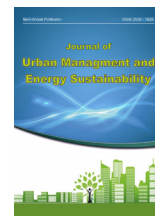


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CASE STUDY RESEARCH PAPER

Evaluation of the visual-perceptual component of ecological landscape architecture with a planning approach in the urban landscape (District 2 Tehran)

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ABSTRACT

Today's cities in Iran, especially in the metropolises, have a lot of discontinuity in the urban landscape, which are spread like limited spots in the city. These spots generally focus on the creation of green space, mainly play the role of park-like recreational places and are unique in a specific environment and have no specific connection with the principle of urban flow. One of the main components of the ecological urban landscape is the visual-perceptual dimension in its different functional levels, which can be understood in urban green spots such as parks. The aim of this research is to evaluate the impact of the visual-perceptual component on ecological urban landscape architecture with a planning approach in the 2nd district of Tehran. The research method of the present study is descriptive-analytical and applied in purpose. The method of collecting documentary and field information. Based on this, according to the table of considered indicators of the component, 24 urban parks have been selected in 4 scales in the 2nd district of Tehran, which were first evaluated using the visual preference method, and finally 8 parks were selected as selected scenery. In the following, using the weighting and ranking method, the desired samples are categorized based on 4 indicators using the TOPSIS method. The findings indicate that the local park of Kaj with an average score of 0.162 has the greatest impact in the ecological urban landscape in the visual-perceptual component in the planning dimension and needs specific strategizing in the upstream documents.

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INTRODUCTION

Due to the process of globalization and the increase in urbanization, major changes have been made in the urban structure as well as the architecture of the intermediate contexts. And semi-private (such as sites related to buildings) are also considered part of the spatial structure in a holistic view. (Smith, 2020). Sustainable development, as a manifesto of urban development, has always depended on the assessment and explanation of landscape architects who intended to challenge the relationship between nature and space (Soulie, 2019). The approach of ecology in the context of the city is a prerequisite for cities to be able to provide a suitable environment for the lives of their citizens, and technological advances can only serve the vitality and physical and mental health of the city together with ecology; And this has been implemented today in the big and rich cities of the world that are able to finance it (after many tests) (Arnberger, 2022). The ecology approach in urban landscape architecture, by creating environments related to nature, can give residents a meaningful life without destroying the ecological base on which it relies (Gary, 2020). In fact, the urban landscape is a tool for reading cities in such a way that it is able to show successive chapters of the history of an urban society (Privar, 2015). In other words, it is an objective reality that appears in the observation of each person, and it is a description of the physical reality of a city, and this description is free from the image that plays a role in the mind of the observer through his experiences (Mahmoudi, 1385). Urban landscape architecture, as a whole process of forming its appearance, has a special importance in establishing the evaluation of the city's visual values. In 1993, Terry Well introduced the factors effective in creating a particular landscape as follows: physical factors (geological landforms, climate, microclimate, drainage, soil and ecology), human factors (archaeology, landscape history, land use, buildings and settlements), aesthetic factors (visual factors such as proportion, scale, appendages, texture,

color, landscape, other feelings, sound, smell, taste and touch) and connections (communications) historical factors (history of settlements, special events) and cultural factors (well-known figures of literature (literature and art, music and painting) (Therivel, 1993). Visual resources in the landscape need to be managed to reflect its values as a non-renewable resource (Dearden, 1980). Since the 1970s, in the United States, environmental planning laws and policies have been formulated with an emphasis on visual values and have taken into account the short-term and long-term consequences of development on the landscape (Dearden, 1980). Manzar has started since the beginning of the 20th century. (Noss, Harris, 1986) Among the examples of studies in this regard, we can mention the location of landscaped industrial sites, the design of urban open spaces, and the evaluation of the road landscape (De Oliveira & Bonvicino, 2020). From the beginning of the 1960s onwards, the understanding of visual and aesthetic values emerged as an interdisciplinary activity in architecture and environmental planning on a large scale (Zube, 1986). Beginning in the 1970s, in the United States of America, NEPA, to respond to the increasing attention of society to the reduction of environmental quality caused by the Second World War, considered visual values during the decision-making process regarding the design of development projects as an interdisciplinary activity of architecture. proposed landscape and urban planning (Zube & Taylor, 1982). The rules and policies in NEPA with the impact of visual values caused the development of reliable methods and processes for recognizing visual value and qualities, to propose the development of a macro-oriented architecture (Zube, 1986). Also, in this decade, the establishment of laws for the protection and maintenance of visual resources in the management and planning of land use also began in Canada, and until today such activities are increasing (Manos et al. 2021). Many processes and approaches have been introduced and applied in visual assessment based on the laws of the United States of America and sub-

