

## THE ECO-CITY PROPOSAL AS A SUSTAINABLE CITY MODEL

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### Abstract

*An Ecocity is a human settlement modeled on the self-sustaining resilient structure and function of natural ecosystems. The ecocity approach is an effort to change the nature of cities to make them more ecologically sustainable. Making existing cities and new urban development more ecologically based and liveable is an urgent priority in the global push for sustainability. Recently, the concept of eco-city has emerged in order to create cities that produce their own energy and respect the nature. The concept of eco-city is the urban design and application approach in which the relation and interaction of city and the environment are discussed. Eco city designs; Sustainable principles such as the use of renewable energy resources, minimum waste generation, recycling material use, biodiversity conservation, minimizing carbon footprint, preventing air pollution, preventing the formation of an urban heat island and reducing the impact of the city on the environment are taken into account. With this approach, the functions of the ecosystem can be maintained in a healthy way and the quality of life of the people will be improved. Although some local administrations and city dwellers adopt the concept of eco-city because of the population of millions of present-day cities, the implementation process is suspended due to the cost of the implementation process and the lack of communication and cooperation between institutions and organizations. With the increasing population, the environmental problems of the rapidly growing cities will have more serious and potentially devastating effects in the future. Therefore, before it is too late, eco-city principles should be accepted as a necessity in order to achieve targeted eco-urban designs.*

**Keywords:** Eco-city, Sustainable City, Urbanization, Urban Design, Environment and Nature

## SÜRDÜRÜLEBİLİR KENT MODELİ OLARAK, EKO-KENT ÖNERİSİ

### Özet

Eko-kent, doğal ekosistemlerin kendi kendine yeten esnek yapısı ve işlevi üzerine modellenmiş bir insan yerleşmesidir. Mevcut kentleri yapımı ve daha ekolojik temelli ve yaşanabilir yeni kentsel gelişim için sürdürülebilirlik konusunda küresel baskının oluşması acil bir önceliktir. Son zamanlarda, kendi tükettiği enerjilerini üreten ve doğaya saygı duyan kentler yaratmak için eko-kent kavramı ortaya çıkmıştır. Eko-kent kavramı, kent ve çevre ilişkisinin ve etkileşiminin tartışıldığı kentsel tasarım ve uygulama yaklaşımıdır. Eko kent tasarımları; yenilenebilir enerji kaynaklarının kullanımı, minimum atık üretimi, geri dönüşüm malzeme kullanımı, biyolojik çeşitliliğin korunması, karbon ayak izinin en aza indirilmesi, hava kirliliğinin önlenmesi, kentsel ısı adası oluşumunun önlenmesi ve kentin çevre üzerindeki etkisinin azaltılması gibi sürdürülebilir ilkeleri ele almaktadır. Bu yaklaşımla ekosistemin işlevleri sağlıklı bir şekilde sürdürülebilecek ve insanların yaşam kalitesi iyileştirilecektir. Bazı yerel yönetimler ve şehir sakinleri eko-kent kavramını benimsemelerine rağmen kentsel nüfus artışı nedeniyle, eko kent uygulaması, uygulama sürecinin maliyeti ve kurumlar ile kuruluşlar arasındaki iletişim ve işbirliği eksikliği nedeniyle askıya alınmıştır. Artan nüfusla birlikte, hızla büyüyen kentlerin çevresel sorunlarının gelecekte daha ciddi ve potansiyel olarak yıkıcı etkileri olacaktır. Bu nedenle, çok geç olmadan, eko-kent ilkeleri, hedeflenen eko-kentsel tasarımların gerçekleştirilmesi için bir gereklilik olarak kabul edilmelidir.

**Anahtar Kelimeler:** Eko kent, Sürdürülebilir kent, Kentleşme, Kent tasarımı, Çevre ve doğa

### INTRODUCTION

The opportunities offered by the cities from past to present and the high diversity of them increased the orientation of people towards the city in the globalization process of the world. For this reason, cities are an organization that maintains its existence in the world. With the migration from rural areas to cities, it is observed that an urban model that people's agricultural activities decreases, energy consumption increases, harms itself and the environment, and consumes nature. With the local government, the citizens did not see the negative impact of the changes occurring in the formation and growth of the cities. In this study, with the explanation of the concept of eco-city, the principles and

standards of eco-urban design have been explained by examining the projects that are planned to be made in the world.

