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# Multi-criteria evaluation of active green spaces in Cukurova district in Adana*

## Adana kenti Çukurova ilçesi aktif yeşil alanlarının çok ölçütlü değerlendirmesi

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**ABSTRACT**

Today, rapid urbanization and rapid population growth increase the pressure on green spaces which have become insufficient to meet public demands. The active green spaces – the places essential for individuals to satisfy their longing for nature and to realize their recreational activities – need to be sufficient in quality and quantity in function in urban areas. To form green spaces to meet the needs, these spaces need to be designed properly by determining their quantity and quality. In this regard, it was aimed to establish the criteria to determine the quality and the quantity of active green spaces in Cukurova district in Adana, Turkey. In the study, the weighted criteria method was used. This method involves assigning values and calculations to defined criteria for determining the quality and quantity of active green spaces in the research area. According to the results, none of the active green spaces within the studied area is suitable for the highest appropriateness level; all local parks are at middle appropriateness level, 8.33% of neighborhood parks are the lowest, 66.67% of them are low and 25% of them are middle regarding appropriateness levels; 2.7% of the playgrounds are the lowest, while 16.23% of them are low, 67.56% of them are middle and 13.51% of them high; half of the sport areas are low, while the other half is high according to appropriateness level. The arrangements, which were made by taking into account the criteria in the study and based on the importance level priorities of active green spaces, will be able to raise the appropriateness levels of active green spaces.

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**ÖZ**

Günümüzde hızlı kentleşme ve yoğun nüfus artışı yeşil alanlar üzerindeki baskıların artmasına sebep olmaktadır. Giderek azalan yeşil alanlar halkın ihtiyaç ve isteklerine cevap vermekte yetersiz kalmaktadır. Kentlerde bireylerin doğaya olan özlemlerini ve rekreasyon etkinliklerini gerçekleştirebilecekleri alanlar olan aktif yeşil alanların kent içindeki işlevlerini yerine getirebilmeleri için nitelik ve nicelik olarak yeterli olması gerekir. Bu bağlamda, Adana kenti Çukurova ilçesinde aktif yeşil alanların nitelik ve niceliklerinin saptanmasında kullanılabilecek ölçütlerin belirlenmesi ve mevcut alanların bu ölçütlere uygunluğunun saptanarak geliştirme önerilerinin getirilmesi amaçlanmıştır. Çalışmada, ağırlıklandırılmış ölçütler yöntemi kullanılmıştır. Bu yöntem, araştırma alanında aktif yeşil alanların miktarını ve kalitesini belirlemek için, ölçütlere değer atama ve hesaplamaları içermektedir. Elde edilen sonuçlara göre, araştırma alanında herhangi bir aktif yeşil alanın en yüksek uygunluk sınıfında bulunmadığı saptanmıştır; Semt parkları orta uygunluk seviyesinde, mahalle parklarının % 8.33'ü en düşük,% 66.67'si düşük ve % 25'i orta uygunluk sınıfında; Oyun alanlarının % 2.7'si en düşük, % 16.23'ü düşük, % 67.56'sı orta, % 13.51'i yüksek; Spor alanlarının ise yarısı düşük, diğer yarısı yüksek uygunluk sınıfındadır. Çalışmadaki ölçütlerin dikkate alınmasıyla yapılacak düzenlemeler yeşil alanların mevcut durumun iyileştirilmesini sağlayacaktır.

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## 1. Introduction

One of the major problems creating negative effects on the environment where we live in is rapid and unplanned urbanization. This problem leads to a gradual reduction in terms of space size, accessibility and provided opportunities in social facility areas (especially green spaces) which are important components of urban life quality. With the functions they provide, green spaces are of great importance in terms of land use, both for the whole city and the urbanites. Depending on their spatial structure and functional characteristics, these are the functional places generating advantages in terms of the

physical and social environment within the city (Ceylan 2007). Green spaces are generally classified into two main groups which are "active green spaces" and "other green spaces" in the relevant literature and legal regulations. The term "active green spaces" refers to the places which provide wide opportunities and are easily accessible urban amenities (parks, playgrounds, sports areas etc.) Considering the features and quality of active green spaces; their purpose of use, their size, equipment status, and functions are important determinants of urban life quality (Emür and Onsekiz 2007).

The "Definitions" title of the Regulation on Principles of Planning promulgated in the official journal no 18916 on November 02, 1985 (the 8th subsection under the 3rd clause) defines the term active green spaces as *parks, children's grounds and playgrounds*. The appendix-1 of the amendment for the same regulation promulgated in the official journal no 23804 on September 02, 1999 determines the total area to be provided per person as 10 $m^2$. Beyond these numerical determinants, there is no prediction that guides to green spaces (Manavoğlu and Ortaçeşme 2007). Even if the mentioned amount of green space per person is achieved either in planning or in practice, the effectiveness of the active green spaces in meeting the needs of urban dwellers decreases when evenly distribution of city units, facility diversity in provided opportunities and fitting elements with the type of the active green spaces are ignored. It is important to make them more qualified in order to ensure more effective use.

Increasing the effectiveness of active green spaces is possible by primarily determining their quality and quantity in accordance with the needs and by directing the findings to plan and practice.

The objectives of the study are specifying the standards and norms for active green spaces in Turkey, evaluating current utilization process of active green spaces in Cukurova District of Adana City and setting forth enhancement possibilities, specifying the status of the active green spaces in terms of planning and design standards within the research area and developing a mathematical method which can be used in comparison and evaluation.

