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Evaluation of Schoolyards with Ecological Indicators: Kilis Case, Turkey

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ABSTRACT: Schoolyards are important components of open-green spaces that shape the physical structure of cities and contribute to citizens from ecological, social and cultural perspectives. These areas are potential educational environments where children and young people can develop their physical, social, emotional and mental skills, and they also act as the key actors to acquire environmental awareness. Designing these areas according to some ecological indicators to have better open-green field qualifications for school gardens in the cities and better relationships with nature is extremely important for contributing to the urban ecosystem and the multifaceted development of the users. The most important indicators are green field ratio, naturalness value of the plants used and vegetation variety. This study examines the open and green areas of 58 schools (8 kindergartens, 36 primary schools, 14 high schools) in Kilis city center within the framework of these indicators. The results show that the amount of open-green areas per person in all schools is below the standard. In the study area, primary schools have the least ratio of green areas and the least amount of green areas per person while high schools have the highest ratio of green spaces. The average naturalness score in all schools is over 60%, but vegetation diversity in schoolyards is insufficient. As a result of the study, it was determined that schoolyards in the city have deficiencies regarding their contribution to urban ecosystem, healthy development of children / young people and establishing relations with nature. So, some suggestions were produced in this context.

Key Words: Ecological indicator, Kilis. Open-green areas, Schoolyard

Okul Bahçelerinin Ekolojik Göstergelere Göre Değerlendirilmesi: Kilis Kenti Örneği

ÖZET: Hızlı kentleşme ile birlikte değişen yaşam koşulları, kent kullanıcılarını ve aynı zamanda çocukların oyun alanlarını da olumsuz etkilemektedir. Günümüzde artan yapı yoğunluğu, trafik ve kentlerdeki göç alımı ile kentlerde değişen insan profiline bağlı olarak azalan güven duygusu, okul çağındaki çocukların sokak ve çevreyle olan bağlantısını koparmıştır. Ayrıca kentlerde açık ve yeşil alanların azalması nedeniyle çocukların oyun alanları kısıtlanırken, eğitim alanları içerisinde bulunan okul bahçeleri de bu açığı kapatmak amacıyla daha fazla önem kazanmıştır. Çocukların ve gençlerin çevre bilinci kazanma noktasında da önemli aktörlerden biri olan okul bahçelerinin ekolojik bazı göstergelere göre düzenlenmesi son derece önemlidir. Bu göstergelerden en önemlileri; yeşil alan oranları, kullanılan bitkilerin doğallık değerleri ve alanlardaki bitki örtüsü çeşitliliğidir. Çalışmanın amacı Kilis kent merkezinde bulunan okul bahçelerinin söz konusu bu göstergelere göre değerlendirilmesidir. Çalışmada Kilis kent merkezinde yer alan 8 anaokulunun, 36 ilköğretim okulunun ve 14 lisenin açık ve yeşil alanları değerlendirilmiştir. Çalışma alanında yeşil alan oranı ve kişi başına düşen yeşil alan miktarının en az olduğu eğitim kurumları ilköğretimler; en fazla olduğu kurumlar ise liseler olarak belirlenmiştir. Tüm okullardaki ortalama doğallık değeri % 40'ın üzerinde olup; okul bahçelerindeki bitki örtüsü çeşitliliğinin yeterli olmadığı sonucuna varılmıştır.

Anahtar Kelimeler: Ekolojik gösterge, Kilis. Açık-yeşil alanlar, Okul bahçeleri

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INTRODUCTION

Urban open-green spaces are one of the main community lands that show and shape the physical structure of a city and are an element of balance that integrate the usage of other areas (Gül and Küçük, 2001), and these spaces make a significant contribution to residents in terms of ecological, social and cultural perspectives. They enhance social interaction and social cohesion / integrity / solidarity and strengthen the sense of community (Zhou and Rana, 2012). Green spaces, which create escape points for people to breathe in the cities that grow without an identity, can have positive effects on integration with nature, meeting active and passive recreation needs and human health (Çetinkale Demirkan, 2019). In addition, they also provide help in reducing drug use, drug addiction and crime rates in that young people spend their leisure time in the activity spaces designed for them (UN-HABITAT, 2008).