Technic of compilation was used as a method.

### The Importance Of Eco-City Design

An ecocity is an ecologically healthy city. No such city exists. There are bits and pieces of the ecocity scattered about in present day cities and sprinkled through history, but the concept- and hopefully, the reality- is just beginning to germinate (Gaffron, et al, 2005; Register, 1987).

There are different approaches to sustainable urban development which focus partly on adapting existing settlements in small, gradual stages and partly on developing completely new solutions. While some approaches concentrate on developing theories of urban development as frameworks for action, others focus on implementing alternatives. The term Ecocity has so far been used mainly by movements which were aiming to realise new, consistent urban solutions as alternatives to current developments. The approach of the ECOCITY project is a step towards combining theory with practice, including both the development of a vision and the planning of concrete model settlements. For this project, an ECOCITY was defined as a vision of a sustainable and liveable city or town to be implemented in a smaller settlement unit, i.e. a model quarter or neighbourhood as an example for the community as a whole. In the ECOCITY project, an urban quarter was defined as part of a city with identifiable functional or spatial borders and a small-scale mixture of functions. An urban quarter is usually composed of more than one neighbourhood (Gaffron, et al, 2005; Yu, 2014; Wong and Yuen, 2011; Register, 1987)

In urban areas, more hot metropolitan areas are formed than rural areas due to more human activities and ecology that disappear. The urban heat islands that are formed have a negative effect on bio-geophysical conditions, socio-cultural features and ecological factors. This causes the deterioration of ecological sustainability.

The purpose of this study is to determine the concept of eco-city and to investigate the eco-city standards. In addition, The another aim of this study is to make recommendations for initiatives in Turkey by researching eco-city examples made in the world.



Figure 1. The component of Eco-city (Kavcar, 2017).

## Eco-City Standards

Eco city standards consist of 18 standards in four categories: urban design, bio-geo-physical conditions, socio-cultural features and ecological imperatives (Table 1) (Register, 2012).

**Urban Design:** Access According to Proximity, Safe and Affordable Housing, Green Building, Eco-Friendly Transportation

**Bio-Geo-Physical Conditions:** Clean Air, Clean and Safe Water, Healthy Soil, Liable Resources/ Materials, Clean and Renewable Energy, Healthy and Accessible Food





**Socio-Cultural Features:** Healthy Culture, Community Capacity/Governance, Healthy and Fair Economy, Lifelong Education, Quality of Life





**Ecological Requirements:** Healthy Biodiversity, World's Carrying Capacity, Ecological Integrity (Roseland, 1997; Joss and Molella, 2013; Engwicht and Davis, 1992).






Table 1. 18 standards of Eco city (Ezer, 2016; United Nations Intergovernmental Climate Panel, 2010; Register, 2012; Pickett & Wilkinson, 2009; Aksan, 2017; Martin & Beatley, 1993; Tezel, 2016; İnsan Hakları Eğitimi İçin Halklar Hareketi, 2013; Redefining Progress 2013; Türküm, 2013; Raworth, 2013; Ergin, 2014; Pimental et al, 2000; Özdemir et al, 2017; URL 1, 2, 3 &4).

1	<b>Access According to Proximity</b>	The fact that people are within walking distance of the places where they go like home, work, activities and shopping or are close to the public transportation vehicles that provide access to these places reduces the use of vehicles, increases the land protection, street life and safety and energy efficiency.	
2	<b>Safe and Affordable Housing</b>	To ensure access according to proximity, people need to find housing to meet their wishes. The diversity of factors such as architectural design, interior design, landscape design, security and price of the houses are the most important factors in people's choice of housing.	
3	<b>Green Building</b>	“Green Buildings” are buildings that have the least damage to natural ecology and take all their energy needs from transformable natural resources. Green buildings are one of the most important factors for minimizing greenhouse gas emissions and sustainability of cities.	
4	<b>Eco-Friendly Transportation</b>	Bicycles, public transport or low-emission, non-polluting, environmentally friendly vehicles should be preferred. Short distances should be reached on foot.	



