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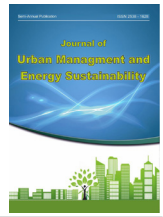

CASE STUDY RESEARCH PAPER

Local model of urban green infrastructure in the direction of sustainability in the urban complex of Tehran city

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ABSTRACT

Green infrastructure includes the provision of designed networks of multi-functional green spaces that help protect natural habitats and biodiversity, respond to climate change and other biosphere changes, the ability to create style to have a more sustainable and healthy life. The research aims to reach a suitable model for planning and their practical design in a way that leads to the sustainability of metropolises and the relationships of the relevant elements and dimensions and the proper management of their performance, which is responsive to the current conditions of Tehran urban complex and its future development and expansion in It is very necessary to have a stable path. The methods of research are Analytical-descriptive, and at first the basic data classification determined in the range and area by digitizing the aerial photos that existed in the vacuum and second, evaluation of indicators is done. Updatesa and consistent databases such as GIS, these quantities are proposed as approximations. For this reason, to examine the forty-year range of urban green infrastructures from 1975 to 2015. In the result two disciplines of landscape architecture and architecture will also be involved in this issue. Adaptation, modification and revision of the comprehensive plan of the city of Tehran city. In future studies all types of patterns can be evaluated of each district.

Running Title: Local model of urban green infrastructure in the direction of sustainability

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
21	18	03

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INTRODUCTION

The rapid increase in urbanization and the unplanned expansion of cities and their rapid horizontal growth, in addition to the phenomenon of urban sprawl and marginalization, lead to the creation of communities and an unstable form of cities, followed by the decline of economic power and social equality, and destruction and decline (Torgbizadeh et al. 2023). Environments, has been urban sustainability requires the connection between social, economic and environmental foundations. (Balling et al., 2014) Factors such as compactness, sustainable transportation, mix of land use and land use pattern, density, diversity, greening and passive solar design are among the ideas for the sustainable form of the city (Freidooni et al. 2022). Compact, urban development compatible with nature and urban containment has been proposed as a sustainable form of the city. (Banigo et al., 2007) Green infrastructure includes the provision of designed networks of multi-functional green spaces that help protect natural habitats and biodiversity, respond to climate change and other biosphere changes, the ability to create style to have a more sustainable and healthy life, to increase the prosperity and livability of the city. (Altıparmak, 2005) Improve access to key entertainment and green areas, support urban and rural development, and help in long-term planning and better management of green spaces and axes (Omidai et al. 2022; Alcayde Egea, 2012). A network of open spaces, forests, wildlife habitats and other natural areas that protect clean air, clean water and natural resources and improve our quality of life. Proposing green infrastructure as a change in the position of protecting open spaces from a problem for societies to a necessity for societies shows the importance of this concept. (Aerts, 2002) The interaction between man and the natural and built environment around him is a very important and common factor among sustainability approaches and sustainable energy supply from renewable sources to solve the mentioned problems (Rahbari et al. 2023). Ecological urbanism, eco-city, green urbanism, healthy city, garden, urban design sensitive to water, urban design sensitive to climate, passive solar design, sustainable transportation, transportation compatible with nature, village city, agricultural city, Landscape urbanism, ecology, eco-technology, etc. (Marzi et al. 2021). Have all been aimed at having a sustainable city for everyone. (Ahern, 2007) Green infrastructure is a term that is mostly used in the development and protection of land and it usually has different meanings depending on the different contexts used by different people. Some points to trees in urban areas because of their "green" benefits. (Barnes, 2005) There are many definitions of urban green infrastructure, but what is common in almost all of them and includes multiple definitions, urban green infrastructure as an ecological framework required for environmental, social and economic sustainability and in They have proposed a system of protecting our natural life. (Beatley, 2009) Green infrastructures are different from conventional approaches to planning open spaces because they are based on the values of conservation and measures related to land development, growth management and planning of built infrastructure and generally creating a sustainable form of the city's look. (Barton, 2000) According to the definition of Webster's New World Dictionary, infrastructure is defined as "basic infrastructure or basic foundation, especially facilities and basic facilities on which the continuity and growth of societies depend". When you hear the term "infrastructure", you think of roads, sewers, water and electricity lines, and other gray infrastructures, or you think of hospitals, schools, prisons, and other social infrastructure. (Sheikbaglou, 2023; Blum et al., 2014) Green infrastructure includes a wide variety of native natural and built ecosystems and landscape features that create a system of poles and connections. The poles strengthen the green infrastructure networks and provide an origin or destination for ecological processes to move towards them or through them. (Bryant, 2004)

The integration of perceived quality of life, place and environment for development policies leads to a necessity in better understanding of the effects caused by the development of societies. This point of view can also be used in the development of green infrastructure as an interaction between economic, social and environmental fields that requires a complete understanding to create active spaces. (Cao, 2020) Urban complex refers to a wide area that is created by the expansion and connection of many cities and towns. In such a way that in the same physical connection they usually maintain their separate existence, in other words, the urban complex is a spatial area consisting of one or more main cities and population, production and service centers around them that have Economic, social and physical-spatial relations are mutual, direct, continuous and increasing with each other and form a single market of housing, employment, services and elegance. (Carlos et al., 2007)

An urban complex is a geographical area that consists of a central city and at least two peripheral cities and rural areas between them, and all peripheral cities have economic, social and service integration with the central city. (Coello, 2007) (Cordon et al., 2009) Therefore, to reach a suitable model for planning and their practical design in a way that leads to the sustainability of metropolises and the relationships of the relevant elements and dimensions and the proper management of their performance, which is responsive to the current conditions of Tehran metropolis and its future development and expansion in It is very necessary to have a stable path.

MATERIALS AND METHODS

Methodology

In this research, in order to understand the functions and processes related to green infrastructures and their dynamics over time, the structural expression of the landscape has been used. In this research, they are considered as criteria for the evaluation of green infrastructures, and the landscape metric can be used to provide a quantitative evaluation of infrastructures. It is necessary to explain that the evaluation of green infrastructures in this research is from the corridor of ecological structure analysis at the scale of the land and in the framework of reasoning based on function and structure or process and form pattern which is generally from the perspective of environmentalism of the researcher and the type of consultation in The phase of eco-geological structuring of the land surface originates from the layers of theoretical foundations hidden in the ideal ideas of the traditional garden or the urban green network. As a principle, it is considered that on the scale of the landscape of the land, without separating the biological, physical and human dimensions, a general understanding of the urban land with psychological and geometric gestalt can be achieved. Therefore, the main concepts in the ecology of modern landscape such as spot size, scale, smallness (creating distance between spots and turning into smaller parcels), continuity (degree or extent of continuity and continuity of the habitat spatially or functionally) and concepts A space like the mosaic of the landscape and the principle of continuity with branches have been used These special structural features are a guarantee for the effective performance of natural stains. In the continuation of the evaluation steps, after the data creation of the studied area using the methods mentioned. This data is divided into three levels of land in the desired index using the IDRISI software, which includes the table below.