## 2. Materials and Methods

The research area covers Cukurova District located within the Adana metropolitan area. The district, which is located in the northwest of Adana city, has 4 283 ha of surface area. It contains 12 neighborhoods and represents 21.5% of the total residential area of Adana city, which is approximately 20 000 ha. According to the current data by TUIK (2016), the total population of Cukurova district is 359 315. The locations of Adana Province and Cukurova district are given in Figure 1.

In this study, 1/1 000 scaled maps, construction plans, satellite images dated 2011, on-site imaging, plans and reports related to the area have been used in order to specify current status of active green spaces. MS Office Excel, SPSS 13 and CAD (AutoCAD) software have been used in analyzing the data and creating maps.

**At the first stage of the study**; literature search has been made both in Turkey and abroad among local laws and regulations in order to specify the norms and standards used while evaluating active green spaces in terms of quantity and quality. 49 different criteria, which are classified into three

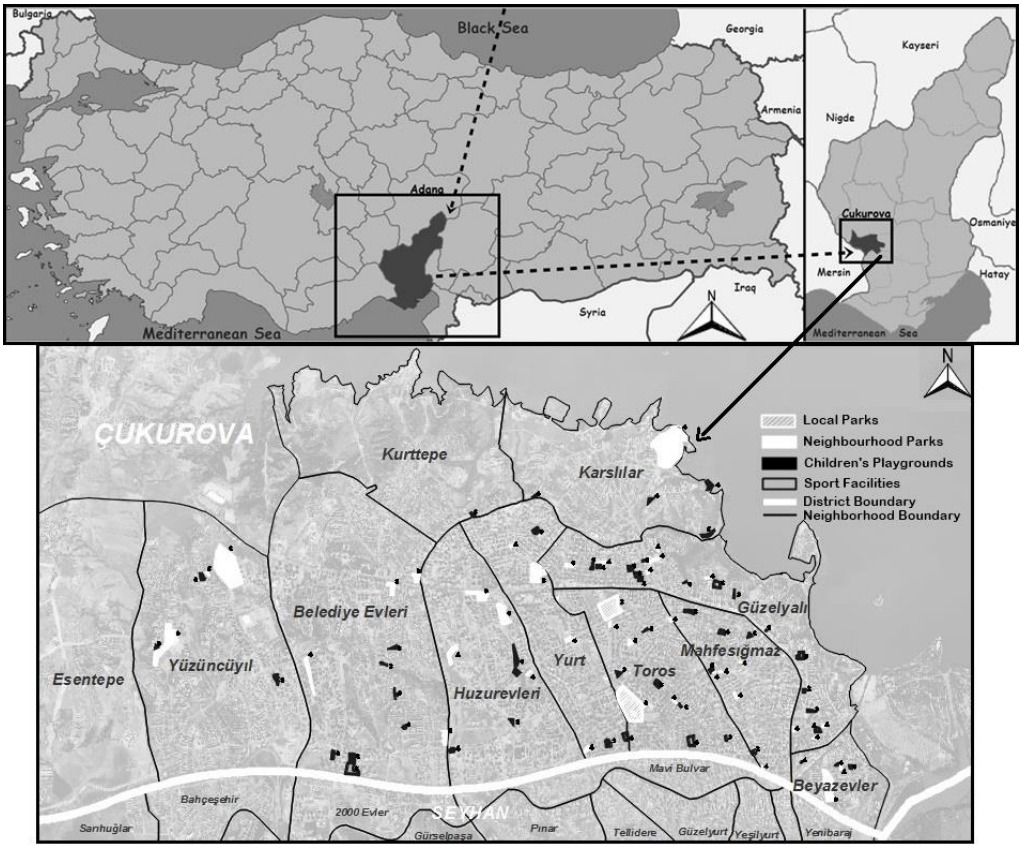


**Figure 1.** The location of the research area (Cukurova district) and Adana in Turkey.

groups (Proportional criteria, leveled criteria, criteria that cannot be leveled) were used to evaluate active green spaces of Cukurova district:

1. Proportional Criteria: Criteria in which the relevant value is converted to proportional values between 0-3.

2. Leveled Criteria: Criteria in which a value between 0-3 is assigned according to the relative importance of the green space characteristic.

3. Criteria that cannot be leveled: Criteria in which a value of 3 is assigned if the green space possesses the relevant characteristics/facility, and a value of 0 if it doesn't.

**At the second stage of the study**, an importance level coefficient (weight) has been assigned to each of the 49 criteria. Coefficient definition process has been carried out by 30 experts (landscape architects, architects, urban and regional planners) who were asked to assign a value between 1-5 to all criteria. Values were calculated and considered as the coefficients (weights) of each criterion. Thereafter, during the fieldworks, all active green spaces were scored based on the determined criteria.

**At the third stage of the study**, depending on the active green space type, weighted scores and total weighted scores have been calculated with the help of the following formulas:

$WS_a$ (Weighted $Score_a$)= $C_a$ (Coefficient a) x $CT_a$ (Criterion a)

$$\text{Total Weighted Score} = \sum_{n=1}^{n} C_{1\ldots n}\ x\ CT_{1\ldots n}$$

Following this stage, in order to specify appropriateness classes, total weighted scores have been calculated depending on active green space type and then, using the following equation, appropriateness levels were defined.

$$\text{Maximum Weighted Score Depending on Active Green Space Type} = \sum_{n=1}^{n} C_{1\ldots n}\ x\ CT_{max}$$

$$\text{Appropriateness Level} = \frac{\sum_{n=1}^{n} C_{1\ldots n}\ x\ CT_{1\ldots n}}{\sum_{n=1}^{n} C_{1\ldots n}\ x\ CT_{max}}\ x\ 100$$

Five different appropriateness classes were defined: the lowest appropriateness (0%-20%), low appropriateness (20.01%-40%), medium appropriateness (40.01%-60%), high appropriateness (60.01%-80%), and the highest appropriateness (80.01%-100%). An appropriateness map showing appropriateness classes of the research area has also been created.

