

Original Research Article

Development Of Quality Promotion Indicators For Maharlu Lake Tourism Based On A Biophilic Model Aligned with City Structure*

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Abstract | The biophilic approach, a subset of sustainability, is considered the most comprehensive approach to nature; also, the components affecting the biophilic model in Maharlu Lake tourism are access to water zones, leisure time spent in green spaces, and per capita green spaces, which can contribute to the biophilic model development.

This study investigated the indicators of biophilic urban development to promote the quality of life. This study is applied in terms of purpose and falls under descriptive-analytical and exploratory research in terms of nature. To gather data, we used documentary and survey methods. The data was collected through a researcher-made questionnaire, interviews, and in-depth observation. The sample of this study consisted of tourists visiting Maharlu Lake, ordinary people, and experts. The most effective components affecting the biophilic model of Maharlu lake tourism were access to water zones, leisure time spent in green spaces, and per capita green spaces, respectively. Of all dimensions affecting development, structural, managerial, and social-cultural dimensions had the most effect on the biophilic model of Maharlu lake tourism.

Keywords | *Biophilic model, Sustainability, Tourism, Maharlu Lake.*

Introduction and Problem Statement | The biophilic approach, which can be considered as a subset of sustainability, is one of the approaches that has attracted the attention of experts in urban planning, urban design, architecture, and urban studies in recent years. To cope with nature, this approach considered comprehensive also predominates over abating problematical widespread devastation on the environment employing alleging the connection and coexistence of people with nature in the form of the process of designing the artificial environment. Biophilia sheds light on the fact, for the sake of mental health and coordination environment,

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urban environments should be mingled with nature. Although biophilic has expeditiously developed, it is still a relatively new topic.

The subject of the article is the structure of Shiraz, one of the main tourist cities in Iran, and Maharlu Lake is considered one of the substantial and influential natural elements having a direct association with Shiraz city in terms of structure and nature. It should be taken for granted that Maharlu Lake is regarded as one of the essential elements of Shiraz tourism. Hence, it seems that the biophilic model can have an impression on magnifying the quality of the environment and tourism in the tourist realm of Maharlu Lake in Shiraz.

To take better advantage of this model to boost the quality of life regarding the tourism industry of this Lake, we investigated and scrutinized its indicators related to tourism. For this purpose, the following research

question was raised: What indicators of a biophilic city can enhance the quality of life affiliated with the tourism industry of Maharlo Lake?

Research Method

This study employs a mixed method that is aligned with the pragmatic paradigm. Since pragmatism has paved the way for multiple practices, different worldviews, and different assumptions, as well as different forms of data collection and analysis, it can also cover both types of research methods. Ergo, corresponding to the substance of the problem and the questions of the current research, an inductive strategy is necessary to respond to the research questions. The statistical population of the present research included the visitors and citizens of the tourism center of Maharlo Lake. Based on the Cochran formula, 391 samples were recruited through a random sampling technique. Also, for the community of experts, according to the nature of the research problem and the research questions, the number of samples to conduct interviews continued to provide comprehensive and sufficient information (30 samples).

Data Collection Methods and Instruments

To gather research data, we used documentary and survey methods. Thus, the data collection instruments included questionnaires, interviews, and observations.

The number of samples and data collection instruments Questionnaires and interviews were used to delve into the indicators of biophilic urban development germane to Maharlo Lake's tourism industry.

• Demographics of respondents

According to the collected data, the characteristics of the respondents are demonstrated in the graphs below based on gender, age group, and education, and the percentage and frequency of each are mentioned. Also, each diagram is drawn separately (Figs. 1-3).