Table 1: Three level data of the study area's classification

Type	Area	Representative
LP[1]	15-186 Km^2	
MP[2]	2-15 Km^2	
SP[3]	1-2 Km^2	

(Source: Authors)

[1] Large Patch

[2] Medium Patch

[3] Small Patch

Explanation that due to the limitation of the basic data in the following references and the lack of creating a database and updating the information available, the researcher had to use the methods of determining the range and area by digitizing the aerial photos that existed in the vacuum. Updates and consistent databases such as GIS or LIDAR, these quantities are proposed as approximations. For this reason, to examine the forty-year range of urban green infrastructures from 1975 to 2015, most of the spots, according to the large scale of the research subject, were stratified and classified with the priority of larger areas, which, taking into account the maximum probability index, between an approximate area of 1 to 186 square kilometers has been selected. The classes of classified surfaces in IDRISI software are evaluated after refinement using FRAG STATS software and mosaic structure in the form of green infrastructure. In order to analyze and evaluate the amount and state of changes in urban green infrastructure spots in the study area from 1975 to 2015, there is a need to identify demarcated spots that can be identified according to the latest changes in the geography and environment of urban areas in the urban complex of Tehran. He had a better understanding of this change of spatial patterns in the form of landscape mosaics. Therefore, assuming the geography and scope of urban areas in 2015, about 29 spots were selected, which can explain and analyze these changes during 40 years by taking into account the mosaic accuracy of 80 square meters based on the three indicators of the number of spots, area and perimeter of the spot. In the evaluation aspect, after analyzing each pair of years from 1975-1980, 1980-1985, 1985-1990, 1990-1995, 1995-2000, 2000-2005, 2005-2010 and 2010-2015, 8 periods of 5 years can be examined.

DISSCOUSION AND FINDINGS

In this research, in order to understand the functions and processes related to green infrastructures and their dynamics over time, the structural expression of the landscape has been used. Green infrastructures are an urban support network that guarantees the health of the human ecosystem and the quality of urban life. Maintenance and planning to strengthen it is one of the most important macro strategies of the country. In order to provide optimal ecological services and effective performance, it is necessary that these infrastructures have a sufficient presence in the city and have high stability and proper distribution, therefore, according to the three mentioned cases that are considered as evaluation criteria of green infrastructures in this research. It is necessary to explain that the evaluation of green infrastructures in this article is from the corridor of ecological structure analysis at the scale of the land and in the framework of reasoning based on function and structure or process and form pattern that Generally, it originates from the perspective of environmentalism of the researcher and the type of consultation during the ecological structuring of the landscape of the land, which is actually from the layers of the theoretical foundations of the master in the ideal ideas of the traditional garden, that this type of approach in all aspects of the analysis and explanation of the pattern with regard to the past of the old city Tehran and the surrounding complex is considered as the principle that in the scale of the landscape, without separating the dimensions, physical and human life, a general knowledge of the urban land with the psychological and geometric gestalt can produce results. The wisdom of creating distance between spots and turning into smaller parcels (degree of continuity) or the degree of continuity and continuity of the habitat spatially or functionally and spatial concepts such as the mosaic of the landscape and the principle of continuity with branches has been used. These concepts of geometrical communication emphasize the maintenance of large patches of natural vegetation, the maintenance of wide riverside corridors, the maintenance of continuity with the priority of larger patches,

and the maintenance of natural heterogeneity among more developed areas, because these specific structural characteristics guarantee the functioning of natural patches. Are the remainder. Explanation that due to the limitation of the basic data in the relevant authorities and the lack of creating a database and updating the information at the disposal of the researcher, he had to use the methods of determining the range and area by digitizing aerial photos, which in the absence of updated and coherent data bases Like GIS or LIDAR, these parameters are proposed as approximations. For this reason, in order to examine the forty-year scope of urban green infrastructure from 1975 to 2015, most of the spots have been leveled and classified according to the macro scale of the research subject, and larger areas have been prioritized, which, taking into account the maximum probability index between the approximate area of 1 Up to 186 square kilometers have been selected. The classes of the classified surfaces in the IDRISI software are evaluated using the FRAG STATS software and the mosaic structure in the form of green infrastructure. Next, with the analysis of eight five-year periods and the changes made in these time periods, by separating urban and suburban areas, the ranking of the ideal limit is done using the TOPSIS method. Based on the ranking result and by placing the failure level and classifying the spots based on their stability, four solutions and based on those solutions, intervention patterns for the urban complex of Tehran are presented. By using these models and strategies presented, the urban green infrastructure of the urban complex of Tehran can be improved and directed towards the ideal.

Analysis of how spots change in 5 years

Analysis of the first 5 years, 1975-1980

According to the examination of the number of changes in spots in the assumed areas in the 5-year period of 1975-2015 the findings include:

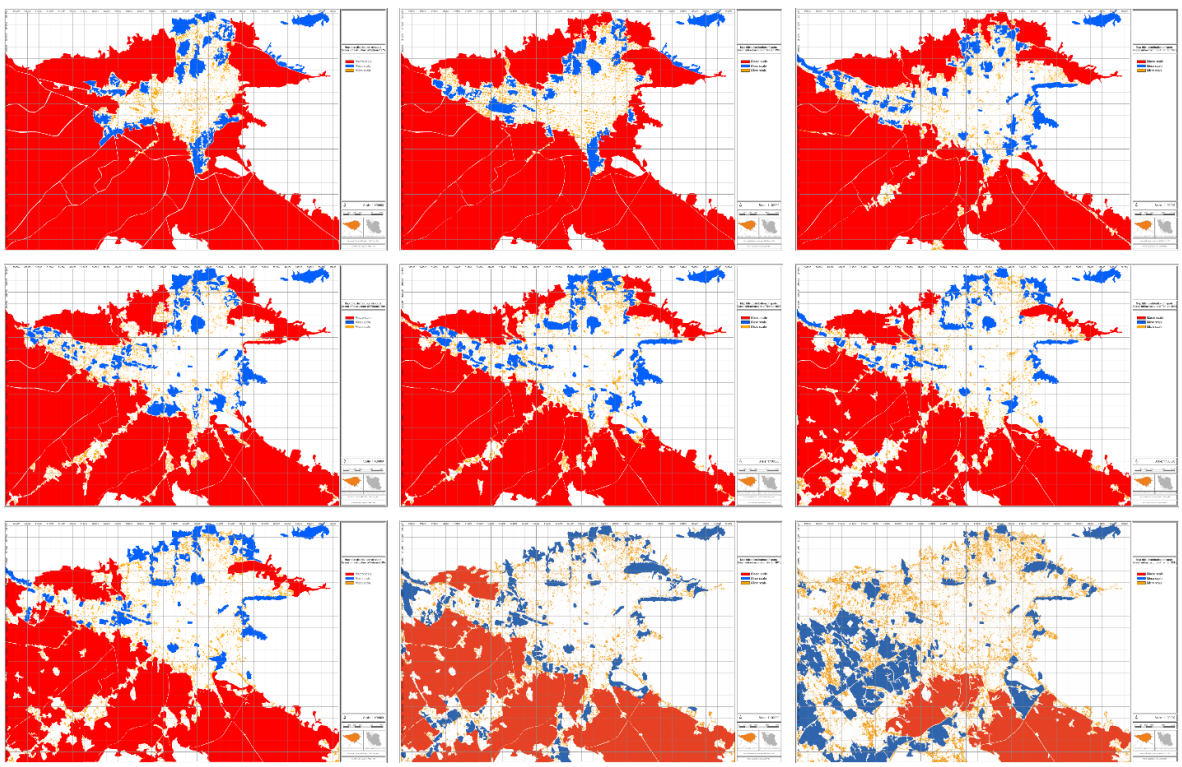
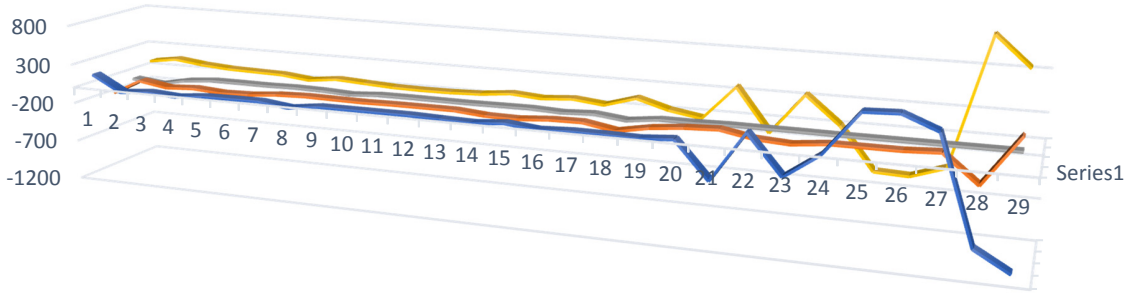


Figure 1: Maps of 8 periods of 5 years of changes in green infrastructure patches of Tehran urban complex

CONCLUSION AND RESULTS

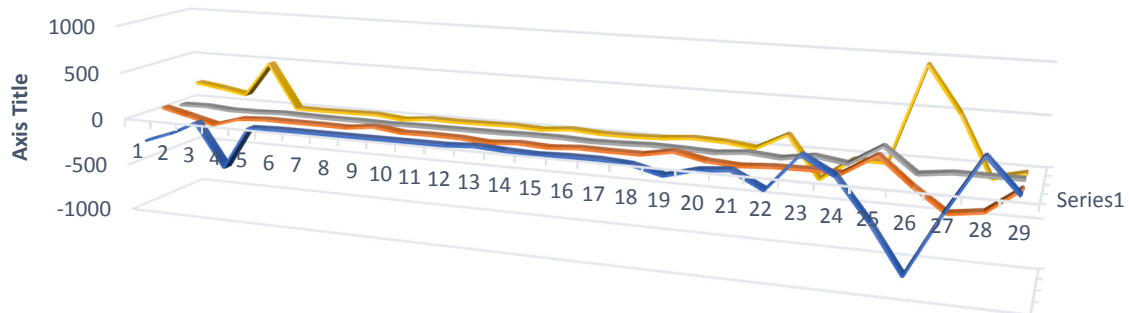
Analysis of changes in green infrastructure spots in the study area

To analyze the infrmation obtained from the explanation of the 5-year periods from 1975 to 2015, we need to use the method and also develop criteria that can be applied in the form of ranked spots after standardizing the information. For this purpose, after standardization, one of the combined methods is used in multi-criteria decision-making, so that in addition to ranking and correcting the 29 stains, it is possible to obtain a ranking structure in the number of changes and finally for each state of change. Suggested the most suitable type of intervention in the form of a model. In the multi-criteria decision-making methods, according to the nature of the research and also the type of goal that is committed to the model of sustainability in green infrastructure with the focus on the landscape of the land,



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	155	-47	-15	-41	-5	-2	0	-47	0	0	0	0	-12	-21	11	-30	-12	-14	-21	8	-43	162	-30	-15	496	512	352	-88	-11
Series2	-17	17	-43	-22	-49	-41	-7	5	-1	-5	0	0	0	-33	-38	-9	-4	-73	0	38	55	-18	-42	0	0	0	21	-30	280
Series3	-73	-11	-39	-7	-7	-10	-4	-11	-30	-5	-4	-7	-9	-6	-3	-20	-1	-46	0	-2	6	4	3	0	0	0	0	0	0
Series4	89	143	97	70	61	53	11	53	31	10	4	7	21	60	30	59	17	133	21	-44	371	-14	342	15	-49	-51	-37	118	832

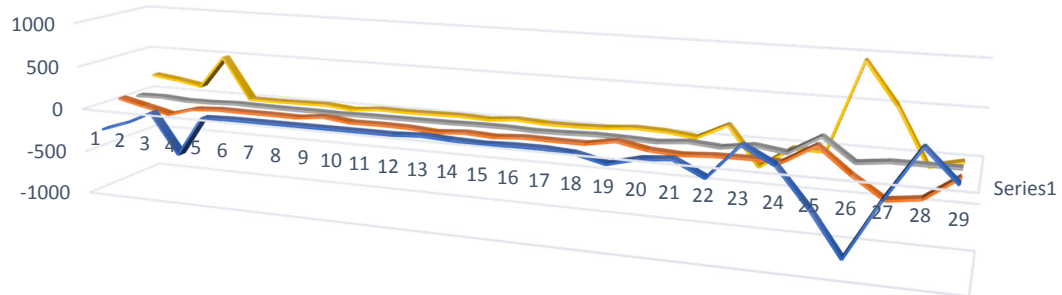
Figure 2: Chart analysis of changes in the first 5-year period 1975-1980



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	-25	-14	0	-46	-10	0	0	0	0	0	0	0	17	0	-11	0	0	-21	-99	-14	14	-14	220	48	-35	-82	-20	352	24
Series2	45	-24	-96	-10	9	6	6	1	36	0	4	-1	-24	0	-17	5	0	-1	56	-8	-28	-7	-2	-10	192	-72	-29	-24	0
Series3	9	14	-8	-5	8	2	-2	-2	-8	-1	-1	0	1	7	7	-6	0	11	4	-7	23	-3	47	0	200	-40	0	0	0
Series4	196	156	104	478	-7	-8	-4	1	-28	1	-3	1	6	-7	21	1	0	11	39	29	-9	156	-26	-38	-40	936	496	-10	-24