**As for the final stage of the study**, in order to test the efficiency of the coefficients and score variables used in the method and to propose suggestions, the following approaches have been used:

Approach A (Low Criteria Approach): Means putting in and/or enhancing the criteria that place in the last 20% percentile when the arithmetic mean of criteria scores, depending on the active green space type sorted.

Approach B (High Coefficients Approach): Means putting in and/or enhancing the criteria that place in the first 20% percentile when weighting coefficient, depending on active green space type sorted.

Values corresponding both approaches have been identified and both approaches have been compared by determining the quantitative differences of appropriateness classes and proportional differences of appropriateness levels in the case that they get the highest scores. Suggestions for increasing the appropriateness scores of the active green spaces within the context of neighborhoods have been given by considering the appropriateness scores obtained as a result of the Weighted Criteria Method.

## 3. Research Findings

According to the results of the quantitative analysis, a total of 87 active green spaces including 2 local parks, 36 neighborhood parks, 37 children's playgrounds and 12 sports areas, which are distributed in 10 neighborhoods, exist in the Cukurova District (Table 1). Any kind of active green space wasn't detected in Sambayadi and Esentepe neighborhoods.

**Table 1.** Number of Active Green Spaces in Cukurova District.

| | Active Green Space Type | | | | |
|---|---|---|---|---|---|
| Neighborhoods | Local Parks | Neighborhood Parks | Children's playgrounds | Sport Areas | Total |
| 100. Yıl | - | 3 | 3 | - | 6 |
| Belediye evleri | - | 4 | 6 | 1 | 11 |
| Beyazevler | - | 2 | 3 | - | 5 |
| Güzelyalı | - | 9 | 8 | 6 | 23 |
| Huzurevleri | - | 4 | 3 | - | 7 |
| Karslılar | - | 1 | 4 | - | 4 |
| Kurttepe | - | - | 1 | - | 1 |
| Mahfesığmaz | - | 5 | 4 | 1 | 10 |
| Toros | 2 | 4 | 4 | 2 | 12 |
| Yurt | - | 4 | 1 | 2 | 7 |
| Şambayadı | - | - | - | - | - |
| Esentepe | - | - | - | - | - |
| Total | 2 | 36 | 37 | 12 | 87 |

Based on the discussions with specialists and as a result of a literature search on the standards and norms, 49 criteria have been determined and classified. Considering the relation between the criteria and active green space types, all 49 criteria for local parks (L); 48 criteria for neighborhood parks (N); 39 criteria for children's playgrounds (CP) and 28 criteria for sports areas (SF) have been used (Table 2). Criteria's references and explanations were given in Table 3.

During the fieldwork, 87 active green spaces were evaluated by 49 criteria. And Active green spaces' weighted scores and total weighted scores have been calculated for all active green space types. Weighted scores of each criterion have been calculated by multiplying coefficient and criterion score. Each active green space's total weighted score has been calculated by aggregating whole criteria's weighted scores. If all the scores are accepted as 5, the maximum total weighted scores of active green spaces were found to be 624.15 for local parks, 613.05 for neighborhood parks, 498.81 for children's playgrounds and 362.34 for sports areas. After fieldworks, total weighted scores of local parks are 332.28 and 357.53. The highest total weighted scores of active green spaces are 351.53 for neighborhood parks, 327.57 for children's playgrounds and 192.19 for sports areas. The lowest total weighted scores of active green spaces are 21.78, 66.63 and 81.64, respectively.

When their appropriateness classes are evaluated, it has been observed that none of the active green spaces located in research area are included in the highest appropriateness class.

