

Original Research Article

Scales of Interactions between Urban Landscape with Urban Ecology in Urban Development Programs

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Abstract | According to available evidence, ancient Iranian cities have been developed based on the duality of man and nature and their interplay. This has resulted in an artificial environment, such as an urban landscape. With the development of urbanism based on scientific, industrial, and technical specializations driven by contemporary science, there has been a great focus on urban structure. Such emphasis on structure-driven development has created a distance between human and nature in the environment. It has resulted in disciplines such as landscape based on the “Inseparability of object-subject,” ecology in urban development based on the “natural ecosystem continuity in the city.” The current study aims to propose strategies for cultural, human, and environmental concerns in urban growth. This study is developmental-applied research, which attempts to develop interdisciplinary strategies in a challenging interaction between the concept of the urban landscape and urban ecology in urban development planning programs that apply to multiple scales. The results indicate that there is an interactive relationship between the subjective and objective layers of the urban landscape and urban ecology on three scales: micro, intermediary, and macro. The components of this interaction include the set of concrete experiences of residents in the face of the urban structure; the creation of perceptual-memory images based on natural and artificial urban signs; and the creation of perceptual realms of the urban environment. If explicable strategies for their formation are incorporated into the urban development program, there would be two layers of the urban landscape and urban ecology in the structure of contemporary cities. This will make human/nature alignment possible. In other words, the urban environment will form a part of the citizens’ mental view of the city and be institutionalized in the public mind as an element of the urban landscape.

Keywords | *Urban Landscape, Urban Ecology, Urban Development Programs.*

Introduction | In traditional Iranian settlements, the perception and experience of nature are primarily centered on something qualitative that is created by experience over history and is based on natural processes. The establishment of Iranian society and the basic foundation of social life, as well as the settlement of the Iranian cities, demonstrate that Iranians have been able to engage with their environment over time. About the formation of Gor city and its surrounding villages, the information written in Ferdowsi (1999)’s Shahnameh is as follows:

*One filled Sharestan with palaces and gardens | within lie the
springs and plains and grasslands
Now a great old farmer | also called it Khore Ardeshir
One endless evil spring inside him | abounds with river and
the creeks
And the destruction of a city is caused by the destruction of
its nature:
“I will bring an army from the Chinese Turks | whose stare
will not
I will see this river of Jehu to musk | to musk of seawater,
clean and dry
[...] I will destroy all their land | I will uproot their trees”*

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It seems that engagement with nature is the most significant feature of Iran's ancient cities. In their article "Iranian Sharbagh; the position of the Persian garden in the urban landscape," Sheybani and Esmaeeldokht (2016) identified traditional city landscapes with water, plants, and architectural seeds that are formed in relation to gardens. In other words, structures formed based on the gardens indicate that the urban landscape is formed in complete connection with nature. Before the era of evolution, the cities and villages of Iran used to be formed based on experience and natural order. As a result, each city had its spatial structure and characteristics. In fact, the city used to be perceived in the context of nature.

After the growth of the urban population in contemporary Iran and the invasion of metropolises and population growth, some physical development in the city seemed to be inevitable. Such fast development was ignoring the nature around the city. The new textures of cities started being formed as rings around the traditional textures of cities or developed on axes with the origin of traditional textures. In this process, issues such as urban development, the importance of the environment, and the natural environment of cities were overlooked. The consequences of such development are ecological catastrophes, droughts, disturbances in cities and urban green infrastructure, destruction of the natural environment of the city and its surroundings, dissatisfaction of residents, alienation and lack of connection between people and the city, economic problems, and the destruction of agricultural products and desertification of lands.

The increasing trend of urban development, the rapid growth of cities, and negligence of the natural features and components of the context have led to the destruction of many natural phenomena. As a result, such phenomena have found their way into the urban fabric and have caused ecological problems. Attention to the natural potential and ecological characteristics of the context in the process of formation and development of cities is an important factor in the urban landscape. Looking at this issue from the perspective of landscape architecture highlights the

importance of reviewing the development process, the necessity of returning to natural and social identity, and preserving the urban environment and its ecological features (Yousefi Najafabadi, 2016).

Reed (2010), a professor of landscape architecture and the environment at Harvard University, believes that modern urban planning, design, and landscape perspectives are important since they are influenced by ecological notions and the natural system. Reed, who works in the field of ecological urban planning, highlights such a necessity and emphasizes that ecological urbanism is concerned with cities, the urban system, social mobility, or technology more than anything else, and it deals with ecological potential. Ecological urbanism presents increasingly comprehensive, complex, and exciting ecological aspects associated with the creation and development of cities, and through time, it generates constructive knowledge and ideas that sustain the life of urban settings.

Considering the concepts of the urban landscape and urban ecology (Fig.1), the main questions that the research seeks to answer are:

1. How is the relationship between the urban landscape and urban ecology defined?
2. How are urban landscape scales formed in interaction with urban ecology?
3. What strategies, which are influenced by the interaction between scales of the urban landscape and urban ecology, play a role in urban development programs¹?

Research method

This research is among the qualitative studies that are descriptive-analytical and it is considered applied-developmental in terms of purpose. Therefore, in the first stage, this study draws upon the concepts and theoretical foundations in the basic research related to the concepts of the urban landscape and urban ecology to show how these two concepts can simultaneously overlap in urban development programs. Since urban development programs in contemporary Iranian cities have not defined a position to preserve the ecological nature of the urban environment and

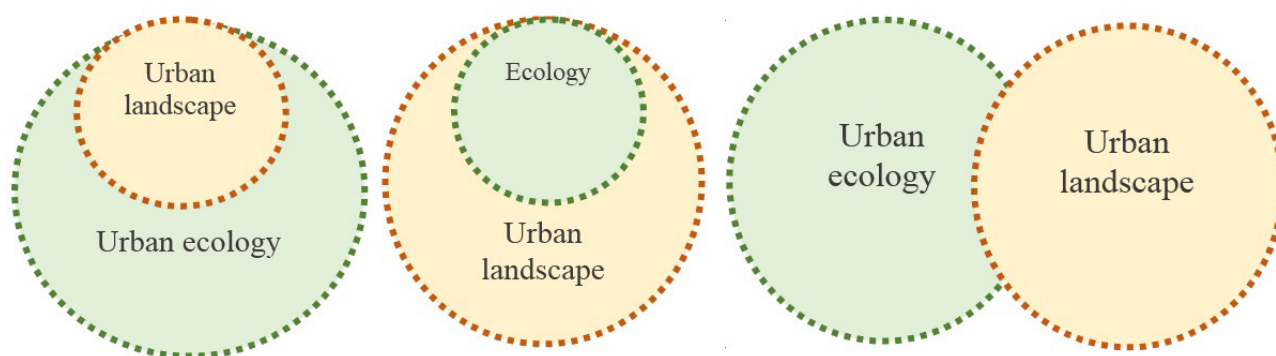


Fig. 1. Visual Expression of Hypotheses and research questions; the relationship between urban landscape and urban ecology. Source: Authors.

create a mental map of the urban landscape, in this study, the characteristics of the urban landscape and urban ecology are described in a descriptive-analytical manner and their commonalities and differences are discussed and studied in a deductive-inferential method. In doing so, the accurate positions of these two approaches in the field of urban planning and urban development programs are identified.

