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Espacios y Territorios

Evaluating the safety and aesthetic of a city park (Case study: Saee Park in Tehran)

Evaluación de la seguridad y la estética de un parque urbano (Estudio de caso: Parque Saee en Teherán)

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Abstract

Proximity to green spaces, waterside, and various cultural or recreational objects increase the quality of life. Nevertheless, the neighborhood with the urban park also has adverse effects on the quality of life. The purpose of this research is to investigate the state of aesthetics and safety in urban parks. Aesthetic service is considered as cultural services and safety service is considered as regulatory services in the park. District 6 of Tehran was selected as a case study. The aesthetic model was used to evaluate the aesthetic quality of Saee Park and the Fuzzy DEMATEL model was used to evaluate the safety of the park. The results of the aesthetic quality assessment of this research indicate that due to the presence of Saee Park in the northeast of this region, the aesthetic quality of this region is maximum in this part and the aesthetic quality of the southwest part of this region is minimum. The results of the safety evaluation in the park also show that the guards are the most influential and the paths through the parks are the most affectability. The management of the park has the most interaction with other factors of the safety system in the park. Finally, it is concluded that the management of the park is suitable for maintaining the safety of the citizens, and in combination with other factors affecting the safety of the park, it can provide a safe environment for the citizens.

Keywords: Urban parks; Aesthetic Quality; Cause and Effect Relationships; Ecosystem Services, Safety.

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Resumen

La proximidad a espacios verdes, orillas del agua y diversos objetos culturales o recreativos aumentan la calidad de vida. Sin embargo, la proximidad al parque urbano también tiene efectos adversos sobre la calidad de vida. El propósito de esta investigación es investigar el estado de la estética y la seguridad en los parques urbanos. El servicio estético se considera un servicio cultural y el servicio de seguridad se considera un servicio regulatorio en el parque. Se seleccionó el distrito 6 de Teherán como estudio de caso. El modelo estético se utilizó para evaluar la calidad estética de Saee Park y el modelo Fuzzy DEMATEL se utilizó para evaluar la seguridad del parque. Los resultados de la evaluación de la calidad estética de esta investigación indican que debido a la presencia del Parque Saee en el noreste de esta región, la calidad estética de esta región es máxima en esta parte y la calidad estética de la parte suroeste de esta región es mínima. . Los resultados de la evaluación de seguridad en el parque también muestran que los guardias son los más influyentes y los caminos a través de los parques son los más afectables. La gestión del parque tiene la mayor interacción con otros factores del sistema de seguridad del parque. Finalmente, se concluye que la gestión del parque es adecuada para mantener la seguridad de los ciudadanos y, en combinación con otros factores que afectan la seguridad del parque, puede proporcionar un entorno seguro para los ciudadanos.

Palabras claves: Parques urbanos, Calidad estética, Relaciones causa-efecto, Servicios ecosistémicos, Seguridad.

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Introduction

Countries and regions differ in the definition of urban areas and their boundaries. Urban ecosystems are defined as areas where built infrastructure covers a large proportion of the Earth's surface or in regions with high concentrations of inhabitants (Pickett et al., 2001). Urban ecosystems often fall into the category of built and ecological infrastructure in urban planning. Ecological infrastructure is a concept of the role that water and vegetation play, in urban or adjacent areas, to supply ecosystem services across different sectoral levels building, street, neighbourhood and region. All "green and blue spaces" that are accessible to urban and suburban areas, i.e. parks, cemeteries, gardens & yards, public space (Cisneros, 2022), urban forestry, single trees, green roofs, wetlands, streams, rivers,

lakes or ponds shall be included in this concept (European Environmental Agency, 2011). It is often difficult to define urban ecosystem boundaries because a large number of changes and interactions in city ecosystems occur far beyond those which are defined for political or biological reasons. This means that analysis of ecosystems in urban areas goes beyond the city itself. These are not only environmental infrastructures in cities, but also internal ecosystems including urban watercourses, urban forests and cultivated plants (La Rosa & Privitera, 2013), which have a direct impact on energy and material flow from urban and suburban areas (Pickett et al., 2001).

Cultural services

The Millennium Ecosystem Assessment (2005) defined cultural ecosystem services as "intangible benefits that people derive from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (p. 40) Cultural ecosystem services are included in many other types of ecosystem services and include different types of cultural services (Costanza et al., 1997), life-enhancing functions (Daily, 1999), informational functions (de Groot et al., 2002), facilities (Boyd & Banzhaf, 2007), cultural and welfare services (Kumar, 2011), or socio-cultural fulfillment (Wallace, 2007).

Aesthetic evaluation theory

Some cultural ecosystem services can be assessed using methods. The four main paradigms are: the psychothetical paradigm, expert paradigm, experiential paradigm, and cognitive paradigm (Zube et al., 1982).

Psychological Paradigm: This paradigm includes evaluation through testing of the general public or selected population's evaluations of the aesthetic qualities of the landscape or specific characteristics of the landscape. It is assumed that external landscape features have a correlation or stimulus-response relationship with observer evaluations and behavior.

Expert Paradigm: This paradigm includes landscape quality assessment by skilled and trained observers. Skills evolve from training in art and design, ecology, or resource management fields where wise techniques of resource movement may have inherent aesthetic effects.

Experiential Paradigm: This paradigm sees landscape values as grounded in the experience of human-landscape interaction, whereby both are shaped and shaped in an interactive process. (Smardon, 2021; Zube et al., 1982).

Cognitive paradigm: This paradigm involves the search for human meaning associated with landscapes or landscape features. Information is received by the human observer and gives meaning to the landscape about past experience, future expectations and socio-cultural conditioning.

Regulatory Services

The benefits resulting from ecosystem processes, such as climatic regulation, water management and some human diseases, are included in these services. Regulatory services contribute to protecting human life and the safety of man's built infrastructure.