jected to testing and experience. Management of visual resources is a process to ensure the recognition and exploitation of the visual qualities of the landscape during the process of environmental management and design. The purpose of visual resource management is to provide visual and systematic information regarding the visual quality of landscapes and the visual effects of development activities in the landscape (Feimer et al, 1981). Regarding the quality of human interaction with the environment, three psychological theories have been proposed, which include “environmental determination” theory, “environmental enabling” theory, and “environmental probability” theory. The environmental determinism theory is based on the fact that changes in the nature of geographical, social, cultural environments and natural or artificial built environments can lead to changes in human perception and behavior, and humans are subject to environmental conditions. In the urban landscape paradigm, the urban landscape needs a kind of medium-scale architecture, but this area is the next priority of planning, which explains the structure of the urban environment, the ecosystem in the form of ecology (Zhou et al. 2021). These principles and their application in landscape architecture require a broader view from the micro to the middle and even the macro scale and pay attention to the main roots (De Oliveira & Bonvicino, 2020). In fact, the gap between landscape architecture as well as urban planning and design has specific solutions, which mainly originate from the process of qualitative design creativity and a little rationality (Opdam et al. 2018). In general, in today’s cities of Iran, especially in the metropolises, we can see a lot of discontinuity in the urban landscape, which have spread like limited spots in the city. These spots generally focus on the creation of green space, mainly play the role of park-like recreational places and are unique in a specific environment and have no specific connection with the principle of urban flow. If this type of view is rejected from the structure of user planning, it will practically suffer a crisis in the field of

urban landscape. The above research is trying to firstly present the scope of landscape architecture in the city as a convergent whole with other branches of science and explain and frame the approach of ecology in the way it is connected to it, secondly, in addition to the mentioned cases, to create a solution Search this whole from top to bottom in the structure of urban planning and with the design-oriented planning approach, reject the areas for mid-scale evaluation, from the purity of ecology and environment. The aim of this research is to evaluate the impact of the visual-perceptual component on the ecological urban landscape architecture with a planning approach in the second district of Tehran, which somehow interprets the relationship between urban landscape structures and the natural environment from the perspective of landscape architecture.

Materials and Methodes

In terms of structure, the current research is analytical-descriptive, which in terms of its main goal is considered to be a type of applied and developmental research, which can be used as an exploratory research approach considering the lack of previous research on the concept of landscape in the field of the city in a methodical way. He brought up the specialty of landscape architecture and planning. The method of data collection will be in the form of a library, as well as field collection using environmental impressions and image recording and information layer analysis, as well as the use of GIS maps and data bases and satellite images and field image recording. At first, according to the course of the theoretical foundations, the effective factors in the impact of the urban landscape in the field of ecology have been taken into consideration, and by explaining the branch of landscape architecture to it, these factors have been identified in previous researches using the Delphi method, by experts and elites, for indexing. It has been tested and based on its results, the framework of the proposed criteria has been proposed. Based on this, a group of components have the ability

to generalize in the direction of conducting research, which includes the assumption of paired criteria including ecological and functional values, urban and natural elements, and aesthetic and functional perceptions. Accordingly, according to the indicators of the proposal using the multi-criteria decision-making method (MCDM) by evaluating the importance of the criteria in pairs based on their importance in a specific area, and determining the weight of the criteria. Criterion priorities are generally determined using one of the MCDM methods, which is essential in planning the main elements of urban landscape architecture. In the same way, paired criteria are explained in six visual-perceptual, environmental, functional, aesthetic, ecological and socio-economic areas in the field of urban landscape. To perform this type of evaluation in three functional scales of neighborhood, district and region and four functional levels of extra-regional, regional, regional and local according to the characteristics specified in the 2nd district of Tehran, a specific number of parks will be selected. The evaluation of each of the samples can provide a qualitative analysis as well as the ranking structure according to the value of each one, which will be done using the Topsis ranking method and weighting according to the Sav method, so that the current situation can be understood based on this. and based on its management structure and landscape architecture planning, he extracted a specific pattern, which will be the way to extract the pattern according to the macro strategies. It is necessary to explain that in the final stage, after determining

the average score of case samples, taking into account the SAV weighting method, as well as the TOPSIS ranking method, and also the weighted feedback of each index in the Delphi method, qualitative ranking is done. Based on this, the visual-perceptual component will be evaluated according to the indicators in the table below.

