

Examining the Influence of Urban Environment and Green Space Perceptions on Quality of Life

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Abstract

Purpose: This study examines how public perception of urban settings, natural ecology, and green areas affects Eastern Saudi Arabian quality of life. It seeks to explain these links and how perceptions of green space affect them. **Method:** The cross-sectional survey included 331 random Dammam, Khafji, and Alhasa residents. Data were collected using validated scales from past research in structured questionnaires. ADANCO software was used for Partial Least Squares Structural Equation Modelling (PLS-SEM) to examine construct direct and moderating effects. **Findings:** The results show that public perception of urban settings, natural ecology, and green areas greatly affects life satisfaction. Green space perceptions successfully moderated these connections, enhancing the favourable effects of urban and ecological factors on quality of life. Study shows significant direct and moderated impacts, validating cognitive and perceptual dimensions' importance in urban quality of life. **Originality/Implications:** This research integrates cognitive evaluations with perceptual criteria to comprehend urban quality of life theoretically. It advises urban planners and legislators on how to build and maintain green spaces to improve citizens' well-being. The findings support future study on moderating variables and longitudinal effects.

Keywords: Perception of Green Space for Health Promotion, Public Cognition of Urban Economy, Urban Society, Urban Environment, Natural Ecology and Environment, Quality of Life Enjoyment and Satisfaction.

INTRODUCTION

Urban planning and environmental psychology are increasingly aware of the complex relationship between urban surroundings, natural ecology, and citizens' quality of life. Understanding how urban design and natural features affect city people's well-being and contentment is crucial as cities grow.¹ The dynamics within the society, economy and environment of a city serves as the liveability index of a city in relation to the health, happiness and satisfaction index of the population of the city.² It has been seen that the main thrust of urban planning in the past was focused on economic growth and physical development of the city without bothering about the impact on the environment or the social structure of the society.³ Within the past few decades, the approaches towards urban development goals have embraced ecological integrity, social equity and on top, people's health.⁴ A growing number of studies reveal that natural environments, green areas, and quality environment enhance urban life.⁵ Academics today know that perceptions of the economic, social and ecological context of urban environments influence the quality of life of the inhabitants.⁶ This is because such views are essential in shaping the perspectives towards pollution, climate change, and social inequality as cities are affected.

Urban environment factors have often been found to influence the quality of life of the citizens in a country across the world.⁷ The perceived changes in the urban economy, especially the employment opportunities, economic certainty as well as infrastructure directly influence life happiness.⁸ Positive perceptions of the urban economy are related to more pleasant and higher well-being because a stable and vibrant economy leads to better living conditions, services and protection.⁴ Also, it has been indicated that metropolitan society plays a major role in determining the quality of life. Good social relations, social interaction and being in group makes up, happy, reduces stress and helps in building up community or group belongingness.⁹ An important factor in people's well-being is the urban environment, particularly its physical and aesthetic aspects.¹⁰ Clean streets, green parks, and well-maintained public places produce a pleasant and favourable living environment, increasing life satisfaction.¹¹ Natural ecology and urban green spaces are equally important, according to research. Research shows that access to green spaces like parks and leisure places improves physical and mental health and life satisfaction.¹² A healthy life requires physical activity, social connection, and relaxation, which green spaces give. Trees, waterways, and various animals in urban environments improve residents' connection to nature, which boosts well-being and life satisfaction.¹³ Green spaces' health-promoting image can boost life happiness by amplifying natural ecology's benefits. The research studies by Wen, *et al.*¹⁴ reveals that clean, green and healthy cities increase the well-being of the citizens. In light of these findings, there is need to assimilate nature and green spaces in the urbanization process to create better and sustainable cities.

Urban environment and the facilitating factors for a good quality lifestyle are researched extensively yet there appears to be a unending research gap.¹⁵ Specifically, prior knowledge including perception on the economy, culture, and physical environment has a bearing on the level of synthesized contentment; nevertheless, the manner in which this function happens is not well understood.¹⁶ These dimensions have been studied separately, but more study is needed on their influence on well-being.¹ Many studies have focused on industrialized countries, where urban planning and environmental factors may differ from those in developing nations.² Similarly this regional focus limits the generalizability of the findings and underscores the need for more heterodox urban research particularly in emerging Global South urban contexts.⁴ In fact, as revealed by the literature, there is scant literature on how green infrastructure such as urban parks, community gardens, and nature reserves impact on citizens' well-being.¹⁷ Therefore, to design healthy and happy cities necessary to consider these details. Further research for other variables that have repercussions on life satisfaction due to the modifications in the urban environment in the long term is also necessary. Majority of the studies have looked at urban environments and quality of life concurrently at a specific point in time with cross sectional designs.¹⁸ In order to gain insights into the impacts of urban design and consequent institutionalized component of environment on well-being trajectories, there is a need for interactive longitudinal research as pointed out by Ge and colleagues³. Although awareness of natural ecology seems to be valued widely in public, few amounts of research focus on the impacts of education, culture, and media on it. These aspects may show how environmental impressions are created by inhabitants of cities and how policy-making together with education might enhance them.¹⁹ Last but not the least, future research is required for exploring the above green areas of moderating public perception of urban environments and life satisfaction. This relation has been studied in some research but the mechanisms that intermediate the impacts of green spaces on environmental perceptions and well-being are still unidentified.²⁰

This research is grounded on environmental psychology and urbanism, fields of study that deal with the impact of the urban environment and natural environment on the human health. In Biophilia, it is said that nature and natural objects and green areas are important to man's psychological health and the experience of life's pleasures. This idea also backing up the findings of the actual studies that green areas help in enhancing mental health stress and social cohesiveness. Focusing and stressing the role of individual, societal and environmental factors of health related outcome, the societal-Ecological Model can assist one to grasp how the public's perception of the urban environment and natural ecology affects well-being.⁵ What this concept suggests is that people's perceptions of urban environments are constructed through social relations, interactions with the environment and experiences. This paper investigates how public awareness of urban economy, society, and natural environment influences quality-of-life enjoyment and satisfaction as well as how green space view moderates these interactions. To close gaps in the literature, this paper investigates the combined impact of several dimensions of public cognition on life satisfaction in various metropolitan environments. This study combines urban studies with environmental psychology to better grasp how natural surroundings and urban environments impact people's quality of life. Urban design and policy decisions should be informed by this study to make cities more livable, sustainable, and healthy.