Safety in the park

The quality of life is enhanced by the proximity to green places (McCormack et al., 2010), waterside (Jim & Chen, 2010) and various cultural or recreational facilities (Henderson et al., 2016; Iqbal & Ceccato, 2015; Smiley et al., 2016). However, the quality of life has also been negatively affected in a neighbourhood with an Urban Park. In order to be considered as areas with a higher likelihood of criminality, such as public parks and pedestrian crossings, transport interchanges, business districts or vacant sites are defined (Wekerle & Whitzman, 1995). Theft, sexual offenses, violence, vandalism, alcohol consumption, and drug dealing are the most common criminal acts associated with urban public parks. Public parks and buffer zones in cities are also showing an increased incidence of crime. (Groff & McCord, 2012). Modern societies are becoming much more concerned about the security of public parks (Kula, 2015). New management policies for urban public parks that contribute to the prevention of crime are constantly being sought by municipalities and police departments (Telep & Weisburd, 2012). Crime Prevention through Environmental Design (CPTED) is a global philosophy that is frequently used to prevent crime in a variety of spaces (Cozens et al., 2005). Surveillance, targeting, access control, zoning, location imagery, and activity support are six CPTED strategies dedicated to reducing fear of crime and preventing crime in public areas (Atlas, 2013). However, CPTED is not dedicated to evaluating the safety level of urban public parks, so it does not offer clear guidelines on which urban parks need immediate CPTED-based

remediation. Additionally, CPTED cannot estimate the level of safety of an urban park in isolation from its geographic, socioeconomic, or criminal context (Mak & Jim, 2018; Maruthaveeran & van den Bosh, 2015). Favorable crime status, high levels of park maintenance, and urban park location near the city center (Cho et al., 2008; Dehring & Dunse, 2006; Morancho, 2003) increase the positive links between green spaces (Lopez & Gentili, 2020) and real estate values. Lack of maintenance, dangerous equipment or urban park location near the street intersection will negatively affect the safety of the urban park (Groff & McCord, 2012). The purpose of this research is to investigate the state of aesthetics and safety in urban parks. Aesthetic service is considered a cultural service and safety service is considered a regulatory service in the park.

Materials and Methods

Case Study

Tehran, the most populous city in Iran, has a resident population of about 9 million people and more than 14 million people daily population. According to the global population overview report, the population of Tehran in 2020 is currently estimated at 9,134,708 people. Tehran is the most populous city in Iran and West Asia and has the third-largest urban area in the Middle East (Khorrami et al., 2021). There are a large number of industrial units in this area and a large number of trips are made daily from nearby cities such as Karaj, Shahriyar and Pardis. Vehicles and industries play an important role in aggravating the problem of air pollution in Tehran. One of the oldest districts of the capital is District 6 of Tehran, which is geographically located in the center of Tehran and with an area of 2138 hectares, covers about 3.3% of the city of Tehran. District 6 municipality of Tehran province has 6 parts and 14 neighborhoods. This area of Tehran has a population of over 250,000 people, and more than 30% of government buildings, institutions, and banks are located in this area of Tehran. District 6 of Tehran is limited to district 3 from the north, district 2 from the west, district 7 from the east, and districts 10, 11 and 12 from the south. Saee Park is one of the parks in Tehran's 6th district, located on Valiasr Street. The area of this park is about 12 hectares, which is considered a cozy place for recreation in Tehran. This park was opened in 1973 after about 10 years. The design of this attractive park was done by Professor Mahjoubi. Figure 1 shows the study area in this research.

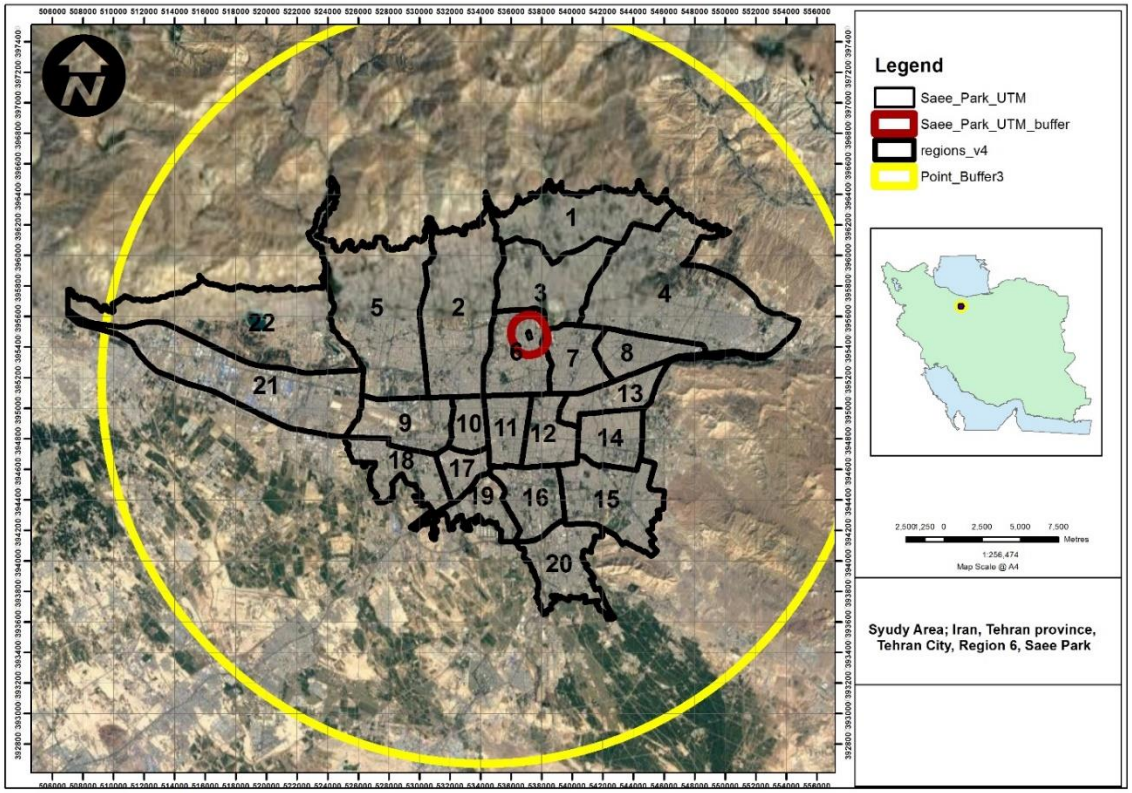

Figure 1. Location of the study area

Source: Own elaboration

Aesthetic quality evaluation

The aesthetic quality model estimates the visual effect of a potential development project in important scenic areas. This model is based on visual impact analysis in the VIEWSHED module, which can incorporate weather conditions to evaluate visual contrast. The visual contrast feature can be important. In this situation, visual contrast is calculated to indicate how easily a feature can be seen relative to its background. The optional step of impact analysis includes data on the population or areas important to estimate the number of people who will be affected or to estimate the extent of the impact of a particular project. There are two visual effect outputs. When air quality is not considered, the output is a value that represents the proportion of features that are visible from that location. Taking air quality into account, the result is the average of the visual contrasts of all features. This is a powerful statement of visual impact considering all the features and their visibility according to the weather conditions. To establish whether developments or new management areas influence views from point of view, the aesthetic quality model will perform a visual analysis. In essence, it creates the "visual footprint"

of the planned land use. For example, the visual footprint of a proposed wind turbine or wave conversion facility can be calculated from the viewpoint of a beach house, a local landmark, or downtown. Similarly, the model may calculate the visual footprint of a new urban park, so that planners can estimate the increase in property value as a result of landscape views. It should also be noted that, while taking into account topography, information on structures or vegetation which may impede the view is not required in this model. The digital elevation model does not include the height and scale of a building, for instance, which could be an obstacle to visibility in one place. However, height information for these obstacles may be optionally added to the model if it is possible to obtain data on trees, buildings etc.

