



<http://dx.doi.org/10.26450/jshsr.2317>

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Citation: Palabiyik, S. (2021). Evaluation of small scale city parks based on ecological design criteria. *Journal of Social and Humanities Sciences Research*, 8(66), 388-399.

EVALUATION OF SMALL SCALE CITY PARKS BASED ON ECOLOGICAL DESIGN CRITERIA*

ABSTRACT

The population growth and dense housing in the cities, especially in recent years, pose a serious threat to open green spaces in the city. By taking measures against this situation, it has become necessary to make urban natural and cultural resources sustainable. At this point, the subject of the study, the ecological parks come to the forefront with the many advantages they provide, such as enabling urban residents to integrate with nature, reducing energy and resource consumption for the park and its vicinity depending on the size and location of the park, and supporting the use of environmentally friendly technologies. This study, in which the conceptual structure of ecological parks is explained, has been organized in two stages. In the first stage, it is aimed to determine the ecological design criteria that can be effective in creating a quality living environment for users in small-scale city parks. In the second stage; The qualifications of the parks determined in the research area were evaluated according to the ecological design criteria created. As a result, it was determined that the small-scale parks considered were organized according to ecological design principles and an inadequate planning approach.

Keywords: Urban transformation; Urban parks; Neighborhood parks; Ecological assessment.

1. INTRODUCTION

With the accelerating urbanization worldwide, migration from rural areas to urban areas is accelerating, and the number, population, and complexity of cities are gradually increasing. While 70 percent of the population lived in rural areas in the 1950s, since 2008 half of the world population, according to 2014 data, 54 percent live in cities. According to the estimates of the United Nations, the proportion of the urban population will increase by 60 percent in 2030, and this rate is expected to reach 70 percent by 2050 (URL1).

When examined in the development of Turkey's private urbanization movement, and it is possible to talk about two different periods before 1950, including after. The urban population of the country, which increased very slowly until 1950, entered a very rapid increase process as a result of the dissolution caused by the structural transformations especially in rural areas caused intense immigration to the cities after this date. This rapid urbanization, which has increased after 1950 and shaped by migration from rural to urban, continues today, as can be seen in Table 1.

Table 1. Numerical and percentage distribution of rural and urban population between the years 1927-2019 (URL2). (Note: Settlements with a population of over 10,000 between 1927-1990, Since 2000, provincial and district centers have been included as urban population.)

Year	Rural	Urban	Rural (%)	Urban (%)
1927	10.342.391	3.305.879	75,8	24,2
1950	15.702.851	5.244.337	75	25
1980	25.091.950	19.645.007	56,1	43,7
2010	17.500.632	56.222.356	23,7	76,2
2019	6.003.717	77.151.280	7,8	92,2

* This study was presented at the "LIVENARCH VI-2019" conference held in Trabzon / Turkey between 25-28 September 2019. It was developed and turned into an article based on the comments and discussions made as a result of the presentation

As the result of social, economic, political and cultural conditions, the rapid increase of population in today's cities has caused to increase multi-storey buildings with the action of demolished and built especially in urban centers and to be added the new residential and industrial areas to the existing settling intensely. This tendency of quick, irregular and unplanned urbanization leads to a decrease in high wind energy, thermal energy a n centers.

Open-green spaces have an important position in balancing the deteriorating relations between man and nature and improving urban living conditions. So that, in developed countries, the quality and quantity of these areas are regarded as an indicator of civilization and quality of life. Therefore, many developed countries, taking into account people's mental and physical needs, are oriented to the effort of planning and building the open-green spaces suitable for human life in parallel to ecological principles (Gül and Küçük, 2001).

Open-green spaces; can be classified in different ways according to the dominance of green areas, property or recreation function assumed (Aydemir, and others, 2004). The parks, located in the classification of urban open-green spaces according to the recreation function undertaken, are one of the main factors in the planning of the urban open-green spaces with the reasons such as, incorporating the gaming venues and sports fields, supporting the ecological diversity of the city with the cover of artificial and/or natural vegetation, not only developing the physical and mental health of the citizens, but also creates an environment for amusement and socializing. The individuals, coming together in these areas, having different social, cultural, economic and demographic characteristics learn to perceive the differences of each other, to look and evaluate each other with tolerance (Aydemir, and others, 2004; Thompson, 2002).

