological services can provide jobs and stimulate local economies. These findings mirror research in the Baikal region of Russia, where green economy principles were found to create socio-economic resilience (21). Likewise, (19) underscored the importance of capacity development and quality of work life in organizational performance within contexts of technological transformation, indirectly supporting the notion that ecological and technological adaptations in urban planning must simultaneously consider employment and livelihood opportunities. The research further resonates with the work of (25), who showed that peri-urban green infrastructures improve perceived well-being, thereby indirectly sustaining economic value by enhancing social cohesion and human capital.

The role of cultural and institutional frameworks emerged as another vital element in the results. Green infrastructure initiatives were shown to be more effective when supported by robust legal institutions, citizen participation, and socio-cultural acceptance. This observation is consistent with (3), who developed urban quality of life indicators through Delphi consensus, stressing the necessity of localized, contextualized measures. Further, in Saudi Arabia, (34) found that assessing quality of life requires frameworks deeply embedded in local contexts, highlighting the limitations of universal models. Complementarily, (1) demonstrated that city innovation trajectories depend on adaptive governance models, where ecological and cultural conditions converge to improve urban life.

A further finding was the critical need for integrated ecological and technological approaches in urban planning. Respondents stressed the importance of ecological corridors, sustainable land-use planning, and digital technologies for monitoring and managing urban ecosystems. This observation strongly resonates with the work of (35), who emphasized that smart city concepts—when integrated with ecological considerations—greatly enhance quality of urban services and life. Similarly, (11) illustrated the path from industrial decline to ecological regeneration, where technology and governance facilitated transformation. Meanwhile, (10) provided comparative evidence from East Asia showing how eco-city models integrate ecological urbanism with technological frameworks. Collectively, these studies underscore the conclusion that sustainable green infrastructure requires a multidisciplinary foundation where ecological, technological, and governance systems converge.

The findings also demonstrated that subjective perceptions of well-being and objective environmental measures need to be considered jointly in planning. For instance, while ecological corridors improved measurable environmental indicators, the perceived improvement in well-being was equally influential in evaluating project success. (14) highlighted a similar observation in poor neighborhoods, where capability approaches revealed that quality of life improvements cannot be understood solely in material terms. Similarly, (22) adopted a non-compensatory approach to rank Spanish cities, demonstrating that subjective measures weigh heavily alongside objective urban metrics. This combination of objective and subjective dimensions validates the current study's methodology and findings.

Green infrastructure also plays a vital role in climate adaptation, a point underlined by the study. Respondents noted that resilient green systems help cities adapt to floods, heatwaves, and other climate-related hazards. This resonates with global analyses such as (4), which stressed green infrastructure as central to climate resilience strategies. More localized evidence was provided by (8), who demonstrated how planning a green infrastructure network in Portugal reduced vulnerabilities, and (26), who focused on the retrofitting of multifunctional urban spaces in the Global South to withstand environmental challenges. These findings demonstrate that cities can mitigate climate risks while simultaneously enhancing livability and well-being by investing in robust green systems.

The emphasis on human health in relation to urban greenery was another consistent theme in the results. Participants identified reductions in stress, improved mental health, and enhanced social connectedness as primary outcomes. These observations echo the findings of (18), who linked health-promoting lifestyle behaviors to improved health-related quality of life among urban youth. (28) also showed that enhancing environmental quality directly impacts sustainable development, particularly in terms of health. Likewise,

(9) demonstrated through a case study in Taichung that the value of green infrastructure lies not only in ecological terms but in substantial improvements to human well-being.

The study also confirmed that urban transformation processes are best achieved through participatory and inclusive models. Respondents emphasized that long-term sustainability cannot be realized without citizen involvement, education, and co-creation. This aligns with findings from (29), who noted that youth engagement in urban greening initiatives is essential for long-term sustainability. Similarly, (31) found that participatory approaches in Montevideo were effective in green infrastructure planning, while (12) showed that ecological assessments in Tehran benefited significantly from landscape-level citizen engagement. These examples strongly support the study's conclusion that participatory governance is a non-negotiable component of successful ecological planning.

Finally, the results demonstrated that sustainable green infrastructure cannot be a one-size-fits-all approach. Instead, it must be context-sensitive, adaptive, and integrative. Research in Arak, Iran, for example, found that life quality factors are shaped by unique industrial and environmental conditions (32). Similarly, (23) developed standardized green view indices to quantify vegetation, but emphasized the importance of adapting tools to local conditions. Additionally, (13) highlighted the need for integrated reviews to refine principles applicable in diverse contexts, while (2) traced the emergence of happiness metrics in urban studies, emphasizing their diversity. Collectively, these studies reinforce the principle that localized, adaptive frameworks ensure that green infrastructure interventions remain relevant, equitable, and sustainable.

This study, while comprehensive, has several limitations. The analysis relied heavily on qualitative perceptions and case-based findings, which may limit generalizability to broader urban contexts. Further, the spatial scope was constrained to specific regions, meaning variations across different socio-political or climatic contexts may not have been fully captured. Additionally, reliance on secondary data sources in some sections introduced potential biases regarding accuracy and completeness. Finally, while the study addressed ecological, social, and economic factors, technological and governance dimensions could have been explored in more depth to strengthen the integrative approach.