Safety analysis

Table 1 shows the effective criteria for evaluating the safety of urban parks.

Table 1. Safety evaluation factors of urban public parks related to crime prevention through environmental design strategies and socio-economic context

Strategy	Factor
Monitoring	Guards
	Paths through the parks
	Sight Lines
	Dense areas of vegetation
	Buildings or window location lighting
Territory	Definition of park boundary
	Signs and rules
	Separation of semi-private and public places
Access control	High-density areas in terms of plant planting
	Number of access routes, input
	Natural barriers to create boundaries without a gate
	Limited working hours
	Dead end paths
	Paths through the parks
Activity support	Family-oriented areas
	Playground or sports areas
	Garden, plants, fountains
	The flow of people
	Cafe
	A place for teenagers to control them
	Age-related equipment
	Artistic, cultural and visual events
Location image	Park management

	Regular service and maintenance
	The aesthetics of the place
	Public toilets
	Clean environment
	Number of trash cans
	Free walls for graffiti artists
	Repair and maintenance of walking paths
Target hardening	Surveillance cameras
	Provisions for alcohol or drug users
	Providing for the homeless
Socio-economic background	The number of crimes in the surrounding area
	Graffiti, the amount of vandalism
	Characteristics of the neighborhood

Source: Zavadskas et al. (2019)

The Fuzzy DEMATEL method is used for the evaluation of this study. The DELMATE method, used to solve complex intertwined and multicriteria problems and decisions, is widely accepted in the Decision Making Approach which uses a wide range of methods (Li & Tzeng, 2009). This method is based on graphs which are directed diagrams and use an expert judgement to determine factors in a system. Furthermore, for the purpose of extracting correlation between factors, this method shall apply the principles of graph theory (Altuntas & Dereli, 2015). The DEMATEL method can be used to assist decision makers in understanding the interdependence of factors by means of diagrams or matrices (Yazdi et al., 2020). One of the special benefits of this method is that there is no need for an allwise pair comparison between variables when using a DEMATEL method, which results in reduced calculation time (Tadić et al., 2014). The DEMATEL method helps us to gain a better understanding of the expert opinion on these parameters and provides practical solutions, by using our Visual Structure Model (Chang et al., 2011). In research, it is common to use the Fuzzy DEMATEL method to deal with ambiguity, uncertainty and lack of information (Acuña et al., 2019). To read the article by Li et al. (2020), see More Details and Information on How to Use This Method (Hosseini et al., 2021):

- First step: collecting evaluation information using linguistic variables
- Second step: constructing the fuzzy primary direct relation matrix
- Third step: calculation of normal direct relation matrix
- Fourth step: calculation of the complete fuzzy relation matrix
- The fifth step: drawing a map of causal relationships
- Sixth step: Calculation of weights

Results

To implement the aesthetic ecosystem service modeler, there was a need for the height data of the plants in Saee Park. After referring to various organizations, because such data was not found with this level of accuracy, plant samples were collected in Saee Park within several days. Figure 2 shows the location of sampling points.

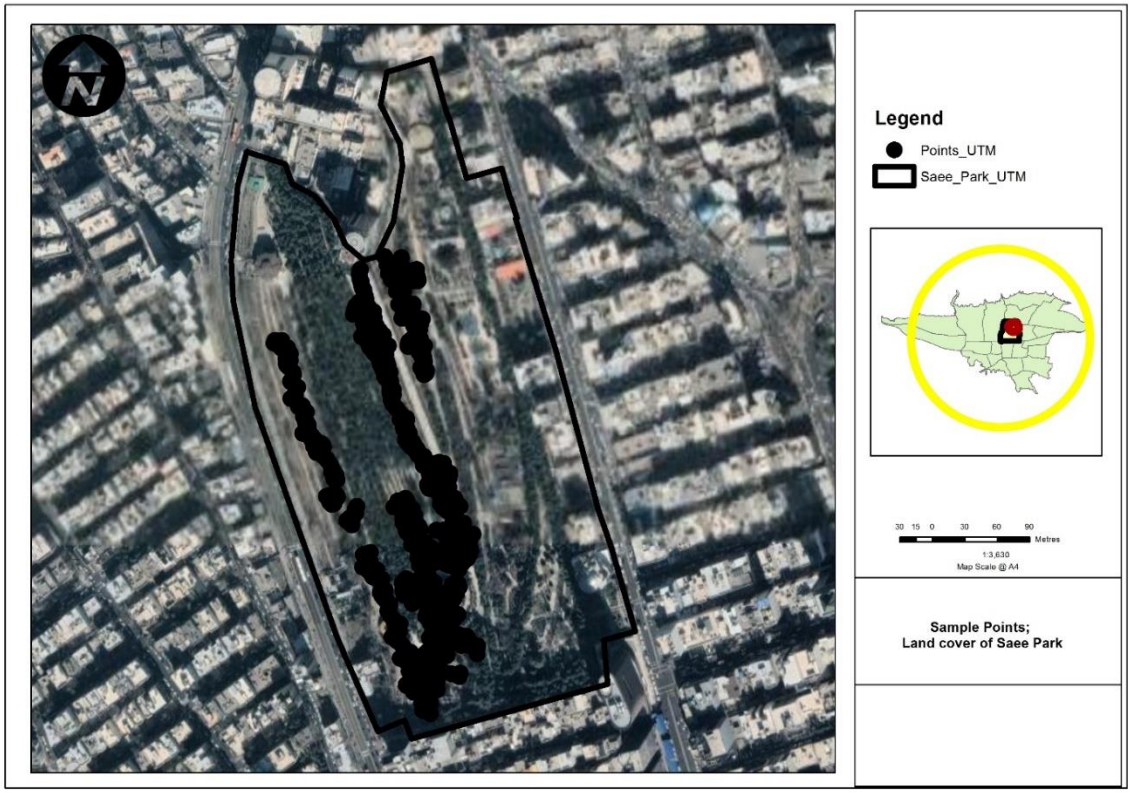

Figure 2. The location of the samples collected in Saee Park

Source: Own elaboration

Figure 3 shows the location of each plant species.