LITERATURE REVIEW

Nowadays, one of the main disciplines that balances society, the economy, and the surroundings is urban planning.²¹ Research indicates that participatory models including local communities, legislators, and urban planners are replacing top-down approaches.²²⁻²⁴ This movement resulted from the awareness that sustainable urban development needed a comprehensive awareness of social dynamics, economic needs, and environmental constraints. Scholars highlighted that green infrastructure, mixed-use buildings, and public space enhancements are now more crucial in helping cities to be more livable and resilient.²⁵ To build more environmentally friendly cities, smart growth and new urbanism advocate more density, walkability, and car independence.²⁶ Increasing amount of research investigates how urban informatics and technical innovations like GIS enhance planning processes and results.⁷ Using these instruments, planners can make evidence-based decisions, foresee future possibilities, and examine difficult data. Another important theme in urban planning literature is social justice and inclusiveness.⁸ Research has shown that choices about urban design have maintained inequalities, marginalised low-income and minority groups. Recent research advise including social justice concepts into urban design to guarantee that all residents have access to affordable housing, essential amenities, and economic growth.²⁷ By supporting democratic access to metropolitan areas and resources the Right to the City questions richly dominant power systems. Emphasising the need of resilient planning strategies, the literature also investigates how climate change affects cities.²⁸ Rising sea levels and strong storms are among the climate hazards planners should handle in order to safeguard infrastructure and sensitive areas. As cities develop and face fresh challenges, urban planning is more crucial than ever in producing sustainable, inclusive, and resilient ones.²⁹

Urban studies have to take public perspective on the urban economy, enjoyment and satisfaction of quality of life, and view of green space for health promotion into account.³⁰ Public cognition of the urban economy is the awareness, impressions, and understanding of urban economic activities, potential, and challenges by individuals.^{31,32} Personal experiences, media coverage, and socioeconomic level affect how city dwellers see their financial situation. People's general well-being, happiness, and contentment with health, economic stability, social relationships, and environmental quality together define their quality-of-life enjoyment and gratification.³³ Views of green space for health promotion depend on how people see parks and the accessibility, availability, and health benefits of leisure activities. Perception shapes behaviour including frequency of outdoor exercise, thereby impacting life satisfaction.³⁴ Urban planning and public health studies has shown that economic attitudes and environmental factors significantly affect quality of life.^{35,36} The urban economy characterized by job possibilities, economic growth, and stability has been found to improve life satisfaction and well-being.³⁷ Sultana, *et al.*³⁸ discovered that residents in economically vibrant cities with low unemployment and strong infrastructure have better life satisfaction than those in economically poor locations. In addition, the studies have revealed that exposure to green areas increases physical and mental well-being; this enhances the quality of life.¹ Research has found that, parks and recreational facilities when properly maintained increases physical exercise, decrease stress levels and enhance the quality of life. These studies prove that economic perceptions and environmental quality of the place have an impact on the life satisfaction of the people living in the urban area.³ Therefore the first hypothesis can be formulated in these relationships given these empirical findings. Understanding the perceived image of the urban economy enhances the quality of life – enjoyment and satisfaction,

hence, where one gains a positive perception about the urban economy, there will be improvement on the experience of happiness among the urban dwellers.^{5,39,40} The look at the urban economy enables the people to have economic security as well as a chance to enhance their welfare. The second hypothesis is based on the role played by perception of green space to mediate. Based on the study, green areas have positive effects on physical and mental health and moderation the positive impact of economic perception on life happiness as stated in Zhang, and Qian⁷. Therefore, in the settings of high availability of green spaces, the role of the PHSP is to significantly moderate the association between the economy cognitions of the public in the urban settings and their enjoyment and satisfaction of quality of life, boosting up the positive impact of economy perceptions on life satisfaction. A buoyant urban economy benefits its inhabitants and builds robustness; and green areas enhance the urban fabric and the people's wellbeing.⁴¹

H1: Public cognition of urban economy significantly impacts the quality-of-life enjoyment and satisfaction.

H2: Perception of green space for health promotion significantly moderates the relationship of public cognition of urban economy and quality of life enjoyment and satisfaction.

The studies have also established that how people think about the society, the networks they hold and social participation, participation them have in the city they live in determines their quality of life.¹¹ Literature revealed that perception of metropolitan society increases the life satisfaction and well-being of residents if they have strong social networks of family and friends, access to community support and a sense of belonging. Rusli, *et al.*¹² found that people living in city that feel their society is integrated and supportive are happier and have higher self-actualization. Research has it that social relationships and participation in community increases social capital which in turn increases life satisfaction, according to Wen, *et al.*¹⁴. Empirical findings reveal that the quality of life among people who perceive that their society is diverse and diverse is higher, as such people feel safe, accepted and are like-minded.¹⁶ The opinions expressed by urban society presented in these results prove significant for the quality of life and social satisfaction of people. These empirical results support the third hypothesis that public cognition of urban society affects thus enjoyment and satisfaction of quality-of-life.² The notion postulates that such an appreciation of metropolitan culture fosters the idea of social integration and social capital and will lead to increase in life pleasure. Good social impressions, which are fundamental to quality of life, boost urban belonging, trust, and security, hence this link is founded on those concepts.¹⁷ Strong social networks and community involvement assist residents manage urban challenges including stress and economic pressures, therefore improving their well-being. Urban experiences and interactions of the public define their perspective of urban society, so influencing their level of life satisfaction.³ In the fourth hypothesis, green space perspective helps to mitigate the correlation between urban society public cognition and quality-of- life enjoyment and contentment. Essential for quality of life, green places help with physical health, social cohesiveness, and community involvement.²⁰ Fu, *et al.*⁵ claim that by motivating social interaction and relationships, green spaces strengthen communities and social capital. In settings when public view of urban society may increase life satisfaction, green areas are considered as improving health and well-being.²² Social perceptions have a more beneficial influence on life satisfaction in regions with plenty and well-maintained green spaces because perception of green space for health promotion moderates the association between public cognition of urban society and quality-of-life enjoyment and satisfaction.^{26,42} Green areas provide a physical backdrop for social events, group activities, and leisure, therefore improving quality of life and the advantages of a metropolitan society that is socially integrated.⁸

H3: Public cognition of urban society significantly impacts the quality-of-life enjoyment and satisfaction.

H4: Perception of green space for health promotion significantly moderates the relationship of public cognition of urban society and quality of life enjoyment and satisfaction.