Research Background

Biophilic urbanism has gained momentum in the works of Levine (2016), Cabanek and Newman (2017), Ebrahimpour, Majedi, and Zabihi (2019), and Xue, Gou, Lau, Lau, Chung & Zhang (2017). According to Izadi, Farrokh Shad, and Hassan Shahi (2018), the biophilic approach has been employed in urban development plans due to its benefits in many developed countries, and it is critical to change Iranian current approach to planning

and managing cities based on biophilic design and its compatibility with the country's territorial characteristics. Bitaraf and Zabihi (2016) in an article entitled "Biophilic attitude, an approach to improving the quality of the living environment of residents of residential complexes" stated that establishing a relationship between humans and nature can contribute to a space with desirable quality. Also, improving the quality of the living environment means providing appropriate and diverse responses to the different physiological and psychological needs of the users of that space with help of the environment. Pedersen Zari (2019) in an article entitled "Understanding and Designing Nature Experiences in Cities: A Framework for Biophilic Urbanization" indicated that biophilic urbanization should include a wide range of human sensory information and should be designed from a four-dimensional perspective (i.e. including time). In an article entitled "Development of biophilic cities in Russia: from an ideal scientific city and an Ecopolis to the green strategy of a modern megapolis", Ignatieva, Golosova, Melnichuk & Smertin (2018) concluded that one of the main goals of the Ecopolis was to create an optimal urban environment with psychological properties to protect nature in urban areas. Ede and Morley (2020) in an article entitled "A review of the transport for London healthy streets approach and its potential contribution to biophilic cities" stated that the urban transport strategy could serve as a framework to integrate health into planning and design decisions and promote collaboration between transportation professionals and designers.

The researchers conducted in this regard are mostly focused on the advantages of using the biophilic model in the planning and development of cities.

Theoretical Foundations

• Urban biophilic pattern

Batley applied the concept of biophilia to cities (Newman, 2013, 47), and the initial inspiration for this concept goes back to Edward Wilson's definition of biophilia (Young, 2016, 1). But, it provides a broad framework for a set of values related to nature as an essential factor in urban life (Scott, Lennon, Haase, Kazmierczak, Clabby & Beatley, 2016, 298). Biophilic cities have both tree-covered spaces and biodiversity. However, there are forested realms and biodiversity in cities, providing many opportunities for design and planning to grow nature forms in the city in different ways, including green facades, balconies,

Table 1. The abundance and types of field data collection tools. Source: Authors.

No.	Instruments	Collection method	Number of samples
1	Questionnaires	random	391
2	Interviews	snowball	30

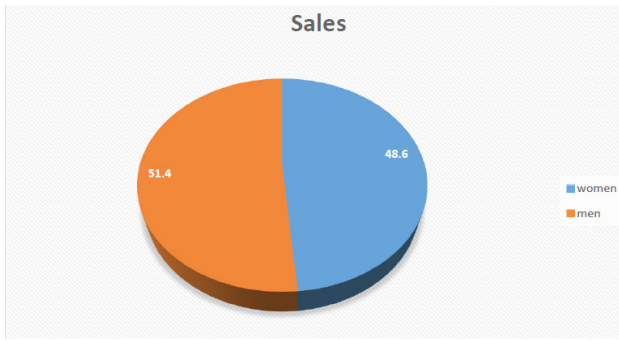


Fig. 1. Gender distribution of respondents. Source: Authors.

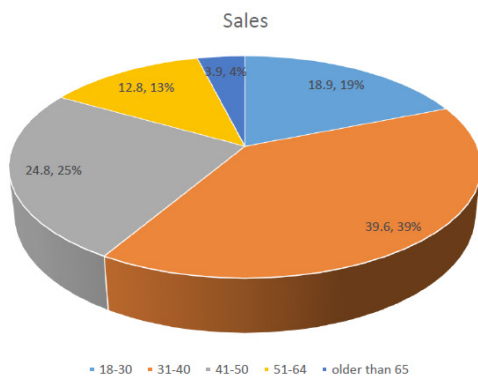


Fig. 2. Age distribution of respondents. Source: Authors.