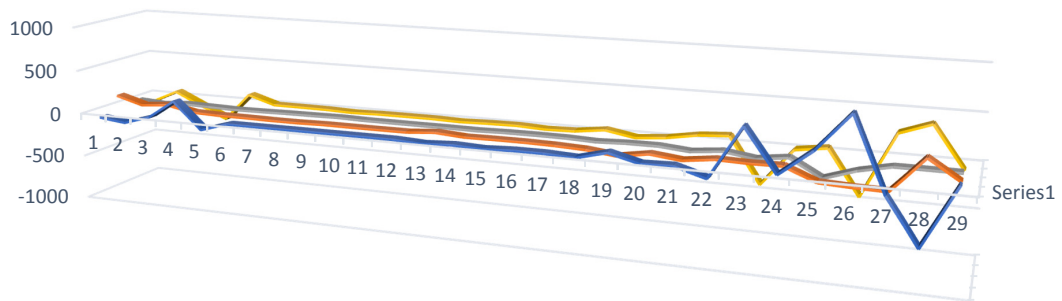
Figure 3: Chart analysis of changes in the first 5-year period 1980-1985

the three criteria of the greatest increase, the greatest decrease and stability using the fuzzy Delphi method and taking into account Pairwise comparisons are given initial weight, for this reason, by using the SAW method in weighting, as well as the TOPSIS compromise model, taking into account the negative and positive criteria, as well as the compensatory structure of the evaluation model in the multi-indicator method, focusing on the distance from the limit. Ideal and anti-ideal, all options (29 spots) are analyzed. Then, after performing and applying the relevant methods, the ranking will be done on the correlation of the considered criteria in the explanation stage (number, area and environment) in an explanation tree structure and as a result, the necessary connection to the state of change (emergence, erosion and transformation) will be done. Naturally, after defining the process of analysis to clarifying the state, the



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	-25	-14	0	-46	-10	0	0	0	0	0	0	0	17	0	-11	0	0	-21	-99	-14	14	-14	220	48	-35	-82	-20	352	24
Series2	45	-24	-96	-10	9	6	6	1	36	0	4	-1	-24	0	-17	5	0	-1	56	-8	-28	-7	-2	-10	192	-72	-29	-24	0
Series3	9	14	-8	-5	8	2	-2	-2	-8	-1	-1	0	1	7	7	-6	0	11	4	-7	23	-3	47	0	200	-40	0	0	0
Series4	196	156	104	478	-7	-8	-4	1	-28	1	-3	1	6	-7	21	1	0	11	39	29	-9	156	-26	-38	-40	936	496	-10	-24

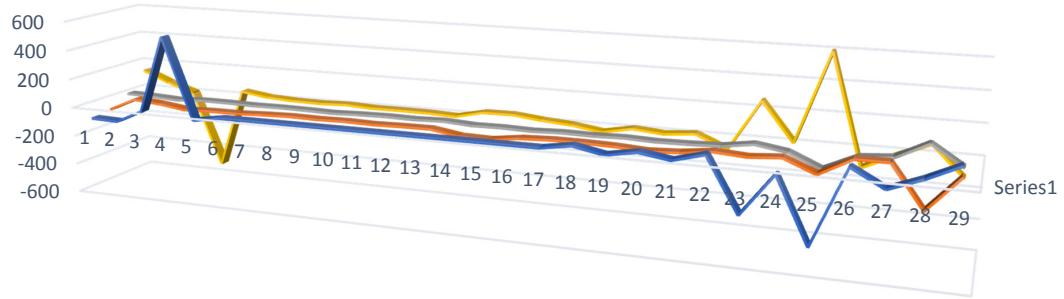
Figure 4: Chart analysis of changes in the first 5-year period of 1985-1990



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	-57	-93	0	208	-94	0	0	0	0	0	0	0	-17	0	-14	0	0	-16	69	-15	-6	-10	455	0	272	664	-10	-59	64
Series2	130	43	70	9	0	-1	-5	-5	1	0	0	1	26	3	6	6	0	-14	-53	1	-36	6	-4	0	-13	-15	-16	208	0
Series3	3	-16	9	1	-7	-4	1	3	7	0	-1	-2	-2	-5	2	3	1	-11	1	2	-27	6	-43	0	-18	-72	0	0	0
Series4	-76	66	-79	-21	101	5	4	2	-8	0	1	1	-7	2	6	-9	-1	41	-17	12	69	92	-40	0	48	-44	264	384	-64

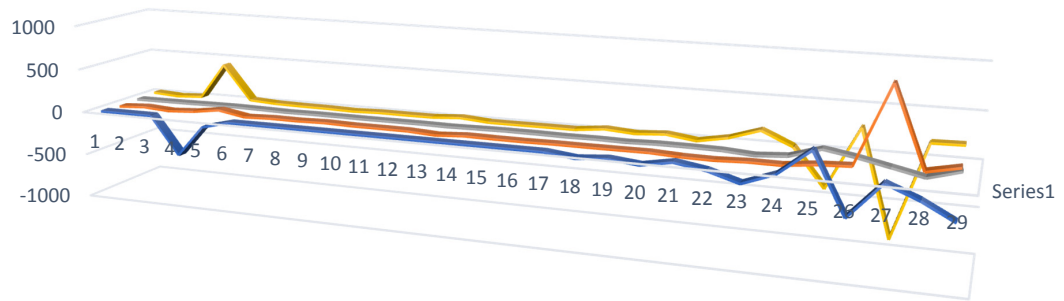
Figure 5: Chart analysis of changes in the first 5-year period 1990-1995

type of intervention in the direction of balancing, optimizing and organizing the urban green infrastructure of the area can be drawn and the main pattern can be explained in harmony with the type of landscape and spatial organization. It is necessary to explain that the resulting information is used in the Topsis model in a standardized manner, taking into account the percentage (numerical change based on the total percentage) According to the extent and manner of destruction of urban green infrastructures in different areas of the study area, as well as scale, spatial and spatial changes of large, medium and small spots, four categories of protection, restoration, development and defense strategies in different areas It has been suggested. In this direction, the changes in urban growth and the number of changes in green infrastructures in a period of 40 years have been investigated with chronological analysis. The growth of



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	-83	-89	0	526	-31	0	0	0	0	0	0	0	0	0	0	0	0	32	-7	29	-2	52	-29	-28	-44	56	-56	24	120
Series2	-63	23	7	-19	-13	-13	-5	0	-3	0	-4	0	1	-30	-34	-8	0	0	-5	-17	-7	18	4	19	-64	48	48	-22	0
Series3	7	2	-8	3	2	-2	0	-2	-6	0	3	0	6	-6	-4	-9	-2	-5	0	-7	-4	2	32	0	-88	8	24	128	0
Series4	139	64	1	-51	42	15	5	2	9	0	1	0	-7	36	38	17	2	-27	12	-5	13	-72	262	9	600	-11	-16	72	-12