Regularly shown to influence quality of life is public perception of the urban environment how people view the physical and aesthetic aspects of their surroundings.²⁸ Studies have found that a positive perspective of the urban environment including well-maintaining infrastructure, clean streets, and easily accessible public areas increases life satisfaction and well-being.³⁰ Safe, clean, and beautiful cities make people happier, according to.³³ Other research indicates that people's impressions of their living circumstances and life satisfaction are influenced by the built environment including noise, air quality, and recreational space.³⁵ These research reveal that the physical surroundings actively changes people's way of life and enjoyment of daily activities, not only provides background for urban life. These empirical facts lead the fifth hypothesis public cognition about the urban environment to suggest that enjoyment and satisfaction of quality-of- life are much influenced by this aspect.³⁸ This theory links better life satisfaction to positive

urban settings. This theory believes that a clean and appealing surroundings enhances daily life of the occupants. Public clean and green spaces can inspire outdoor activities, therefore improving physical and mental health as well as life enjoyment.² A good perspective of the city could also help to lower tension and increase security and safety, thereby enhancing welfare.⁴ The theory is supported by the assumption that the urban surroundings affect the experiences and interactions of people, therefore influencing their quality of life.⁶ According to the sixth hypothesis, perception of green space helps to mitigate the relationship between urban public cognition and quality-of-life satisfaction. Empirical research⁸ show that urban green areas enhance social cohesiveness, mental health, and physical health as well as their general appeal. In well-maintained urban settings, green areas have been demonstrated to increase life satisfaction.⁹ People who live in green surroundings report higher levels of life satisfaction, particularly if they feel their surroundings help to improve their health¹⁰. The hypothesis suggests that green space for health promotion reduces the correlation between public cognition of the urban environment and quality-of-life enjoyment and satisfaction, therefore improving the beneficial effect of environmental perceptions on life satisfaction.¹³ Green areas are said to enhance the urban environment by giving people chances for leisure, recreation, and social interaction all of which raise standard of living. In a good urban environment, then, green areas enhance the physical surroundings and raise the quality of living for the people.¹⁵

H5: Public cognition of urban environment significantly impacts the quality-of-life enjoyment and satisfaction.

H6: Perception of green space for health promotion significantly moderates the relationship of public cognition of urban environment and quality of life enjoyment and satisfaction.

Concerning research on public perception about natural ecology and the environment, it is worthy noting that people's perception of natural environment impacts on their wellbeing because it determines their quality of life.¹ The research investigates that positive perception of natural landscape including air, biological diversity & other natural elements enhance the quality of life & pleasure. According to the study by Zheng, *et al.*⁴, people who perceive physical environment as clean, varied, and well-preserved felt happier and more satisfied with their lives. Trees, water bodies and up diverse animals bring the feel of nature especially to the urban dwellers; this impacts their mental health and well-being positively.^{18,43} Ecological literacy thus plays a key role in understanding quality of life since a qualitative natural environment is regarded as providing aesthetic- recreational value and service value that is fundamental to human life such as clean air and water which are essential for human health.¹⁹ Using these empirical results the seventh hypothesis postulates that familiarisation with natural environment and ecology significantly affects the satisfaction of quality-of-life. Based on this hypothesis, those who continue to perceive environment as clean and well maintained, are happier.⁴⁴ To according to natural ecology, they have options in leisure, recreation, or contact with the natural world to provide them with needful in life. Another perspective is that Enhanced physical health including decreased respiratory diseases and stress which enhance life satisfaction is beneficial to be related with better natural environment in Kefale.²¹ As for natural ecology, it increases the aesthetic quality of the metropolitan setting by developing pleasurable places suitable for inhabitants' physiological and psychological well-being.²⁵ Based on the eighth hypothesis, natural ecology and quality-of-life satisfaction with moderating role of green space perception was analyzed. In fact, there is evidence from empirical literature that the supposed health benefits derived from green space improve the satisfaction with life's benefits that comes with natural spaces.⁷ Particularly in areas with well-preserved and easily accessible natural ecosystems, Vargas-Hernández, *et al.*²⁷ found that those who see green areas as benefiting their physical and mental health are happier. The hypothesis suggests that green space for health promotion reduces the correlation between public cognition of natural ecology and quality-of-life enjoyment and satisfaction,²⁹ therefore enhancing the favourable impact of ecological views on life satisfaction. Green areas provide direct access to the advantages of nature, therefore reflecting natural ecosystems in metropolitan environments.³¹ When individuals believe that these areas enhance their health and well-being, the whole influence of a good natural environment on life satisfaction is reinforced since green areas provide physical exercise, social connection, and stress reduction, therefore boosting quality of life.³⁴

H7: Public cognition of natural ecology and environment significantly impacts the quality-of-life enjoyment and satisfaction.

H8: Perception of green space for health promotion significantly moderates the relationship of public cognition of natural ecology and quality of life enjoyment and satisfaction.

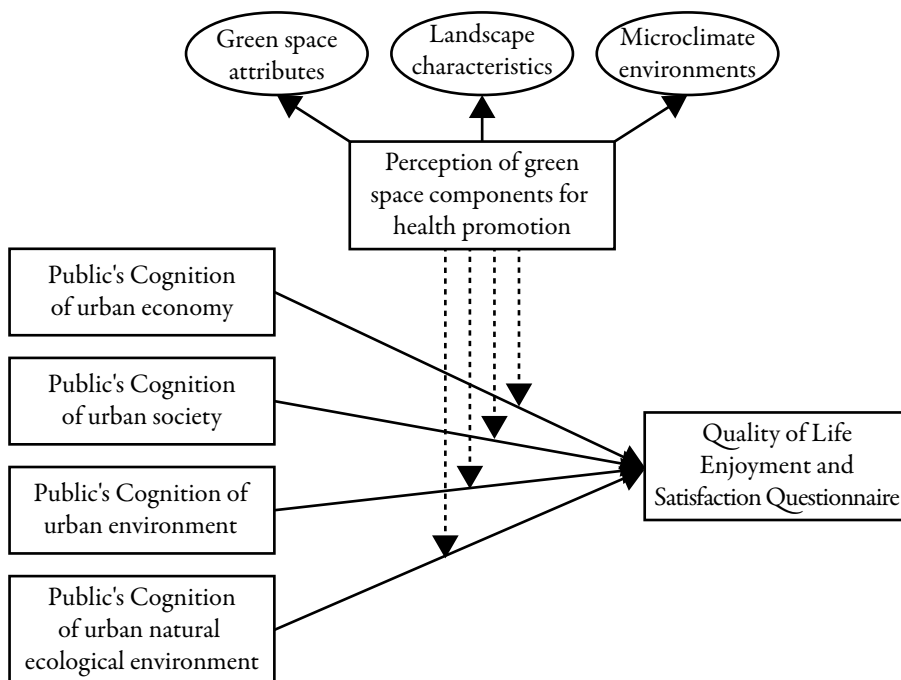


Figure 1: Conceptual Model.