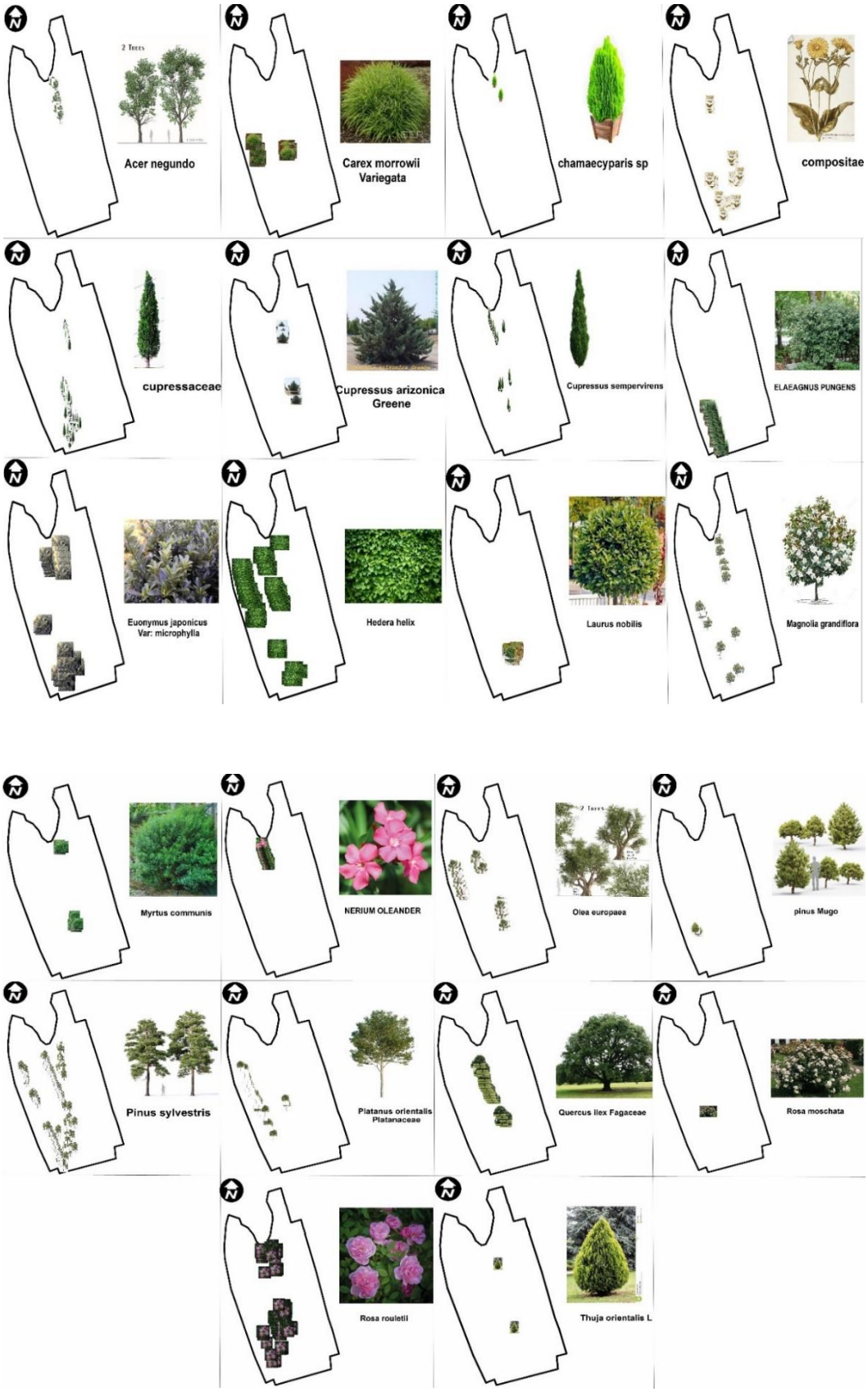

Figure 3. Location of plant species in Saee Park

Source: Own elaboration

In Figure 4, the visual effect of Saee Park on the people of Tehran's district six is measured. The most important criterion for this evaluation is the altitude map of Saee Park's vegetation.

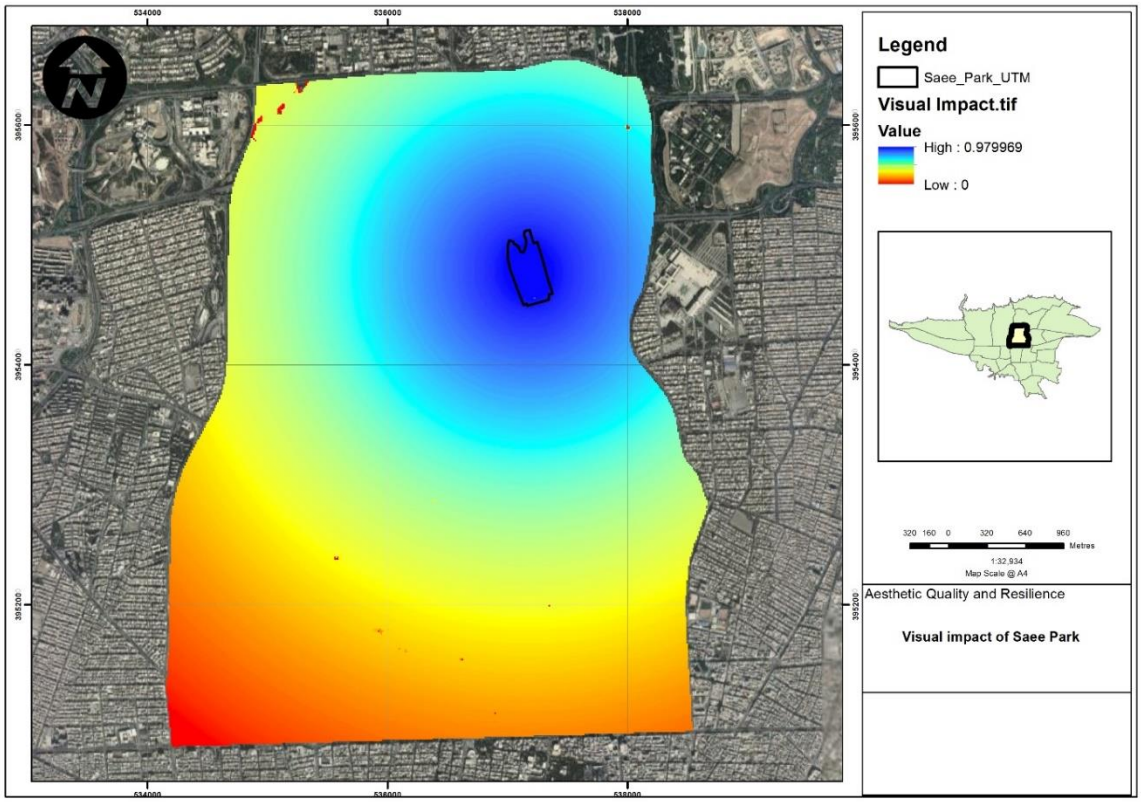

Figure 4. The visual effect of Saee Park on District Six of Tehran municipality
Source: Own elaboration