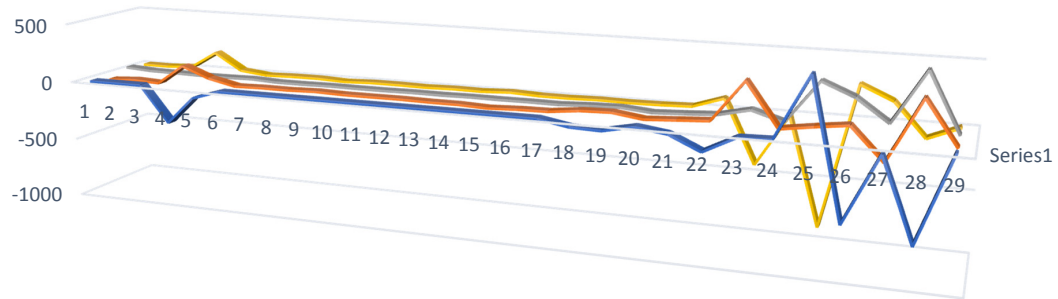
Figure 6: Chart analysis of changes in the first 5-year period 1995-2000



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	0	0	0	-43	-78	0	0	0	0	0	0	0	0	0	0	0	0	-37	-10	-44	17	-36	-13	-10	264	-37	0	-13	-31
Series2	-15	4	-17	2	46	-9	2	0	8	0	0	-1	-19	1	-3	-4	0	-1	0	2	-14	-18	-4	-6	32	48	896	56	128
Series3	0	1	3	7	9	4	-2	1	0	-2	-1	-1	-5	0	4	3	-1	2	-3	6	5	0	-23	0	104	48	-24	-96	0
Series4	15	-5	14	422	23	5	0	-1	-8	2	1	2	24	-1	-1	1	1	36	13	36	-8	54	163	16	-40	280	-87	176	184

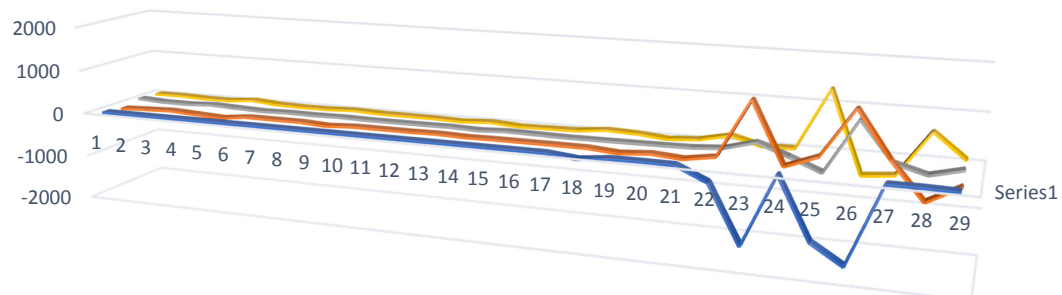
Figure 7: Chart analysis of changes in the first 5-year period 2000-2005

about 213 percent of the city and the decrease of 50 percent of the city's green infrastructure, considering their amount at the starting point of the survey in 1975, shows the sharp decrease of these vital infrastructures during the 40-year period, which is a clear confirmation of the constructions The lack of procedure and, of course, the city's lack of planning and the imprudence of experts in various urban areas in correctly guiding the city's development path. On the other hand, the loss of these elements, whose benefits and functions are undeniable in various social, economic and environmental dimensions, the landscapes which are referred to as a layer of infrastructure and in all dimensions Tangible and intangible, physical, semantic, psychological, aesthetic, etc., are effective, completely on the path of instability in such a way that, as a result, the point of interaction between man and nature has become weaker and weaker day by



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	0	0	0	-30	-73	0	0	0	0	0	0	0	0	0	0	0	0	-44	-52	0	-34	-14	-16	-10	488	-59	-48	-69	8
Series2	-34	-19	-30	136	47	-4	1	0	7	0	0	1	-3	-3	-13	-3	0	27	34	0	15	30	354	11	48	80	-17	320	-24
Series3	27	13	10	5	6	10	-1	-1	2	0	0	3	1	4	2	3	1	12	17	-4	7	21	78	3	336	232	56	472	8
Series4	7	6	20	162	20	-6	0	1	-9	0	0	-4	2	-1	11	0	-1	5	1	4	12	95	-41	-4	-87	280	168	-96	8

Figure 8: Chart analysis of changes in the first 5-year period 2005-2010



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
Series1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-70	0	2	-3	-29	-15	0	-13	-17	0	0	-16
Series2	-57	-30	-9	-41	-72	0	-2	0	-36	0	0	0	10	-9	0	0	0	-2	-54	-2	-53	53	128	-21	240	126	304	-48	-10
Series3	41	7	6	39	13	-7	8	2	12	1	2	3	9	-11	21	10	0	4	8	14	23	67	251	5	-26	888	64	-12	48
Series4	16	23	3	2	59	7	-6	-2	24	-1	-2	-3	-19	20	-21	-10	0	68	46	-14	33	177	4	16	132	-43	-36	600	72

Figure 9: Chart analysis of changes in the first 5-year period 2010-2015

day. According to the analysis of the information obtained by the aforementioned method, the ranking of 29 stains was determined, so that stain No. 24 has the best condition and rank 1, and stain No. 1 has the worst condition. Therefore, the following ranking can be considered as the result of the analysis. (Table 2)

Table 2: Ranking of 29 stains

Rank	Area number	Geographic compatibility	Score (close to the ideal option)
1	24	Karaj area	596/0
2	12	District 12	576/0
3	11	District 11	570/0
4	10	District 10	547/0
5	27	Shemiran area	532/0
6	7	District 7	527/0
7	17	District 17	520/0
8	20	District 20	509/0
9	14	District 14	492/0
10	22	District 22	489/0
11	5	District 5	467/0
12	13	District 13	464/0
13	6	District 6	455/0
14	26	Shahriar area	453/0
15	29	Tehran area	450/0
16	28	Tehran area	449/0
17	4	District 4	448/0
18	19	District 19	445/0
19	23	Islamshahr area	444/0
20	25	Ray area	431/0
21	8	District 8	426/0
22	9	District 9	424/0
23	16	District 16	417/0
24	15	District 15	410/0
25	18	District 18	399/0
26	2	District 2	370/0
27	21	District 21	365/0
28	3	District 3	364/0
29	1	District 1	263/0

In the following, using the criterion method of placing the Cl score and the distance from the ideal in each spot number of the 29 spots, it is classified into 4 spectra so that the upper spectrum of the studied collection is divided into two relatively stable and stable spectra and The two lower spectrums are divided into unstable and relatively unstable spectrums, so that the status of each spot in the urban area can be determined to determine the type and degree of intervention from the point of view of urban sustainability. In addition to that, the Likert spectrum method, including the numerical value from 1 to 4, according to the first method, as well as the natural breakdown method, is used to categorize through natural distances between classes. In other words, it can be said that the analyzed data of each class is homogenous and different from other classes, which by including this method: Using breakpoints between analytical data to determine the boundaries of classes to determine intervention and Placement of homogeneous data in one floor

In this method, the borders of each class are also classified and the border of these complications occurs in a large change in information values, and as a result, the complications within each class find a homogenous status. As a result, in the zoning of the states (according to the investigation of the probability of the states in assimilation with analytical information, the 3 states of erosion, emergence and metamorphosis have the highest number of changes in the landscape of the land) through the three main breaking points, the amount of each class has been determined. And the high, low and middle values of each Likert structure from 1 to 4 are equivalent to instability to stability.