Literature review

Landscape is an evolving theoretical concept, and the landscape approach is a concept that comes from theoretical definitions of the landscape, explaining a bilateral relationship between man and the environment. The landscape approach draws upon this philosophy and its various aspects to introduce new dimensions for addressing problems. Therefore, the nature of the landscape approach is shaped by the commonalities and differences among definitions in the areas of the environment, the concept of the audience, the scale, and scope of the intervention, as well as the resources available in the environment (Masnavi, Motedayen, Saboonchi & Hemmati, 2021).

The significance of the landscape and urban environment is highlighted by ecological disasters on the one hand and alienation between humans and urban environments on the other. This reinforces specialized research in the field of urban planning to suggest a practical fusion between perception and nature and, in turn, to preserve cities and their growth. Mostafavi, President of the Harvard School of Design in the United States, conducted a thorough investigation entitled “Why Ecological Urbanism?” “How come now?” In this research, which was carried out in 2016, Mostafavi presented human ecological deterioration in urban areas and underlined the importance of an ecological approach in urban planning. He admitted that there was no way to return to conventional cities. According to Mostafavi (2016), ecological urbanism is a method that is formed to provide a set of perceptions and actions to improve natural urban environments and urban design and development approaches. Mostafavi and Doherty (2016) in a book entitled “Ecological Urbanism”, compiled the perspectives and research of Harvard professors and researchers on various topics such as predicting future needs, interdisciplinary cooperation, human sensory needs in relation to nature, organization, renewable energy production, interactions between management and urban planning and citizens, mobility and sustainable transportation in cities, criteria for assessing environmental relevance and the community, the way a city adapts to the ecological body, resilience, and metamorphosis in the evolving world.

In the article “Landscape Ecological Urbanism: Origins and Trajectories”, Steiner (2011), Professor of Architecture at the University of Austin in Texas, focuses on the topic of landscape ecological urbanization and examines the

concepts and evolution of landscape urbanism and urban ecology as a possible synthesis of the ecological urban landscape. This issue is of great importance because of the following factors: the growth of urbanization in the world; population growth; climate change; energy use; and the scarcity of water availability.

In the article “Urban Form & Ecosystem Dynamics,” Alberti (2000), a researcher in the field of urban ecology, an architect, and an urban designer considers urban growth and the transformation of land into a city as a major threat to the ecosystem. Alberti examined the factors affecting the relationship between urban patterns and ecological systems and proposed features of urban planning that maintain the ecological conditions of the region in the face of the development of cities. In his book “Advances in Urban Ecology”, she argues that one of the most important challenges for scientists and futurists is to know how urban areas evolve in the interaction between ecological and human processes. In his research on the environment and society in urban design, Calthorpe considers the criteria of conservation, environmental quality, and energy efficiency in development, as well as design as a community strategy that also responds to cultural and social needs as proposed by Jacobs. According to him, if traditional urbanization and sustainable urban development can reduce dependence on fossil fuels, limit air pollution and greenhouse gases, and create cohesive and stable social spaces, they would be desirable (Calthorpe, 2015, 19). In Urban Ecology, from Forman’s perspective, ecology is a powerful force capable of preserving modern cities despite their socio-physical flaws. Using the term “nature of the city,” he argues that cities have a better future when the special and effective presence of nature in the city is ensured, real analysis and approach to human interventions are used, and attention is drawn to the nature of the city in the formation and development of cities. However, this results in positive population growth. In this view, the centrality of nature, rather than the centrality of the city, leads to a realistic view of the city, and then nature will be presented as the main element alongside the city, and this view becomes practical if all sciences move toward a coherent and comprehensive point. That is, the consensus of all sciences associated with urban issues is covered by urban ecology as a holistic science (Forman, 2014). According to Forman, the best and most useful idea of urban ecology for the construction and improvement of urban areas includes the study of the interaction of organisms (microbes, plants, animals), artificial structures (roads and buildings), and the physical environment (soil, water, air) where there are a lot of people (cities and neighborhoods) (Fig. 2).

Drawing upon Backhaus, Reichler & Stremlow (2008) and Keller and Backhaus (2019) proposed the quadrupole model of landscape perception (Fig. 3), which presents the landscape at four poles. They attempted to categorize

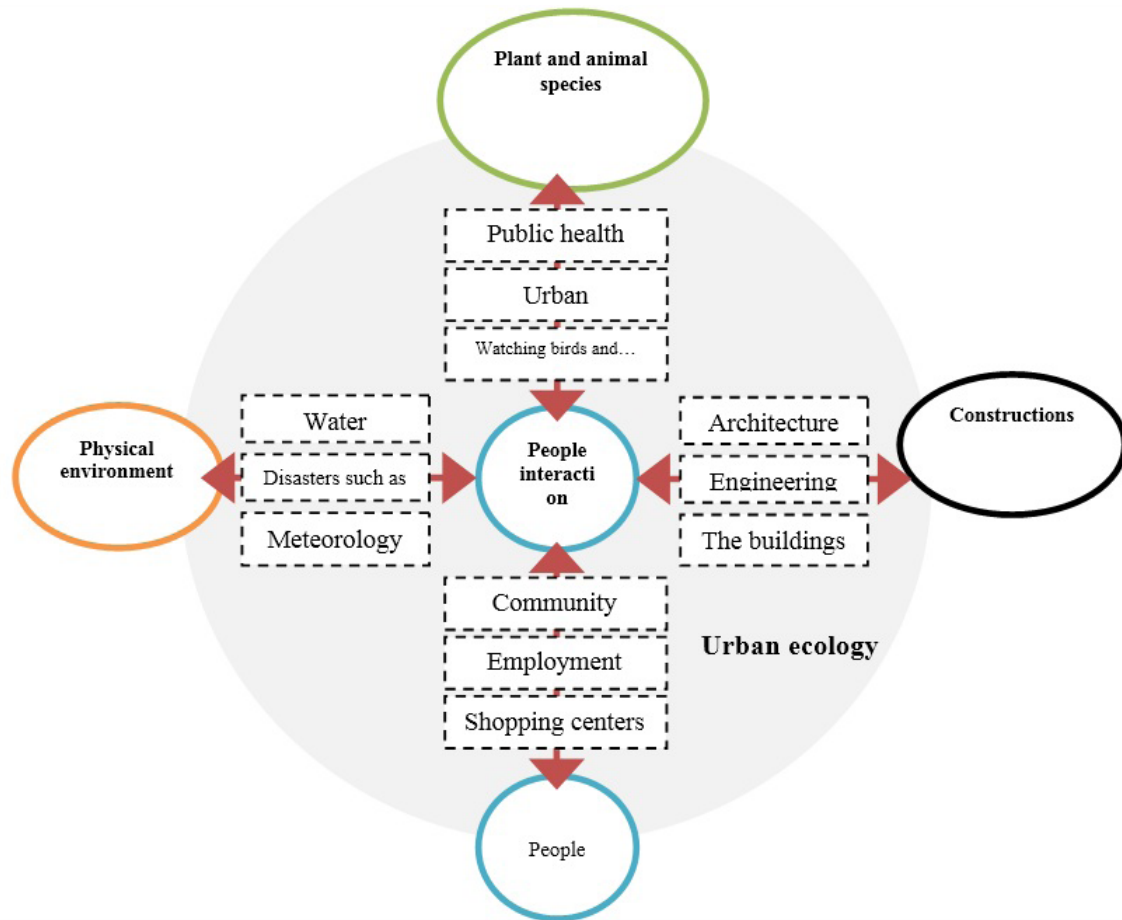


Fig. 2. Concept of urban ecology: people's interaction with the structures affecting the city and the context of those structures, people, the physical environment, and plant and animal species. Source: Authors adapted from Forman, 2014.