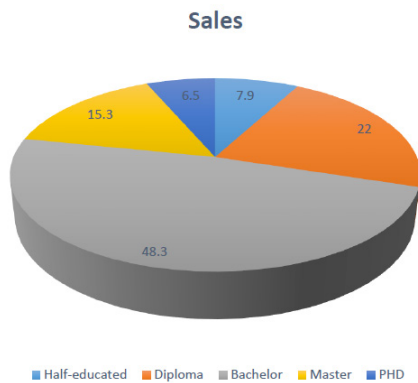


Fig. 3. Education distribution of respondents. Source: Authors.

urban food forests, and the restoration of urban rivers, but biophilic cities have intensive nature (ibid., 296). In these biophilic cities, landscaping is done both inside and outside buildings, walls, and roads so that nature enters every element of the built environment (Newman, 2013, 47). A biophilic city utilizes nature as a basis for city design, planning, and management and meets the needs of its citizens for daily contact with nature (Totaforti, 2020, 4). It should be acknowledged that such a city has high biodiversity, wherein citizens experience flourishing nature and diverse animals and trees during their daily lives, work, and leisure time. A biophilic city is not only rich in parks and wildlife but also includes many natural elements that are available everywhere for all citizens. Moreover, it is the most environmentally friendly city. Biofill elements

are included at different geographic scales, from urban parks and green streets at the city and neighborhood level to green walls and potted plants at the level of buildings. All concepts of biophilic cities have one thing in common involving access to nature and all of what citizens and neighborhoods deserve these real requirements are vital to fabricate a meaningful and happy life. Biophilic cities seek to create a nature that is equally accessible to all residents (Ziari, Pourahmad, Fotouhi Mehrabani & Hosseini, 2018; Beatley, 2010). These cities venerate and protect and revive the plants, animals, and fungi of an area wherein every opportunity is used to combine nature with built structures (Beatley, 2017). Nature and city in such cities are inextricably linked and pervade people's lives from childhood to adulthood. Biophilic cities invest in infrastructure for people to spend time outdoors. Furthermore, there are also investments in trees, gardens, and other types of nature to encourage people to walk. Additionally, they create opportunities in cities for people to be awed and experience the exciting feeling of watching falcons, diving, and seeing clouds in the sky and the city (McDonald & Beatley, 2021). A biophilic city is a kind of city where there are opportunities for its citizens to learn and take pleasure in nature (Scott et al., 2016, 297)

Classification of Biophilic City Indicators Based on Theoretical Foundations

• Biophilic conditions and infrastructure

- Percentage of the population within 100 meters of a park or green space,
- Existence of an integrated and connected ecological network, green urban planning from the roof to the region,
- The percentage of the land area of the city in the form of wild and semi-wild nature,
- The percentage of vegetation in the city (in some areas, this ratio is lower),
- The extent and number of green urban complications (such as green roofs, green walls, and trees),
- Per capita miles of footpath,
- The number of garden plots and local community gardens (boys), access to the local community garden area (Yousefi & Jafari Khodavardi, 2016)

• Biophilic activities

- Percentage of the population that is active in nature with outdoor clubs or organizations. The number of active institutions within the city,
- The percentage of the population involved in nature recovery and voluntary efforts, such as urban nature conservation groups, as well as their total number,
- Percentage of time residents spend outdoors,

- Percentage of residents who actively garden (e.g. on balconies, rooftops, and community gardens),
- The amount of break time and playing time outside in schools (Kellert & Wilson, 2008).
- **Biophilic knowledge and behavior**
 - The percentage of people who can recognize common species of animals and plants.
 - The extent to which residents are aware of the natural world around them (Herzog & Bryce, 2007).
- **Biophilic institutions and governance**
 - Adaptation of a local biodiversity strategy or action plan,
 - The scope of local biophilic support institutions, for example, the existence of a history museum, Natural active botanical garden,
 - Priority to environmental education,
 - Percentage of local budget allocated to conservation restoration, education, and nature-related activities,
 - Compliance with green building and planning codes assistance programs, density incentives, green space measures, and dark sky lighting standards,
 - The number of biophilic pilot projects and measures supported by the municipality (Mavadat & Valipour, 2019).