Therefore, the amount of natural failure range can be explained according to the ranking results and Cl index. Finally, according to the type of interventions discussed, the type of planning strategy can be expressed in a structure according to the determined range and class. Therefore, according to the analysis of the

obtained information, regarding the 40-year status of the assumed area of the urban area of Tehran and the changes in green infrastructures, it can be determined that the issues related to their modification, repair and reconstruction are important in what area and which corrective measures are necessary for them. What is the priority? In this regard, the following strategies are proposed for the modification, restoration and reconstruction of the green infrastructures of the urban area of Tehran and, in the case of favorable conditions, their efficiency, in the framework of comprehensive measures without case-by-case separation of ecological values and services. (Table 3)

Table 3: The range of natural failure in the CL index according to the stability and instability of 29 stains

Ran;	Area number	Numeric range of points	Classification	CL	Score
1	24	512/0 – 596/0	Stable	596/0	4
2	12			576/0	4
3	11			570/0	4
4	10			547/0	4
5	27			532/0	4
6	7			527/0	4
7	17			520/0	4
8	20	429/0 – 512/0	Relatively stable	509/0	3
9	14			492/0	3
10	22			489/0	3
11	5			467/0	3
12	13			464/0	3
13	6			455/0	3
14	26			453/0	3
15	29			450/0	3
16	28			449/0	3
17	4			448/0	3
18	19			445/0	3
19	23			444/0	3
20	25			431/0	3
21	8	346/0 – 429/0	Relatively unstable	426/0	2
22	9			424/0	2
23	16			417/0	2
24	15			410/0	2
25	18			399/0	2
26	2			370/0	2
27	21			365/0	2
28	3			364/0	2
29	1	263/0 – 346/0	Unstable	263/0	1

Determining and recognizing the strategies adopted to explain the physical pattern of urban green infrastructure in accordance with the results of the analysis of land features, landscape pattern and spatial organization

Based on the spatial radius of each of the following strategies, the type of arrangement of the existing situation can be proposed as a strategy:

Conservation strategy: When the landscape supports sustainable patterns and processes, a conservation strategy is suggested. This strategy is used to prevent the erosion of the surface of the land in the form of assumed spots and to achieve the desired spatial arrangement of the surface of the land. Also, when the existing nature in urban and non-urban areas is decreasing, this strategy can be proposed together with the defensive strategy to control the inevitable processes of changing the face of the land. In the 29 spots of the urban area of Tehran, when there are green and open lands, such as fertile land, gardens, etc., with a high level of stability, which is the result of density, these natural elements are facing a severe destructive process. Were, it seems necessary to protect the land, therefore, to protect the mentioned spots, the spots number 24, 12, 10, 27, 7, 17 are in priority. The protection strategy in these spots is more for the purpose of system stability and the reason is not only the existence of green lands. In general, maintaining the existing situation in terms of green infrastructure, as well as not expanding construction and changing land use in these areas is the next priority, as in some of these spots, the appearance of the land has changed a lot, but in a systematic and logical approach Fazi has not yet suffered a crisis and the level of stability can be increased with the protection strategy as well as the restoration and development policies.

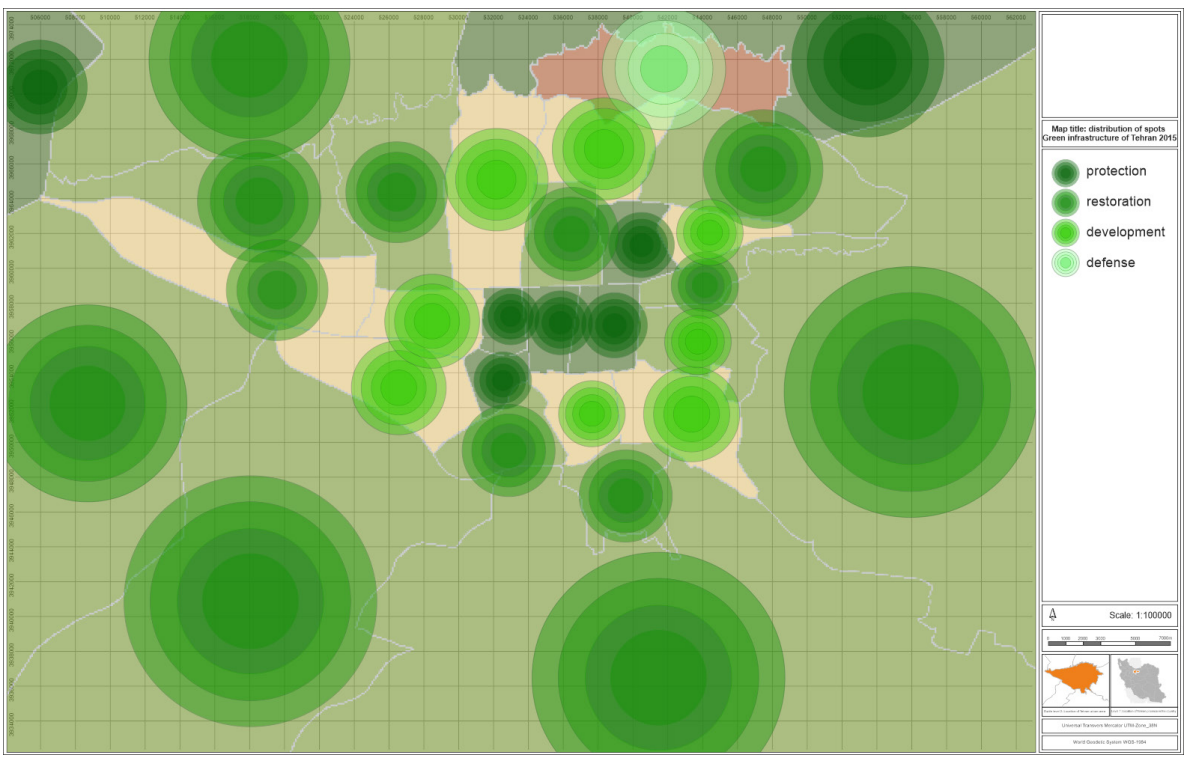


Figure 10: Strategies in overall pattern

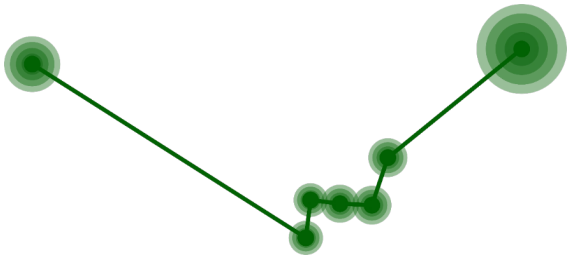


Figure 11: Spatial radius of the spot's protection strategy of the assumed area of the urban area of Tehran