the mental pole (cognitive sciences), the social pole (middle mind), the physical pole (natural sciences), and the symbolic pole (cultural sciences) by experts in various fields. Under the umbrella of these four poles, they identified six different dimensions of landscape perception that can be thought of as different though largely overlapping perspectives: 1. Physical-spiritual dimension, 2. Aesthetic dimension (it deals with beauty or intellectual discoveries and emotions), 3. Identity dimension (it is related to the feeling of belonging), 4. Political dimension (highlights the various needs and desires of interested groups), 5. Economic dimension (demonstrates the importance of landscapes as an economic resource, such as in tourism) and 6. Ecological dimension (relates to all aspects of the ecological goals of sustainable development) (Backhaus, Reichler & StremLOW, 2008; Keller & Backhaus, 2019).

In this model, landscapes are equivalent to environments, and the landscape is considered an interdisciplinary discipline. Moreover, the objective and subjective dimensions of the landscape are examined separately from the object (i.e., the environment). In the mentioned studies, which are part of the studies in the field of ecology and landscape

relations, most of the research has considered theoretical and managerial dimensions on a large scale. This has limited the dimensions of urban space designs on different scales to management or theoretical levels. The implicational gap of such topics is felt by designers.

Concept of landscape

The European Landscape Convention defines a landscape as "a part of a territory as perceived by populations and the result of natural or human factors and the relationship between the two". "Landscape" is a polysemous term used in the continuity of objectivity and subjectivity: from the materialistic or objective perspective of geographers and natural scientists to the immaterial or subjective perspective that emerges from history, particularly art" (Luginbuh, 2014, 53). The landscape is not only an objective phenomenon made up of natural components, but it is also an objective-subjective phenomenon shaped in people's minds by the intervention of history, religious beliefs and myths, climate, biological tradition, and other factors (Mansouri, 2005). On the other hand, the landscape cannot be static because it represents the dynamic relationship between culture and

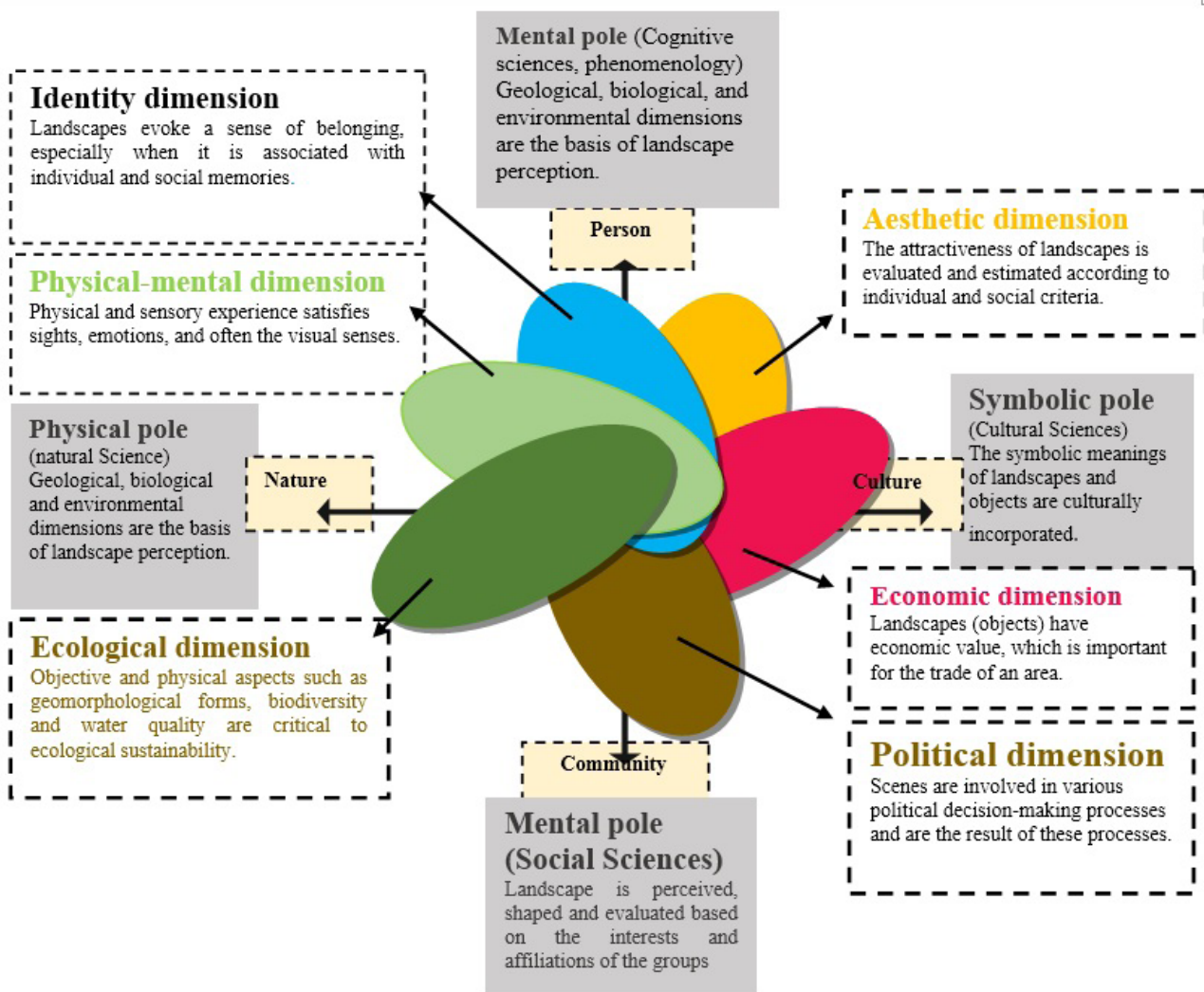


Fig. 3. Quadrupole model of landscape perception. Source: Backhaus Reichler & StremLOW, 2008; Keller & Backhaus, 2019.

natural processes (Antrop, 2005). Even if the landscape does not change physically, individual and social perceptions of the landscape change over time (Nassaur, 1995).

The nature of the product of landscape relations is expressed in three ways: objective, subjective, and objective-subjective. It seems that the first two concepts cannot present all the features and dimensions of the landscape, and each of them conveys a part of the nature of the expressed cognitive relation. The reason is that objective nature focuses on the perceived aspect and subjective nature focuses on the perception. This relationship has two simultaneous and interactive aspects that only emerge if they are seen as a coherent whole. Thus, only the objective-subjective nature, which benefits from the bilateral relationship between man and the environment, reflects identity features and the fundamental concept of landscape. On this basis, then, the term “landscape” can be defined as follows: Landscape is a perceptual relationship that is in a “continuous” connection between “man as a perceiver” and “environment as a perceived object” (Hemmati & Saboonchi, 2021). It gives

rise to a product of an “objective-subjective” nature. Based on the above definitions, landscape as an interdisciplinary field encompasses a wide range of scopes, from objective-subjective dimensions of man to the environment in which he has intervened. Hence, in the field of humanities, either defined individually or socially, it is a cultural category that depends on the perception of the individual and society, and in the field of natural sciences, it discusses the environments in which cultured people have been or are present. As a result, “landscape and related studies require both social science and natural science skills simultaneously (Keller & Backhuas, 2019). This field examines the human perception of the environment from different dimensions and angles (Fig. 4).