METHODOLOGY

This study examined how public cognition of urban settings, natural ecology, and green spaces affects quality of life in Dammam, Khafji, and Alhasa, Eastern Region of Saudi Arabia. This region's various urban and natural qualities provide a comprehensive setting for studying urban perceptions and quality of life. A cross-sectional survey was used to obtain data from 331 random residents in the cities. Random selection ensured that the sample was representative of the Eastern Region's population. To reflect demographic diversity, participants were chosen based on their age, gender, and socioeconomic status. A systematic questionnaire was used to assess perceptions of the urban environment, natural ecology, green areas, and quality of life using scales from previous research. The study relied on validated scales from earlier research to ensure measurement instrument reliability and validity. Scales were used to assess the Urban Environment (UE), Natural Ecology (NE), Urban Society (US), Urban Environment and Natural Ecology (UEN), Quality of Life Enjoyment (QLE), and perception of green space for health promotion. The measures were chosen due to their shown capacity to capture relevant urban perceptions and quality of life data. While maintaining the key characteristics of the original instruments, each scale was tailored to Saudi Arabian culture and context.

Table 1: Profile of Instruments.

No	Variables	Items	Taken from
1	Perception of green space for health promotion	09	Chen, et al. ⁴⁵
2	Public Cognition of Urban Economy	04	Lin, et al. ⁴⁶
3	Public Cognition of Urban Society	05	
4	Public Cognition of Urban Environment	05	
5	Public Cognition of Natural ecology and environment	04	
6	Quality of Life Enjoyment and Satisfaction	16	Stevanovic ⁴⁷

Partial Least Squares Structural Equation Modelling data were analysed using ADANCO software. ADANCO was chosen because of its capacity to handle complex models while providing significant construct relationship and model fit insights. The measurement model was tested for reliability and validity with Dijkstra-Henseler's rho (ρ_A), Jöreskog's rho (ρ_c), Cronbach's alpha (α), and Average Variance Extracted (AVE). The structural model was then evaluated for its direct and moderating effects on construct links. R-square statistics, Cohen's f^2 values, and

goodness-of-fit assessments were used to assess model performance and predictive significance. The findings were examined to establish how public cognition and green space perceptions influence Eastern Saudi Arabian quality of life. The method used in this study was effective in investigating the relationships between perceptions of the urban environment, green spaces, and quality of life. The study used validated scales and advanced analytical methodologies to determine how these factors influence the well-being of Eastern Saudi Arabian inhabitants.

RESULTS

Table 2 displays study idea reliability and validity statistics. This table provides measurement features for each construct, including Dijkstra-Henseler's rho (ρ_A), Jöreskog's rho (ρ_C), Cronbach's alpha (α), and Average Variance Extracted (AVE). These markers are critical for assessing study concept consistency and validity. It is reliable and valid to use the Urban Environment. Dijkstra-Henseler's rho (ρ_A) for UE is 0.9052, over the 0.70 threshold, indicating good internal consistency. Jöreskog's rho (ρ_C) of 0.7684 and Cronbach's alpha (α) of 0.8102 indicate high dependability, exceeding the required level of 0.70. The Average Variance Extracted (AVE) for UE is 0.54282, which exceeds the minimum threshold of 0.50 and demonstrates convergent validity. Natural ecology has moderate to high reliability and validity. Dijkstra-Henseler's rho (ρ_A) of 0.73117 and Jöreskog's rho (ρ_C) of 0.71526 demonstrate acceptable internal consistency. The Cronbach's alpha (α) for NE is 0.76943, which meets the reliability threshold of 0.70. The AVE for NE is 0.51249, which exceeds 0.50, indicating excellent convergent validity. These findings show that the Natural Ecology construct was accurately measured and represents the predicted variance in the study.

Table 2: Variables Reliability and Validity.

Construct	Dijkstra-Henseler's Rho (ρ_A)	Jöreskog's Rho (ρ_C)	Cronbach's Alpha(α)	Average Variance Extracted (AVE)
UE	0.9052	0.7684	0.8102	0.54282
NE	0.73117	0.71526	0.76943	0.51249
US	0.7767	0.7677	0.7717	0.54014
UEN	0.7576	0.7342	0.7379	0.53636
QLE	0.808	0.7889	0.7999	0.53263
PGC	0.74333	0.71168	0.8762	0.50727

The Urban Society construct is dependable and valid. Dijkstra-Henseler's rho (ρ_A) is 0.7767, while Jöreskog's (ρ_C) is 0.7677, indicating high internal consistency. Cronbach's alpha (α) of 0.7717 demonstrates great dependability, exceeding the minimum criteria. The AVE for US is 0.54014, above the 0.50 criterion, indicating strong convergent validity. This shows that the Urban Society construct is well-measured and explains much of the variance in related measures. The Urban Environment and Natural Ecology construct displays adequate reliability and validity by combining components of both the urban environment and natural ecology. Internal consistency is indicated by Dijkstra-Henseler's rho (ρ_A) of 0.7576 and Jöreskog's rho (ρ_C) of 0.7342. Cronbach's alpha (α) is 0.7379, exceeding the acceptable threshold. UEN's AVE is 0.53636, exceeding the minimum threshold of 0.50, showing its convergent validity by capturing a lot of the variance in the observed variables. The Quality of Life Enjoyment construct is reliable and valid. The Dijkstra-Henseler's rho (ρ_A) is 0.808 and Jöreskog's rho (ρ_C) is 0.7889, suggesting good internal consistency. Cronbach's alpha (α) of 0.7999 satisfies the dependability requirement of 0.70. The AVE for QLE is 0.53263, over 0.50, indicating strong convergent validity. These findings demonstrate that the Quality of Life pleasure construct accurately measures life satisfaction and pleasure variance. The Perception of Green Space for Health Promotion construct is reliable and valid. Dijkstra-Henseler's rho (ρ_A) is 0.74333, whereas Jöreskog's (ρ_C) is 0.71168, indicating strong internal consistency. Cronbach's alpha (α) is strong at 0.8762, indicating great reliability. While PGC passes the basic condition for convergent validity, its AVE is 0.50727, which is at the threshold of 0.50, signalling that it must be continuously monitored to ensure it continues to capture variation.