Restoration strategy: In the spots where the elements of the landscape are disturbed and eroded and the stability is on the verge of wear and tear, it is suggested to restore and restore them. This strategy can improve the appearance of the land by relying on planning and ecological knowledge as well as urban design policies. The decrease in the presence of natural elements, the decrease in stability and continuity between open and green spots, the decrease in the presence of natural elements, the decrease in stability and continuity between green and open spots, the increase in the smallness of spots and their improper distribution are among the changes that lead to the destruction of natural elements. It had led to the face of the land. Therefore, in order to compensate for the destruction of these infrastructures, the restoration of green and open lands can help in their reconstruction. For the restoration of green lands, spots No. 20, 14, 22, 5, 13, 6, 26, 29, 28, 4, 19, 23 and 25 are prioritized.

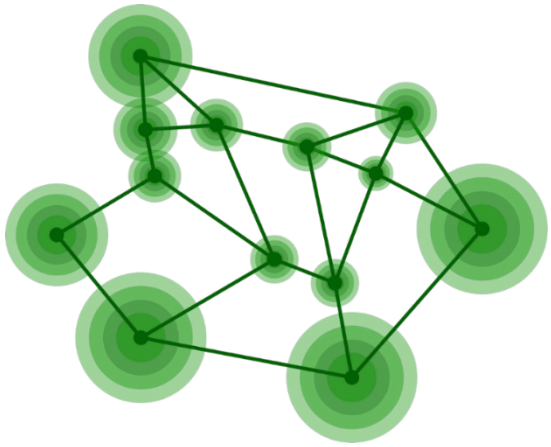


Figure 12: Spatial radius of the restoration strategy of spots in the assumed area of the urban area of Tehran

The way of development: the presence and stability of green lands in some spots are very low in the process of severe destruction in the period of 40 years, so the development of green lands in spots No. 9, 8, 16, 15, 18, 2, 21, 3 and 2 In order to improve the quality of the landscape, it becomes natural with regard to land services.

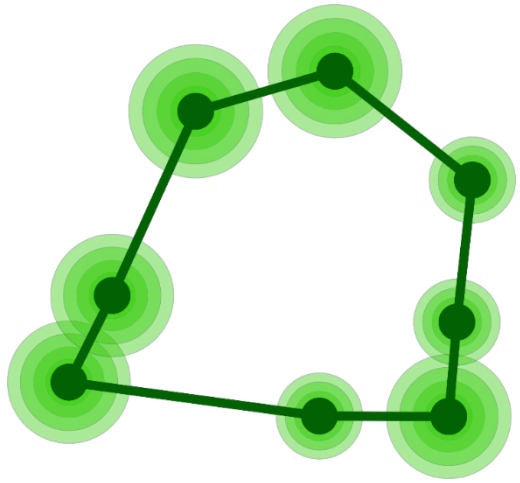


Figure 13: Spatial radius of the spots of the development strategy of the assumed area of the urban area of Tehran

Defensive strategy (reconstruction, rehabilitation and revitalization): When the landscape includes unique elements with special functions, these elements can be used to support the ecological or cultural processes of the landscape, but it should be kept in mind that in some cases Many peaks of construction and change of urban use are such that detailed plans undergo fundamental changes, and these changes are applied to the extent of changing the landscape of the land. Therefore, in this example of intervention, the system is in a defensive state, and the restoration of green lands, the rehabilitation of mosaics that are undergoing transformation with other white mosaics, and the revival of these mosaics make it a priority in the planning and policies of these types of changes. It is considered necessary and after the intervention in maintaining the minimum power of the system, he also added development strategies, stain number 1 has the said priority due to the maximum of this type of changes.

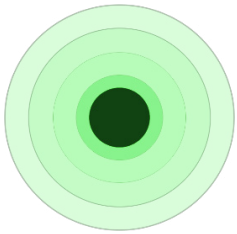


Figure 14: The spatial radius of the spots of the defensive strategy of the assumed area of the urban area of Tehran

The expansion of green spaces in Tehran has been done with a one-dimensional approach and according to the increase in the area of green spaces; Also, the lack of a structure and model for the development of green infrastructure has made all efforts ineffective. At the same time, each of the 22 districts of Tehran has potentials that can facilitate the creation of an integrated green infrastructure. The natural and artificial spots of Tehran include the remaining lands in the heights and hills, forest and urban parks and open office areas, universities and gardens. Also, green corridors such as gorges, natural channels, linear parks, green roads and green spaces on the side of streets and highways are other potentials of Tehran. In addition to that, in the case of the urban green belt in the urban area of Tehran, in addition to creating a barrier against dangers such as dust and air pollutants, it can also be considered as a boundary for urban privacy. Therefore, by creating a belt in the 2 mentioned rings, in addition to controlling these risks in two layers in the assumed adaptation of the spot and the corridor between the regions, a coherent ecosystem structure can also be created. In this type of attitude, in addition to urban areas, gray and blue infrastructure areas are also involved and completes an integrated process. Finally, the proposed model for the urban area of Tehran is presented in a composite form, which can also be considered in the form of micro and medium scale structure. Regarding the spatial organization of the city of Tehran, which has been proposed in recent years, an urban green belt has been proposed in the outskirts of the city of Tehran, which, due to the green areas at different levels, has inspired a pattern of the urban green belt of Tehran and also in the middle areas. , a network of green areas is not foreseen. According to the proposed model of the spatial organization of Tehran and other cities within the assumed limits, the basis has been changed so that these changes in the spatial organization can completely change the composition of space, mass and place. Regarding the application of the spatial organization of the city of Tehran to the optimized type, these measures should be included at the level of the landscape of the land, as the main macro strategies, and at the middle and micro level, along with the concept of green infrastructure, in a landscape preference, it presented the best appearance of a spatial organization in the urban area.

Bringing up this model in the form of policy, rules and instructions on a medium and small scale by urban design researchers, in this case the two disciplines of landscape architecture and architecture will also be involved in this issue. Adaptation, modification and revision of the comprehensive plan of the city of Tehran. And detailed plan based on sustainable ecological network. Paying attention to the design requirements of masses in the form of blocks, pieces in criteria and indicators such as density, scale, etc., according to macro models of sustainability. Identification of lost and remaining landscape species in different areas of Tehran city and problem-finding to explain the strategies of maintaining and improving more sustainable landscapes in the future development of the city. Identifying the type and amount of animal and plant species that have disappeared during a certain period of time and finding complications.