Schoolyards classified under "Semi-Private Open-Green Spaces" class (Gül and Küçük, 2001) are potential areas for providing all the benefits of the spaces outlined above. In many parts of Europe and America, schoolyards are designed in connection with urban open-green spaces.

School gardens are important environments where children can improve their physical, social, emotional and mental skills. In fact, studies show that a balanced physical activity in open air is two or three times more useful than that performed indoors (Andersen et al., 2015). It is a known fact that school-age children and young people are more interested in physical activity. In this sense, green spaces are known to promote physical activity in the school environment by facilitating open and flexible play conditions (Martensson et al., 2014). Research shows that in outdoor activities students integrate mathematics, science, grammar and other skills with their close environments through their five senses and that they learn better (Şişman and Gültürk, 2011).

Schoolyards have great value with their outdoor environment, but they also have the quality of being an invaluable observation area for children living in limited areas and have minimal contact with nature (Gök, 2012). These areas help students have direct experiences, and develop new knowledge, skills and values besides their role in creating an experimental learning environment (Bowker and Tearle, 2007). They also help students have an idea about living organisms, plants and environment, where many physical and chemical events take place (Erdönmez, 2007). At this point, the plants in these gardens, come to fore as important living materials that offer different play opportunities and improve their creativity in a positive way as well as ensuring that children are intertwined with nature (Acar, 2003). School gardens, where children spend most of their time and are a part of school environments, can contribute to their development by creating suitable spaces for children (Çetinkale Demirkan and Sandal Erzurumlu, 2018). Bowker and Tearle (2007) emphasized that schoolyards are potential areas that help children have deeper ecological understanding and thus, enable them to approach environmental problems and solutions with greater awareness. In this sense, the experience and information that children gain by playing and participating are of great importance (Erdönmez, 2007).

In this context, the green field ratio of the schoolyards, the natural value of the vegetation species used in the gardens and vegetation variety are important in students' improving their environmental knowledge, making observations and recognizing the local plants. This study examines the schoolyards in Kilis city center within the framework of these criteria.

MATERIALS AND METHOD

The study was conducted in schoolyards in Kilis city center. Kilis is located in the southwestern part of the Gaziantep Plateau in the Southeastern Anatolia Region, extending between the Hatay-Maras direction and the Euphrates River. This geography, covering an area of 1.521 km², is between 36º north latitude and 32º east longitude, surrounded with Oğuzeli in the east, Islahiye in the west and north, Şahinbey in the north and northeast and the Syrian border in the south (Figure 1). Kilis province is located in the Mediterranean vegetation cover area according to Phytogeography (Altan, 2000).

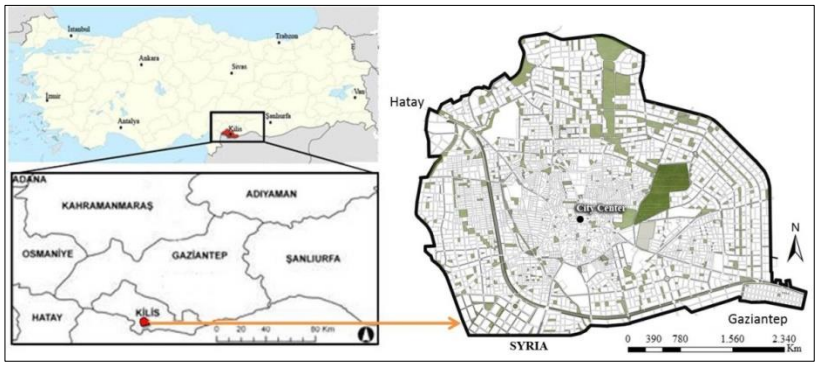

Figure 1. Geographical location of the research area

The research ground of the study is the schoolyards Kilis city. The study was carried out in 8 kindergartens, 36 elementary schools and 14 high schools in Kilis city center (Figure 2). The number of students in 58 educational institutions in Kilis city center is 24.289 (Kilis Provincial Directorate of National Education, 2017). Total educational area including building and garden areas are 342.815 m². The study consists of three stages including data collection, analysis-synthesis and evaluation stages. In the first stages of data collection, the school locations in the parcel maps were marked on the last current Kilis city map (Kilis Municipality, 2017).