FINDINGS AND DISCUSSION

Area of study

District 2 of Tehran Municipality is one of the urban areas of Tehran, which is in the northeast of Azadi Square; It continues from the center to the north of Tehran. This area is bounded by Azadi Street from the south, Ashrafi Esfahani Highway and Mohammad Ali Jinnah Highway from the west, and Shahid Chamran Highway from the east. Region 2 includes the neighborhoods of Shahrak Gharb, Saadat Abad, Ponk, Aryasher (Sadeghieh), Shahrara, Sattarkhan, Farahzad, Geisha, Shahrak Gendarmeri (Marzadaran) and Tarasht.

Figure 1: Location of the 2nd district of Tehran

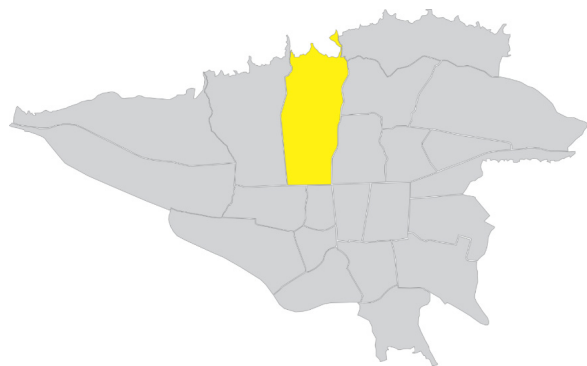
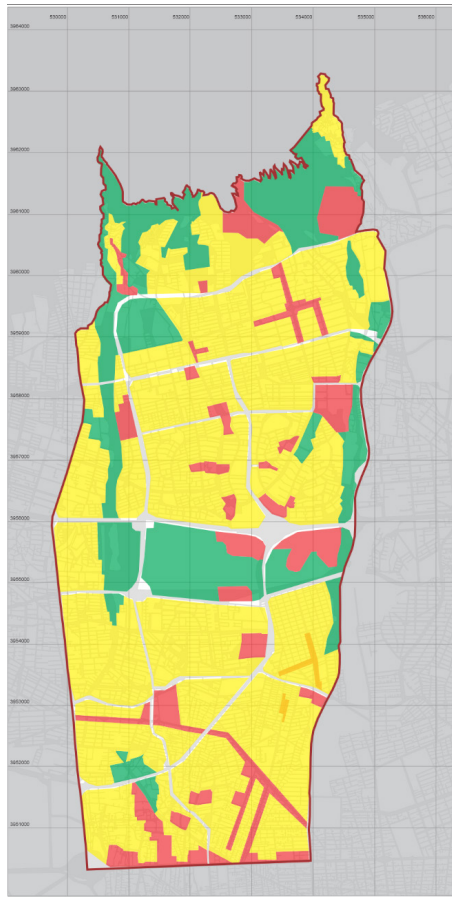


Table 1: Indicators of the visual and perceptual component in explaining the architecture of the ecological urban landscape with a planning approach

Minimum spatial scale of measurement	Practical scale	Measurement method	Index type	Indicator	component	Added concept
Urban area	macro-medium	Visual preference	quantitative	Visual scale	visual-perceptual	Urban landscape architecture, ecology
			quantitative	Visual clarity		
			quantitative	Visual influence		
			quantitative	Form feature		

Figure 2: The zoning map of area two of Tehran



How to divide green and open areas in the 2nd district of Tehran

According to the way of dividing green and open areas in region 2, it is necessary to describe the condition of green spaces and examine the process of its changes over time. Based on this, it presents the following content. Some of the general characteristics of the second zone in relation to the green space are as follows:

- The area of green space in the region is 5,956,476 square meters (11,306,476 square meters including private green space and gardens).
- Green space per capita in the region: 52.20 (square meters/person).
- The number of parks in the region is one hundred and two according to table number 8.

- The number of gardens in the region is 418 (199) plots with an area of less than 226 plots with an area of more than 2000 square meters.
- There are 102 parks in the second region, whose characteristics include the name of the area, address, functional level and the area where they are located in Table No. 8. To determine the functional level of these parks, their area is considered as the main indicator and other factors including the location and the type of functions available in them.