Future research should focus on comparative, cross-regional studies to better understand how cultural, climatic, and institutional contexts shape the outcomes of green infrastructure initiatives. Quantitative modeling and mixed-method approaches could complement the qualitative findings, enabling stronger causal inferences. Moreover, longitudinal studies that track the long-term effects of green infrastructure on health, well-being, and economic performance would provide more robust evidence. Further exploration of digital technologies, such as smart sensors and AI-driven urban planning tools, could also expand the scope of ecological monitoring and management.

Practitioners should prioritize participatory planning, ensuring that citizens are actively involved in shaping green infrastructure projects. Local governments need to adopt adaptive policies that integrate ecological science, urban design, and cultural values, avoiding universal models that fail to capture local complexities. Investments should be directed toward multifunctional green systems that simultaneously provide ecological, social, and economic benefits. Finally, policies must emphasize inclusivity, ensuring equitable access to green spaces across socio-economic groups, while leveraging technology to monitor progress and ensure long-term sustainability.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants. The ethics code of the Ethics Committee of Research, Islamic Azad University, Isfahan (Khorasgan) Branch, was approved under the number IR.IAU.KHUISF.REC.1401.313 on December 19, 2022.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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References

1. Popescu AI. Long-Term City Innovation Trajectories and Quality of Urban Life. Sustainability. 2020;12(24):10587. doi: 10.3390/su122410587.
2. Papachristou AI, Rosas-casals M. Cities and quality of life. Quantitative modeling of the emergence of the happiness field in urban studies. Cities. 2019;88:191-208. doi: 10.1016/j.cities.2018.10.012.
3. Al-Qawasmi J, Saeed M, Asfour OS, Adel S, Aldosary AS. Assessing Urban Quality of Life: Developing the Criteria for Saudi Cities. Front Built Environ. 2021;7. doi: 10.3389/fbuil.2021.682391.
4. Oecd. Executive summary. 2020. doi: 10.1787/ea714361-en.
5. Wiesli T, Hammer T, Bär R. Sustainable Quality of Life: A Conceptualization That Integrates the Views of Inhabitants of Swiss Rural Regions. Sustainability. 2021;13(16):9187. doi: 10.3390/su13169187.
6. Matsler AM, Meerow S, Mell IC, Pavao-Zuckerman MA. A 'green' chameleon: Exploring the many disciplinary definitions, goals and forms of "green infrastructure". Landscape and Urban Planning. 2021;214:104145. doi: 10.1016/j.landurbplan.2021.104145.
7. Grimm NB, Pickett STA, Hale RL, Cadenasso ML. Does the ecological concept of disturbance have utility in urban social-ecological-technological systems? Ecosystem Health and Sustainability. 2017;3(1):1-18. doi: 10.1002/ehs2.1255.
8. Ferreira J, Monteiro R, Silva V. Planning a Green Infrastructure Network from Theory to Practice: The Case Study of Setúbal, Portugal. Sustainability. 2021;13(15):8432. doi: 10.3390/su13158432.
9. Hsu KW, Chao JC. Study on the Value Model of Urban Green Infrastructure Development: A Case Study of the Central District of Taichung City. Sustainability. 2021;13(13):7402. doi: 10.3390/su13137402.
10. Lin Z. Ecological urbanism in East Asia: A comparative assessment of two eco-cities in Japan and China. Landscape and Urban Planning. 2018;179:90-102. doi: 10.1016/j.landurbplan.2018.07.008.