Table 3 shows the fitness statistics for measuring items related with each concept in the study, revealing indicator validity and reliability. Items PGC1–PGC9 had fitness scores from 0.625 to 0.794 for the Perception of Green Space for Health Promotion (PGC) construct. Note that PGC9 has the highest fitness statistic at 0.794, indicating a robust construct indicator, whereas PGC4 has 0.686, supporting the construct's measurement. Items UE1–UE4 have acceptable fitness statistics for the Urban Environment (UE) construct, ranging from 0.667 to 0.796, indicating their ability to capture its dimensions. Natural Ecology (NE) indicators NE2–NE4 have fitness statistics between 0.537

and 0.773. NE2 and NE3 fit well, however NE4 has a fitness score of 0.537, suggesting it may be less robust but still useful. US1–US5 exhibited fitness values ranging from 0.618 to 0.708, showing a good fit for the Urban Society (US) construct, with US3 having the highest value of 0.685. UEN1 has the highest fitness statistic of 0.801, implying that it is a useful indication. The Urban Environment and Natural Ecology (UEN) construct has elements ranging from 0.599 to 0.801. Finally, the items in the Quality of Life Enjoyment (QLE) construct have fitness statistics ranging from 0.502 to 0.907, with QLE1 having the highest fitness of 0.907, indicating a significant contribution to measuring the construct. Other products, such as QLE10 and QLE12, have lower fitness levels but remain appropriate. These findings indicate that the measuring items for each construct are generally effective, contributing to their constructions to varying degrees, hence confirming the validity and reliability of the study's measurement methodology.

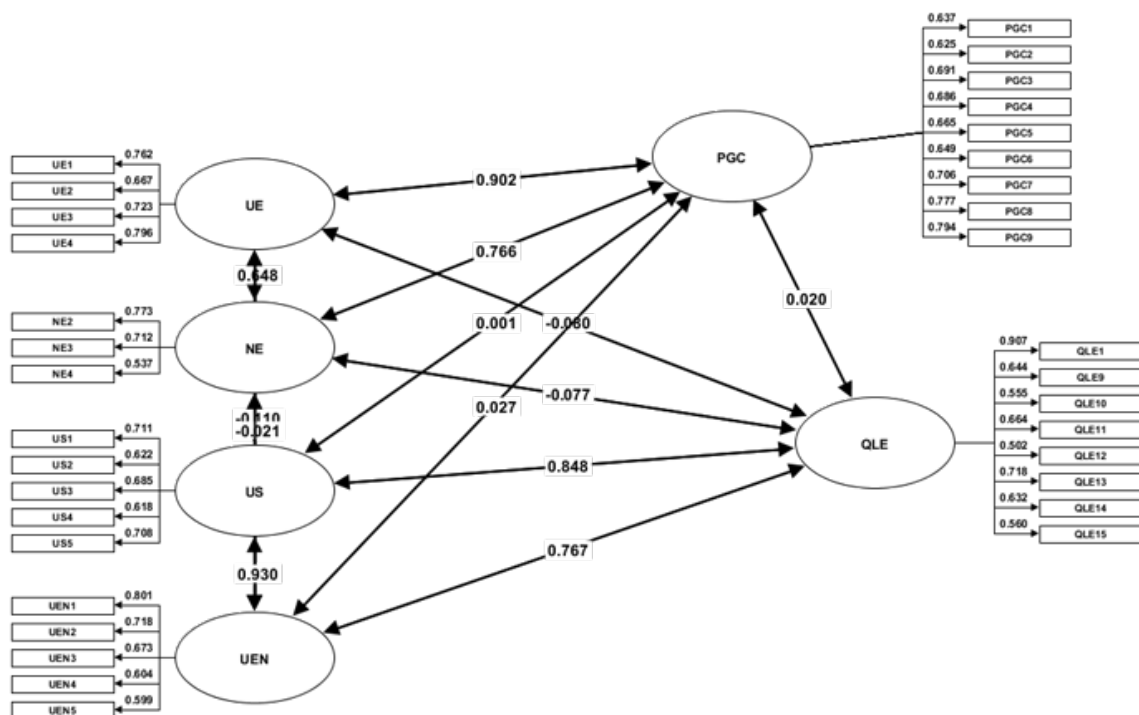


Figure 2: Estimated Model.

Table 4 shows the heterotrait-monotrait ratio of correlations (HTMT) results for construct discriminant validity. This table guarantees the diversity of every construct so that it measures several ideas. Excellent discriminant validity is shown by the low HTMT values of the Urban Environment (UE) construct among other constructs. Though it still satisfies discriminant validity criteria, a 0.7064 value between UE and Natural Ecology (NE) points to some intersection. UE is unusual since its HTMT values are much low than those of Urban Society (US) (0.0252) and Quality of Life Enjoyment (QLE) (0.0673). HTMT values for Natural Ecology (NE) using different approaches are conflicting. Urban Environment (UE) comes out to be 0.7064, high but reasonable. Low HTMT levels distinguish NE from Urban Society (US) (0.0118) and Quality of Life Enjoyment (QLE) (0.0725). Perception of Green Space for Health Promotion (PGC) had the greatest HTMT score for NE at 0.7838, indicating moderate overlap but discriminant validity. In the Urban Environment and Natural Ecology (UEN) construct, HTMT values with Urban Society (US) (0.8228) and Quality of Life Enjoyment (QLE) (0.7326) are higher, showing overlap but still within acceptable ranges. Perception of Green Space for Health Promotion (PGC) has the lowest HTMT (0.1041), distinguishing UEN from PGC. Finally, the Perception of Green Space for Health Promotion (PGC) construct's HTMT values are low, especially with Quality of Life Enjoyment (QLE) (0.0202), highlighting its uniqueness. The HTMT results show that the constructs are distinct enough to justify the study's measuring paradigm.

Table 3: Measurement Items Fitness Statistics.