According to the purpose of the research, there is a need to select from among the parks in the 2nd district of Tehran so that the evaluation can be done as a case study. Based on this, the selected parks are divided into four scales and performance levels: regional, regional, district and neighborhood. In this regard, the selected cases were selected based on three different scale factors, not being located in the same area, proximity to the main artery, lack of major changes in recent years, and 6 parks were determined out of all four types.

Evaluation of visual scale index, visual clarity and form characteristic

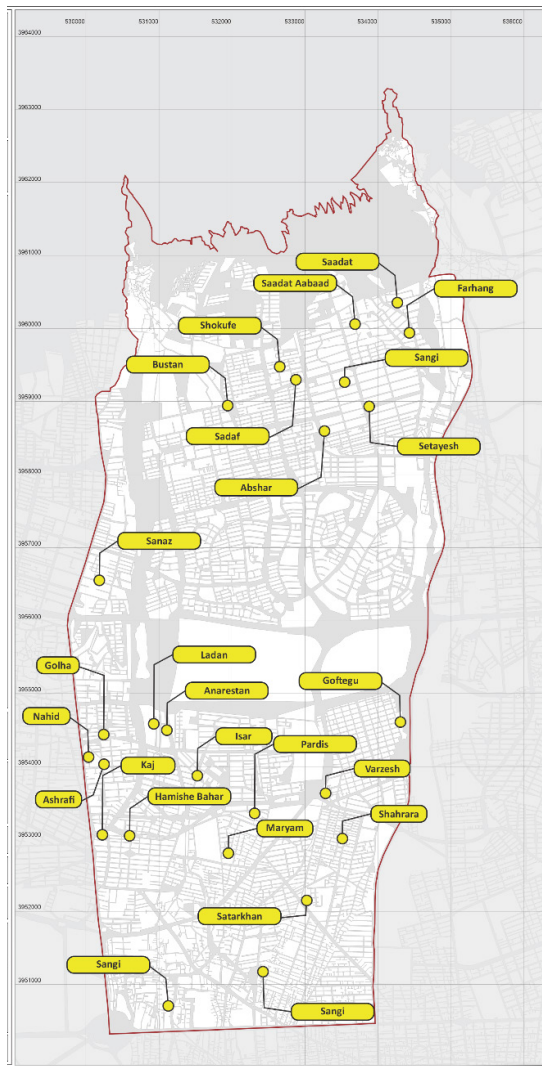
In the visual analysis performed by photographs, it is important that the researchers record all the conditions at the time of photography in such a way that it is possible to repeat the photography with the same conditions as before. For this reason, things such as the position of the photographer and the angle of the camera, time, and distance must be clear in the analysis of urban views (Junwei, 2013). Accordingly, in this research, from every city park in it and from a fixed position and in the same time frame. Several photos have been taken. Study samples were photographed with different lenses, angles and distances. Finally, the best angle of view to show the real scene, the position of the photographer and the right lens were chosen by experts and researchers. All the photos taken and selected from the study site were taken using a Sony N50 digital camera with a 35 mm lens at the viewing level of a standing observer. In the end,

Table 2: Selected parks of Tehran's 2nd district

No	Park Name	Area	District	Address	Functional level
1	Sadat Aabad	29400	1	Second St. Saadat Aabad, intersection of Behzad Blvd	Transregional park
2	Abshar	21700	1	24 Saadat Aabad St., northeast of the intersection with Shahradari Blvd	
3	Ashrafi Esfahani	37500	2	The intersection of Ashrafi Esfahani and Marzdaran streets	
4	Goftegu	33000	3	West of Koi Nasr, between Hakim Highway and Javad Fazel Street	
5	Varzesh	20000	3	At the end of 13 Geisha Street, the intersection of Jalal and Sheikh Fazallah highways	
6	Satarkhan	23500	4	Sattar Khan Street, next to Maktoll Al-Sadegh Mosque	
7	Setayesh	7844	1	Southeast of the intersection of Saadat Aabad and Niayesh Highway	Regional park
8	Sangi	7364	1	Saadat Aabad, between 11th and 13th streets	
9	Anarestan	18675	2	Entrance of Yadgar Imam Highway to Merz Daran Blvd., Delavaran	
10	Shahrara	12600	4	Chelal Al Ahmad Highway, Arash Mehr St	
11	Isar	7000	4	Merz Daran Blvd. - Itsar St	
12	Bustan	9000	8	Farahzadi Blvd., the intersection of Saro West Street	
13	Sadaf	4500	1	West Saro Blvd., northwest side of Shahrdari Square	Regional park
14	Saadat	3000	1	St. 24 meters of Saadat corner 2 east	
15	Sanaz	5000	2	Ashrafi Esfahani Kh., Stad Nazar Kh	
16	Golha	4866	2	Marzdaran Kh., Bolfazl Square, Golha	
17	Ladan	4500	2	The intersection of Ashrafi Esfahani and Marzdaran streets	
18	Nahid	4000	2	Marzdaran Khanahid Intersection of Vahdati	
19	Kaj	1650	2	K. water organization, west of the building of the 2nd district of urban services	Neighborhood park
20	Hamishe Bahar	1632	2	K. Water Organization, next to Mesil, in front of District 2	
21	Farhang	1300	1	Darya Boulevard (Management), Farhang Street, Farhang Street	
22	Maryam	1400	4	Sattarkhan st. Jahani nasab st. Shahid Jeldi alley.	
23	Pardis	1208	4	Sheykh Fazlollah highway. Sazman Aab st. Haji Pour Amir st. Pardis st.	
24	Razegi	1000	5	Azadi Street; Shahid Javad Akbari St. in front of Tarasht Park	