According to the course of the theoretical foundations and the examination of the concepts related to the subject of the dissertation, and further considering the direction and results of this research in the context of urban green infrastructure and the concept of sustainability in landscape and spatial perceptions, a theoretical model has been proposed. Since the theoretical framework of the

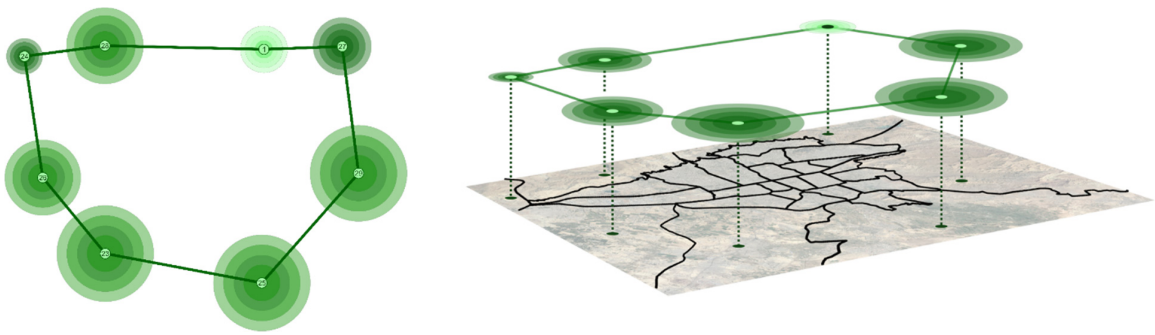


Figure 15: Composite pattern, part of the urban belt of the outer ring

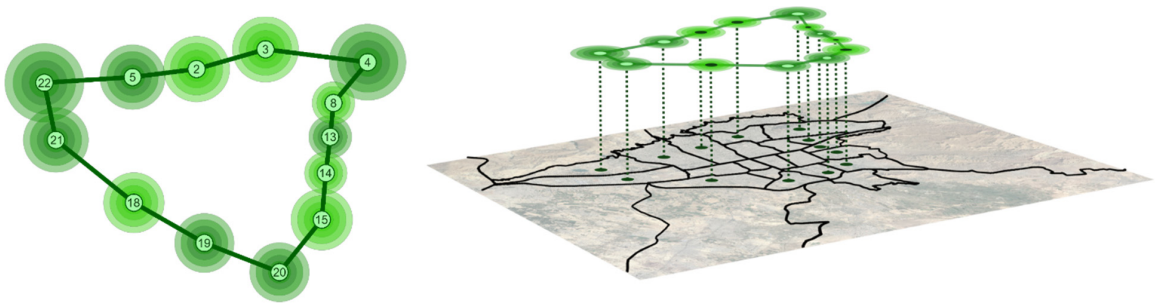


Figure 16: Composite pattern, part of the urban belt of the inner ring

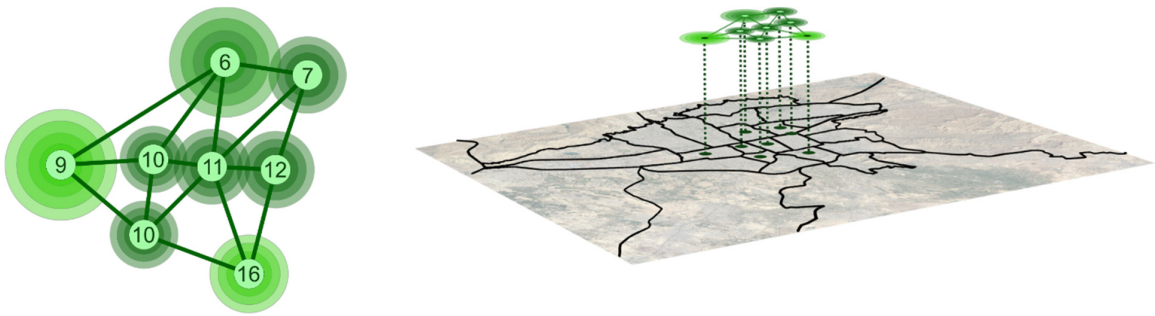


Figure 17: Composite pattern, part of urban green network

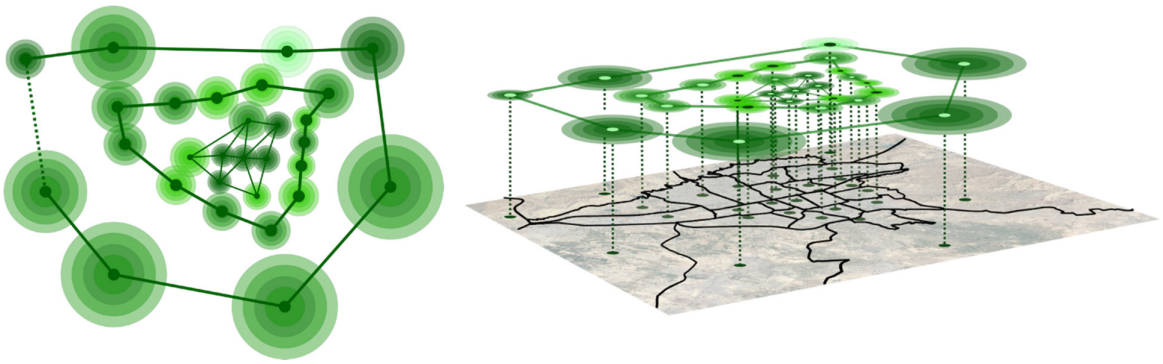


Figure 18: Overlapping composite patterns

research is presented in the second chapter based on 4 theories of ecological urbanism, landscape ecology, garden city, rural city and sustainable development, the relevant components are considered in the proposal of the final model along with the findings from the research. Is. Creating urban settlements with an environmental urbanization approach to maintain the balance between society, economy and environmental sustainability is one of the main concepts of the rural town theory, which emphasizes the interaction between humans and nature. As investigated in the research, the process of changes in urban green infrastructure over time is completely influenced by the growth process of the city and urban and marginal settlements, which should be balanced in different levels of urban planning. Impressions should be taken into consideration. One of the benefits of green infrastructures is human health and social cohesion, which is a clear alignment with the approach of Ebenezer Howard Gardens, emphasizing self-reliance, social and economic balance, balanced societies, enjoying the benefits of the city, the village, and preserving natural landscapes, housing, work and it has leisure, balance and social cohesion. According to the related theories and the results of perceptual perception in the course of research, it is obvious that environmental perceptions and green infrastructures have a significant impact on each other, and just as not paying attention means ignoring natural, psychological and social characteristics. And then the interaction between man and nature.

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