Urban landscape theories

Developing the academic concept of “urban landscape” and associated terminologies related to this phenomenon in numerous areas have been the result of the attention to people-environment interactions, the attention to the

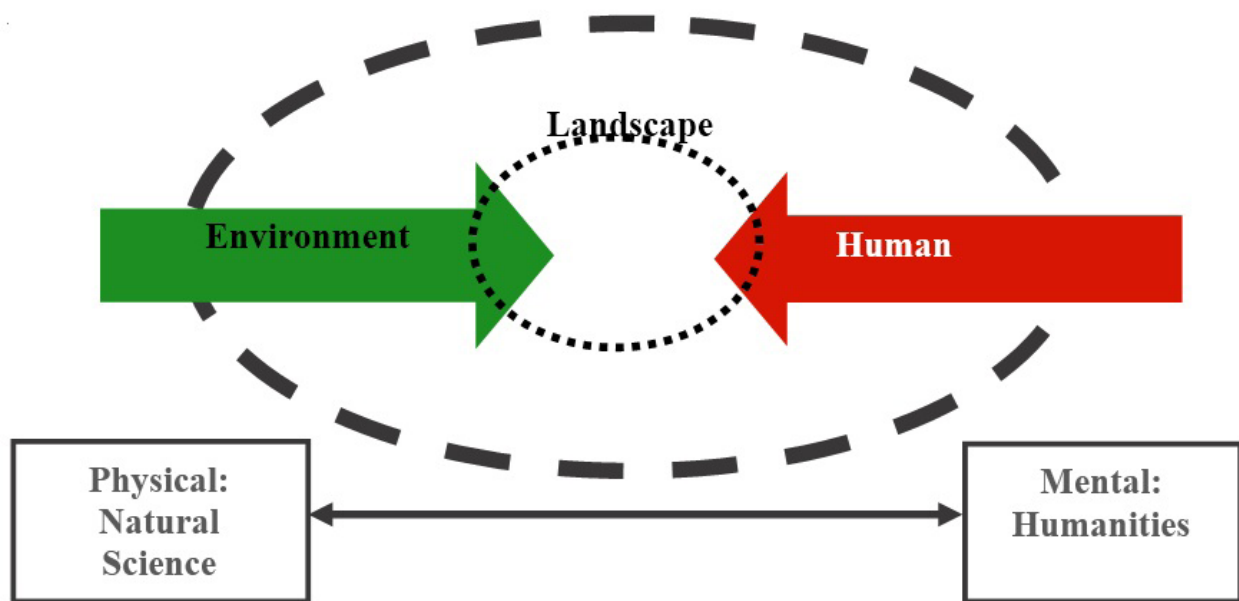


Fig. 4. The relationship between man and the environment in the field of landscape. Source: Authors.

bilateral relationship between man and the environment, the attention of experts and urban managers to physical development in response to population growth, and the neglect of residents' perceptions of the city as the main audience of urban life. To address the existing shortcomings, a group of intellectuals started intellectual currents specific to that period. For instance, nature, which in traditional cities was an intertwined factor with human life, created a challenge for geographers in contemporary cities to explain the concept of urban landscape based on their expertise with reference to some shortcomings. Due to ecological catastrophes in the next period, ecologists became the leaders of intellectual currents in the field of urban landscape. According to Burque, "the development of the urban landscape has been more dependent on the evolution of modern society and the formation of a special intellectual structure that emphasizes a kind of dichotomy between us and cities" (Berque, 1990).

The term "urban landscape" in particular came to be associated with American cities in the late nineteenth century, when Frederick Olmsted, the father of landscape architecture, introduced his designs. Subsequently, the term "urban landscape" was used in urban texts in the 1940s and 1950s with a critical look at the disappearance of rural and urban identities in post-World War II reconstructions, which was a result of weak urban development programs. The word is derived from the Roman word, "Genius Loci", the English equivalent of which is "the prevailing character or atmosphere of the place." Cullen first theorized concepts of the urban landscape in Architectural Review Journal (Atashinbar, 2012). After the introduction of the field of urban design to universities in the 1960s, the design of

empty spaces between urban buildings received much attention from urban planners. This was offered as part of the course on urban planning, and landscape architects introduced it as the design of the area between the buildings (Golkar, 2008). In this period, mere attention to the structure resulted in visual desirability, and beautiful landscaping was adopted as a dominant model in urban landscape actions. For example, the urban landscape introduced by Cullen was presented as the successive views (visual perceptions) of citizens of the experience of moving to the city. Carmona and Punter (2011) refer to this approach in urban design as the "Townscape tradition". The dominant pattern in the actions of the urban landscape in this approach is beautiful objectivity, which aims to decorate the urban space to satisfy the visual perception of the urban audience.

With reference to the concept of landscape and considering the city as an environment, it can be said that an urban landscape is a "phenomenon" formed by the physical and tangible characteristics of the urban environment and the spatial experience and subjective perception of the city dwellers. This includes the interactions between "natural" and "cultural" processes in the urban environment. The inhabitants of the city get engaged in two-way interactions between the natural environment and the man-made environment and construct the phenomenon through subjective glasses influenced by culture in the interaction with natural processes and experience and perceive it on three scales: micro, intermediary, and macro. In this interactive process, the cultural man represents nature and is represented in nature, and by perceiving the environment represented, he perceives the structure and physical aspects of the city based on the lived experience in his mind.

Urban landscape perception scales

Urban landscape refers to the process of representation during experience and life in the city, human interaction with nature, and the perception of the urban landscape. The urban landscape is formed on three scales: micro, intermediary, and macro; the urban landscape as a whole.

• Urban scale micro-scale

It refers to the mental images of an object that are created by residents of a city through their everyday lives in concrete spaces. The images are the results of the realities they encounter through their sensory perception in concrete spaces and are influenced by their experience of the environment. In the process of exposure, signs, including physical, functional, and symbolic, are reproduced during the actions and lead to the production of action-perception images. The cultural dimension of the experience of space is associated with the attention to signs. The production of signs on a micro-scale is the first step of the urban landscape model, which has been referred to as an urban landscape on a micro-scale (Fig. 5) (Esmaeeldokht, 2020).

Memorial landscapes are one of the important topics in landscape on a micro-scale. Semiotics has always been used for their understanding. They are part of a collective memory shaped through action-perception images. Even sometimes, tangible and intangible aspects of collective memory can subconsciously affect the landscape design process (Karamanea, 2015, 118). In recent decades, there has been a great variety in the structure of theatrical landscapes and their signs. The designs and themes of contemporary monuments are not limited to artificial elements and sculptures but serve as elements and spaces that encourage the audience to actively attend in public spaces (Stevens, Franck & Fazakerley, 2018). Based on the research of KhajehSaeed, Balilan, and Sattar Zadeh (2021), natural elements such as vegetation and water are contemporary formal landscapes that produce signs and from the total elements of objective or physical (visual elements) and subjective or mental perspectives (narrative perspective).