The purpose of this study is to measure the visual effect of a natural environment on the population of an area, which is different from the measurement of man-made environment in other Viewshed sample studies. The proximity of other man-made environments such as power plants or wind turbines causes negative effects in such visual effect studies. But in this study, which aims to evaluate the visual effect of the natural environment, proximity to each of the areas shown in the green space map (Saee Park) is to prove and reveal the positive effects of the ecosystem in cultural and economic-social dimensions, increase the price of land and real estate, and improve the air quality of the area. As can be seen in the map obtained from the study of the visual effect of the studied green space (Saee Park) in the blue areas, the most visual effect of aesthetics quality is observed and in fact, people who are in this range have higher productivity and in the same proportion, the further away we are, the effects and benefits are less in the yellow and orange areas.

The application and use of this research in the evaluation reports of the effects related to decision-making and the construction of micro and macro projects helps to improve the quality of the urban structure. The examination of the quality of aesthetics in this research has made it to be considered as one of the key criteria for awareness and making the right decision in construction and implementation. Also, clarifying and accurately determining the limits of the visual effect of aesthetics quality by considering and producing this map in the implementation of various projects, if there is a need for proximity or lack of proximity in these limits, is a great help to other projects.

Safety analysis in Saee Park

Table 2 shows the results of the internal relationships of the criteria required for safety analysis in the park.

Table 2. The final output

Criteria	D	R	D+R	D-R	Wi	Wfinal
Guards	6.8826	4.0002	10.8827	2.8824	13.7651	0.0336
Paths through the parks	6.1672	6.8785	13.0457	-0.7113	12.3344	0.0301
Sight Lines	6.2626	6.8052	13.0678	-0.5426	12.5252	0.0305
High-density areas in terms of plant planting	6.1648	5.9016	12.0664	0.2633	12.3297	0.0301
Buildings or window location lighting	5.8190	6.8590	12.6780	-1.0401	11.6379	0.0284
Definition of park boundary	5.3235	2.8832	8.2067	2.4402	10.6469	0.0260
Signs and rules	6.3104	6.8785	13.1889	-0.5681	12.6208	0.0308
Separation of semi-private and public places	6.3212	6.6605	12.9817	-0.3393	12.6424	0.0308
Number of access routes, input	6.0680	5.6161	11.6841	0.4519	12.1360	0.0296
Natural barriers to create boundaries without a gate	6.1178	6.8785	12.9963	-0.7607	12.2356	0.0298
Limited working hours	5.1204	6.8785	11.9989	-1.7581	10.2408	0.0250
Dead end paths	5.7221	6.7173	12.4395	-0.9952	11.4443	0.0279
Family-oriented areas	6.5173	5.9883	12.5057	0.5290	13.0347	0.0318
Playground or sports areas	6.4957	6.8785	13.3742	-0.3828	12.9913	0.0317
Garden, plants, fountains	6.1746	6.6834	12.8581	-0.5088	12.3493	0.0301
The flow of people	6.4964	5.8206	12.3170	0.6759	12.9929	0.0317
Cafe	6.0954	6.7988	12.8942	-0.7033	12.1908	0.0297
A place for teenagers to control them	6.5175	6.7988	13.3163	-0.2812	13.0351	0.0318
Age-related equipment	5.5118	6.8785	12.3903	-1.3667	11.0236	0.0269
Artistic, cultural and visual events	5.6435	6.7072	12.3507	-1.0637	11.2871	0.0275
Park management	6.7299	6.7373	13.4671	-0.0074	13.4598	0.0328
Regular service and maintenance	5.4339	6.8785	12.3124	-1.4446	10.8678	0.0265
The aesthetics of the place	6.3826	6.6196	13.0022	-0.2370	12.7652	0.0311
Public toilets	5.4665	6.2903	11.7568	-0.8238	10.9330	0.0267

Clean environment	5.5261	5.0327	10.5588	0.4934	11.0521	0.0269
Number of trash cans	4.9234	6.0971	11.0205	-1.1736	9.8469	0.0240
Free walls for graffiti artists	5.6973	6.1581	11.8554	-0.4609	11.3945	0.0278
Repair and maintenance of walking paths	6.2118	5.7982	12.0101	0.4136	12.4237	0.0303
Surveillance cameras	6.4925	4.6131	11.1056	1.8794	12.9850	0.0317
Provisions for alcohol or drug users	5.8327	5.3861	11.2188	0.4466	11.6654	0.0284
Providing for the homeless	5.7273	4.7294	10.4567	0.9979	11.4546	0.0279
The number of crimes in the surrounding area	6.1426	4.7068	10.8493	1.4358	12.2851	0.0300
Graffiti, the amount of vandalism	6.0957	4.9905	11.0863	1.1052	12.1914	0.0297
Characteristics of the neighborhood	6.6828	5.5282	12.2109	1.1546	13.3656	0.0326

Source: Own elaboration

The Figure 5 also shows the pattern of significant relationships. This pattern is to be seen as a chart where D+R values are used for the horizontal axis and D-R values on the transversal axis. A point with coordinates (D+R, D-R) in the device relationship determines the position and relationship of each factor.