Urban parks may be classified as a city, district, quarter and neighborhood unit parks depending on scale and location. In these, the neighborhood unit parks are the species having the most common usage in the planning of urban open-green space with such reasons, taking place in residential areas, being accessible on foot, can be used short term but almost every day and every hour of the day by young or old. The distance of neighborhood unit parks, serving about 4-5 thousand people, from housing is limited to 500 m. in many countries, but this values can be varied according to social preferences and the area's topography.

In our country, social limitations reduce the usage rate of parks whose transport distance is remote. This rate gets bigger if the site-dependent population such as old or disabled people is taken into account. In addition, instead of a few large parks, a large number of small-scale parks dispersed across the city are more beneficial in terms of recreational usage and the effect on the overall climate of the city, because parking size's contribution to the city, beyond a certain size, is very limited in terms of climate (Aydemir, and others, 2004). For these reasons, at a lower scale from the neighborhood unit parks, regulation of closer green areas to the housing is quite important with regard to offer a better life quality to the citizens.

In the study's extend, in these green areas defined as "small scale park", the condition of having a minimum 2000 m² area in the standard of optimum park size has been sought (Eşbah, 2006; Westmacott, 1991). This understanding of the planning of urban open-green spaces is one of the predicts of this study's bases.

However, ignoring ecological quality factors in today's urban green areas, which are organized by prioritizing human use, further reduces the contribution of these important areas to the urban environment. (Cranz, 2000). At this point, the necessity of developing a design approach brings the relation of human and nature forward and produces solutions to the ecological problems of the city, changing the existing design concept in the planning of green areas, is another predict of this study's bases.

In this concept, the study is built on integrating a multi-faceted perspective of ecological design with the design of small scale parks closer to the housing and transferring today's endangered resources to the next generation by protecting them.

In this study developing within the frame of this base understanding, it is aimed that the small scale parks of Balıkesir are analyzed according to ecological quality criteria determined the scope of this work and proposals of recreational and ecological contribution, providing benefit from these areas in a higher rate, are developed.

2. MATERIALS AND METHODS

2.1. Materials

Balıkesir province selected as the study area (Figure 1) is located in northwestern Anatolia and in the triangle of İstanbul, Bursa and İzmir which are the three advanced centre of Turkey. Balıkesir, being in the position of the most developed province in the agriculture and food industry, is also one of the cities which has the most important renewable energy source in the country. The city has the potential of for high wind energy, thermal energy and biomass energy. Balıkesir outstanding with summer tourism with its coast-coastal plains and islands, secondary residences and yacht tourism, is becoming a major regional center in the field of transportation, transporting and logistics (URL3).

According to TurkStat data, Balıkesir province, although below the average population growth rate of Turkey urbanization rate is increasing steadily. While 61.32% of the population lived in provincial and district centers, namely urban areas in 2012, it is seen that the urbanization rate in Balıkesir province reached 69.1% as of 2019. (URL1).



Figure 1. The location of the research area.

With the increasing pressure of urbanization, metropolitan and centre district municipalities of Balıkesir are building small or large parks in terms of transporting nature to the city and meeting the recreational needs of people. The open-green areas being in the boundary of Altieylül district municipality and defined as “small scale park” in the scope of the study are the main material of this study. The digital maps showing the current zoning status of Balıkesir province and satellite images with 1m. the resolution was used in the study as assistant materials.

2.2. Methods

This study aimed to evaluate the small scale parks in the boundaries of the Balıkesir Altieylül municipality according to the ecological design criteria determined in the scope of the study was carried out in two stages.

Stage 1. Determination of ecological design criteria that will be used to analyze the ecological aspects of city parks.

Stage 2. Located the small scale parks being in the research area and analyzed them in terms of ecological efficiency.

In the first phase of the study, studies about ecology, ecological planning, urban planning, creation of ecological cities and open-green areas providing urban ecology and ecological design criteria identified in these studies are examined in order to establish a set of criteria to be used in the assessment of the urban open-green areas in terms of ecology.

In the literature, the four features required to be close to the natural state are emphasized in determining the ecological quality of an area. Forman (1997), stated that more objective interpretations can be made about the ecological quality of an area taking into account one or several criteria expressed in the form of vegetative production, water, biodiversity and land (Eşbah, 2006; Cook, 2002).

Under the scope of the study, ecological design criteria for assessing the ecological characteristics of small scale parks is organized in three different groups on configuring these four ecological quality criteria. These groups are: 1- Physical and Ecological Design, 2- Environment, 3- Culture and Education.