• Intermediary scale

The continuity of daily experiences and the construction of patterns based on social experiences, combined with signs reproduced on a micro-scale, result in the production of domains² and the construction of perceptual-memory images that are dependent on the continuity of space experience, specific behavioral patterns, or the result of different spatial experiences. Perceptual-memory images reproduce the landscape on an intermediary scale as a mental space. In the continuity of the reproduction of mental spaces on an intermediary scale in a traditional city, a social structure called a Mahallah with its signs and social relations is formed, which is the result of the juxtaposition of action-perception images on a micro-scale. Each mahallah comprises the signs that residents have reproduced over time (*ibid.*). For example, Ishaq Bey Mahallah, as a small part of the traditional social texture of Shiraz, was composed on a large scale of small units that indicated local relations, such as Bayat mahallah, where the Turkish tribe lived. The majority of the people were into selling and trading horses, and there was a passage in the mahallah called the Bayat Bazaar passage. One of the symbolic signs on a small scale, for example, is the passage of Dar-be-Sheikh, which gained its reputation because of its proximity to Sheikh Roozbehan's tomb, but the name of Dar-be-Sheikh is no longer in use. However, Sheikh Roozbehan's tomb, with the same mental images, is a spectacular place for people who narrate these images to tourists (Fig. 6).

A: Large scale: The social boundaries between mahallat, the sense of belonging to one mahallat, and understanding the mental space of other mahallat determine the territories of each mahallah as a small whole. The juxtaposition of small wholes based on mental spaces (territories) on an intermediary scale led to the perception of the city and the reproduction of the overall image of the city and the construction of a landscape on a large scale. Lynch's cognitive maps among theorists and the image of the city or the notion of the city among social scientist thinkers



Fig. 5. Concrete space, microscale of the urban landscape. Source: Esmaeeldokht, 2020.

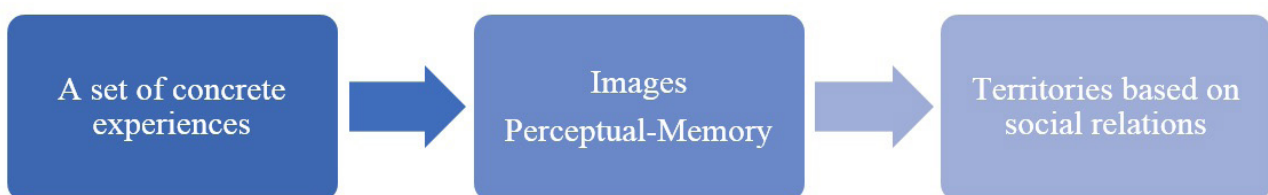


Fig. 6. Mental space, the intermediary scale of the urban landscape. Source: Esmaeeldokht, 2020.

place more emphasis on the intermediary scale of the urban landscape. In this empirical-perceptual model of the city, residents experience the city and urban spaces according to their presence in space (concrete space), which reproduces the mental space based on the social and functional relations of city residents in concrete spaces. He says the mental space of the inhabitants is not based on the mathematical and logical lines of an engineer or expert (Fig. 7) (Esmaeeldokht, Mansouri & Sheibani, 2021).

The concept of ecology

Ecology literally means “ecology,” and this term refers to the natural relationship between plants, animals, and humans on the one hand, and their environment on the other. The term “ecology” expresses broad concepts in all fields. This concept was first applied to explain the dependence of plants and animals on the natural environment. Since the late nineteenth and early twentieth centuries, the concept of ecology has been considered by scientists of various sciences and disciplines, and urban studies have been rapidly influenced by this trend (Behbahani, 2007). The word ecology has Greek roots and consists of the two words “Oikos” (meaning dwelling, house, bed, or place of residence) and “logos” (meaning cognition, science, or knowledge), and its literal meaning is the study of living organisms in their biological environment (Ardakani, 2022). In 1886, the term “ecology” was first used in biology by the prominent German zoologist, naturalist, and philosopher

Heinrich Hegel in his course on the general morphology of living organisms. Hegel used the word “ecology” in the course to examine the interrelationships between the individual and the habitat. This part of ecology is now known as autecology. According to Hegel, ecology is the knowledge of the interactions of living things with the outside world. In a broader sense, this includes all environmental conditions, whether living or inanimate. Today, ecology is the study of natural systems at a level where humans interact with all living things as part of a system (Moghadasi, 2016).

The field of ecology has a 140-year history. This field has now gained more significance due to the “urban tsunami”. At the same time, natural environments and systems are getting smaller. Ecology was introduced in Germany in the 1860s and accepted as a science in Europe in the 1890s. It was introduced in West America around 1900 with a focus on “ecological sequencing”. Specialized societies and magazines addressed this issue from 1912 to 1915. Modern ecology came to the fore in the 1940s and 1950s. Ecosystems, theory, evolution, society, and ecological systems were given special attention. Until the 1980s, several sciences were developed under this category. These include landscape ecology, biological conservation, and urban ecology. Fortunately, ecologists have allied in several areas, focusing on the topic of “the interaction of organisms and the environment.” In the 1960s and 1970s, they presented their warnings through international environmental conferences. In the 1990s and 2000s, urban