**Table 2.** Active green space evaluation criteria, characteristics and scores used for evaluation.

| Evaluation Criteria and Characteristics Used | Score | Evaluation Criteria and Characteristics Used | Score |
|---|---|---|---|
| 1.Space size (A) (L, N, CP, SA) *KT: 3.55* | | 2. Space slope (B) (L, N, CP) *KT: 3.60* | |
| • For local and neighborhood parks 0-11 383 m² and above | 0-3 | • 0-2% almost flat and 2-6% gentle slope | 3 |
| • For children's playgrounds 0-8 535 m² and above | 0-3 | • 6-12% moderate slope | 2 |
| • For sports areas 0-45 520 m² and above | 0-3 | • 12-20% steep | 1 |
| | | • 20-30% stiff and 30% and above | 0 |
| 3. Fitting elements appropriate for the disabled (B) (L, N, CP) *KT: 4.58* | | 4. Presence of ramps for the disabled (C) (L, N, CP, SA) *KT: 4.79* | |
| • 5 and 6 pieces of appropriate elements | 3 | • Yes | 3 |
| • 3 and 4 pieces of appropriate elements | 2 | • No | 0 |
| • 1 and 2 pieces of appropriate elements | 1 | | |
| • No appropriate elements | 0 | | |
| 5. Presence of bordering elements (C) (L, N, CP, SA) *KT: 3.74* | | 6. Positional safety of sitting elements (C) (L, N, CP, SA) *KT: 4.21* | |
| • Yes | 3 | • Safe | 3 |
| • No | 0 | • Not safe | 0 |
| 7. Roads surrounding the park (A) (L, N, CP, SA) *KT: 3.42* | | 8. Presence of pedestrian crossings to reach the park (C) (L, N, CP, SA) *KT: 4.47* | |
| • Score for the roads | 0-3 | • Yes | 3 |
| | | • No | 0 |
| 9. Pavement width on the roads to the park (B) (L, N, CP, SA) *KT: 3.68* | | 10. Plantation maintenance (C) (L, N, CP, SA) *KT: 4.37* | |
| • 2.25 < Pavement width | 3 | • Well-maintained | 3 |
| • 1.5 < Pavement width < 2.25 m | 2 | • Ignored | 0 |
| • Pavement width < 1.5 m | 1 | | |
| • No pavement | 0 | | |
| 11. Maintenance of fitting elements (C) (L, N, CP, SA) *KT: 4.53* | | 12. Presence of a drainage system (C) (L, N, CP, SA) *KT: 4.53* | |
| • Well-maintained | 3 | • Yes | 3 |
| • Ignored | 0 | • No | 0 |
| 13. Presence of water surfaces (C) (L, N, CP) *KT: 3.58* | | 14. Appropriate plant selection for the use (C) (L, N, CP, SA) *KT: 4.68* | |
| • Yes | 3 | • Yes | 3 |
| • No | 0 | • No | 0 |
| 15. Creating appropriate shade effect through plantation (C) (L, N, CP) *KT: 4.47* | | 16. Correct positioning and creating signaling effect through plantation (C) (L, N, CP) *KT: 3.74* | |
| • Yes | 3 | • Yes | 3 |
| • No | 0 | • No | 0 |
| 17. Presence of visual control through plantation (C) (L, N, CP) *KT: 4.16* | | 18. Presence of wind control through plantation (C) (L, N, CP) *KT: 3.74* | |
| • Yes | 3 | • Yes | 3 |
| • No | 0 | • No | 0 |
| 19. Appropriateness of the material used in transportation network for the stipulated use (B) (L, N, CP) *KT: 4.58* | | 20. Presence of guidance on transportation network (C) (L, N, CP) *KT: 4.00* | |
| • 4 and 5 appropriate features | 3 | • Yes | 3 |
| • 2 and 3 appropriate features | 2 | • No | 0 |
| • 1 appropriate feature | 1 | | |
| • No appropriate feature | 0 | | |
| 21. Road width of transportation network (B) (L, N, CP) *KT: 4.05* | | 22. Appropriate material for climate conditions in group sitting elements (C) (L, N, CP, SA) *KT: 4.63* | |
| • 2.25 < Road width | 3 | • Appropriate | 3 |
| • 1.5 < Road width < 2.25 m | 2 | • Inappropriate | 0 |
| • Road width < 1.5 m | 1 | | |
| • No transportation network | 0 | | |
| 23. Situating sitting elements for group use considering climate conditions (C) (L, N, CP, SA) *KT: 4.68* | | 24. Ergonomic characteristics of group sitting elements (B) (L, N, CP, SA) *KT: 4.63* | |
| • Situated considering climate conditions | 3 | • 5 and 6 appropriate characteristics | 3 |
| • Not situated considering climate conditions | 0 | • 3 and 4 appropriate characteristics | 2 |
| | | • 1 and 2 appropriate characteristics | 1 |
| | | • No appropriate characteristics | 0 |
| 25. Appropriate material for climate conditions in sitting elements (C) (L, N, CP, SA) *KT: 4.74* | | 26. Ergonomic characteristics of sitting elements (B) (L, N, CP, SA) *KT: 4.68* | |
| • Appropriate | 3 | • 5 and 6 appropriate characteristics | 3 |
| • Inappropriate | 0 | • 3 and 4 appropriate characteristics | 2 |
| | | • 1 and 2 appropriate characteristics | 1 |
| | | • No appropriate characteristics | 0 |