after removing a number of photos, 24 photos were finally selected. So that each of the photos shows the various features of the landscape. In the table below, the number of 8 selected photos for classification of the 8 urban parks in question was briefly displayed. Also, in this section, it has been tried so that certain visual effects are not effective in taking pictures. The pictures also show the same scenes that the observer sees with his own eyes. Accordingly, the number of selected images according to the geographical location can be seen in the map below.

Figure 3: The location of selected parks in the second district of Tehran



Identification of selected landscape images in urban parks using the visual quality classification method of experts

In this section, in order to identify the selected images and prioritize effective criteria in visual improvement, including 3 main sub-indices, a group of 20 people consisting of three bachelor's, master's and doctorate degrees was considered. In the first stage of assessment, 24 selected photos from the perspective of 8 main selected parks were provided to the people in the form of an illustrated questionnaire and they were asked to give each photo a score between five numerical values (very beautiful) based on their beauty preference. Give +2, beautiful +1, normal 0, ugly 1- and very ugly 2-). In the present method, it has been used as much as possible according to the respondents. Also, people's opinion about each photo has been examined separately (Krueger et al, 2001). The high average score of each photo indicates the desirability and high quality of the view in the park in question. By using the visual quality classification method at this stage of the research, photos with high quality of view are selected to check the measured criteria and other photos are excluded from the next research cycle. In order to calculate and summarize the score and average score of each photo, equation 1 is used:

$$N = \sum_i^{\Delta} \ln_i (r-i)$$

- N: the set of points of each photo
- n1: the number of people choosing a photo with very nice quality
- n2: the number of people choosing a photo with good quality
- n3: the number of people choosing photos with normal quality
- n4: the number of people choosing photos with bad quality
- n5: The number of people choosing photos with very bad quality

Equation 1: average score of each photo. Source: Razavi and Vaezi Heer, 2016

Measuring the criteria of visual quality of images with the matrix of achieving measures

In order to measure the beauty criteria in the selected photos obtained by the Q-Sort method, in the first stage, the Hill evaluation method or the goal achievement degree matrix was used. The following table briefly shows 8 photos out of 24 selected photos and the results of the Q-Sort method. This method was proposed in 1966 by Morris Hill. (Pettit & Pullar, 2001) This matrix has a wide range of uses in the planning process and, like other techniques of this group, it helps to make rational decisions for appropriate actions in the exploitation of scarce resources, in order to achieve the expected goals. Sedaghati, (2015) This method is used in contrast to cost-benefit analysis and planning balance sheet, in cases where their goals are not completely clear and there are relative and not quantitative values to measure them (Samadi, 2013). Also, the method of achieving goals has been proposed to overcome the lack of resources for comprehensiveness, which can be used to examine qualitative goals and compare the achievement of goals such as economic, aesthetic, and environmental. (Sadaqati, 2015) The criterion in the beauty of the photo on a three-spectrum scale; Complete fulfillment (favorable) +1, partial fulfillment (relatively unfavorable) +2, non-fulfillment (unfavorable) +3 are specified. (Hill, 2007). Before completing the questionnaire, a brief explanation was given about the criteria and how to score the photos. The criteria examined through a questionnaire including selected photos from 24 photos were measured and evaluated by experts with the help of the achievement matrix and at the end the most important criteria affecting the beauty of these photos were identified by the people and then using Analytical software in Spss 22, the following table was obtained. The positive and negative average score of each photo shows the desirability and quality of the photo, and its negativity shows the lack of photo quality. According to the results of the

table below, it can be concluded that 8 of the 24 photos surveyed by the experts have the highest average scores, in other words, the selected photos have the highest visual quality.