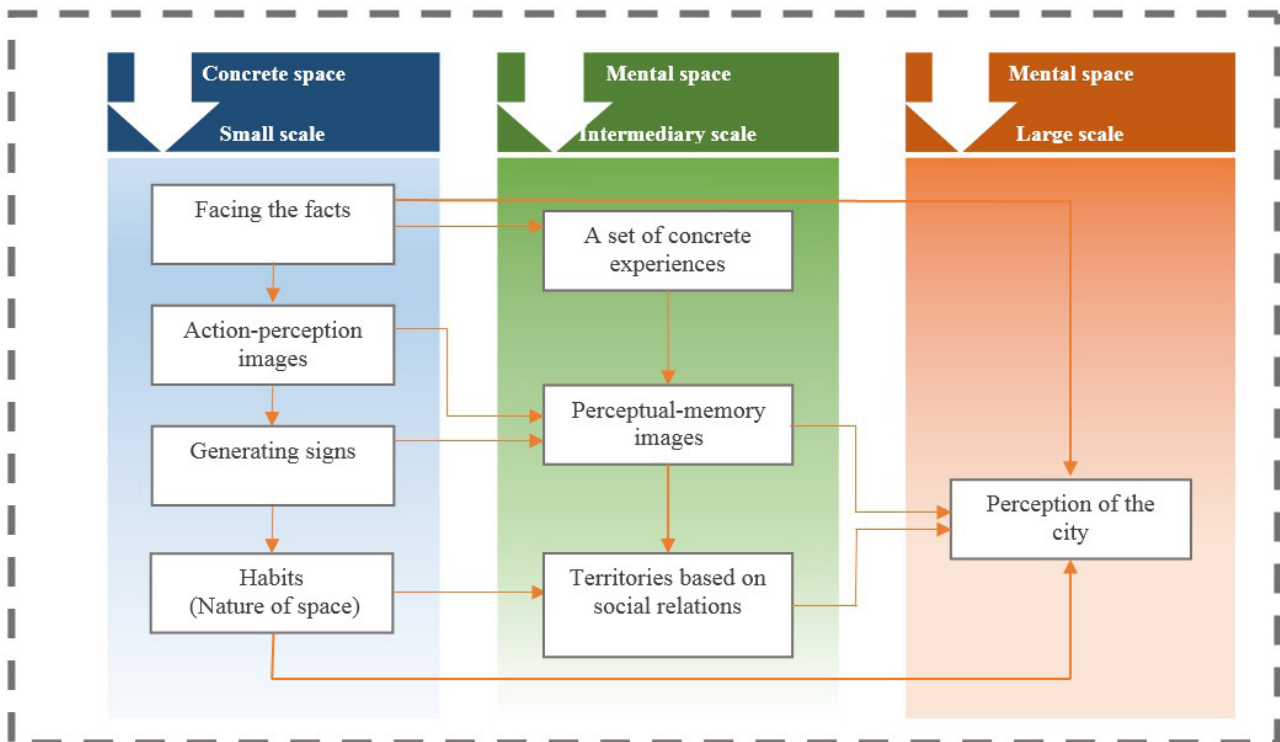


Fig. 7. Conceptual model of the urban landscape reflecting a citizen's experience and his perception of the city- Source: Esmaeeldokht, Mansouri & Sheibani, 2021.

planning and global climate change made environmental issues front and center (Forman, 2010). Ecology belongs to the outside world. It recognizes the phenomena and the relationship between them and focuses on the needs and living conditions of the components and the set. The science of ecology is growing and, in this direction, has transformed views from atomistic to holistic (Mansouri, 2015). Makhzumi consider ecology as a way of thinking that inspires views related to human existence. A changing philosophical view of man's relationship with nature (Makhzumi, 2015).

Urban ecology

Urban ecology offers an opportunity to ponder the social consequences of the environmental movement (the relationship between society and the environment) and the possible long-term consequences for our understanding of cities (human-environmental relations). The question is whether urban ecology is merely an attempt to create communities surrounded by ecological factors, or whether it can also contribute to the development of important environmental ideas and concepts in the face of numerous ecological emergencies (Hodson & Marvin, 2016). In fact, urban ecology serves as a guide for urban planners to coordinate urban development with ecological programs. Urban ecology, on which various studies are being conducted, examines the complex interactions between humans and architectural artifacts with living organisms in the city. Researchers who study the unbalanced ecology of cities attempt to find the best solution to integrate nature within cities (Moghadasi, 2016). Definitions of the ecological city refer to different dimensions of the city, especially environmental-social dimensions. An ecological city approach is a non-physical approach that includes a set of dimensions and characteristics of the city to achieve sustainability (Jomehpour, Ettehad & Nourian, 2020). According to the definitions provided by the European Union in 2018, a sustainable city is the only city that must manage urban consumerism of natural resources (such as forests, soil, and water resources) and match those structures and characteristics to achieve a sustainable environment. Furthermore, urban environmental pollution should not obstruct the renewal of natural resources and ecosystems (European Commission, 2018). Susan Hagan, a British architect and professor at the Royal College of Architecture, has researched "urban ecological metrics". She studies ecological design in connection with contemporary architecture and urban planning. According to her, when environmental design emerged ten years ago and was considered a threat to the mainstream of European architecture, numerous predictions promised the decline of artificial structures (architecture). We are currently facing a variety of situations involving technology, nature, and

architecture. A few of them are highly engineered examples that have been defined by ecological function, but most of them are a combination of convention and innovations. Urban-scale ecological design now raises the same warnings: the new city is informal, uneconomical, and anti-design; or it is a mass of over-engineered plans, or it contains perfectly designed ecosystems that disrupt the geometry and materials of the city. If eco-architecture is considered, then both of these states (ecology and engineering) will be reflected in ecological urban planning, but most designs will be a combination of emergency and planned, biotic and geometric situations, and this combination has not yet evolved. The ecological narrative and its performance are immature, while the urban engineering narrative has a long history and its performance is different and well-established (Hagan, 2010). Ecology must find its place and definition in urban planning to improve the urban environment as a factor playing a role in identifying the ecological features of the city with related strategies. Those who are trained in environmental design use the term "ecological urban planning" in the true sense of the word. Now is the time for change. Ecological urbanism is the art of sustainability. It means expanding the city based on ecological infrastructure at different scales. Planners need to understand that the earth is a living system to identify ecological infrastructure. These infrastructures have a strategic meaning in the integration and natural and cultural identity of the landscape and ensure the sustainability of ecosystem services (Kongjian, 2016). In addition, this idea is a new expression of the idea of urban metabolism, a metaphor that is no longer a metaphor. At the urban level, our environmental goal now is to build an "artificial ecosystem" of cities that can create the same level of interdependence of natural habitats between their components; the identity of an ecosystem is defined by biotic and abiotic factors.

A: Abiotic compounds refer to minerals, climate, soil, water, sunlight, etc. B: Biotic compounds include all living organs, living, and organic materials from all living organisms and plants. These elements are related to two main forces: the flow of energy in the ecosystem and the cycle of nutrients within the ecosystem. In the future, the goal is to move between natural ecosystems (though rearranged by humans) and artificial ecosystems (though they also contain nature) and improve them. In such cases, since environmental, social, and economic problems are inseparable, environmental causes can be addressed first before the effects. Analysis of environmental measures of a context can lead to the production of site-specific priorities and maintain its ecological conditions (Hagan, 2010).

In Table 1, effective theories in ecological urban planning and related strategies are presented.

Table 1. Effective theories in ecological urban planning. Source: Authors adopted from Hagan, 2010.

No.	Effective Theories in Ecological Urbanism	Strategy
1	The goal of the environment is to create an urban “artificial ecosystem” that can create the same level of interdependence as natural habitats between its components.	Rebuild ecosystem
2	Land devoid of construction is no longer considered empty, but full of something else. Undeveloped fields are as important as developed fields.	Scattered construction fits the ecological approach
3	In the future, the goal is to move between natural ecosystems (though rearranged by humans) and artificial ecosystems (although they also have nature).	Urban planning with an ecological approach
4	Analysis of environmental measures of a site can lead to the production of priorities specific to the same context to develop the urban landscape.	Analysis of environmental measures of the context
5	In each context, certain environmental elements and factors can be applied: buildings, infrastructure, biotictextures, abiotictextures, and dense and empty textures. Then, there will be challenges between the mental image of the city, the current life of the city, and the landscape of its data.	The challenge between the urban landscape and urban ecology in urban development programs
6	At the urban scale, where ecology has a significantly greater economic and cultural burden, there is no longer a direct relationship between the cause of ecology and the effect of the design, and the city can no longer play a role merely as engineering and physical design. Starting design with ecological parameters is effective in preserving the urban environment.	Selection of ecological strategies in urban design

Discussion: Interaction between the scales of an urban landscape with urban ecology