Tourism and Biophilic Cities

The prospect of biophilic cities has recently received attention (Beatley, 2017). By turning cities into biophilic cities, urban tourism also offers various recreational and cultural experiences, and the supply sector related to a set of amenities, activities, infrastructure, and experiences will be affected. Urban tourism covers a wide range of special interests, including cultural tourism, shopping, nightlife, sightseeing attractions, health, etc. These forms of urban tourism can be influenced by different forms of green infrastructure, and green infrastructure can strengthen, support, or improve this tourism experience (Terkenli et al., 2020, 3). Nevertheless, there is still not enough information about tourists' use of green infrastructure. Only limited and scattered studies have been done. Biophilic urbanism has the potential for long-term recreational visits outside the living and working environment. The purpose of these parks is to provide aesthetic pleasure and educational opportunities, as well as create a pleasant environment for a variety of outdoor activities (Terkenli et al., 2017, 197). That might explain why this environmental education has created a prominent position in the tourism production chain. In this regard, we can also mention museums as they have attracted many tourists. Museums are among the main reasons for visiting destinations, and visitors travel to museums

for several purposes, including different interests in history, events, or special programs.

Investigation of the Study Area

The city of Shiraz is located at an altitude of 1486 meters above sea level, and in terms of nature and morphology, it corresponds to the folded Zagros structural unit. Its unevenness has a northwest-southeast trend and in terms of natural structure, it is in the form of a synclinal. Under the influence of tectonic and climatic factors, the area of Shiraz consists of high mountains, wide plains, intermountain plains, and numerous valleys and unevenness. But, the main morphological macro units in this range are mountains and plains. Shiraz city has been surrounded by relatively high mountains ranges of the region including Sabz Pushan, Bamo, Rahmat, Kushk Hezar, Zaraghan, Darian, Kelestan and Qalat, Derak, Gar, Khorbahreh and Dalou.

The maximum height of the mountains around the city of Shiraz, at the peak of Mount Dalou in the southwest of this city, is the height of Siyakh Darangun, which reaches 3097 meters. The best urban views of Ma'ali Abad area and Qasr al-Dasht gardens have been created by the heights of the Derak Mountains. This city can be seen from the top of those mountains and provides the best view of Shiraz's garden city. The general slope of the Shiraz plain is in the direction of east and south-east towards Maharlo Lake and it is located in the distance among the heights of the region. In fact, the floor of synclinal folds is within the range (General Department of Meteorology of Fars Province, 2012). Maharlo Wetland is a part of Maharlo Hunting Prohibited Zone. The length of Maharlo Lake is 31 km and its maximum width is 11 km. The area of the lake is 24,000 hectares and the average depth of the lake is 50 cm and its deepest point is 3 meters in the wettest season. This lake is fed in the west by the Baba Haji River, the Chenar Rahdar River, and the Dry River with

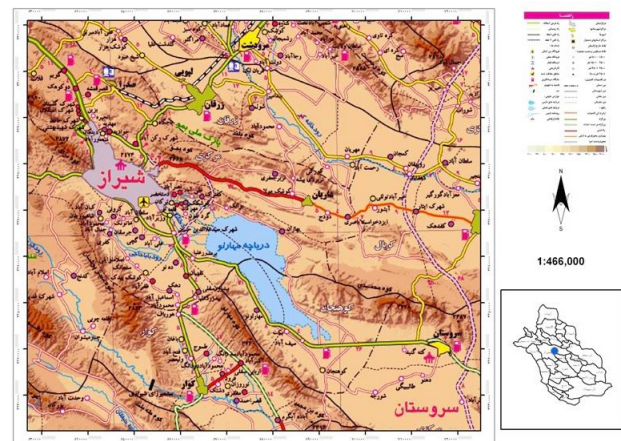


Fig. 4. Location of the study area. Source: Authors.

seasonal and intermittent flows, and in the east by the Nazar Abad watershed and by numerous waterways (Fig. 4).