In the second stage, the firm ground, building space, green area ratios and the amount of green area per student using the number of students obtained from the Provincial Directorate of National Education (Kilis Provincial Directorate of National Education, 2017) were determined. Then, the existing plant life in the green areas in the related schoolyards was determined. To determine the local plant species in Kilis, the studies conducted by Yaltırık 1993, Ürgenç 1990 and Altan 2000 were utilized.

In the synthesis stage, the naturalness value of a given area was determined by comparing the total number of natural plants to the sum of all plants. Then, vegetation cover structural diversity (tree-shrub, shrub, ground cover and clutching-climbing plants) was determined. Since the vegetation period is active during spring and summer, the field studies were carried out at these months in 2017. In the last stage, the number of students in kindergartens, primary schools and high schools, the firm ground ratio (%), building area ratio (%), green area ratio (%), amount of green area per student (m^2) and naturalness value obtained in 2nd stage (%) and vegetation diversity were tabulated and evaluated within the scope of the study.

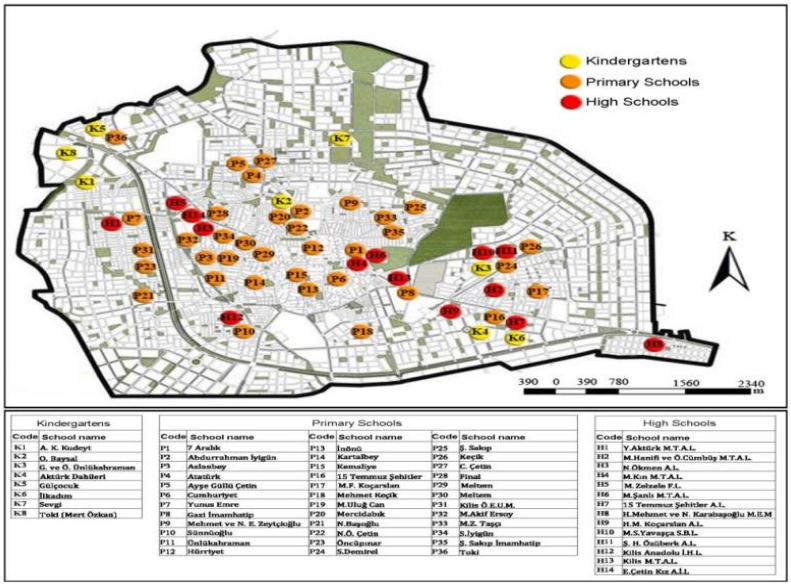

Figure 2. Schools in the research area

RESULTS AND DISCUSSION

Evaluation of Kindergartens

The green area ratio of the 8 kindergartens in which the study is conducted is 0-85.9%; and the green area per student varies between 0 and 50 m^2. While Aktürk (K4) and İlkadım (K6) have no green space, Atilla Kamil Kudeyt Kindergarten (K1) is the one with the highest amount of green space per student. Kindergarten with the highest firm ground rate is Mert Özkan Kindergarten (K8). Aktürk Kindergarten (K4) and İlkadım Kindergarten (K6) are formed entirely from the building space; they have no open-green space. When all kindergartens are evaluated together, the average hard-soil rate is 32.3%, the average green space rate is 28.2% and the green space per student is 9.3 m² (Table 1). The average naturalness score of kindergartens is 40.3%. Kindergarten with the highest naturalness score is Osman Baysan Kindergarten with 89.1%. Kindergartens have mainly two types of vegetation (trees and shrubs). There are no ground cover and climbing plants (Table 1).