Table 3: How the selected people rate the 24 photos from the selected parks

Photo selectors (n=50)							Picture
Average	N	n5	n4	n3	n2	n1	
-0.28	-14	2	17	28	5	0	1
-0.32	-16	0	22	27	3	0	2
0.16	8	0	4	34	12	2	3
0.18	9	0	10	22	20	0	4
0.36	18	0	7	22	20	3	5
0.52	26	0	0	25	26	1	6
-0.78	-39	8	26	16	2	0	7
-0.28	-14	2	21	19	10	0	8
-0.56	-28	3	26	21	2	0	9
-0.56	28	0	7	13	27	5	10
0.44	22	0	5	20	24	3	11
-0.50	-20	5	22	19	2	0	12
-0.96	48-	9	32	11	0	0	13
-0.6	-30	4	24	23	1	0	14
-0.54	-27	2	23	27	0	0	15
0.36	19	0	9	16	25	2	16
-0.68	-34	6	24	22	0	0	17
0.82	41	0	1	12	36	3	18
-0.88	-44	11	27	11	3	0	19
-0.8	-32	5	19	25	1	0	20
-0.66	-33	6	25	19	2	0	21
-0.6	-30	5	21	25	1	0	22
-0.82	-40	10	26	10	3	0	23
-0.52	-22	5	22	21	2	0	24

At this stage, the results obtained from the evaluation of the research criteria, the weight points given in the perceptual-visual criterion of each sample using the TOPSIS method and the order of the decision matrix, linear scaleless and applying the assigned coefficient in the final stage, according to the coefficient Its effect is determined and introduced by taking into account the positive and negative levels, the closest and the most distant sample to the ideal.

Table 4: Measurement of visual quality criteria in selected images

Measuring visual quality criteria in selected images (n=50)								Picture selected
Landscape visual connectivity scale	Continuous view of the landscape	Elements and details	The central line of the landscape	Landscape spatial hierarchy	Connecting the view space to the outside view	Landscape continuity	Landscape functional connection space	
-1	-1	-1	0	-1	-1	1	1	1
-1	-1	-1	0	-1	-1	1	0	2
0	1	1	1	1	1	1	-1	3
0	0	1	1	0	1	0	-1	4
-1	1	0	1	1	-1	-1	1	5
0	-1	0	0	1	0	0	1	6
1	-1	-1	0	1	1	0	0	7
1	1	-1	-1	1	0	-1	1	8
3	4	4	1	2	3	2	2	number of points - 1
3	1	2	4	1	2	3	2	Number of points 0
2	3	2	4	5	3	3	4	Number of points 1
45.2	41.7	51.8	66	75	48.9	48	56	The percentage of complete fulfillment of the criteria

Table 5: Classification of images based on the criteria of the action matrix

Number of elements	Form			Visual clarity			Visual scale			Image type	Image number
	mixed	central	linear	vague	Semi specific	specific	macro	middle	micro		
5	-	-	x	-	x	-	-	-	x	Landscape functional connection space	1
4	x	-	-	-	-	x	-	x	-	Landscape continuity	2
5	-	-	x	x	-	-	-	-	x	Connecting the visual space to the outside view	3
4	-	-	x	-	x	-	-	-	x	Landscape spatial hierarchy	4
3	x	-	-	-	x	-	-	x	-	The central line of the landscape	5
4	-	x	-	-	-	x	-	-	x	Elements and details	6
4	x	-	-	-	-	x	x	-	-	Continuous view of the landscape	7
3	x	-	-	x	-	-	x	-	-	Landscape visual connectivity scale	8