- **Planning of the parks on the axis of the physical and ecological design;** requires that the buildings in the park, access roads inside the park, children's play areas and parking areas must be planned according to certain principles of ecological design. The ecological criteria requiring to consider the design of buildings in parks can be summarized as follows: Utilization of photovoltaic panels for electricity production, hot water supply through solar collectors, using solar shading elements in the windows, making thermal insulation on the roof and the building shell, the use of intelligent control systems for comfort conditions, using natural and/or recycled materials, using collection systems for rainwater on roofs and other surfaces, using water filtration systems, using the systems of waste separation and conversion of solid waste fertilizer, making arrangements to ensure the use of natural light throughout the day in the building design.

The standards and design requirements for access roads in parks can be summarized as follows: Walking tracks designed appropriately in terms of the structure of natural areas, enabling to connect people with nature with looking and recreation areas, the use of natural and local materials for the floor.

The standards and design requirements for parking areas in parks can be summarized as follows: Positioning them far away from the main park area, the use of water and moisture-absorbing floor, designing the bicycle parking area near the main building.

The ecological criteria requiring to consider the planning of playgrounds for children in the parks can be summarized as follows: Compliance with the standards and security policy, the use of toys designed appropriately for children scale and produced from high-quality raw materials, giving place to the muddy grounds, the use of correct night lighting, establishing a bond with green spaces with designing in close proximity to trees (Razzaghian, 2012).

- **In the planning of the parks in the environmental axis;** energy, plants and animals, pollution, recycling of waste, wastewater, fertilizer production and water consumption, the continuation of the life cycle, the sustainability of wildlife, seed provision for birds, cultivation of medicinal plants are the most important indicators for reduction of air and noise pollution (Razzaghian, 2012).

- **In the planning of the parks in culture and education axis;** the understanding proper to the concept and aim taking into recreation areas is very important.

While the parks are planning, a focal point and/or a theme of each park that is a reason for being is important. This can be a beautiful viewpoint either a centuries-old tree, a well-maintained and attractive flower garden, periodically stage outdoor performances / concerts / exhibits, artworks symbolizing social history / culture / important events. People should know that they can find something special when they come to the park. In addition, the parks should include arrangements and functions that all age groups can find something for themselves, enjoy the time with. These include playgrounds, zoos, animal shelters for children, sports areas for young people, walking paths and resting places etc. for elderly people (Aydemir, and others, 2004; Razzaghian, 2012).

In the second phase of the study, digital maps were investigated in the computer environment, and 35 small-scale parks with a minimum area of 2000 m² to 8573 m² were determined in the study area by making use of satellite images. In practice, the greening works carried out on the roadsides and intersections were not considered in the park status and were excluded from the research. The ecological evaluation criteria determined within the scope of the study are expressed in Figure 2.



Figure 2. Ecological park evaluation criteria.

3. RESULTS AND DISCUSSION

It has been determined after the results of the examinations made on-site that 31 of the 47 small-scale parks surveyed served as parks, while the 16th did not have a parking function because they have not arranged yet, although they are seen as parks in the 1/1000 scale implementation plan of Balıkesir province (Figure 3). The evaluation of 31 small-scale parks serving as present parks according to the ecological design criteria determined within the scope of the study is made below under the main heading of each criterion.



Figure 3. Small-scale parks evaluated within the scope of the study.

After the detection of 31 parks (Figure 4) implemented in Balıkesir Altıeylül District, on-site evaluations were made by 3 different evaluators according to the set of generated criteria. The evaluation results are

scored between 0 and 4, with the expressions "absolutely", "partially", "providing", "providing at a good level" and "absolutely providing" based on the 5-point Likert scale; the total score values of the parks were found by taking the average of the scores given by the evaluators.

According to the situation of the parks having a playground and a functional building, they were evaluated on the following total scores (Table 2).

Table 2. Total scores of parks.

	Parks with a functional structure and a children's playground	Parks without a functional building	Parks that do not have a functional structure and children's playground
Total score	224	144	124



Figure 4. Applied parks covered in the study.

3.1. Evaluation of Parks on the Physical and Ecological Design Axis

In the assessment made according to the ecological criteria that should be considered in the design of park buildings, the building (cafeteria, buffet and public building) functioning was identified in 5 out of 31 parks (P7, P11, P17, P20, P26). However, none of the buildings has been arranged according to the ecological design concept (Figure 5).