Indicator	UE	NE	US	UEN	QLE	PGC
PGC1						0.637
PGC2						0.625
PGC3						0.691
PGC4						0.686
PGC5						0.665
PGC6						0.649
PGC7						0.706
PGC8						0.777
PGC9						0.794
UE1	0.762					
UE2	0.667					
UE3	0.723					
UE4	0.796					
NE2		0.773				
NE3		0.712				
NE4		0.537				
US1			0.711			
US2			0.622			
US3			0.685			
US4			0.618			
US5			0.708			
UEN1				0.801		
UEN2				0.718		
UEN3				0.673		
UEN4				0.604		
UEN5				0.599		
QLE1					0.907	
QLE9					0.644	
QLE10					0.555	
QLE11					0.664	
QLE12					0.502	
QLE13					0.718	
QLE14					0.632	
QLE15					0.56	

Table 4: Discriminant Validity: Heterotrait-Monotrait Ratio of Correlations (HTMT).

Construct	UE	NE	US	UEN	QLE	PGC
UE						
NE	0.7064					
US	0.0752	0.0118				
UEN	0.0064	0.0636	0.8228			
QLE	0.0673	0.0725	0.8003	0.7326		
PGC	0.6955	0.7838	0.1048	0.1041	0.0202	

The Fornell-Larcker criterion, which compares the square root of the Average Variance Extracted (AVE) to construct correlations, determines the constructs' discriminant validity in Table 5. To prove discriminant validity, the square root of the AVE for each construct must be larger than its correlations with other constructs, according to the Fornell-Larcker criterion. The square root of the AVE for the Urban Environment (UE) construct is 0.4282, higher than its correlations with NE, US, UEN, QLE, and PGC, indicating good discriminant validity. The Natural Ecology (NE) construct can be distinguished from UE (0.4089), US (0.4103), UEN (0.013), and PGC (0.31084) due to its higher AVE square root of 0.51249. A lower correlation with UE (0.3033), NE (0.4103), UEN (0.3476), and PGC (0.4294) indicates that Urban Society (US) is unique from these constructs. The AVE square root of the Urban Environment and Natural Ecology (UEN) construct is 0.3636, higher than its correlations with UE (0.3742), NE (0.013), US (0.3476), and PGC (0.5084), therefore validating its unique measurement. Finally, the Quality of Life Enjoyment (QLE) construct shows its uniqueness with an AVE square root of 0.7263, higher than its correlations with UE (0.0075), NE (0.0136),

US (0.4784, UEN (0.5897), and PGC (0.5137). The Perception of Green Space for Health Promotion (PGC) construct has reduced correlations with other constructions, therefore verifying its discriminant validity with an AVE square root of 0.7207. Generally, the Fornell-Larcker criterion supports the originality of any study construct.

Table 5: Discriminant Validity: Fornell-Larcker Criterion.

Construct	UE	NE	US	UEN	QLE	PGC
UE	0.4282					
NE	0.4089	0.51249				
US	0.3033	0.4103	0.4614			
UEN	0.3742	0.013	0.3476	0.3636		
QLE	0.0075	0.0136	0.4784	0.5897	0.7263	
PGC	0.30145	0.31084	0.4294	0.5084	0.5137	0.7207

Table 6 displays R-square statistics and model goodness of fit measures for Quality of Life Enjoyment (QLE). With a coefficient of determination (R^2) for QLE of 0.7034 the model explains 70.34% of the variance in quality of life pleasure. Reversing for the number of predictors, the modified R^2 value of 0.6988 confirms the strength and explanatory capability of the model. With a Q^2 predict score of 0.750, the model shows great predictive relevance, hence guiding new observations. The Root Mean Square Error (RMSE) for QLE is 0.0596, indicating that the model's predictions are near to observed values. The model's MAE of 0.0817 confirms its accuracy in predicting quality of life enjoyment. These fit statistics show that the model fits the data well and captures construct relationships, demonstrating its capacity to explain and forecast quality of life enjoyment.

Table 6: R-square statistics Model Goodness of Fit Statistics.

Construct	Coefficient of Determination (R^2)	Adjusted R^2	Q^2 predict	RMSE	MAE
QLE	0.7034	0.6988	0.750	0.0596	0.0817

Table 7 displays route analysis results, including direct, moderating, total, and Cohen's f^2 values for construct relationships. Beta coefficients show direct link strength, while moderating effects show how Perception of Green Space for Health Promotion (PGC) affects them. Direct effects from Urban Environment (UE) to Quality of Life Enjoyment (QLE) have a Beta coefficient of 0.5165, indicating a significant positive influence. PGC moderates this connection with a Beta of 0.471, showing a substantial interaction between PGC and UE on QLE. Cohen's f^2 values of 0.4027 and 0.3891 indicate significant effect sizes based on standard benchmarks. Natural Ecology (NE) has a small direct effect on QLE, 0.1075. The moderating effect of PGC on the NE-QLE connection is significant, with a Beta of 0.2579 and a Cohen's f^2 of 0.2237, indicating a moderate effect size. This shows that PGC boosts NE's effect on QLE, though less than other interactions. Urban Society (US) to QLE has a strong Beta of 0.9144, indicating a positive impact. Moderation by PGC had a significant effect, with a Beta of 0.7291 and a Cohen's f^2 of 0.5021, indicating a big effect size. This shows that PGC greatly enhances US's effect on QLE. Urban Environment and Natural Ecology (UEN) to QLE has Beta of zero. With a Beta of 0.3189 and Cohen's f^2 of 0.2021 PGC moderates this relationship with a moderate effect size. Although PGC improves the UEN-QLE link, its influence is less clear than that of other moderating factors.

Table 7: Path Analysis.

Effect	Beta	Moderating effects	Total effect	Cohen's f^2
UE → QLE	0.5165		0.5165	0.4027
PGC * UE → QLE		0.471	0.471	0.3891
NE → QLE	0.1075		0.1075	0.1014
PGC * NE → QLE		0.2579	0.2579	0.2237
US → QLE	0.9144		0.9144	0.3509
PGC * US → QLE		0.7291	0.7291	0.5021
UEN → QLE	0.4125		0.4125	0.4018
PGC * UEN → QLE		0.3189	0.3189	0.2021

DISCUSSION

Urban quality of life is investigated in this paper under the influence of public perspective of urban economy, society,

environment, and natural ecology. Growing knowledge of the aspects influencing people's well-being is essential as cities evolve. The findings reveal the intricate interaction between life quality and urban characteristics. This highlights both public subjective experiences with these qualities and their objective management. Green spaces help to balance these interactions, therefore stressing the need of including nature into urban design. This section investigates the complex interactions among these elements offering both theoretical and useful understanding. As one explores possibilities, the discussion emphasises how much urban experience is shaped by public opinion. Validation of all eight hypotheses reveals that life happiness is much influenced by the urban environment perception, which consists of economic conditions, social structures, environmental quality, and natural ecology. Green areas serve as a moderating factor that increases this effect, indicating how important nature and how it is seen in cities are for enhancing urban living. These links' procedures and important consequences for urban planners and legislators are discussed in this paper.