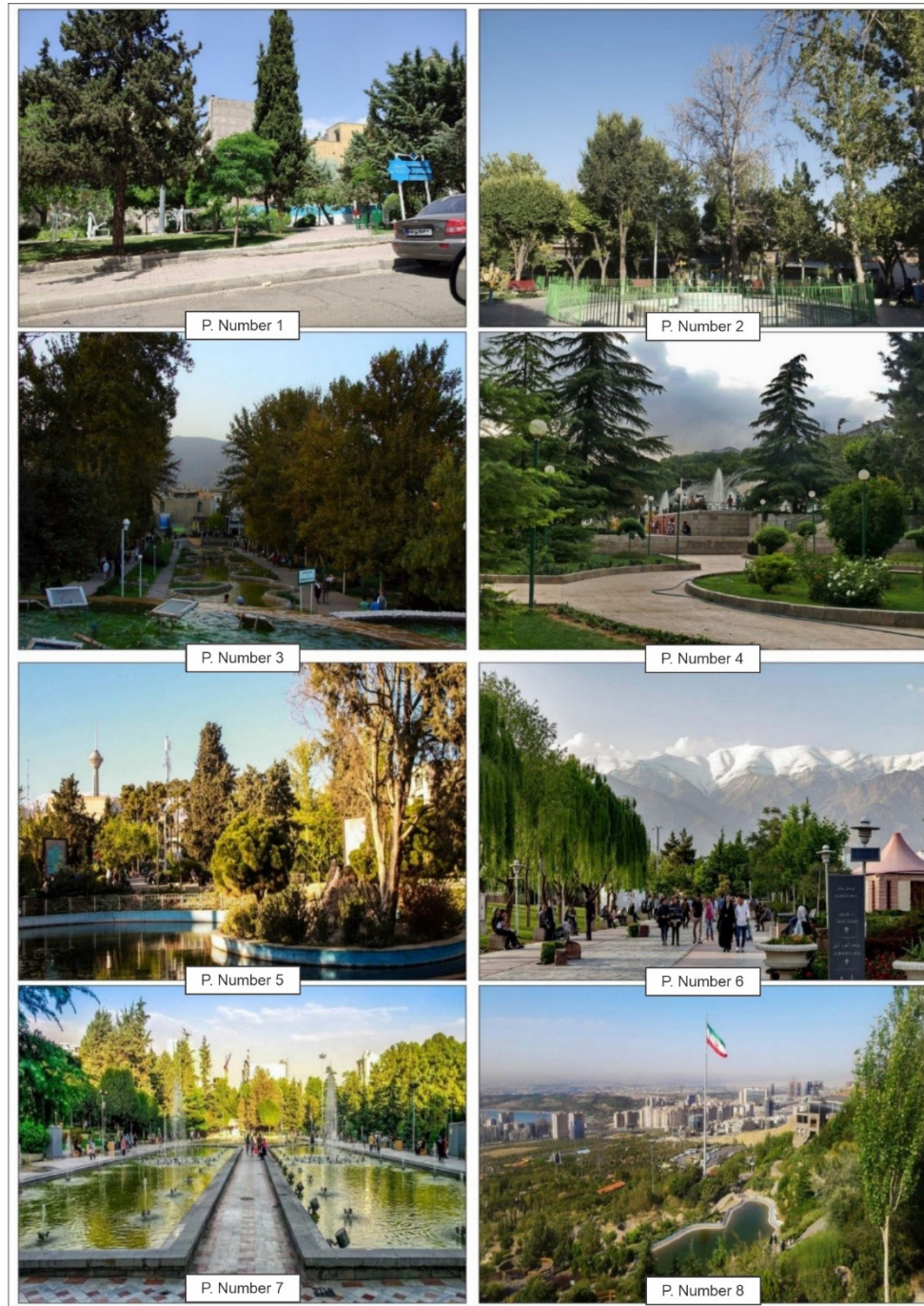


Figure 4: 8 selected images

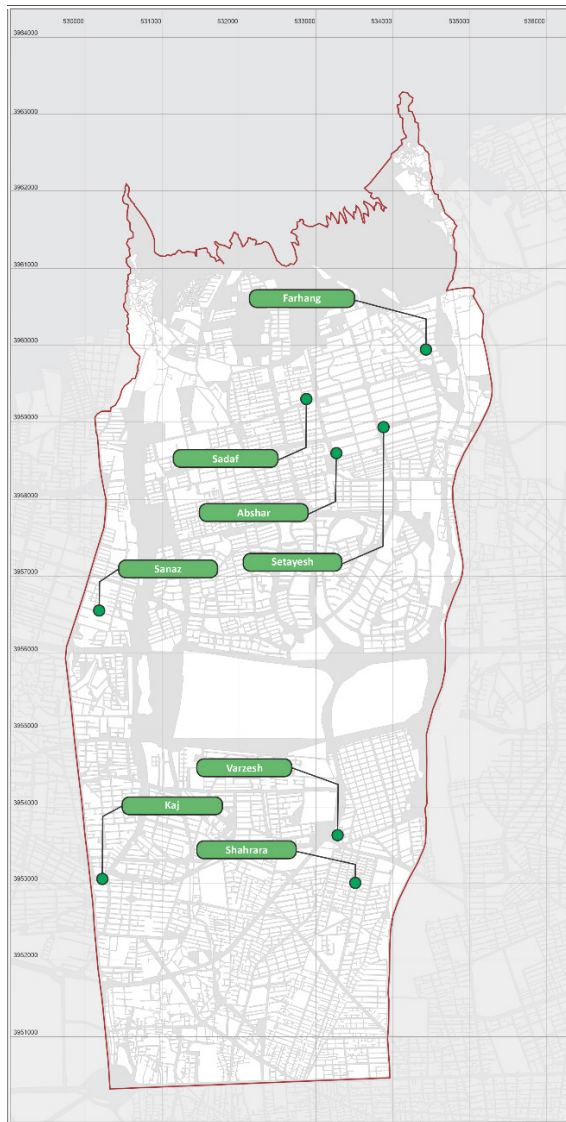


Figure 5: Location of evaluated park

Table 6: Initial decision matrix

Park Name	Perceptual-visual component
Farhang	56.00
Sanaz	48.00
Varzesh	41.70
Kaj	75.00
Setayesh	51.80
Sharara	66.00
Sadaf	48.90
Abshar	45.20

Table 7: Linear scaleless matrix

Park Name	Perceptual-visual component
Farhang	0.129449838
Sanaz	0.110957004
Varzesh	0.096393897
Kaj	0.173370319
Setayesh	0.1197411
Sharara	0.152565881
Sadaf	0.113037448
Abshar	0.104484512

Table 9: Close to the ideal

Park Name	Perceptual-visual component	
	Negative	Positive
Farhang	0.001093	0.001929
Sanaz	0.000212	0.003895
Varzesh	0	0.005925
Kaj	0.005925	0
Setayesh	0.000545	0.002876
Sharara	0.003155	0.000433
Sadaf	0.000277	0.00364
Abshar	6.55E-05	0.004745

Table: Evaluation status of the average scores of the indicators in the studied parks

Park Name	Visual scale
Kaj	0.162
Abshar	0.144
Varzesh	0.139
Setayesh	0.127
Shahrara	0.120
Sadaf	0.101
Farhang	0.09
Sanaz	0.10

RESULT AND CONCLUSION

Obviously, the scale of the urban landscape and its function can be considered effective in influencing the conceptual model in urban landscape architecture, but it cannot be concluded that the larger the scale and area of the park, the more effective it is in improving the quality of the urban

landscape. But the relationships of these three criteria with the results can be interpreted as follows: in the Pine Park, which has a local functional level, the perceptual-visual component has obtained a higher score, thus the following codes can be seen. The relationship between the effectiveness of the perceptual-visual component and its functional criteria, the relationship between the effectiveness of the perceptual-visual component and the planning approach in extra-regional dimensions. This type of impact is not shown in the park scale criterion, that is, the larger the area of the urban park spot, it can be concluded that it has a greater impact on improving the