Figure 5. Functional building examples in parks.

In the assessment made according to the standards and design requirements for the access roads in the parks, in one of the 31 parks (P23), hiking trails, viewing and recreation areas were never considered;

other than these, it has been determined that these areas are designed in good order in some, and weaker in others. Very few of the parks evaluated have seen the use of rubber-based flooring materials with high flexibility in hiking trails (Figure 6). However, it has been observed that applications do not conform to the character of natural areas, they are produced with extremely artificial solutions and are weak at the point of linking with nature. In addition, in many parks, materials, which are preferred as concrete parquet far from locality and naturalness, used for hard floors have been seen as negative at the point of using ecologically recyclable materials.



Figure 6. Different floor materials used in parks.

In the assessment made according to the standards and design requirements for parking spaces in the parks, it has been seen that parking space is considered in the design of only 2 of 31 parks. However, design requirements such as the positioning of these areas away from the main parking area, the use of water and moisture absorbing flooring in the ground have not been fulfilled. Another design requirement, bicycle parking areas (Figure 7), is seen in only 2 parks.

In the assessment made according to the ecological criteria to be considered in the planning of playgrounds for children in parks, it has been found that 27 of the 31 parks have children's play areas (Figure 7). In these areas, it has been observed that the required standards and safety guidelines are followed. Children's scale was taken into consideration in toys located in the fields; on the other hand, it is seen that the materials used are not natural but mostly plastic based. The floors of the areas are mostly covered with rubber material and it has been observed that the elements used to illuminate these areas are located at sufficient frequency. However, it has been found that the lighting elements used are higher than necessary and that solar energy systems are not used for lighting except only one park. In addition, it has been estimated that the point playgrounds are designed in places close to the trees so that children can connect with green areas is considered in 13 parks and P2 and P15 parks are designed at a good level. In the parks except these, there is no correct planning in this regard.



Figure 7. An example of a bicycle parking area, and playgrounds.

When the parks are evaluated on the physical and ecological design axis, three groups are allocated according to the situation of being a functioning building and a playground for children in the park. The evaluation of these three groups is given in the following tables (Figure 8,9).

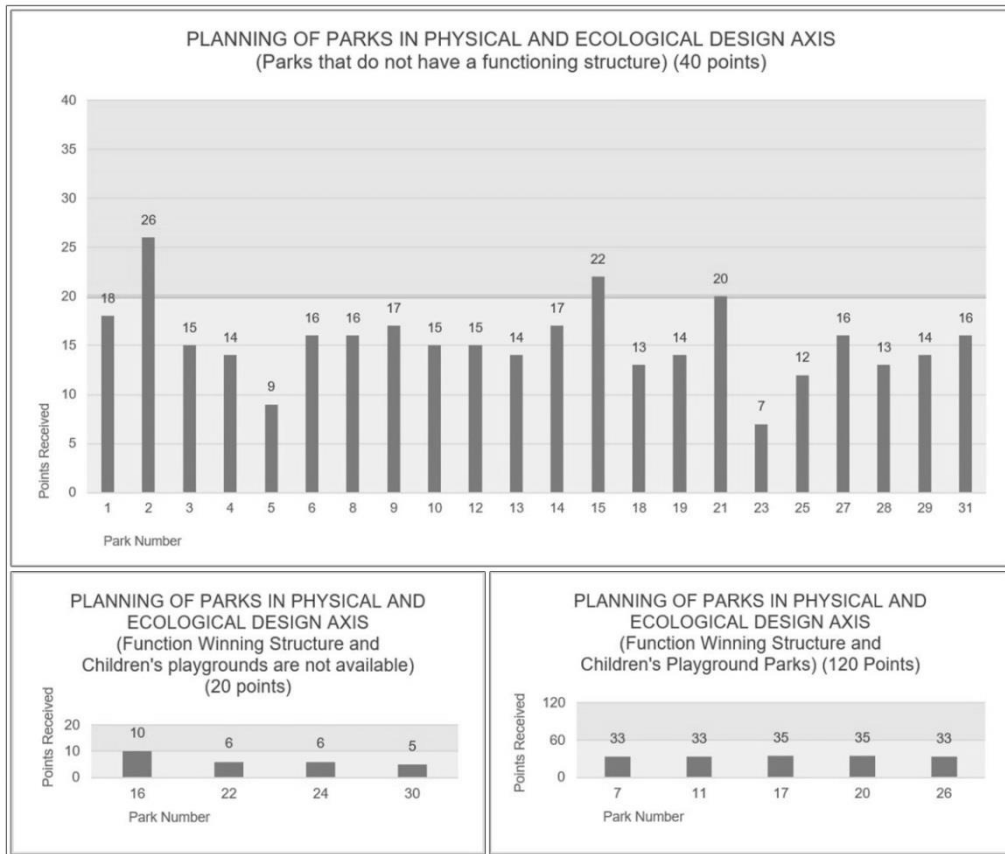


Figure 8. Evaluation of parks on the physical and ecological design axis.