**Table 2 (continue).** Active green space evaluation criteria, characteristics and scores used for evaluation.

| Evaluation Criteria and Characteristics Used | Score | Evaluation Criteria and Characteristics Used | Score |
|---|---|---|---|
| 27. The Size of the children's playgrounds in neighborhood (A) (L, N) *KT: 4.00* | | 28. Choosing harmless materials for children in children's playgrounds and activity areas (B) (L, N, CP) *KT: 5.00* | |
| • 0-3 096 m² and above for children's playgrounds | 0-3 | • 3 appropriate materials | 3 |
| | | • 2 appropriate materials | 2 |
| | | • 1 appropriate material | 1 |
| | | • No appropriate materials | 0 |
| 29. Situating playgrounds and activity areas considering climate conditions (C) (L, N, CP) *KT: 4.72* | | 30. The relation between playgrounds and surrounding elements (B) (L, N, CP) *KT: 4.00* | |
| • Situated considering climate conditions | 3 | • Related to 3 elements | 3 |
| • Not situated considering climate conditions | 0 | • Related to 2 elements | 2 |
| | | • Related to 1 element | 1 |
| | | • No relation | 0 |
| 31. Ergonomic characteristics of play elements (B) (L, N, CP) *KT: 4.78* | | 32. Play element diversity (B) (L, N, CP) *KT: 4.44* | |
| • 5 and 6 appropriate characteristics | 3 | • 5 and more than kinds of play elements | 3 |
| • 3 and 4 appropriate characteristics | 2 | • 3 and 4 kinds of play elements | 2 |
| • 1 and 2 appropriate characteristics | 1 | • 1 and 2 kinds of play elements | 1 |
| • No appropriate characteristics | 0 | • No play elements | 0 |
| 33. Presence of appropriate plantation in children's playgrounds and activity spaces (C) (L, N) *KT: 4.67* | | 34. Sport area size in local and neighborhood parks (A) (L, N) *KT: 3.30* | |
| • Appropriate plantation exists | 3 | • 0-4 132 m² and above for sport areas | 0-3 |
| • Appropriate plantation doesn't exist | 0 | | |
| 35. Correct positioning of sport areas (C) (L, N, SA) *KT: 4.22* | | 36. Windswept Plantation for Summer Winds in Sport areas (C) (L, N, SA) *KT: 4.50* | |
| • True positioning | 3 | • Appropriate plantation exists | 3 |
| • False positioning | 0 | • Appropriate plantation doesn't exist | 0 |
| 37. Appropriate Plantation of Sport areas against Winter Winds (C) (L, N, SA) *KT: 4.50* | | 38. Appropriate plantation in sport areas (C) (L, N) *KT: 4.39* | |
| • Appropriate plantation exists | 3 | • Appropriate plantation exists | 3 |
| • Appropriate plantation doesn't exist | 0 | • Appropriate plantation doesn't exist | 0 |
| 39. Presence of appropriate floor cover for sport areas (C) (L, N, SA) *KT: 4.83* | | 40. Connection presence of sports facilities to main traffic route (C) (L, N) *KT: 3.67* | |
| • Yes | 3 | • Yes | 3 |
| • No | 0 | • No | 0 |
| 41. Presence of publicity board (C) (L, N, CP, SA) *KT: 4.11* | | 42. Presence of amphitheater (C) (L) *KT: 3.70* | |
| • Yes | 3 | • Yes | 3 |
| • No | 0 | • No | 0 |
| 43. Presence of lavatory-toilet (C) (L, N, CP, SA) *KT: 4.68* | | 44. Appropriate material use for dustbins (C) (L, N, CP, SA) *KT: 3.89* | |
| • Yes | 3 | • Appropriate | 3 |
| • No | 0 | • Inappropriate | 0 |
| 45. Ergonomic features of dustbins (B) (L, N, CP, SA) *KT: 3.78* | | 46. Presence of lightening elements (C) (L, N, CP, SA) *KT:4.33* | |
| • 5 appropriate characteristics | 3 | • Yes | 3 |
| • 3 and 4 appropriate characteristics | 2 | • No | 0 |
| • 1 and 2 appropriate characteristics | 1 | | |
| • No appropriate characteristics | 0 | | |
| 47. Appropriateness of the space for night Use (B) (L, N, CP, SA) *KT: 4.56* | | 48. Presence of separate usage area for fountains (C) (L, N, CP, SA) *KT: 3.83* | |
| • Completely illuminated | 3 | • Yes | 3 |
| • Half illuminated | 2 | • No | 0 |
| • Semi illuminated | 1 | | |
| • Completely dark | 0 | | |
| 49. Ideal height for the fountains (C) (L, N, CP, SA) *KT: 4.22* | | | |
| • Appropriate | 3 | | |
| • Inappropriate | 0 | | |

Criterion type: A= Proportional Criteria, B= Levelled Criteria, C= Criteria that cannot be levelled, Green space type: *L= Local Parks, N= Neighborhood Parks, CP= Children's Playgrounds, SA= Sport areas, KT: Importance level coefficients (weights).

All of the local parks were found to be in the medium appropriateness class. Regarding the neighborhood parks, 8.33%, 66.67% and 25% of them fall in in the lowest, low and medium classes, respectively. As for children's playgrounds; 2.7% is in the lowest, 16.23% is in low, 67.56% medium, 13.51% is in high appropriateness classes. When sports areas are evaluated, it has been observed that half of them is in the low and the other half is in the high class. Figure 2 shows the appropriateness classes of active green spaces.

When the Approach A (Low Criteria Approach) is implemented, it has been understood that the primary problems of local parks, neighborhood parks, and