5	<b>Clean Air</b>	<p>Healthy biodiversity and healthy living depend on a healthy atmosphere. The World Health Organization (WHO) declared air pollution as the most important environmental cause of cancer in 2012. It also causes heart and respiratory diseases, paralysis and similar diseases. 8 million people early die annually in the world due to air pollution. Also it is becoming increasingly difficult to breathe in Turkey. In 2015, the air quality was the dirty compared to the values measured in 80 of the province of Turkey's 81 (Clean Air Rights Platform).</p>	
6	<b>Clean and Safe Water</b>	<p>Clean and purified water flowing from the tap is a modern luxury that many of us have accepted. 75% of the earth is water. But 97.5% of this water is brine and 2.5% is fresh water. 80% of fresh water is frozen in the poles. The remaining fresh waters are located on the ground and underground. The most important factor is the formation of fresh water. The creeks, lakes, groundwater resources and similar areas where fresh water is located should be protected, construction should not be allowed until certain distance and waste should not be disposed of. According to the measured value of water, it should be rested in the biological pond and left to nature.</p>	
7	<b>Healthy Soil</b>	<p>Soil functions and processes include healthy ecosystem functions in accordance with their species and environment; fertility is protected and developed.</p>	
8	<b>Liabe Resources / Materials</b>	<p>Without affecting non-food and non-energy, renewable and non-renewable resources human health and ecosystems, are welded in a responsible and equal manner, allocated, managed and recycled. Cities utilizing locally available materials reduce the need to import foreign materials and support locally available building technologies that enable people to access materials to build their own dwellings. Besides, the use of the used materials as raw material</p>	

		again enables a large amount of energy savings.	
9	<b>Clean and Renewable Energy</b>	It is the technologies which are obtained from the continuous energy flow in natural processes and which are produced and consumed without any negative impact on ecology. Fossil-based fuels, which have been widely used in the world for a long time, are one of the main reasons of today's air pollution and global warming due to the greenhouse gas they emit.	
10	<b>Healthy and Accessible Food</b>	While every year, 12 million hectares of agricultural land is destroyed by erosion and various reasons, climate change threatens agricultural production globally. Today's cities supply their food needs from largely remote areas. When it is looked at many factors such as energy, time, distance and contacts, it is hard to reach healthy and cheap food. Permaculture Design contains in the foundation not the nature of being opposed to nature but living in harmony with nature and principles that fit this purpose.	
11	<b>Healthy Culture</b>	Cultural events that strengthen eco-literacy, human knowledge patterns and creative expression patterns are facilitated, symbolic thought and social learning are developed. Eating and drinking culture, tradition and custom, clothing spontaneously take shape by nature.	
12	<b>Community Capacity/ Governance</b>	As considering the present and future of the individual who is a part of society, respecting the nature and other living beings is expressing the environmental consciousness. The socio-political dimensions of an eco-city reflect the cultural values of the people living in it. Increasing community capacity can be seen as an important starting point not only for building eco-cities, but also for the transition to the Exozoic age.	

13	<b>Healthy and Fair Economy</b>	While many cities focus on economic growth to achieve prosperity, research suggests that equity is more strongly related to health and social development.	
14	<b>Lifelong Education</b>	Access to education is a basic human right. The location information in a person's home provides both a self-identity and an important context and can infuse a care ethic to protect those who keep us alive.	
15	<b>Quality of Life</b>	Human welfare depends on access to sufficient resources to sustain an honorable life. Changes in income distribution, volunteering, crime, pollution and depletion of resources are seen as factors affecting quality of life.	
16	<b>Healthy Biodiversity</b>	Ecologies are related to the preservation of healthy biodiversity in the world. Alive diversity and ecosystems have a variety of regulatory and restorative properties.	
17	<b>World's Carrying Capacity</b>	With the ecological footprint, we find the burden on the nature of man. Demands for ecosystems are within the limits of the world's bio-capacity. Reasons such as population growth, soil deterioration, increasing energy costs, and decrease in fresh water cause biological capacity to decrease every day.	
18	<b>Ecological Integrity</b>	Ecological integrity is an organism or ecosystem, its ability to organize, reproduce and develop itself. The integrity of the ecosystem is closely related to health. An ecosystem may be disrupted, but its integrity remains intact as long as it has the ability to survive (rearrangement, reproduction, etc.). Ecologies support ecological integrity by preserving the fundamental linkages between ecosystems.	