Ecological problems make it necessary to pay attention to ecology and nature in the city. Therefore, the practical manifestation of concepts such as urban landscape and ecology in the city and development challenges require finding a common ground to place these concepts in the field of urban action. To put the concept into practice, apply, and expand these concepts in the form of urban projects, it seems that the best option is to understand how ecology and urban landscape interact with each other on three scales: micro, intermediary, and macro to develop strategies in urban development plans. The urban landscape on a micro-scale is associated with the daily experience of objective spaces, both natural and artificial, which is based on the five sensory experiences and the experience of space (e.g. mass-space, skyline, architectural grain performance) and social actions (e.g. density in the city center depending on public uses; environmental behavior such as movement and experience; natural elements such as vegetation turning to physical and memorial urban landmarks over time; images related to the experience of space; and individual and social actions of residents formed in the body). On a small scale, urban ecology focuses on environmental elements and their places in the overall structure, such as water and green elements (rivers, vegetation, and animals on urban patches) and natural elements of a passage and an urban arena, which can provide space for people to gather together and connect with nature and the environment as well. At this scale, the simultaneous attention to the urban landscape and its ecology requires the representation of the natural environment

in the form of small local and regional signs. Moreover, attention should be paid to the network connections of these signs, and natural elements for perceiving the city and urban experiences need to be understood (Fig. 8). At the intermediary scale, the concept of urban landscape relies on a set of concrete experiences based on urban landmarks and the formation of memory-perceptual images of the city. Such images are based on perceptual-social patterns. Among these patterns; mental domains, such as neighborhood definitions and collective actions, are combined with natural networks in the city (such as water and green corridors). If the network of sign elements and urban ecological elements is formed on the intermediary scale of mental perception, the urban landscape can contribute to domains based on signs and networks. In the field of the relationship between the city and the environment, the duality of culture/nature can be infinitely analyzed. If nature is culture, then it is time for culture to be nature. The concept of a “functional” or “productive” landscape for biomass, urban agriculture, water management, etc. implies a different way of thinking about the city and the environment and contains cultural requirements to be considered and influence urban development plans. In fact, any land devoid of construction is no longer considered empty but is full of something else, and that is nature and the environment. Undeveloped lands are as important as other lands and can give identity to urban spaces (Fig. 9).

Conclusion

The city is a process of human-place interaction that is reflected in spatial experiences and mental images

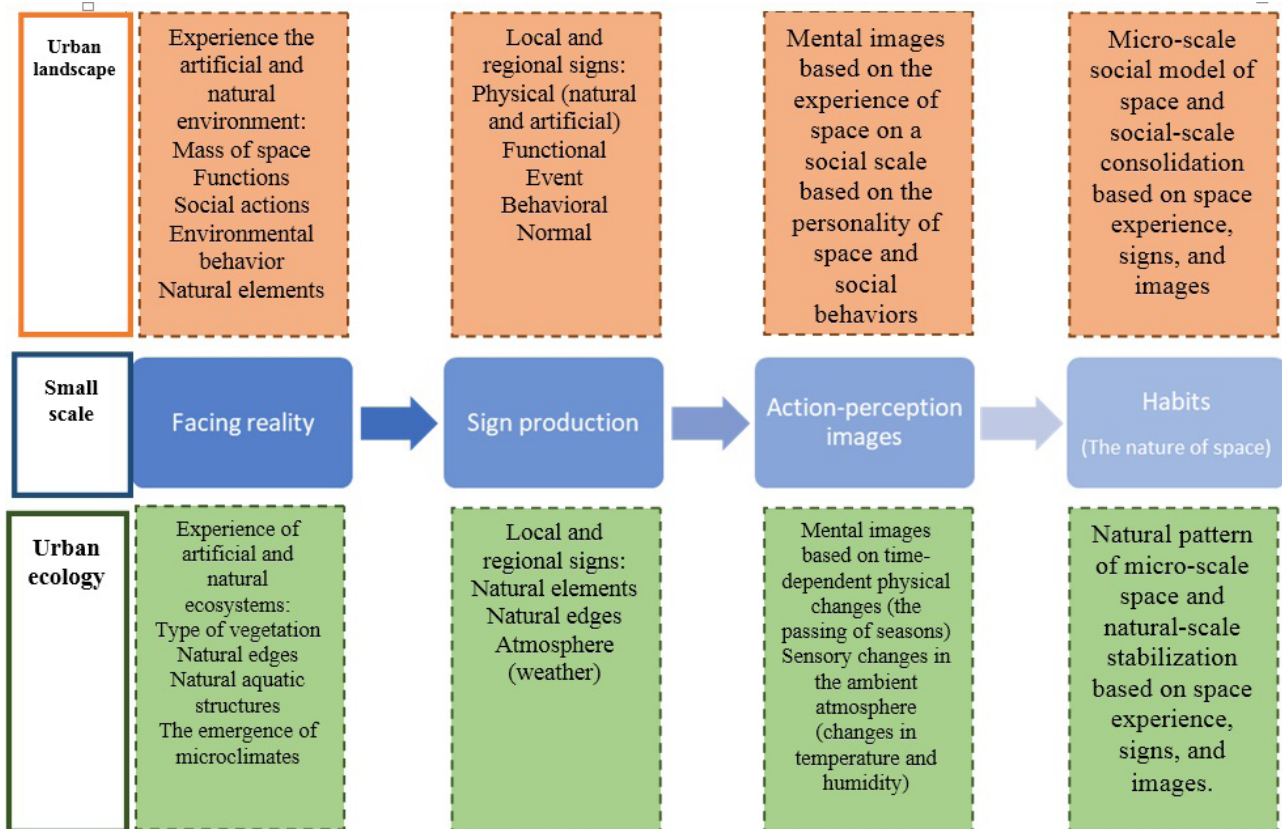


Fig. 8. Concrete space on a micro-scale in the urban landscape and urban ecology. Source: Authors.

are created according to the physical elements of the environment and according to the continuity of citizens' experience-perception, originality is the experience of city residents over time. If the reading is based on science devoid of wisdom and man is considered to be a living being devoid of thought and authority in matters related to the city, then the city will turn into a laboratory environment that is constantly abstracting the urban environment and measures of changing the structure from macro to micro. In the perception and experience of urban spaces, man is the one, the subject, who consciously thinks, and his actions and reactions are formed in the process of facing the environment, and his experience and perception turn the environment into a landscape. By emphasizing the characteristics of the physical and objective environment, ecology sees cultural human beings in the form of objects in the city, while the urban landscape discipline considers urban residents as subjects who perceive the environment based on objects. They perceive nature as an ecology. As a result, in development-oriented and practical measures in the city, organizing the urban landscape from the ecologists' point of view depends on the urban ecology aspect, and less attention has been paid to the perceptions of city residents. Many attempts have been made to explain a model for shaping the city structure based on ecology. According to Calthorpe, solving the ecological problems in the city is a

solution to the social and cultural problems in the city. It seems that the response of ecologists to urban issues and problems is associated with natural sciences and their approaches fit into the framework of knowledge and social sciences are the missing link in the strategies of ecologists. The social aspect of man in the field of ecology does not deal with human culture. Man is a part of the environment, not an active subject who is different from other living beings. In the discussion of the urban landscape from the perspective of landscape architects, perception is associated with the mind and there is an emphasis on cultural man, and the category of the ecosystem is not considered as a set of biotic and abiotic organisms, but what cultural man thinks of the body over time. However, the problems of contemporary cities now involve both human and environmental dimensions. Therefore, in practice, it seems that a holistic and systematic view that defines the urban environment as an urban landscape in relation to natural processes and ecosystems should be considered. This requires considering ideas on the micro, intermediary, and macro scales. It is because these scales focus on the perception of environmental factors and the physical dimension of the urban landscape in the urban space. Based on those ideas, it is possible to make the necessary changes in the field of urban design, urban planning, and urban development (Fig. 10).