When we look at the percentage distribution of parks that have children's playground but do not have a functioning building; we can see that 91% of the parks (20 parks) get points between 25% and more of the total points and 9% of the parks (2 parks) get between 10% and 25% of the total score.

If we look at parks that have children's playgrounds and a functional building or that does not have a functional building and a children's playground, we can see that all of these parks score 25% or more of the total score they can get.

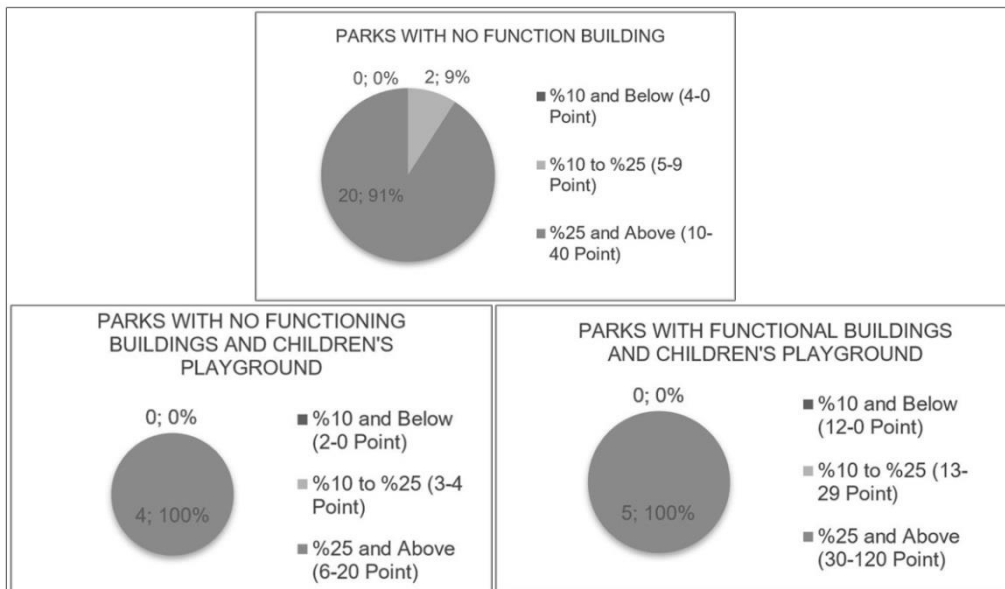


Figure 9. Percentage distribution of parks.

3.2. Evaluation of Parks on the Axis of the Environment

Well in 6 out of 31 parks and in 14 parts, it has been tried to prevent the parking areas from being influenced by intense wind and sunlight with appropriate plant species and orientation according to seasons (figure 10). It was observed that in 6 from 31 parks, locally-specific plants were aimed to be cultivated by carrying out planting even if it is limited. It was found positive that utilization of the solar energy system with the use of photovoltaic panels in only seen at P11 (Figure 10). In the parks where the evaluations are made apart from these limited applications; there have been no applications in the areas of continuation of the life cycle, continuity of wildlife, energy, plants and animals that are very important in terms of reducing air and noise pollution, environmental pollution, waste recycling, wastewater, fertilizer production and water consumption.



Figure 10. Application example of active (photovoltaic panel) and passive (solar control with trees) methods.