**Table 3.** Criteria's references and explanations.

| Criteria's references and explanations |
|---|
| 1) According to Altunkasa 2004, ideal access distance for local and neighborhood parks is 400 m, for children's playgrounds it is 400 m and for sports areas it is 800 m. According to this, ideal amount for each active green space type has been found out by dividing total research area surface area by the area where access distance for related active green space is effective. Total active green space amount stated to be 22 $m^2$ (local and neighborhood parks 8 $m^2$, children's playgrounds 6 $m^2$, sport areas 8 $m^2$) by Altunkasa (2004) have been calculated through comparing with the standard total (without stating any type) 10 $m^2$ of active green space per person promulgated in the official journal no 23 804 on September 02, 1999. The result of the calculation for local and neighborhood parks is 3.63 $m^2$, children's playgrounds 2.72 $m^2$ and sports areas 3.63 $m^2$. The amount of the area necessary for the whole population has been calculated by multiplying ideal space amount per person by research area population. Ideal space amount considering green space type has been calculated by dividing the amount of the area necessary for the whole population by the number of parks necessary for research area. |
| 2) Scores stated by Ersoy (1994) have been used. |
| 3) During the evaluation of the criteria, appropriateness amount of 6 elements has been determinative. **(**1) Footpath width: 1.5 m according to TSI (1999) 12576 (2) Bench: seat width 45cm and backrest height 70 cm (3) Resting area for disabled chairs: beside the benches 90 x 90 cm, (4) Lavatory-Toilet: Required space size; width 2.25 m, length 2.25 m (5) Litter bins: height of the litter bins 90-120 cm, (6) Fountains: height of the fountains must be 90 cm. |
| 4) According to TSI (1999) 12576, the minimum width of the ramps must be 90 cm, and the maximum slope must be 8%. |
| 6) The distance between the benches and the path should be 60 cm and lightening elements should be present. |
| 7) The number of sides due to the geometrical shape of active green space parcel is accepted as the number of surrounding roads. Each road has been evaluated according to the types of the roads stated by Ersoy (1994) and the scores assigned for. Total score has been divided by the number of the sides of the parcel and an average score between 0 and 4 has been calculated. Since the methodology requires all the scores are between 0 and 3, this average score has been proportioned by 3. Footpaths 4 , Local roads (15 m) and blind streets (15 m) 3, Frontage roads (19.5 m) 2, Secondary roads (24 m) 1, Main roads (36.5-46 m) 0. |
| 9) Scores stated by Harris and Dines (1998) have been used. |
| 15) Situating plants in a way that they can provide shade for mentioned spaces, means that plants have shade effect. |
| 16) Situating plants in a way that they can provide shade for mentioned spaces, means that plants have shade effect. |
| 17) Masking unpleasant scenes, controlling reflections caused by natural-artificial light sources and preventing spaces from being totally covered by plants through the appropriate use of plants show that visual control exists. |
| 18) Use of sparsely leaved plants that allow wind blow through, along south and southwest direction and use of densely leaved plants that do not allow winter winds blow through, along north and northwest direction are accepted as appropriate use of plantation |
| 19) While evaluating this criterion, convenience of material characteristics such as (1) Structural characteristics of the surface material which does not limit pedestrian use, (2) Appropriate joint density and width, (3) Reflection characteristics of the surface (albedo), (4) Nonslip surface characteristics under rain, (5) Sufficiency of road infrastructure (tamped soil, stabilized filling or rubble etc.) has been determinant. |
| 20) The relation between the road and use has been considered. |
| 21) Standards stated by Harris and Dines (1998) have been used. |
| 22, 25) Wood is accepted as appropriate material. |
| 23) Spaces situated in the dominant summer wind direction and in the way that the users' faces are not directly exposed to the sun are accepted as appropriate. |
| 24, 26) While evaluating the criteria, presence of the characteristics such as (1) Ideal seat height which is 40-45 cm, (2) Ideal seat width which is 35-40 cm, (3) Backrest, (4) Ideal backrest height which is 50 cm, (5) Ideal angle between the seat and backrest which is 95-105°, (6) Armrest (Uzun 1989) has been determinant. |
| 27) Considering the idea that playgrounds and sports areas should exist in neighborhood parks, based on the method explained in standard no 1 "space size", children's playground ratio (2.72 $m^2$) in 10 $m^2$-active green space amount has been compared with the minimum acceptable value (11 383 $m^2$) in neighborhood parks. As a result of this comparison, 3096$m^2$ is the minimum acceptable value for children's playgrounds located in neighborhood parks. Size of children's playgrounds located in neighborhood parks has been specified considering the paths bordering these playgrounds (as parcels). |
| 28) While evaluating the criterion following materials' appropriateness has been determinant: (1) Grass area or sandy soil, (2) Game elements made of wood or plastics, (3) Secure connection points. |
| 29) Spaces situated in the dominant summer wind direction and in the way that the users' faces are not directly exposed to the sun are accepted as appropriate. |
| 30) While evaluating this criterion, the distance of the spaces to the following has been determinant: (1) Close distance to lavatory-toilet, (2) Close distance to fountains, (3) Away from the streets. |
| 31) While evaluating this criterion the following characteristics have been determinant: (1) Ideal slide slope, (2) Ideal slide width, (3) Ideal distance between stairs, (4) Ideal swing height and chain length, (5) Ideal seat width, (6) Ideal seesaw length and height. |
| 32) Instrument diversity such as slide, swing, seesaw, climbing instruments, sandpit has been considered. |
| 33) Thornless, non-poisonous, unattractive plants for bees have been accepted as appropriate. |
| 34) Considering the idea that playgrounds and sports areas should exist in neighborhood parks, based on the method explained in standard no 1 "space size", children's playground ratio (3.63 $m^2$) in 10 $m^2$-active green space amount has been compared with the minimum acceptable value (11 383$m^2$) in neighborhood parks. As a result of this comparison, 4 132 $m^2$ is the minimum acceptable value for sports facilities located in neighborhood parks. Size of sports facilities located in neighborhood parks has been specified considering the paths bordering these playgrounds (as parcels). |
| 35) Positioning sports areas in northern direction with an angle of ±7º has been accepted as ideal. |
| 36) Use of sparsely leaved plants that allow wind blow through, along south and southwest direction is accepted as appropriate use of plantation. |
| 37) Use of densely leaved plants that do not allow winter winds blow through, along north and northwest direction is accepted as appropriate use of plantation. |
| 38) Evergreen, unattractive plants for bees with ideal distance (so that branches shall not lean towards the sports area) is appropriate. |
| 44) Metal, wood, fiberglass and cast concrete have been accepted as appropriate material for dustbins. |
| 45) While evaluating this criterion, the appropriateness of the following characteristics has been determinant: (1) Ideal height, (2) whether being of close ones or not, (3) Ideal waste throw angle, (4) Appropriate capacity, (5) Binbagged or having buckets. |
| 47) This criterion has been evaluated considering the amount of light provided by lightening elements. |
| 49) Ideal fountain height is accepted as 90-100 cm by Harris and Dines (1998). |