Findings

The findings show that among the components influencing the biophilic pattern in the tourism industry of Maharlu Lake, respectively, access to water areas, the amount of leisure time spent in green spaces, and green space per capita can have the greatest impact on the development of the biophilic pattern. Moreover, the number of large-scale buildings with green roofs, knowledge of native plant species, and level of gardening activities have relatively had less influence on the studied area. Among the indicators affecting the development of the biophilic model in the tourism industry of Maharlu Lake, the necessary infrastructure and conditions, biophilic activities, biophilic organizations and institutions, and attitudes and awareness have had the most influence, respectively. Among the effective aspects of developing the biophilic model in the tourism axis of Maharlu Lake, the physical dimension, the management dimension, and the socio-cultural dimension are the most influential aspects in the development of the biophilic model in the tourism industry of Maharlu Lake (Table 2).

For the current status of the research indicators, documentary and field methods were used. To identify the current situation of the studied area from a biophilic point of view, indicators such as infrastructure and conditions, biophilic activities, people's participation, and organizations were used. Also, then the contribution of biophilic city indicators to improve the quality of life in the research area was examined. Consequently, in the current study, the dependent variable is quality and the independent variables are the variables of the biophilic city.

To identify the effective factors affecting the biophilic pattern corresponding to the structure of the city in the tourism industry of Maharlu Lake, factor analysis was used. For this purpose, the points obtained from 23 factors or variables in the physical, socio-cultural, and managerial dimensions were entered into the test. In the first stage of factor analysis, (i.e. forming the initial matrix of factor analysis), based on the scores calculated in the previous stages. In the second step, in the examination of the values of the commonality of each index, it is evaluated with other indices (Table 3).

Also, the findings show that among the components influencing the biophilic pattern, the quality of life

indicators in Maharlu tourism area is in a favorable state based on three analyses of the status of biophilic urban development indicators.

Evaluation of the degree of realization of biophilic urbanism from the point of view of the physical environment

According to the assessment of biophilic urbanization from the physical environment index, the components related to access to transportation networks and health and treatment infrastructures were ranked highest and lowest, respectively. Likewise, the components related to health and treatment infrastructure, the quality of environmental hygiene and garbage collection, the quality and quantity of furniture, the quality of access to sports and recreational environments, the quality of the environment and personal space, and access to green space were not in a suitable condition.

Evaluation of the degree of realization of biophilic urban development from the point of view of the economic environment

The evaluation of economic environment indicators demonstrates that components such as the contribution of novel technologies, the quality of access to services, the quality and quantity of job opportunities that have been created, and the amount of income are very different from the defined optimal level.

Evaluation of the realization of biophilic urbanism from the perspective of the social environment.

The assessment of biophilic urbanization from the social environment in the tourism industry of Maharlu Lake exhibits that the components of personal and social security, compliance with citizenship rights, social and cultural health, social relations between people, and the level of information were below average. It has been determined that, however, the degree of calmness and vitality and sense of belonging to the place were higher than average.

With regard to the goal of compiling indicators for improving the quality of tourism in Maharlu Lake based on the biophilic model, the indicators were examined from three perspectives: social, economic, and physical aspects. Accordingly, the most influential biophilic indicators in three areas should be considered (biophilic organizations and institutions, attitude and awareness, biophilic field activities, and infrastructures) in developing the biophilic model in urban planning (Fig. 5).

Discussion

According to the studies conducted in the theoretical foundations of research, some of the most important

Table 2. Research indicators and variables. Source: Authors.

Perspective	Indicator	The dependent variable	The independent variable			
Biophysical	Infrastructure and necessary conditions	Resilience and environmental sustainability	Access to water areas			
			Pedestrian area			
			Number of sidewalks			
			The number of parks in the area			
			The area of parks in the region			
			The number of large-scale buildings with green roofs			
			The number of large-scale buildings with green walls			
			The number of forests and urban parks			
			The number of urban green facades			
			The number of urban gardens			
			Green space per capita			
			Social and cultural	Biophilic activities	Social life and sense of belonging	The amount of participation to preserve and restore green space
						Spending leisure time in green spaces
Sensitivity to environmental issues						
Biophilic knowledge and behavior	Economic dynamics	The amount of gardening activity				
		The level of interest in planting trees and green spaces				
		Knowledge of native plant species				
Management	Biophilic institutions and governance	Efficient urban management	The level of people's participation in bio-oriented programs			
			The degree of curiosity about the surrounding natural environment			
			Number of local biophilic support organizations			
			Number of experimental and innovative biophilic projects			
			The percentage of the local budget for nature protection, recreation and entertainment, education, and related activities			
			The amount of environmental education by organizations			
The degree of connection between municipal programs and environmental activities						

Table 3. Importance of the effective variables of the biophilic pattern according to the structure of the city environment in the tourism industry of Maharlu Lake. Source: Authors.