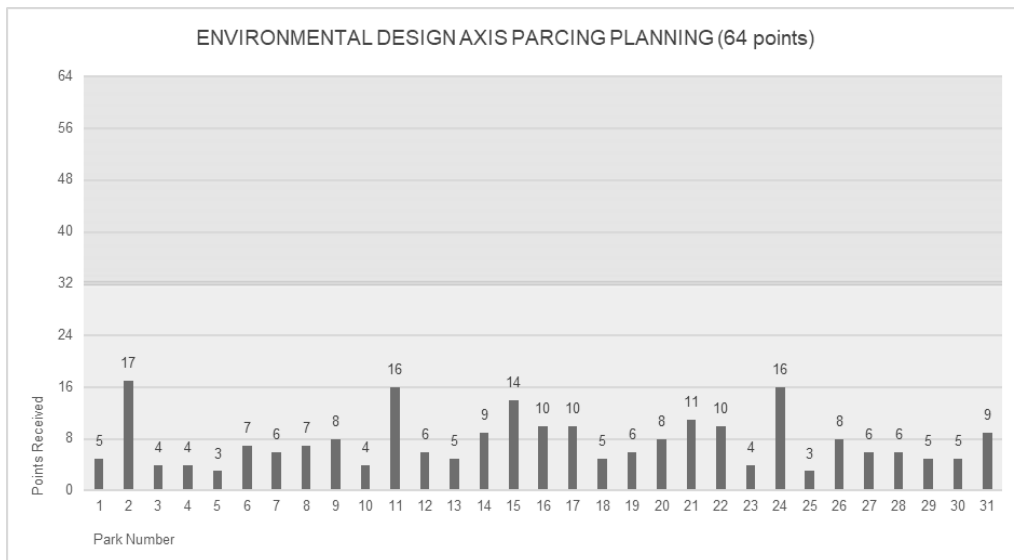


Figure 11. Evaluation of parks on the axis of environmental design.

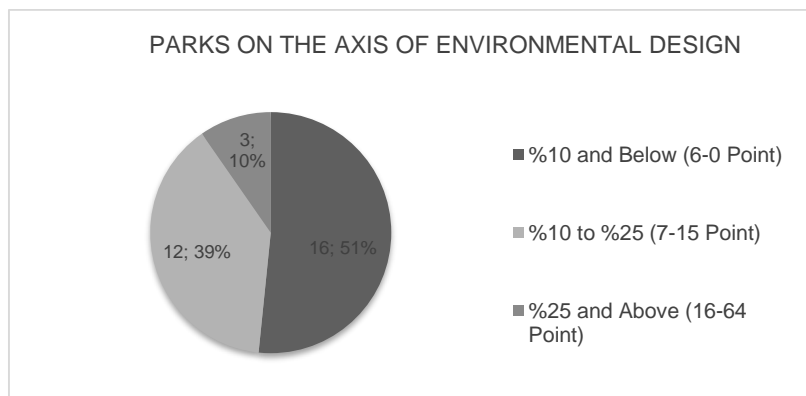


Figure 12. Percentage distribution of parks on the axis of environmental design.

When we look at the percentage distribution of parks on the axis of environmental design; it can be seen that 10% of the parks (3 parks) get 25% and above of the total score; 39% of the parks (12 parks) get

points between 10% and 25% of the total score; 51% of the parks (16 parks) receive 10% or less of the total score (Figure 11,12).

3.3. Evaluation of Parks on the Axis of Culture and Education

27 of the 31 parks have playgrounds for children, 19 of them have walking and resting areas for the elderly, 30 of them have viewing areas, 22 of them have sports equipment (Figure 13), and 12 of them have sports fields for young people (Figure 13). An animal shelter is not considered in any park, and no educational building is located in any park. It has been detected that only 1 park within 31 parks has been tried to be organized according to a certain theme, taking into account the existing tree and the location and size of this tree.



Figure 13. Sports fields in parks.