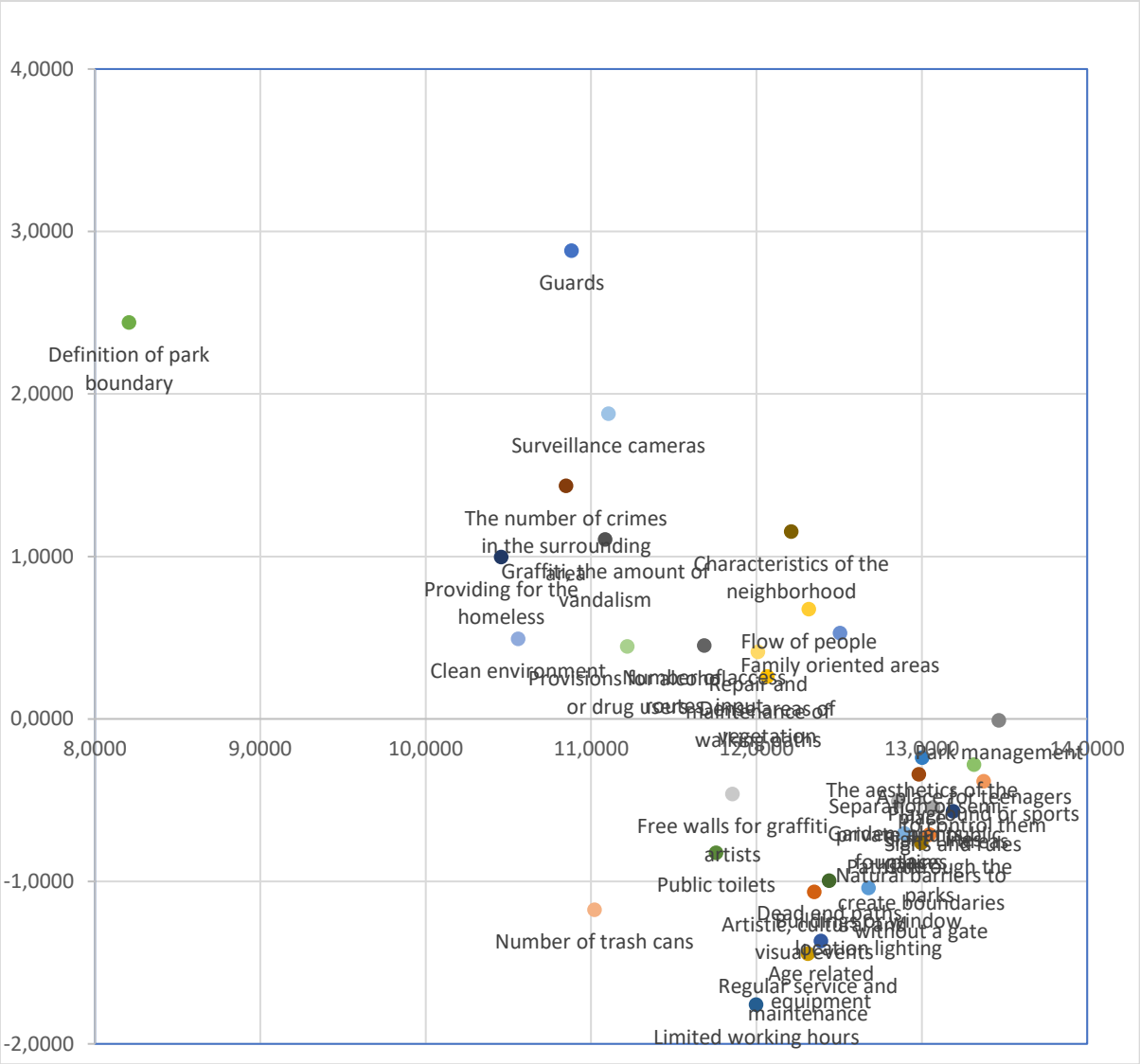

Figure 5. Diagram of cause and effect relationships between criterio

Source: Own elaboration

Each factor shall be assessed on four aspects, in accordance with the Figure 5 and Table 2:

The influence of variables

The sum of the elements of each row (D) for each factor indicates the degree of influence of that factor on other factors of the system. In this research, Guards have the most influence. Park management, Characteristics of the neighborhood, A place for teenagers to control them, Family-oriented areas, The flow of people, Playground or sports areas, Surveillance cameras, The aesthetics of the place, Separation of semi-private and public places, Signs and rules, Sight Lines, Repair and maintenance of walking paths, Garden,

plants, fountains, Paths through the parks, High-density areas in terms of plant planting, The number of crimes in the surrounding area, Natural barriers to create boundaries without a gate, the amount of vandalism, Cafe, Number of access routes, input, Provisions for alcohol or drug users, Buildings or window location lighting, Providing for the homeless, Dead end paths, Free walls for graffiti artists, Artistic, cultural and visual events, Clean environment, Age-related equipment, Public toilets, Regular service and maintenance, Definition of park boundary, Limited working hours and Number of trash cans are in the next degrees of influence.

The affectability of variables

The sum of the elements of the column (R) for each factor indicates the affectability of that factor from other factors of the system. In this research, paths through the parks has the most affectability and Regular service and maintenance, Playground or sports areas, Signs and rules, Natural barriers to create boundaries without a gate, Age-related equipment, Limited working hours, Buildings or window location lighting, Sight Lines, A place for teenagers to control them, Cafe, Park management, Dead end paths, Artistic, cultural and visual events, Garden, plants, fountains, Separation of semi-private and public places, The aesthetics of the place, Public toilets, Free walls for graffiti artists, Number of trash cans, Family-oriented areas, High-density areas in terms of plant planting, The flow of people, Repair and maintenance of walking paths, Number of access routes, input, Characteristics of the neighborhood, Provisions for alcohol or drug users, Clean environment, Graffiti, the amount of Vandalism, Providing for the homeless, The number of crimes in the surrounding area, Surveillance cameras, Guards and Definition of park boundary are in the next degrees of affectability.

Interaction of variables

The horizontal vector (D+R) shows the influence of the desired factor in the system. In other words, the higher the value of D+R factor, The factor more interaction with other system factors. In this research, Park management has the most interaction with other system factors and Playground or sports areas, A place for teenagers to control them, Signs and rules, Sight Lines, Paths through the parks, The aesthetics of the place, Natural barriers to create boundaries without a gate, Separation of semi-private and public places, Cafe, Garden, plants, fountains, Buildings or window location lighting, Family-oriented areas, Dead end paths, Age-related equipment, Artistic, cultural and visual events, The

flow of people, Regular service and maintenance, Characteristics of the neighborhood, High-density areas in terms of plant planting, Repair and maintenance of walking paths, Limited working hours, Free walls for graffiti artists, Public toilets, Number of access routes, input, Provisions for alcohol or drug users, Surveillance cameras, Graffiti, the amount of vandalism, Number of trash cans, Guards, The number of crimes in the surrounding area, Clean environment, Providing for the homeless and Definition of park boundary are in the next levels of interaction in the safety system of the park.