The first hypothesis, that public awareness of the urban economy improves quality-of-life satisfaction, shows how economic perceptions affect urban residents' psychological well-being. This finding supports previous research showing that economic stability, employment possibilities, and infrastructural development significantly affect urban life satisfaction.³⁷ This observation matches the previous studies. Residents feel more secure, optimistic, and satisfied when they think the urban economy is robust and supportive. Being in a rich and financially stable environment gives people psychological security as well as concrete benefits like better jobs and quality of life. The discovery that economic knowledge directly affects life happiness emphasises the importance of a stable and inclusive economy in urban design. The suggestion also advises lawmakers to prioritise economic efforts that boost public confidence in the economy. Our goals include transparent governance, equitable resource distribution, and public infrastructure funding. These programs aim to improve civilian life. This research also shows that urban planners and municipal governments must accurately and validly communicate economic development to the public to improve citizens' quality of life.

This study supports the second premise that urban society's public consciousness improves quality of life. This discovery shows how social viewpoints and neighbourhood dynamics affect urban residents' well-being. A united, supporting, and participatory urban culture increases inclusion and community, which are crucial to life enjoyment.²⁸ Residents' happiness and contentment are positively influenced by social environment perceptions. This perception can be achieved by strong social networks, community engagement, or social equity. According to the social capital hypothesis, the interconnected networks of interactions among residents and workers in a society are the key to its success and the well-being of its people. If accepted, urban planning should consider social connections and community engagement as well as physical infrastructure. Community centres, public events, and inclusive social policies are expected to raise public awareness of urban society and life satisfaction. This study stresses the necessity to address socioeconomic gaps and promote inclusion in urban contexts, as well as the fact that equitable and inclusive societies are seen more favourably and increase life satisfaction.

The third hypothesis, which ties public awareness of natural ecology to quality of life satisfaction, highlights the natural environment's role in urbanites' well-being. This reinforces growing research on urban parks, green areas, and rivers' psychological and physiological advantages.²⁶ The discovery matches the study. Environmentally healthy, green, and sustainable cities boost life satisfaction. The views encourage relaxation, well-being, and nature connection. Natural ecosystem boosts life enjoyment in many ways. Green places offer fitness, beauty, and environmental benefits including cleaner air and less noise. These results suggest urban planners and politicians should incorporate nature into urban design. This helps the environment and locals. Public education on urban natural ecosystem is necessary. Improving environmental perceptions and life satisfaction requires this.

This study validated the fourth premise that green space perception affects public views towards urban environments and quality of life. This shows how green spaces improve urban environmental perceptions and life satisfaction. Even if residents like their urban economy, community, or natural ecosystem, green areas and how they are viewed might boost life pleasure. Due to our natural attraction to nature, green areas boost mental and physical wellness.²⁸ City green areas protect against noise, pollution, and overcrowding while offering recreation and socialisation. Green spaces encourage socialising. In conclusion, providing accessible, well-maintained, and public-respected green places is crucial. Thus, urban designers must integrate green space to improve citizens' lives. This suggests that community involvement in green space development and maintenance might boost public image. Environmental education programs that stress green places' health and welfare may also help.

The fifth hypothesis, that urban dwellers' perceptions of their surroundings considerably affect their happiness and quality of life, underlines the relevance of how they see their surroundings. Research links urban people's environmental impressions to their well-being.⁸ This confirms past causality investigations. Clean, safe, and attractive cities improve residents' quality of life. Urban liveability and enjoyment are improved by air quality, noise, recreational opportunities, and urban environment design. Urban planners and policy makers must prioritise environmental quality in development projects since environmental cognition affects life satisfaction. This involves minimising pollution, enhancing green spaces, and prioritising human welfare in urban development. This study also emphasises the need for public awareness campaigns to promote sustainable urban environments and encourage individuals to participate in improving their communities.

The sixth hypothesis, that green space for health promotion significantly moderates public cognition of the urban environment and quality of life, was likewise supported. First two hypothesis supported this theory. Green spaces improve urban environmental impressions and human well-being by moderating. Green spaces are good for health promotion because they improve urban surroundings and offer exercise. The declaration promotes growing research on green areas' health, mental, and social benefits.²¹ Increasing literature supports this finding. Metropolitan inhabitants value their surroundings more when they recognise it improves their health. Urban living is more enjoyable in healthy green settings. Therefore, establishing, protecting, and educating the public about green spaces' health advantages is crucial. Accessible, beautiful, and exercise-friendly green places must be constructed by urban planners. The amenities may include sidewalks, gyms and fields. Public health programs that emphasise green spaces' benefits in preventing chronic diseases, lowering stress, and enhancing mental health may increase public opinion of these locations, increasing life satisfaction.

Environmental consciousness in urban living is stressed by the seventh hypothesis, which claims that communal understanding of natural ecology substantially affects quality-of-life enjoyment and contentment. This finding complements previous study on the psychological and emotional benefits of a well-maintained natural environment in urban areas.²⁹ People's well-being depends on natural ecology, including plentiful plant and animal life, clean air and water, and biodiversity. Natural connections, especially in cities, can soothe, rejuvenate, and gratify. These findings suggest that metropolitan inhabitants who value nature are happier and more contented. Ecosystem conservation, ecological city design, and biodiversity should be prioritised in urban development strategies to promote quality of life. This study also emphasises the necessity for environmental education to help urbanites appreciate nature. This boosts life satisfaction from ecological consciousness.

The eighth hypothesis that green space for health promotion moderates public cognition of natural ecology and quality of life was also supported. This theory was academically proposed. This moderating effect demonstrates that green spaces and ecological awareness promote health. People comprehend natural ecosystems better when they value green places for their health. Environmental psychology study shows green spaces improve urban health and the environment.³¹ Community members value natural ecosystems for environmental and human well-being. Green spaces boost physical health and enjoyment. After reading this paper, urban planners and policymakers should promote green spaces with natural diversity and health advantages. Community gardens, walking trails, and meditation sites boost green space wellness. Green space and environmental interaction awareness campaigns may potentially improve urban residents' life satisfaction by improving their views of natural ecosystems.