Table 1. Evaluation of kindergarten yards

School Number	Number of Students	Building Ratio (%)	Firm Ground Ratio (%)	Firm Ground Per Student (m²)	Green Area Ratio (%)	Green Area Per Student (m²)	Naturaln ess Value (%)	Vegetation Diversity			
								V1*	V2**	V3***	V4****
K1	91	9.5	4.6	2.7	85.9	50	68	169	17	0	0
K2	114	22.6	17.4	3.4	60	11.6	89.1	141	25	0	0
K3	203	15	44.8	7.8	40.2	7	85.4	181	58	0	0
K4	14	100	0	0.0	0	0	0	0	0	0	0
K5	20	39.7	56	42.3	4.3	3.25	0	22	7	0	0
K6	15	100	0	0.0	0	0	0	0	0	0	0
K7	87	35.7	56.3	11.3	8	1.6	45.6	17	29	0	0
K8	165	47.4	44	2.0	8.6	0.69	35	11	9	0	0
TOTAL	709	46.2	27.9	8.7	25.8	9.3	40.4	541	145	0	0

*: Number of Trees-small trees, **: Number of Shrubs, ***: Number of Ground cover, Number of clutching-climbing plants

Table 2. Evaluation of Primary Schools Gardens

School Number	Number of Students	Building Ratio (%)	Firm Ground Ratio (%)	Firm Ground Per Student (m²)	Green Area Ratio (%)	Green Area Per Student (m²)	Naturalness Value (%)	Vegetation Diversity			
								V1*	V2**	V3***	V4****
P1	332	28.1	62.5	4.5	9.4	0.67	100	70	0	0	0
P2	310	24.4	65.6	5.2	10	0.8	67.3	42	4	0	0
P3	347	34.8	34.5	2.0	30.7	1.8	92.5	54	0	0	0
P4	340	12.5	21.1	3.2	66.4	10.2	70	215	0	0	0
P5	222	18	57.6	9.4	24.4	4	81.6	96	2	0	0
P6	387	28.4	47.3	3.9	24.3	2	96	75	0	0	0
P7	897	7	43.3	4.1	49.7	4.7	88.8	270	34	0	0
P8	368	19.3	63.4	6.2	17.3	1.7	84.7	99	32	0	0
P9	414	16.5	80	11.4	3.5	0.5	68	44	0	0	0
P10	129	15	33.5	3.3	51.5	5	98.6	181	173	0	0
P11	203	27.7	34.3	7.4	38	8.2	88.8	196	0	0	0
P12	723	34.1	54.9	2.9	11	0.59	59	78	17	0	0
P13	398	34.8	49.4	1.6	15.8	0.5	80	30	12	0	0
P14	719	39	46	2.5	15	0.8	70.1	53	34	0	0
P15	172	21.3	68	4.4	10.7	0.7	3.1	29	0	0	0
P16	1488	13.9	55.5	3.8	30.6	2.1	74.1	323	122	0	0
P17	545	20.2	57.1	3.3	22.7	1.3	100	151	0	0	0
P18	205	13.8	22.4	4.8	63.8	13.7	92.1	286	31	0	0
P19	903	24.6	52	3.8	23.3	1.7	82.2	113	22	0	0
P20	605	9.8	48.1	9.1	42.1	8	86.7	248	84	0	0
P21	542	14	40	3.2	46	3.7	91.3	161	0	0	0
P22	271	16	32.1	4.6	51.9	7.4	84.2	160	14	0	0
P23	157	17.3	32	8.0	50.7	12.7	79	81	0	0	0
P24	1095	16.8	45.4	5.9	37.8	4.9	87.6	495	64	0	0
P25	305	28.7	66.6	7.1	4.7	0.5	90.4	63	0	0	0
P26	388	18.4	50	4.1	31.6	2.6	82	286	31	0	0
P27	190	10	34.3	10.7	55.7	17.3	96.6	236	5	0	0
P28	194	0	0	0	0	0	0	0	0	0	0
P29	72	0	0	0	0	0	0	0	0	0	0
P30	81	0	0	0	0	0	0	0	0	0	0
P31	71	36	46.9	31.5	17.1	11.5	80	40	27	0	0
P32	768	17.5	78.4	5.7	4.1	0.3	15.6	21	11	0	0
P33	409	35.5	60	2.7	4.5	0.2	16.6	0	14	0	0
P34	395	24.7	61.4	6.6	13.9	1.5	98.8	116	47	0	0
P35	97	28.5	61.7	25.8	9.8	4.1	52.7	36	6	0	0
P36	1273	27.7	50.9	2.1	21.4	0.9	11.4	72	51	0	0
TOTAL	16015	20.4	46.0	6	25.3	3.8	68.6	4420	837	0	0