Determination of cause and effect criteria

The vertical vector (D-R) shows the power of each factor's influence. In general, if D-R is positive, the variable is considered a cause variable, and if it is negative, it is considered an effect. In this research, Guards, Definition of park boundary, Surveillance cameras, The number of crimes in the surrounding area, Characteristics of the neighborhood, Graffiti, the amount of vandalism, Providing for the homeless, The flow of people, Family-oriented areas, Clean environment, Number of access routes, input, Provisions for alcohol or drug users, Repair and maintenance of walking paths, High-density areas in terms of plant planting, are considered as causes. Park management, The aesthetics of the place, A place for teenagers to control them, Separation of semi-private and public places, Playground or sports areas, Free walls for graffiti artists, Garden, plants, fountains, Sight Lines, Signs and rules, Cafe, Paths through the parks, Natural barriers to create boundaries without a gate, Public toilets, Dead end paths, Buildings or window location lighting, Artistic, cultural and visual events, Number of trash cans, Age-related equipment, Regular service and maintenance and Limited working hours are considered as effects.

Cause factors

Guards have the most D-R, so they are considered the most critical cause factor. This means that this factor has more impact on safety in the park than any other factor. It also has relatively high D values among cause factors. This means that this factor has a significant effect on other factors as well. According to the D-R values, the second cause factor is the definition of park boundary. This factor has low D values and the lowest D+R. This means that features are independent and can affect only a few other features. The next notable cause is Surveillance cameras because its D-R value (1.9) ranks third among all factors. Although surveillance cameras do not have a very high D value (6.5),

you should know that it is still one of the key factors that affect park safety. Also, The number of crimes in the surrounding area is another prominent cause among the factors due to the D-R value and ranks fourth (1.4) in all the cause factors. More importantly, The number of crimes in the surrounding area has a medium D value, low R value, and low D+R value. Therefore, this factor has little effect on park safety, but it can be the cause of a lack of safety in the park. Characteristics of the neighborhood ranks 5th in terms of D-R, 19th in terms of D+R, 3th in terms of D and 26th in terms of R. Therefore, Characteristics of the neighborhood has a great influence, but it has relatively little interaction with other factors in creating safety in the park. The amount of vandalism ranks sixth in terms of D-R, twenty-eighth in terms of D+R, nineteenth in terms of D, and twenty-ninth in terms of R. Therefore, this factor is independent and can affect only a few other factors. Providing for the homeless is ranked 7th, 33th, 24th, and 30th in terms of D-R, D+R, D, and R, respectively. The flow of people is ranked 8th, 17th, 6th, and 23th in terms of D-R, D+R, D, and R, respectively. Family-oriented areas are ranked 9th, 13th, 5th, and 21th in terms of D-R, D+R, D, and R, respectively. Clean environment ranks 10th, 32th, 28th, and 28th in terms of D-R, D+R, D, and R, respectively. A number of access routes ranks 11th, 25th, 21th, 25th in terms of D-R, D+R, D, and R, respectively. Provisions for alcohol or drug users ranks 12th, 26th, 22th, and 27th in terms of D-R, D+R, D, and R, respectively. Repair and maintenance of walking paths ranks 13th, 21th, 13th, and 24th in terms of D-R, D+R, D, and R, respectively. High-density areas in terms of plant planting is ranked 14th, 20th, 16th, and 22th in terms of D-R, D+R, D, and R, respectively.

Effect factors

Park management ranks 15th, 1th, 2th and 12th in terms of D-R, D+R, D, and R, respectively. This indicates that this factor is the main problem that needs to be solved. However, it is one of the effect-type factors that cannot be improved directly. The aesthetics of the place is ranked 16th, 7th, 9th, and 17th in terms of D-R, D+R, D, and R, respectively. A place for teenagers to control them, Separation of semi-private and public places, Playground or sports areas, Free walls for graffiti artists, Garden, plants, fountains, Sight Lines, Signs and rules, Cafe, Paths through the parks, Natural barriers to create boundaries without a gate, Public toilets, Dead end paths, Buildings or window location lighting, Artistic, cultural and visual events, Number of trash cans, Age-related equipment, Regular service and maintenance and Limited working hours are effect.

Discussion and conclusión

Aesthetics in the park

Although eco-aesthetics aims to enhance the environment and aesthetics in Green Infrastructure Systems, it creates opportunities for "green social-ecological cities" capable of adapting to world climate changes. Implementation of the "eco-aesthetics" approach in urban planning in Ghana and other developing countries in sub-Saharan Africa requires the creation of new urban green infrastructure systems and the strengthening of existing systems that provides valuable "ecological", "social" and "economic" benefits to cities and communities.

According to the Millennium Ecosystem Assessment (2015), these benefits from eco-aesthetics can be referred to as "ecosystem services". Ecosystem services are defined as the direct and indirect contributions of natural systems to the environment and human well-being (Matlock & Morgan, 2011; Pert et al., 2015). These ecosystem services are grouped into four main categories in the Millennium Ecosystem Assessment (2005) report: provisioning (outputs of materials or energy from ecosystems); regulatory (promoting healthy environmental conditions); cultural (providing ecosystem value to people); and support (providing habitat for biodiversity) services. The strengthening of cities' environmental and social resilience in Ghana and Sub-Saharan Africa is the result of the regulatory, cultural, supporting, and provisioning ecosystem services provided by eco-aesthetics technologies. The development of green infrastructure systems that deliver both environmental and societal benefits to individuals and the environment is encouraged by eco-aesthetics. Green infrastructure is, according to Fassbinder (2016), the most cost-effective means of mitigating some of the main challenges faced by cities today such as flooding, air pollution, rising temperatures, and soil erosion that does not require further energy. For instance, local temperatures could decrease by 2 C if 10 % of the region's green infrastructure is increased. In the environment, up to 30% of small particles can be absorbed by plants' chlorophyll (Fassbinder, 2016). Greater adaptive environments and the preservation of genetic diversity are promoted by other regulatory and support services, such as stormwater management and biodiversity promotion (Sharifi & Yamagata, 2014). Due to the frequent flooding that hits major cities, construction of flood mitigation buildings is very important in Ghana and elsewhere in Africa (Amoateng et al., 2018). Furthermore, Vargas et al. (2014) and Ni’mah & Lenonb (2017) argue that

urban green infrastructure (parks, gardens, and waterways) is an important adaptation strategy for emerging cities. After a natural disturbance such as a flood, green open spaces provide opportunities for adaptation by fostering conditions for recovery and renewal (Ni'mah & Lenonb, 2017). The social and economic value of land and property in relation to ecological green spaces has been significantly improved, with a view to strengthening the adaptive capacity of cities. The aesthetic values provided to people through eco-aesthetics also help to ensure the long-term sustainability of such projects, while the cultural and provisioning services provided increase urban social resilience through the creation of "livable cities" which provides an alternative economic efficiency for urban residents. In 2015 the United Nations Member States committed themselves to achieving a series of Sustainable Development Goals in order to end poverty, fight inequality and address climate change by 2030 as a result of global warming and growing environmental challenges. Haruna et al. (2018) stated that the benefits of environmental aesthetics as shown in the table below directly and indirectly contribute to the realization of 5 of the 17 Sustainable Development Goals (Goals 3, 11, 13, 14, and 15) in Ghana and other developing countries in sub-Saharan Africa. The building of Socioecologically Resilient Cities in particular with regard to climate change adaptation and disaster risk management could be an extension of these five priorities, health and well being, sustainable cities and society, protection of the planet, life underwater and biodiversity on land. For example, the socio-cultural benefits of eco-aesthetics help sub-Saharan African countries achieve Sustainable Development Goal 3 (good health and well-being) while the environmental benefits of aesthetics help promote goals 11, 13, 14 and 15 on a local and global scale. Building socially and environmentally resilient cities in sub-Saharan Africa will also help save developing countries' limited resources that would otherwise be used to cope with climate change and natural disasters.