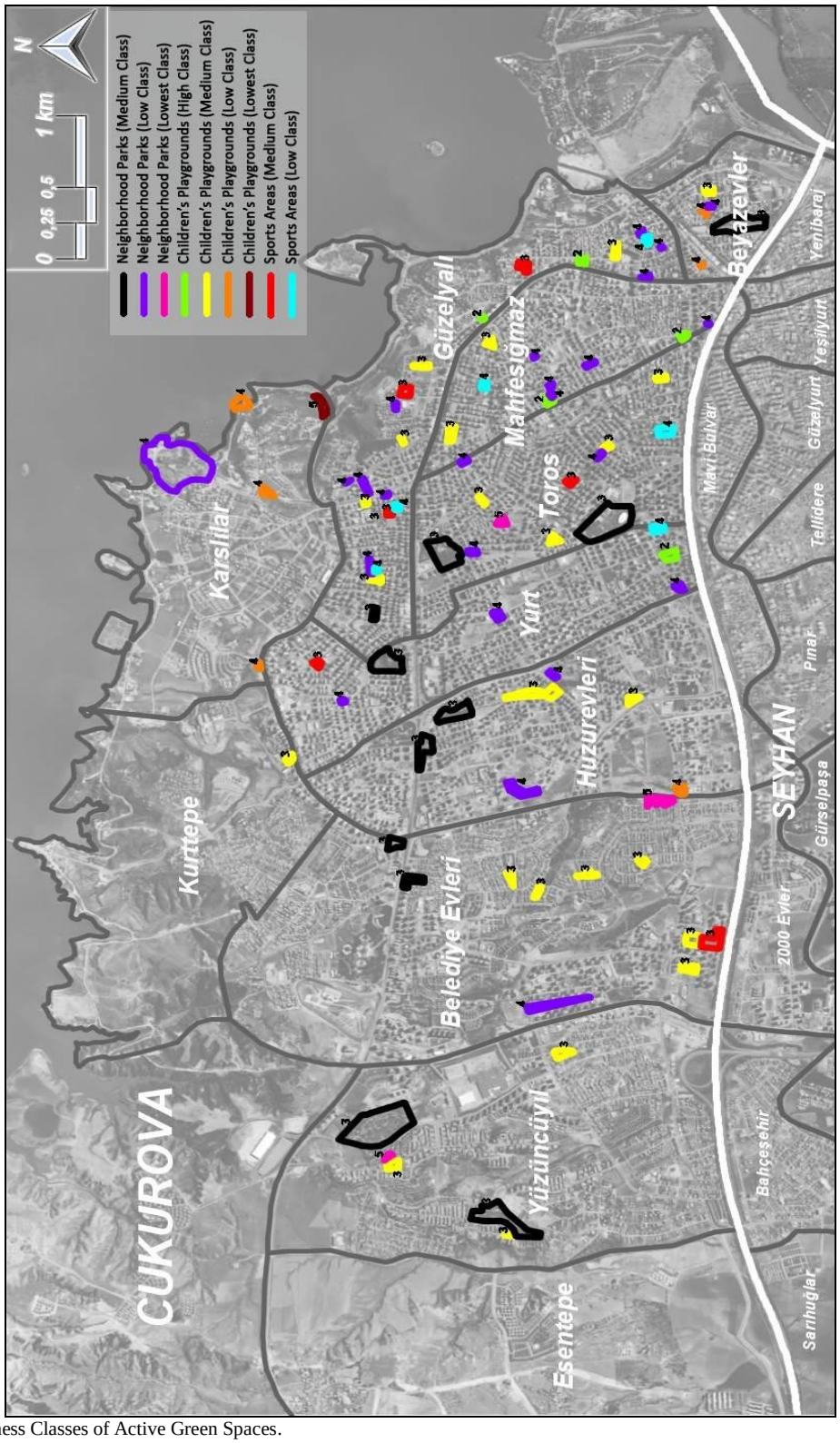


**Figure 2.** Appropriateness Classes of Active Green Spaces.

playgrounds are the lack of functional plantation design and also lack of consideration of the handicapped people in design. Besides, it has been detected that the fitting elements in the neighborhood parks and playgrounds are not placed in accordance with the climate, and the pedestrian crossings that would provide safe access to the parks are ignored. Also, sports areas have problems such as lack of fountains and problems related to safe access similar to aforementioned spaces.

When approach B (High Coefficients Approach) is implemented, it has been detected that the constructional characteristics of fitting elements in all types of active green spaces are appropriate and climate characteristics are considered

in positioning. It is observed that when the criteria placing in the last 20% percentile according to the arithmetic mean sorting of the active green space types are put in and/or enhanced, the appropriateness class of local parks, neighborhood parks, and children's playgrounds increases. As for sports areas, it is observed that, when the criteria placing in the first 20% percentile in weighting coefficient sorting are put in and/or enhanced, their appropriateness level also increases**.**

## 4. Discussion and Conclusion

Urban life quality directly enhances the satisfaction and changes satisfaction level of individuals in the daily life. Qualitative effectiveness should be provided to ensure the success of green spaces and also to increase the quality of life (Ceylan 2007; Oztürk and Ozdemir 2013).