*: Number of Trees-small trees, **: Number of Shrubs, ***: Number of Ground cover, Number of clutching-climbing plants

Evaluation of Primary Schools

The total green space ratio of 36 primary schools is between 0.4-66.4%; the firm ground ratio is between 0% and 80%. The school with the highest green space rate is Atatürk Secondary School (P14); the school with the highest level of firm ground is Hacı Mehmet and Nimet Erman Zeytçioğlu Primary School (I9). The number of

schools with a firm ground rate above 50% or more is 17. There are no open-green spaces in 3 primary schools. These schools are Meltem Primary School (P28), Final (P29) and Meltem Secondary School (P30). The amount of green space per student in primary schools varies between 0-17.3 m². While the amount of green space per student in 14 schools is less than 1 m², Cemil Çetin Primary School (P27) has the highest score per student. When all primary schools are evaluated together, the average firm ground rate is 46%, the green area rate is 25.3%, the amount of green area per student is 3.8 m^2 (Table 2).

The average naturalness value of primary schools was determined to be 68.6%. The school with the highest naturalness score is 7 Aralık Primary School (P1) with a rate of 100%. Two types of vegetation (trees and shrubs) have been identified in primary schools. They have no ground cover and climbing plants (Table 2).

Evaluation of High Schools

The firm ground ratio of the 14 high schools is 18.4%-62%; green area ratio varies between 12.7% and 74.2%. The high school with the highest level of firm ground is H. Mehmet and N. Karabaşoğlu High School (H8); the school with the highest rate of green areas is 15 Temmuz Şehitler Anatolian High School (H7). The green space per student in high schools varies between 1.6m² and 49.5m². The school with the lowest score is H. Mehmet and N.Karabaşoğlu High School (H8), and the one with the highest score is N. Ökmen Anatolian High School (H3). When all high schools are evaluated together, firm ground rate average is 37.5%; green field average is 45.4%; green space per student is 12.5 m^2.

The average naturalness value of the high schools in the research area is 78%; the school with highest naturalness score is N. Ökmen Anatolian Teacher High School (H3) with 96.5% and lowest score Yaşar Aktürk Vocational and Technical Anatolian High School (H1) with 30%. Two types of vegetation were used in high schools (Table 3).