Determination of importance	Variables
1	Access to water areas
2	The width of the sidewalk
3	Number of sidewalks
4	The number of parks in the area
5	The size of the parks in the region
6	The number of large-scale buildings with green roofs
7	The number of large-scale buildings with green walls
8	The number of forest and urban parks
9	The number of urban green facades
10	Green space per capita
11	The amount of participation to preserve and restore green space
12	Spending leisure time in green spaces
13	Sensitivity to environmental issues
14	The amount of gardening activity
15	The level of interest in planting trees and green spaces
16	The level of recognition of native plant species
17	The level of knowledge about the use of native plant species
18	The degree of curiosity about the surrounding natural environment
19	Number of local biophilic support organizations
20	Number of experimental and innovative biophilic projects
21	The percentage of the local budget for nature conservation, recreation and entertainment, education, and related activities
22	The amount of environmental education by organizations
23	The degree of connection between municipal programs and environmental activities

principles that should be considered in the planning and design of biophilic urban development are climate, renewable energy in order not to emit CO² gas, a city without waste materials and garbage, water, landscape, garden, and urban biodiversity, sustainable transportation, and good public space, including

compact and polycentric cities, local and sustainable materials with low energy consumption, densification and retrofitting of existing parts, buildings, and green parts, passive design principles, programs to create lively and healthy mixed-use communities, local food supply chain, cultural heritage, identity, and