This study showed that public cognition affects various urban characteristics that affect quality of life and happiness. The findings imply that inhabitants' views on the urban economy, society, environment, and natural ecosystem strongly influence their urban lifestyle. Whether positive or negative, this is true. The fact that green areas moderate health promotion in all of these connections emphasises the need of incorporating nature into urban spaces. The findings advise urban planners and policymakers to ensure access to green spaces and promote their benefits to better urban life. Positive public impressions of these urban elements are also absolutely vital. This study adds to our knowledge and provides workable ideas to enhance the conditions of urban life. The results highlight the need of giving urban people's physical and psychological well-being top priority, particularly in view of the issues cities confront resulting from fast urbanisation and environmental sustainability. By addressing the key categories, this study implies that city planners and legislators can produce caring, functional, and efficient urban surroundings for people. Following this chore allows one to more effectively enhance urban quality of life.

CONCLUSION

At last, this research has clarified how public view of urban surroundings, natural environment, and green places influences quality of life. Improving theoretical frameworks and offering empirical evidence on the complexity of urban quality of life, the study revealed how urban economic, social, and environmental forces affect inhabitants' views and well-being. The results show the need of objective and subjective elements in urban design since people's happiness and experiences are much influenced by their perspective on the surroundings and green areas. Therefore, in developing and carrying out urban development plans, politicians and urban designers have to include cognitive assessments and perceptual aspects. This will guarantee that psychological and physical aspects of urban life are in harmony to raise people's quality of living. Furthermore shown by the study are modest urban attitudes and quality of life in green areas. These results suggest that, from urban surrounds and natural environment, well-planned and perceived green areas can significantly raise the quality of life. This realisation strongly supports giving green areas in urban design top priority. By encouraging physical and psychological well-being, cities can help to support better lifestyles, increase quality of living, and raise happiness. Ultimately, this research advances our knowledge of urban well-being and provides recommendations for building more vibrant, strong, and fulfilling cities.

Implications of the study

This study illuminates how urban contexts and green space perceptions affect quality of life, which has substantial theoretical consequences. Integrating and extending urban sociology, environmental psychology, and health promotion theories, the study reveals how public perception of urban economic, social, and environmental factors affects quality of life enjoyment and satisfaction. The research reveals that urban experience involves physical surrounds, senses, and cognitive evaluations. Kaplan's Preference Matrix and Maslow's Hierarchy of Needs are confirmed and expanded by incorporating environmental cognition in urban quality of life. It expands our theoretical understanding of urban well-being by showing that subjective and cognitive impressions of urban surroundings are as essential as objective ones. The study adds to the theory that green spaces moderate urban quality of life. Perception of Green Space for Health Promotion (PGC) moderates the relationship between urban environment, society, and natural ecology, supporting environmental aesthetics and stress reduction theories like Ulrich's Stress Recovery Theory and Kaplan's Attention Restoration Theory. These findings imply that green spaces' presence and perception significantly impact urban life satisfaction. This highlights cognitive and perceptual components of green space interactions, expanding theoretical frameworks and revealing novel urban design and policy strategies to increase public well-being. The research highlights the need to combine perceptual and psychological elements into urban design theories and practices to bridge environmental design, cognitive science, and quality of life studies.

Urban designers, legislators, and community activists striving to enhance urban living are among those impacted by this study. The results emphasise the need of urban design and development taking physical and perceptual aspects into account. Study indicates that public knowledge of urban economic, social, and environmental problems affects quality of life. Thus, while developing and carrying out urban policy, urban designers should incorporate physical infrastructure as well as subjective views and cognitive evaluations. Emphasising environmental beauty, social cohesiveness, and financial stability will help to enhance metropolitan settings. This approach improves urban projects and the welfare of the citizens. The study also underlines how green areas help to modify urban environment perceptions and quality of life. The results show that urban experience and impression are much influenced by green areas. Cities should plan for easily available, well-kept green areas. Parks, leisure spaces, and green corridors help to change people's emotional and cognitive impressions of their surrounds. Urban leaders should thus support green space projects and gather public opinions to satisfy local demands. Encouragement of healthy living, resident satisfaction, and urban liveability helps communities to be more resilient and lively.

Limitations and Future Research Directions

This research on urban surroundings, public cognition, and quality of life has limits, yet it provides useful insights. The study's cross-sectional design makes causal inferences about urban environment and green space perceptions' effects on quality of life difficult. In order to understand how these associations vary over time and how urban surroundings and green space perceptions affect inhabitants' quality of life, longitudinal research are needed. The research is also constrained by self-reported measurements, which might be biased by social desirability and recollection bias. To further understand how urban surroundings and natural areas affect quality of life, future research should use objective

metrics and mixed-methods approaches. Future study should examine the findings' generalisability across urban locations and demographic groupings. The current study's sample may not fully represent urban residents, therefore future studies could evaluate how socio-economic position, cultural background, and geographic location effect interactions. Additional moderating and mediating variables may illuminate the complicated relationship between urban surroundings, green areas, and quality of life. Future research may examine how social capital, community participation, and resilience affect quality of life in urban and green locations. Expanding research to encompass these variables would improve theoretical and practical understanding of urban well-being and inform more targeted and successful urban planning and policy actions.

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Appendix A

Perception of Green Space for Health Promotion

Green Space Attributes

1. Access
2. Type
3. Size

Landscape characteristics

1. Plants
2. Water
3. Sensory features
4. Microclimate Environments

Facilities

1. Rest facilities
2. Amenity facilities

Urban economic

1. Combining characteristics with local industries;
2. Increasing entrepreneurship and employment opportunities;
3. Improving transportation planning;
4. Developing protection policy.

Urban social

1. Improve the quality of tourism services;
2. Increase leisure opportunities;
3. Public participation in decision-making;
4. Increase friendly interaction;
5. Increase security quality.

Urban environment

1. More convenient transportation;
2. Exhaust and noise pollution from automobiles and locomotives increases;
3. Adequate trash cans;
4. Adequate toilets;
5. Landscape and heritage maintenance.

Natural ecology and environment

1. Turbid river;
2. Soil erosion along the river;
3. Ecological species decline;
4. Ecological habitat change.

Quality of Life Enjoyment and Satisfaction

1. Physical health
2. Mood
3. Work
4. Household activities
5. Social relationships
6. Family relationships
7. Leisure time activities
8. Ability to function in daily life
9. Sexual drive. Interest and/or performance

10. Economic status
11. Living/housing situation
12. Ability to get around physically without feeling dizzy or falling
13. Your vision in terms of ability to do work or hobbies
14. Overall sense of well-being
15. Medication
16. Overall life satisfaction and contentment