In this study, it is possible to determine the quality of green spaces, which can be revealed by quantity values, by using evaluation criteria. The more these criteria are used, the better spaces are analyzed. In this study, active green spaces in Cukurova district of Adana city have been evaluated in terms of their appropriateness and efficiency.

Many researchers such as Uzun (1974), Gültekin and Altunkasa (1983), Hisarlı (1988), Türk (1993), Bozkurt (1994), Eymirli (1994), Ayaşlıgil (1996), Oztürk and Ozdemir (2013) mainly studied the green space amount per person defined by the regulations and space size. In their studies, Çinçinoğlu (2001) and Etli (2002) had also addressed fitting element diversity in addition to space size and space amount per person. On the other hand, Sorkun (1996) and Levend (2008) had addressed space size, fitting element diversity, and plantation. In addition to Sorkun (1996)'s and Levend (2008)'s criteria, Yağcı (2006) had addressed availability. Virtanen (2017) indicated that active green space quality can be judged with various attributes including general condition and maintenance, specific features and fitting elements for the purpose. Zhang et al. (2017), in their studies, declared that qualified and usable green spaces significantly associated with neighborhood satisfaction, apart from the number of green spaces. In this study, unlike many other studies, a multi-criteria evaluation was carried out and the qualities of the green spaces were determined.

In this study, multiple criteria were used while evaluating active green spaces. 87 active green spaces were evaluated by 49 criteria and active green spaces' weighted scores and total weighted scores have been calculated for all active green space types. The results show that the lowest total weighted score of active green spaces is neighborhood parks.

Measuring the amount of green space in urban areas is not enough alone because they may be in an unqualified situation and may not serve urban dwellers effectively due to the absence of a rich fitting element diversity and/or lack of eligible standards. The study shows this, the size of the space alone is not sufficient for quality, the neighborhood parks in the Belediye Evleri and Karslilar neighborhood have a large size but have low appropriateness class.

In the study, while scoring space sizes, green spaces having the most appropriate size and above it have been deemed a score of 3. Other spaces in the same category were scored according to their relative size. This method has allowed the size of the spaces to attain real scores that they deserve. Furthermore, this method has been found in this study and is specific to this work.

For the active green space standard, no quantity is specified for each type in the regulation. In this study-specific method, the total regulation ratios for each species were determined. In this solution, Altunkasa (2004), which explains the scientific studies related to the subject, has been utilized. In this study, the proportions of the green spaces were compared with the legal values and the per capita values of the active green spaces were determined separately, so as to the size of the corresponding urban settlement area for the respective population, the active green space has been reached to the number and size of active green that can meet legal standards. If the space size is evaluated as for size ranges in the scoring sequence as 0,1,2,3, the space sizes will need to be represented by the same points in different space sizes. In order to overcome this negativity, the size of the green spaces is proportionate to the optimal amount and amount of the area determined as 3 points.

A questionnaire survey was implemented to some specialists in order to determine the coefficients of the criteria for another part of the method used in the study. The coefficients show the importance level of the criteria. These coefficients were found to be between 3.42 and 5.00 according to the results of the survey. So, when a criterion obtains the highest score, the weighted score of the criterion varies between 10.26 and 15.00. The wide difference between the lowest and the highest weighted scores makes importance levels of the criteria more apparent.

As a result of the study, appropriateness class of each active green space has been identified. Unfortunately, it has been detected that no local parks, neighborhood parks or sports areas exist either in high or in the highest classes. Similarly, no playgrounds exist in the highest appropriateness class. Making improvements in the active green spaces considering the importance level may advance appropriateness classes of some spaces.

According to the results of the study**,** the following suggestions may be considered in order to improve the quality of active green spaces of Cukurova district:

1. Particularly, functional plantation design should be carried out appropriately in local parks. Especially the following should care:

- Signaling and guidance effect through the plantation
- Wind control through the plantation
- Enhancing appropriate plantation criterion in children's playgrounds and activity spaces.

2. Ramps should be prioritized for people with disabilities.

3. Especially in local parks, the following criteria should be considered:

- Positional safety of sitting elements
- Diverting within the transportation network
- Separate usage area for fountains
- The relation between children's playgrounds and surrounding utilizations
- The roads surrounding the area

4. In local parks, the following criteria for functional plantation should be considered:

- Wind control through the plantation
- Plantation open to summer winds on sport areas
- Winter winds blocking plantation on sport areas
- Visual control through the plantation

5. Considering the following criteria in the design stage in neighborhood parks shall have positive effects:

- True guidance on sport areas
- Positioning children's playgrounds and activity areas considering climate conditions
- Positioning sitting elements for group use considering climate conditions
- Pathways to reach the areas

6. Functional plantation design should be carried out appropriately on children's playgrounds. The following criteria have the highest priority:

- Wind control through the plantation
- Proper plant selection in children's playgrounds and activity areas
- Visual control through the plantation
- Signaling and guidance effect through the plantation

7. Additionally, the following criteria should be considered on children's playgrounds:

- The establishment of water surfaces
- Pathways to the space for safety accessibility
- Drainage system
- Positioning children's playgrounds and activity areas considering climate conditions

8. Constructional characteristics of the elements and their positioning according to climate conditions in all active green spaces should be considered.

As a result of this study, making improvements according to the importance level order may advance appropriateness classes of spaces. This study can be useful for helping to determine criteria for active green spaces, to increase the urban life quality by ensuring the success of green space qualification.

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