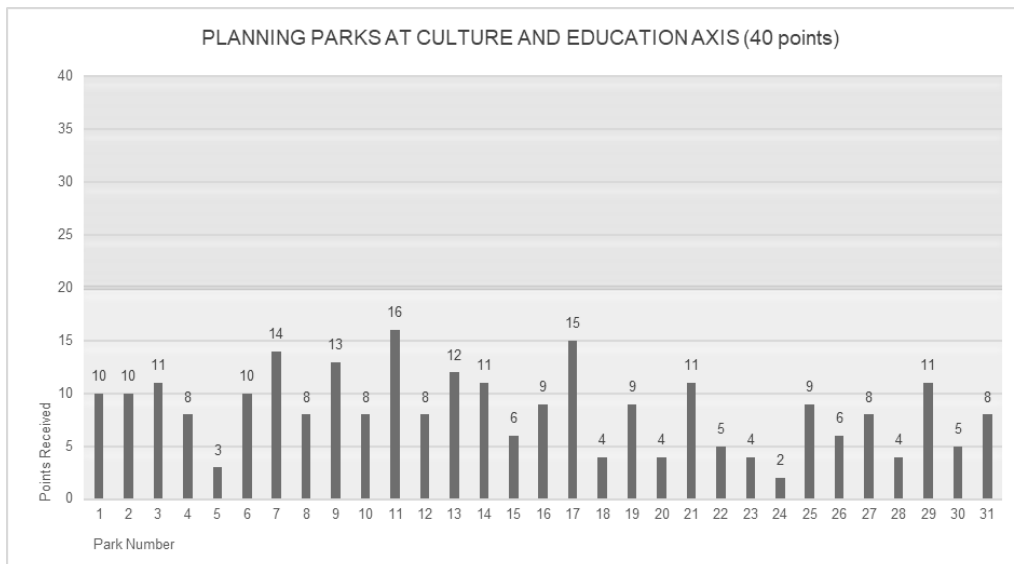


Figure 14. Evaluation of parks on the axis of culture and education.

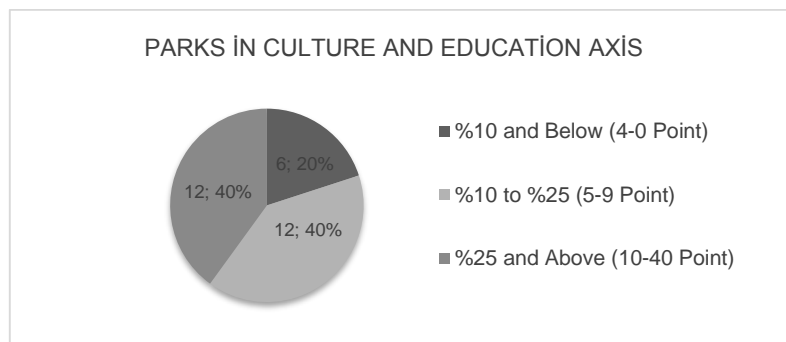


Figure 15. Percent distribution of parks in culture and education axis.

When we look at the percentage distribution of parks in terms of culture and education; we can see that 40% of the parks (12 parks) that the parks can get 25% of the total points and above; 40% of the parks (12 parks) get points between 10% and 25% of the total score; 6% of the parks (6 parks) receive 10% or less of the total score (Figure 14,15).

4. CONCLUSION

The rapidly depleted resources with the increasing technological and economic developments in the world in recent years cause the natural balance to deteriorate. Intense urbanization pressure caused by population growth, especially in cities, changes urban ecosystems to a great extent. At this point, while urban parks contribute to urban ecology and aesthetics, they also play an important role by allowing individuals to regenerate physically and spiritually and to engage in many active-passive recreational activities.

Regarding the city parks, which offer the opportunity to be alone with nature and play a significant role in increasing the life quality of the users as well as the formation of urban culture; In response to changing social needs and urban-nature approaches, the form and functions of parks have changed, and the concept of "ecology" has come to the fore in park design with the reinterpretation of nature. So much so that parks, as Chiesura stated; Besides their social benefits such as creating a sense of community; It is also ecologically important due to their features such as being home to many living species, reducing CO2 emissions, and protecting the climatic balance (Chiesura, 2004).

In this study, firstly, it is aimed to determine the ecological design criteria that can be effective in creating a quality living environment for the users in small-scale city parks by explaining the conceptual structure of ecological parks that have become a tool in the goal of sustainable cities in societies where environmental awareness has matured. For this purpose, three main ecological design criteria and sub-criteria related to these main criteria have been established. These; on the axis of physical and ecological design, on the axis of environmental design, and on the axis of culture and education. In the second phase of the study, it was aimed to determine the adequacy of the small-scale parks determined in the research area according to the ecological design criteria. Accordingly, it has been determined that small-scale parks, which are sufficient in number but do not show a balanced distribution, are organized according to ecological design principles and an inadequate planning approach.

As a result, while small-scale city parks, one of the important centers of urban open and green spaces, are being planned to protect the ecosystem and ensure its sustainability; Specific to ecological design principles, it should be planned in terms of quality and quantity, in a balanced manner and in accordance with the user profile, and these areas should be associated with other open and green areas in the city. In the arrangements to be made in these areas, standards for sustainable area design and management should be clearly defined at the local and regional scale and relevant legal regulations should be made based on these data.

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