Table 3. Evaluation of High School Gardens

School Number	Number of Students	Building Ratio (%)	Firm Ground Ratio (%)	Firm Ground Per Student (m²)	Green Area Ratio (%)	Green Area Per Student (m²)	Naturalness Value (%)	Vegetation Diversity			
								V1*	V2**	V3***	V4****
H1	306	13.3	49.8	10.5	36.9	7.8	30	111	24	0	3
H2	465	6.9	21.7	3.6	71.4	11.7	90	276	35	0	0
H3	669	15.6	19.1	14.5	65.3	49.5	96.5	1888	41	0	0
H4	723	28.4	34.5	3.3	37.1	3.6	75	476	127	0	0
H5	279	16.5	47.3	17.4	36.2	13.3	75.1	365	85	0	0
H6	310	27.6	50	8.7	22.4	3.9	94.4	88	24	0	0
H7	700	7.4	18.4	2.4	74.2	9.8	87.2	395	58	0	0
H8	272	25.3	62	7.8	12.7	1.6	95	158	0	0	0
H9	591	14.5	30.4	4.2	55.1	7.6	79.3	177	2	0	0
H10	231	18.2	31.3	21.6	50.5	34.8	58.6	174	75	0	0
H11	621	12.8	54.9	12.6	32.3	7.44	65.7	246	37	0	0
H12	678	12.6	19.9	3.0	67.5	10.1	91.6	669	81	0	0
H13	1120	32.1	53.4	10.7	14.5	2.9	75.9	148	18	0	0
H14	600	8.5	32.5	5.9	59	10.8	77.1	242	42	0	0
TOTAL	7565	17.1	37.5	9	45.4	12.5	78.0	5413	649	0	3

*: Number of Trees-small trees, **: Number of Shrubs, ***: Number of Ground cover, Number of clutching-climbing plants

The studies conducted in our country on school yards (Aksu and Demirel, 2011; Muhacir and Özalp, 2011; Özdemir, 2011; Şişman and Gültürk, 2011; Karadağ et.al. 2012, Karakaya and Kiper, 2013; Vural and Yılmaz, 2018) focus primarily on primary school schoolyards. In addition, structural design elements and space usage of the schools were examined from the point of landscape design. In this study, the gardens of all schools (8 kindergartens, 36 primary schools and 14 high schools) in Kilis city center were investigated in terms of plant design elements. Thus, it is unique compared to other studies from this perspective

The space size and standards per person to be employed in educational institutions during zoning work in Turkey are determined in accordance with "Code on Construction of Spatial Plans" dated May 17, 2017 issued based on Zoning Law No 3194. According to this regulation, though there might be certain changes based on population size, while an average of 0.5 m² - 0.8 m²/person is suggested for kindergartens and 2 m²/person for primary, secondary and high schools, approximately 1500-4000 m² space is allocated for kindergartens, 5000-8000 m² for primary schools, 5000-10000 m² for secondary schools and 6000-10000 m² for high schools (Anonymous, 2017). These amounts are well below the recommended 25 m²/person standard (Kelkit and Özel, 2003) ideal for schoolyards. As a matter of fact, the contribution of schoolyards to child development and education has led schoolyards to have important design principles in various countries in the world. For instance, 40 m² space per student is allocated in Bulgaria, 30 m² in Germany, 25 m² in the UK, 20 m² in the US, 16 m² in Poland, and 15 m² in France and China (Özyaba, 1998). In the study, green space per person is 9.3 m^2 in kindergartens; 3.8 m^2 in primary schools; 12.5 m^2 in high schools. The amount of firm ground per person is 8.7 m^2 in kindergartens; 6m^2 in primary schools, 9 m^2 in high schools. These findings inform us that the amount of green space per student is 18 m^2, 9.8 m^2 in primary schools, 21.5 m^2 in high schools, which are insufficient.

In addition to schools' having insufficient open-green areas in the study area, they also have qualitative problems. In parallel researches conducted in our country (Gül and Küçük (2001; Algan and Uslu (2009); Kelkit and Özel (2003); Aksu and Demirel (2011); Muhacir and Özalp (2011); Özdemir (2011); Şişman and Gültürk (2011); Karadağ et al., 2012; Karakaya and Kiper, 2013; Vural and Yılmaz, 2018), most of the garden areas of the schools in the city have concrete or asphalt surfaces. The schoolyards in question are insufficient at the level of structural and landscape-planting designs and consist of spaces with monotonous appearance. Çukur (2011) emphasized that the 0-6 age range, which is expressed as pre-school early childhood stage, acts as the most important building block for individual in becoming a healthy adult in the future and that the characteristic traits gained in this period are carried to the next stage of childhood and they contribute positively to personality formation. Çukur and Özgüner (2008) stated that nature consciousness and education should be conveyed to children through the use of natural elements and places in childhood and they need to cover 0-12 age range, especially early childhood periods. Therefore, kindergarten and primary school schoolyards should be viewed as educational places rather than as places that children spend their free times during the breaks, and the tools to be developed should support this kind of nature education. The places must be designed where the most natural learning environments are created by increasing the quality of life of a child, and where they can test what they