Analyzing the results of aesthetic assessment

The most important criterion for evaluating the visual effect of Saee Park on the people of Tehran's sixth district is the altitude map of the vegetation of Saee Park. The purpose of this study is to measure the visual effect of a natural environment on the population of a region which is different from the measurement of a man-made environment in other Viewshed sample studies. The proximity of other man-made environments such as power plants or wind turbines causes negative effects in such visual effect studies. But in this study, which aims to evaluate the visual effect of the natural environment, the proximity

of each of the areas shown in the green space map (Saee Park) to prove and reveal the positive effects of the ecosystem in cultural and economic-social dimensions, the increase in the price of land and real estate and improving the air quality of the region. As seen, in the map obtained by examining the visual effect of the studied green space (Saee Park) in the blue areas, the most visual effect of aesthetics quality is observed and in fact, people who are in this range have higher productivity, and the further away we are in the yellow and orange areas, the less effects and benefit. The application and use of this research in impact evaluation reports related to decision-making and construction of micro and macro projects helps to improve the quality of the urban structure. Examining the quality of aesthetics in this research is one of the key criteria for awareness and making the right decision in construction and implementation. Also, clarifying and accurately determining the limits of the visual effect of aesthetics quality by considering and producing this map in the implementation of various projects, if there is a need for proximity or lack of proximity in these limits, is a great help to other projects.

Safety in the park

Urban public parks provide nature in urban areas, but if they are not adequately maintained, supervised, or provide an environment for positive activities, they can be a focal point for crime (Zavadskas et al., 2019). High-quality green spaces are especially important for parents with babies, children, the elderly, citizens who work near the park, and residents who live nearby (Wang & Zhao, 2017). Urban parks provide a space to increase social interaction and enable residents' participation in health promotion processes (Blanck et al., 2012; Chawla, 2015; Roe et al., 2016; Root et al., 2017). Time spent outdoors also cures mental fatigue, inattention, irritability, and impulsiveness (Chiesura, 2004). Greening of vacant land and greater tree canopy cover can also be associated with reduced levels of vandalism, theft, drugs, or shootings (Bogar & Beyer, 2016; Schusler et al., 2018; Troy et al., 2012)

The results of safety evaluation in the park

In this research, Guards have the most influence and Paths through the parks have the most affectability. According to the study of Zavadskas et al. (2019), the monitoring of the urban park is done by guards, workers, managers and employees of stores or cafes, the presence of these people leads to an increase in the maintenance of the park and prevents criminal activities such as theft, vandalism, violence or arson. However, the

optimal number of guards and supervisors should be defined separately for each region. According to the research of Iqbal and Ceccato (2015), places with more than one route or exit usually have many cases of violent crimes. Park management has the most interaction with other system factors. Park management ranks 15th in terms of D-R, 1th in terms of D+R, 2th in terms of D and 12th in terms of R. This indicates that this factor is the main problem that needs to be solved. However, it is one of the effect-type factors that cannot be improved directly. Park management, Regular service and maintenance, The aesthetics of the place, Public toilets, Clean environment, Number of trash cans, Free walls for graffiti artists and Repair and maintenance of walking paths indicate the image of the place. According to the study by Ceccato (2020), the image of place or maintenance shows how environmental aesthetics can increase the security of an area and keep potential criminals away because well-maintained environments show that people are in control of the area. Playground or sports areas are highly interactive and affectability in creating safety in the park. Therefore, the playground or sports area in interaction with other criteria has a great effect on creating safety in the park. In the sense that if there is a sports area in a park, there is lighting, workers and employees are working, there is supervision, etc., all these things together by interacting with each other can be effective in creating safety in the park. According to Iqbal & Ceccato (2015), more than half of the violent crimes committed in Tantolunden Park occurred in the sports and gardens area. Guards have the most D-R, so they are considered the most critical cause factor. This means that this factor has more impact on safety in the park than any other factor. It also has relatively high D values among causal factors. This means that this factor has a significant effect on other factors as well. According to the D-R values, the second cause factor is the definition of park boundary. This factor has low D values and has the lowest D+R. This means that features are independent and can affect only a few other features. The next notable cause is Surveillance cameras because its D-R value (1.9) ranks third among all factors. Although surveillance cameras do not have a very high D value (6.5), you should know that it is still one of the key factors that affect park safety. Also, the number of crimes in the surrounding area is another prominent cause among the factors due to the D-R value and ranks fourth (1.4) in all the cause factors. More importantly, The number of crimes in the surrounding area has a medium D value, low R value, and low D+R value. Therefore, this factor has little effect on park safety, but it can be the cause of a lack of safety in the park. Characteristics of the neighborhood ranks 5th in terms of D-R, 19th in terms of D+R, 3th in terms of D and 26th in terms of R. Therefore,

Characteristics of the neighborhood has a great influence, but it has relatively little interaction with other factors in creating safety in the park. The amount of vandalism ranks sixth in terms of D-R, twenty-eighth in terms of D+R, nineteenth in terms of D, and twenty-ninth in terms of R. Therefore, this factor is independent and can affect only a few other criteria. According to the study of Maruthaveeran & van den Bosh (2015), some conditions in urban green spaces such as dark areas, signs of vandalism, graffiti, lots of garbage, drug paraphernalia, overgrown bushes, abandoned vehicles and the presence of some potential illegal users such as beggars, wandering youths can raise the fear of crime among park users. Andrews & Gatersleben (2010) found in their work on various risks associated with natural environments that the threat of attack by another person (social risk) had the greatest impact. This threat is more likely to occur than other threats such as being attacked by an animal, falling over obstacles, or getting lost (physical hazards).

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