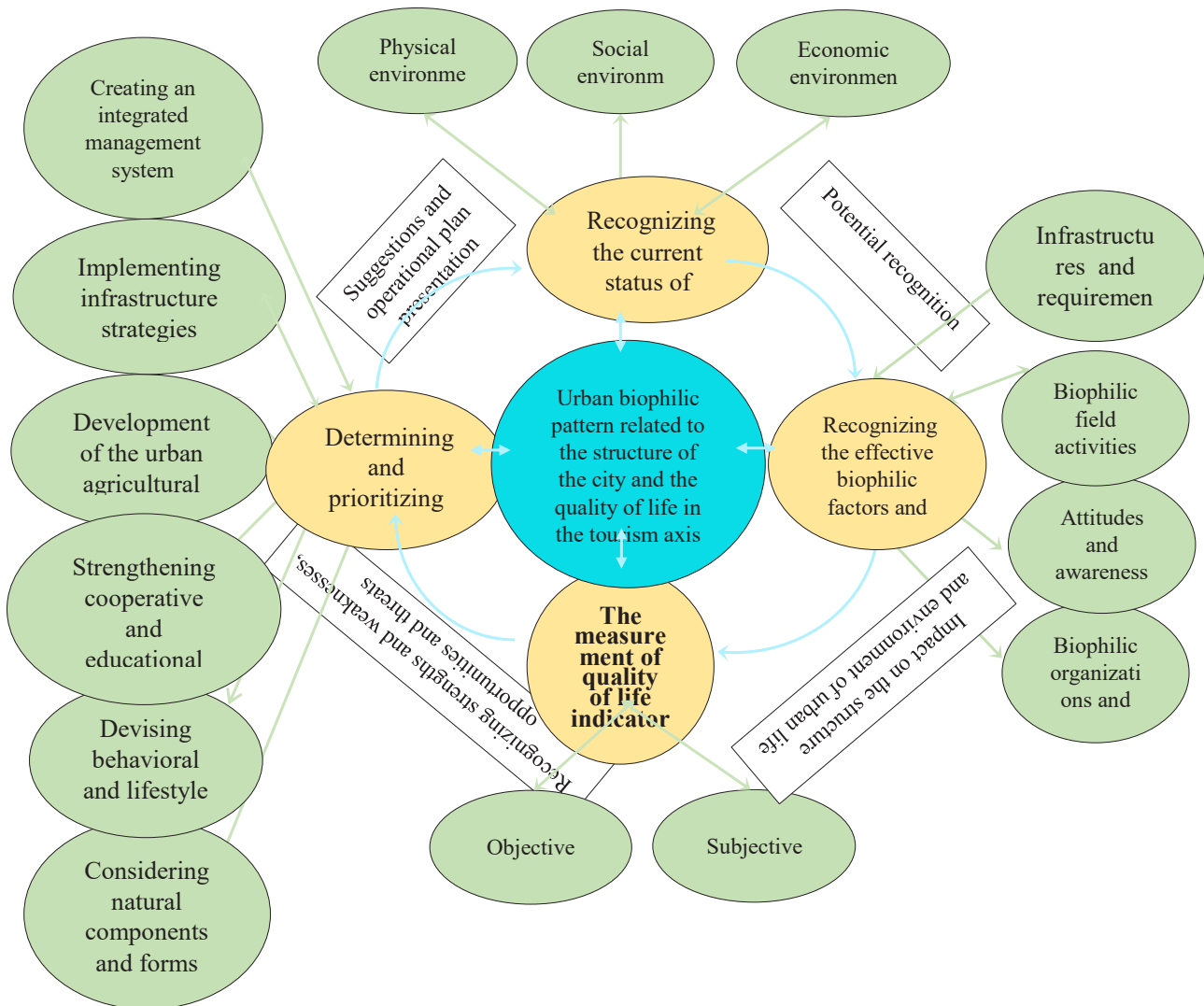


Fig. 5. Biophilic urban planning indicators, urban planning considerations, and experts' views. Source: Authors.

the sense of belonging to the place, leadership and urban governance, adoption of the best methods and education, research, and awareness of the benefits of biophilia.

Conclusion

In recent decades, the necessity of dealing with a new zone of development under the title of an “environmental zone” has been highlighted. The purposes of the zone are managing and maintaining natural resources, directing the developments and structures of growth and technology, addressing the needs, and satisfying all generations. Biophilic urbanism is a new concept and has been proposed as a response to these developments and urban development needs. The latter concept supports the use and preservation of nature and natural elements at the scale of the city, region,

neighborhood, and even the building. With regard to the importance of environmental aspects of cities, every year the best livable cities in the world are selected by institutions such as Mercer and the Economist; this highlights the importance of paying attention to the issues in this area of the city. This highlights the importance of paying attention to the issues in this area of the city. Since the natural environment has a limited ecological capacity for people’s use and natural ecosystems such as the one at Maharlo Lake are considered biological treasures of the region, it is, therefore, necessary to preserve them for the next generation. Therefore, using the principles of sustainable tourism and biophilic design in the design and preparation of the Maharlo tourism area is considered one of the basic priorities and can be considered an important indicator in measuring the quality of life in the area. According to what was discussed, both types of objective

indicators (organic agriculture in harmony with the region's ecosystem and climatic conditions, the design of the natural landscape of the lake, the quality of access and the road network, the economic power and income of the residents of the region, etc.) and mental indicators (residents' satisfaction with the design of the lake landscape, health, and safety, security in the area, etc.) were considered. There is a quality of life in the tourist area of Maharlu that should be measured and improved. In the end, in developing a biophilic model that fits the structure of the city environment to improve the quality of life based on this model, six strategies are proposed in the planning, which are:

- Creating an integrated management system centered on sustainable tourism development in Maharlu region
- Adopting an infrastructural strategy based on biophilic urbanism
- Development of the agricultural sector based on the ecosystem of the region
- Strengthening social systems and public participation and social education to protect the region's ecosystem
- Devising behavioral and lifestyle strategies such as increasing the percentage of trips made by walking
- Designing with consideration of the natural elements and forms in the area.

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