## Eco-City Samples

### *Forest City – China*

The 175-hectare project, which is a derivative of the theme of urban forestry, is designed to prevent air pollution from serious levels in China (Boeri, 2015).



Figure 2. A settlement area project designed for the aim of integrate with nature (Boeri, 2015)

The development of urban and architectural environment renewal models, demineralization of soil and the increase of biodiversity have led to a new generation of urban understanding that can become a sustainable growth model at the global level. Offices, houses, hotels, hospitals and schools in the Forest City of China are completely covered with plants and trees (Boeri, 2015).



Figure 3. Design of vertical landscape in buildings (Boeri, 2015)

Once completed, the new city will host 30,000 people, attracting approximately 10,000 tonnes of CO<sub>2</sub> and 57 tonnes of pollutants per year and will produce approximately 900 tonnes of oxygen. A total of 40,000 trees and more than 100 species will host about 1 million plants. It allows plants to spread not only in parks, gardens and streets, but also on building facades. To decrease the average air temperature, to create noise barriers and to improve the biodiversity of living species, generating the habitat for birds, insects and small animals that inhabit the Liuzhou territory (Boeri, 2015).



Figure 4. Transportation with electric train and car (Boeri, 2015)

The energy needs will be supplied with geothermal and solar panels on the roofs. Transportation will be provided by electric vehicle and high-speed train (Boeri, 2015).

### *The Sustainable City – Dubai*

There are 500 villas, 89 apartments and offices, retail, health facilities, nursery and food and beverage sales points in the area of 46 hectares. Stage second level will include a hotel, school and innovation center. Only electric vehicles are allowed in the area. They supply the energy needs of the region with solar energy (The Sustainable City, 2015).



Figure 5. Settlement plan (The Sustainable City, 2015)

For residents of the region; Charging stations,



Figure 6. Electricity production is provided by solar panels on the roofs (The Sustainable City, 2015)



Water and waste recycling, horse and bicycle trails,



Figure 7. Bicycle path in the site (The Sustainable City, 2015)

Indoor and outdoor gyms, equestrian center, a hospital and clinic for alternative medicine, urban agriculture and locally grown products, business opportunities for residents,



Figure 8. The area where the residents produce vegetables (The Sustainable City, 2015)

The world's first residential development has introduced a natural, green and relaxing environment with a sustainable natural cleaner, 60% green space and two recycled biological lakes that are fifty times more effective than household bleach.



Figure 9. Biological pond. (The Sustainable City, 2015)

New community members can take part in workshops and training, social events for all family members including meeting and greeting for entertainment and celebrations.

Natural cooling of wind towers (The Sustainable City, 2015).



Figure 10. Shading elements and wind tower that made to prevent heating of the environment. (The Sustainable City, 2015)

## RESULT AND CONCLUSION

Eco city standards are directly or indirectly related to each other. Eco city design should be made and applied by taking into consideration all criteria. When designing the eco city, all criteria should be made and applied.

When we look at today's cities, they are far away from sustainable cities as they are not built by taking into consideration all of these criteria. When we consider increase in factors like the growth rate of cities, pollution, ecological and carbon footprint, we continue to be exposed to the negative effects in ecological sustainability by increasing their violence day by day. Considering the reconstruction process of the existing cities in accordance with the eco-city criteria, it is a long-term process. In order to minimize the negative effects in this process, people should accelerate the efforts of countries towards ecological sustainability.

Especially in recent years Eco-city rhetoric has begun to be debated in Turkey too (Özdemir, 2017). If this idea taken as a method of holistic planning design and implementation, it can be able to provide a successful conversion. To the authors of this article, in developing countries such as Türkiye, small or

at most, medium-sized cities should be considered for the pilot and exemplar eco-city applications, where they have some preferential-unspoiled- potential compared to larger and metropolitan cities.

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