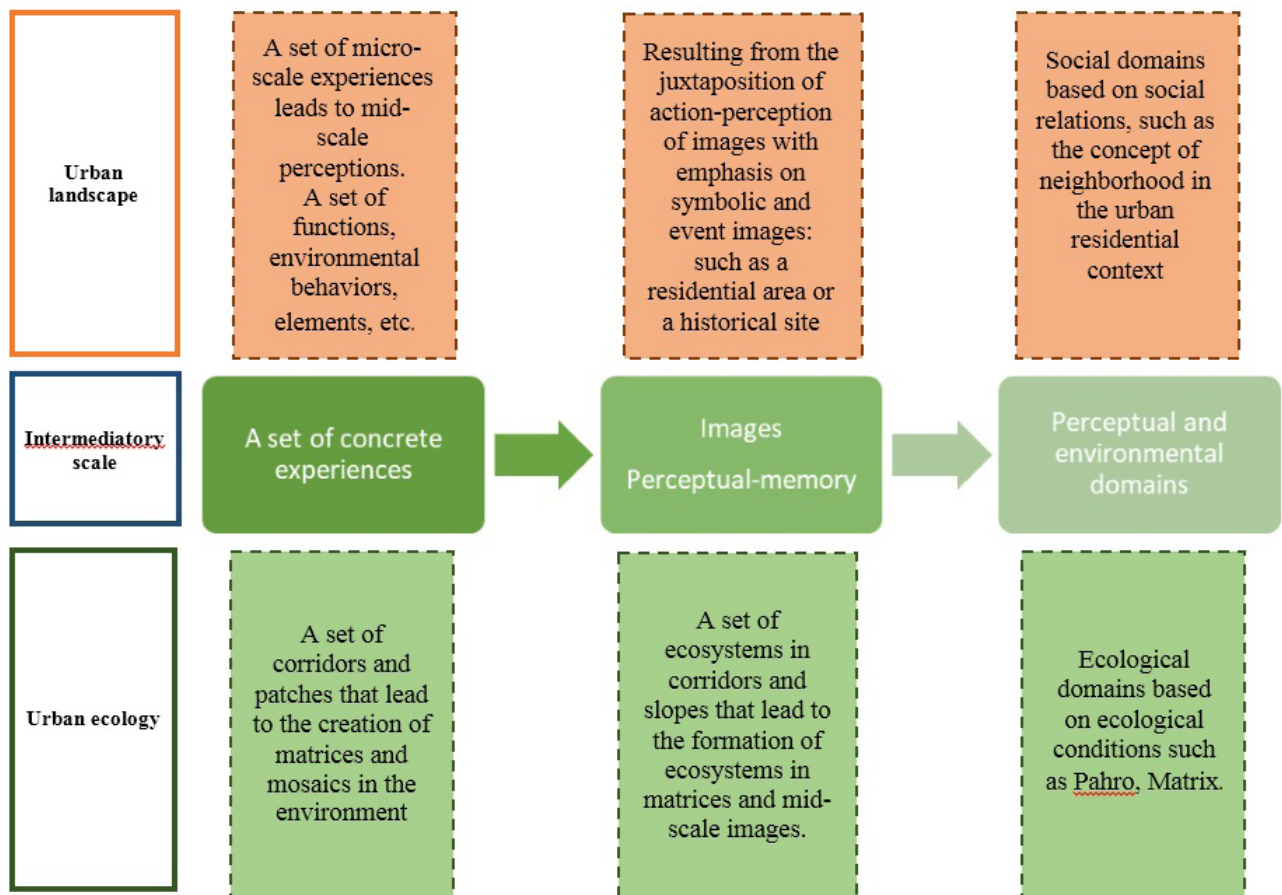


Fig. 9. Concrete space on an intermediary scale in the urban landscape and urban ecology. Source: Authors.

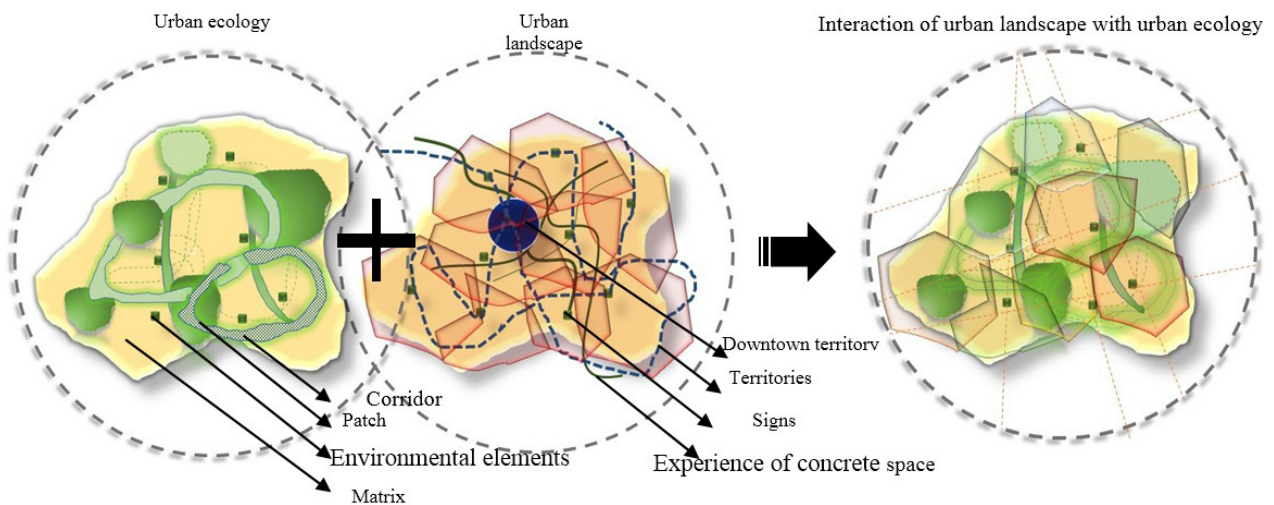


Fig. 10. Graphics showing the interaction between urban landscape with urban ecology. Source: Authors.

Endnote

1. By examining the events and currents of urban planning and urban development in Iran, we can identify two categories of development: a) without a plan and action-oriented and, b) a plan-based development. This first category includes a kind of practical intervention in urban development and renovation based on a long-term plan and perspective and only seeks to renovate and create new urban spaces. Developing the cities without a predetermined plan occurred in the late Qajar, first Pahlavi, and the first period of the second Pahlavi before the formation of a program organization (1949) and the development of the first urban plans (1968). After the formation of the grand plan organization in 1949 during the second Pahlavi period. In the same period, seven-year and five-year development plans, according to the new urban conditions were developed. Urban development with pre-determined plans such as urban networking or comprehensive plan, etc started to gain popularity. At present, before taking any action in the city, development documents based on macro-plans with a long-term perspective are prepared and as upstream documents, are the basis for development. In this research, urban development programs mean upstream documents (Esmaeeldokht, 2020).

2. Habits are a system and a scheme of perception and receipt of actions and epistemological structures, a value that is acquired during constant exposure to social status. Habits are both a system and a plan of production of actions and perception and receipts of actions' (Bourdieu, 1989, 19).

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