quality of the ecological urban landscape. Rather, the density and compactness of vegetation is more important than its area in the greenness index. The type of interpretation of this result can also raise the concept of greenness in the density criterion. which can be clearly analyzed in the visual and perceptual component. For more understanding, a theory based on Gestalt perception can be proposed. So that it is clear that the landscape is perceived by the observer as a three-dimensional form and shape, and it can be considered based on the type of complementary look. The observer often likes to see a complete form in the city, and this in his mind goes through a process that is obviously related to its aesthetic and idealistic dimension and requires understanding a certain amount of density in the presented desirability. The amount of density when it is concentrated in one point actually has a greater darkness contrast on a closer scale, but when it is looked at further away, it covers less space. In fact, creating a park with a large scale and taller trees and at the same time vegetation with high greenery and more area in its function in the urban landscape is much weaker than creating several parks with greenery and less area, because in the visual dimension and the visual component, the concept of landscape can be understood as a whole. Also, the type of texture in the vegetation has a definite relationship with its density in the

greenness index. In such a way that the legibility of a park in the eyes of the urban landscape, the use of dense texture in the vegetation is in the perception of it in the eyes of the citizens. This is more important when the macro and medium scale is desired in the urban landscape. The size of the urban park components is also an indicator with a direct effect on the impact of landscape architecture in the urban landscape, and finally, the proportions, especially in the vertical axis, can increase the readability.

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