11. Kitheka BM, Baldwin E, Powell R. Grey to green: Tracing the path to environmental transformation and regeneration of a major industrial city. Cities. 2021;108:102987. doi: 10.1016/j.cities.2020.102987.
12. Hassanpour P, Sayyahnia R, Hassan Esmaeilzadeh H. Ecological structure assessment of urban green space using the landscape approach (case study: Tehran's 22nd district). Environmental Sciences. 2020;18(1):187-202. doi: 10.29252/envs.18.1.187.
13. Monteiro R, Ferreira J, Antunes P. Green Infrastructure Planning Principles: An Integrated Literature Review. Land. 2020;9(12):525. doi: 10.3390/land9120525.
14. Grabowska I. Quality of Life in Poor Neighborhoods through the Lenses of the Capability Approach: A Case Study of a Deprived Area of Łódź City Centre. Sustainability. 2021;13:7185. doi: 10.3390/su13137185.
15. Zahrah W, Ginting N, Aulia DN, Marisa A. Quality of life for livable mixed use living. IOP Conference Series: Earth and Environmental Science. 2021;780(1):012043. doi: 10.1088/1755-1315/780/1/012043.
16. Williams MO, Whitmarsh L, Haddock G, Chríost DMG. A Grounded Theory of Pro-Nature Behavior: From Moral Concern to Sustained Action. Sustainability. 2021;13(16):8944. doi: 10.3390/su13168944.
17. Perelman NL, Kolosov VP. Differences in the health-related quality of life in patients with asthma living in urban and rural areas in the Amur Region of Russian Federation. PloS one. 2023;18(11):e0284683. doi: 10.1371/journal.pone.0284683.
18. Mallick A. Unravelling the Role of Health-Promoting and Health-Abusive Lifestyle Behaviours on Health-Related Quality of Life Among the Urban Community-Dwelling Youths: A Cross-Sectional Study in the Balasore District of Odisha, India. 2025. doi: 10.21203/rs.3.rs-6087073/v1.
19. Akinwale OE, Kuye OL, Doddanavar I. Scourge of replacing contemporary work environment with artificial intelligence (AI-dark-side): the role of capacity development in quality of work-life and organisational performance. Journal of Systems and Information Technology. 2025;27(1):116-45. doi: 10.1108/JSIT-08-2024-0297.
20. Fang W, An H, Li H, Gao X, Sun X. Urban economy development and ecological carrying capacity: Taking Beijing city as the case. Energy Procedia. 2017;105:3493-8. doi: 10.1016/j.egypro.2017.03.801.
21. Bilgaev A, Dong S, Li F, Cheng H, Sadykova E, Mikheeva A. Assessment of the Current Eco-Socio-Economic Situation of the Baikal Region (Russia) from the Perspective of the Green Economy Development. Sustainability. 2020;12(9):3767. doi: 10.3390/su12093767.
22. Goerlich F, Reig E. Quality of life ranking of Spanish cities: A non-compensatory approach. Cities. 2021;109:102979. doi: 10.1016/j.cities.2020.102979.
23. Kumakoshi Y, Chan SY, Koizumi H, Li X, Yoshimura Y. Standardized Green View Index and Quantification of Different Metrics of Urban Green Vegetation. Sustainability. 2020;12(18):7434. doi: 10.3390/su12187434.
24. Muro RST, Granados S, Romero ER. Green Infrastructures in the Peri-Urban Landscape: Exploring Local Perception of Well-Being through 'Go-Alongs' and 'Semi-Structured Interviews'. Sustainability. 2020;12(17):6836. doi: 10.3390/su12176836.
25. Muro RST, Granados CST, Romero EJR. Green Infrastructures in the Peri-Urban Landscape: Exploring Local Perception of Well-Being through 'Go-Alongs' and 'Semi-Structured Interviews'. Sustainability. 2021;12(17):6836. doi: 10.3390/su12176836.
26. Fluhrer T, Chapa F, Hack J. A Methodology for Assessing the Implementation Potential for Retrofitted and Multifunctional Urban Green Infrastructure in Public Areas of the Global South. Sustainability. 2021;13(1):384. doi: 10.3390/su13010384.
27. Nikoofam M, Abdollah Mobaraki A. Assessment of Quality of Life in the Urban Environment; Case Study: Famagusta, N. Cyprus. Civil Engineering and Architecture. 2020;8(5):860-72. doi: 10.13189/cea.2020.080513.
28. Shafiei Sabet N, et al. The Effect of Enhancing Components of Environmental Quality of Life on Sustainable Development in Iran. JSRD. 2020;4(1):71-88. doi: 10.32598/JSRD.03.02.05.
29. Orîndaru A, Constantinescu M, Ţuclea CE, Căescu SC, Florescu MS, Dumitru I. Rurbanization-Making the City Greener: Young Citizen Implication and Future Actions. Sustainability. 2020;12(17):7175. doi: 10.3390/su12177175.
30. Kaklauska A, Zavadskas EK, Radzeviciene A, Ubarte I, Podviezko A, Podvezko V, et al. Quality of city life multiple criteria analysis. Cities. 2018;72:82-93. doi: 10.1016/j.cities.2017.08.002.
31. Apud A, Faggian R, Sposito V, Martino D. Suitability Analysis and Planning of Green Infrastructure in Montevideo, Uruguay. Sustainability. 2020;12(22):9683. doi: 10.3390/su12229683.
32. Pazhuhan M, Zanganeh Shahraki S, Kaveerad N, Cividino S, Clemente M, Salvati L. Factors Underlying Life Quality in Urban Contexts: Evidence from an Industrial City (Arak, Iran). Sustainability. 2020;12(6):2274. doi: 10.3390/su12062274.

33. Faraji Sabokbar HA, Najarzadeh M, Torabi Z, Malakan A. Studying factors affecting quality of life using multilevel models: A case study in rural areas of Kangavar County. Journal of Sustainable Rural Development. 2017;1(1):5-14. doi: 10.18869/nrip.jsrd.1.1.3.
34. Al-Qawasmi J. Selecting a Contextualized Set of Urban Quality of Life Indicators: Results of a Delphi Consensus Procedure. Sustainability. 2021;13(9):4945. doi: 10.3390/su13094945.
35. Vaziri M, Bani Khalifi N, Mofidi Shamirani SM. Examining the Concept of Smart City: Integrating Information Technology to Improve Quality of Life and Urban Services. Quarterly Journal of Modern Architectural Research. 2023;10:45-62.