have seen and heard and reinforce what they have learned in order to support activities that are essential for the social, emotional, cognitive, physical development and education of children. Natural elements such as trees and shrubs, herbaceous plants, lawns, flowers with vivid color, soil ground, tree stumps, rock fragments, sand and water should be used in these areas, and environmental education programs such as plant production, pet feeding, vegetable and fruit cultivation should be supported.

The amount of open-green space and their naturalness score and vegetation diversity per person in high schools in the research area are relatively higher than the other educational levels. However, it has been observed that these areas are not regulated within the framework of principles that will promote young people's physical abilities, education and training, social communication skills and health. Planning the recreational activities in high school gardens within the framework of these principles and reflecting these principles on the design is extremely important. Studies show that drug use is directly affected by how individuals make use of their free time. In a quasi-experimental study with a control group that observed a 12-year change of participants in Iceland, it was stated that planned leisure activities had a positive effect on young people and they decreased number of bad habits (Ertüzün et al., 2016).

When the vegetation diversity structure of the research areas is taken into consideration, it is seen that trees are mostly used while bushes, ground cover and climbers are not used that much. In addition, it is observed that the plants belonging to the same species are used quite frequently in the research area. These species are *Pinus brutia*, *Robinia pseudoacacia, Cupressus sempervirens* and *Thuja orientalis.* Since each species will need different types and forms of vegetation for housing, nutrition and breeding, the variety of vegetation structure in these areas is not capable of meeting all these needs of different living species. Thus, vegetation diversity to be formed in schoolyards will let one observe seasonal transitions and different species.

In recent years, especially in Europe and North America professionals working in the field of landscape design, are conducting researches that support habitat diversity and nature-based practices especially in the studies on schoolyards and playgrounds within the framework of ecological principles to increase the diversity of habitat and practices in support of using methods close to nature (Çukur and Özgüner, 2008). The benefits (educational, social, physical, and cultural) of schoolyard designs that include ecological diversity and wildlife have been documented in many studies (Louv, 2010). Therefore, the use local natural plants such as *Pistacia terebinthus*, *Pistacia lentiscus*, *Cotinus coggygria Rhus coriaria*, *Quercus coccifera Cistus* sp., *Arbutus andrachne*, *Arbutus unedo Laurus nobilis Rosmarinus officinalis*, *Ceratonia siliqua*, *Paliurus spina-christi*, *Crataegus* sp. should be increased in schoolyards designs. Thus, the chance of students to observe local plant and animal species on site will be increased. In addition, natural diversity can improve children's ability to form shape, color, dimension perception, and to form relationship between objects. Children will be able to gain awareness about the nature of their existence through observation of nature and comprehend the order of nature (Çukur, 2011). This way, a living environment will be created for different species in the areas; urban biodiversity, which is a high ecological quality indicator in the city, will increase.

CONCLUSIONS

As a result, the multi-faceted contributions of the schoolyards to the city and the children have been revealed through scientific research. In order to increase these contributions, sufficient open-green areas should be allocated in the zoning plans by taking the needs of educational institutions and the group of students served into account, and these areas should be associated with other open and green areas in the city in zoning plans. The structural and landscape-planting designs of the schoolyards should be done based on the urban ecosystem and the educational, mental, social and physical development of children. In this context, this issue should be dealt with the professionals from the field of child education, development, planners and designers. In order to improve the existing schools within this framework, Provincial National Education Directorates, students, parents, working groups including landscape architects should come together to establish and implement structural and vegetative landscape projects within the framework of related standards.

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