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EFFECT OF CLIMATE CHANGE AND CONTRUBUTION OF WATER CONSERVATION IN URBAN LANDSCAPE DESIGN[1]

KENTSEL PEYAJ TASARIMINDA İKLİM DEĞİŞİMİNİN ETKİSİ VE SU KORUMANIN KATKISI

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ABSTRACT

Cities are ecosystems that embrace natural-artificial systems and interact between them. The city of ecosystem function in an appropriate manner, it is possible to fulfill the balanced planning policy. Today, with the increase of intense urbanization, the environment we live in every day is affected negatively. Future intensification of technological developments, climatic pressures in urban areas with increasing population will be a big problem. The rapidly climate changes that occur in urban areas have affected the urban design of urban open spaces and the environment. Especially the increase of the impervious grounds on the surface of the city and the decrease of the green areas related to it are triggering this situation. In this context, the amount of green space in urban areas is increased and suitable design for climatic changes are improved. Because of these reasons, changes in temperature, rise in surface flows due to precipitation, and increases in sea level should be addressed and evaluated. In this way water protection in the cities will be ensured. In this study, it is aimed to investigate the methods of struggle in the landscaping areas of water conservation measures brought about by the negative situation caused by climate change. However, proposals on urban design practices were developed. Green tapes, which are important elements of landscape architecture applications, were emphasized and examples of water conservation practices in urban areas with climate change related drought were demonstrated.

Key words: Climate change, water conservation, urban planning

ÖZ

Şehirler doğal yapay sistemleri kucaklayan ve aralarında etkileşim kuran ekosistemlerdir. Ekosistem şehri uygun bir şekilde işler, dengeli planlama politikasını yerine getirmek mümkündür. Günümüzde, yoğun kentleşmenin artmasıyla, her gün yaşadığımız çevre olumsuz etkilenmektedir. Gelecekte teknolojik gelişmelerin yoğunlaşması, nüfus artışı ile kentsel alanlardaki iklim baskısı büyük bir sorun olacaktır. Kentsel alanlarda meydana gelen ani iklim değişiklikleri, kentsel açık alanların kentsel tasarımını ve yaşadığımız çevreyi etkilemektedir. Özellikle şehrin yüzeyindeki geçirimsiz zeminlerin artması ve bununla ilgili yeşil alanların azalması bu durumu tetiklemektedir. Bu bağlamda, kentsel alanlardaki yeşil alan miktarı arttırılmış ve iklim değişikliği için uygun tasarımlar geliştirilmiştir. Bu amaçla sıcaklık değişimleri, yağış nedeniyle oluşan yüzey akışları ve deniz seviyesindeki artışlar dikkate aşınarak değerlendirilmelidir. Böylece şehirlerde su korunması sağlanmış olacaktır. Bu çalışmada, iklim değişikliğinin yarattığı olumsuz durumun getirdiği su koruma önlemlerinin peyzaj alanlarındaki mücadele yöntemleri araştırılmıştır. Kentsel tasarım uygulamaları ile ilgili öneriler geliştirilmiştir. Peyzaj mimarlığı uygulamalarının önemli unsurları olan yeşil bantlar üzerinde durulacak ve iklim değişikliğine bağlı kuraklık ile kentsel alanlarda su korumaya yönelik uygulama örnekleri verilmiştir.

Anahtar kelimeler: İklim değişimi, su koruma, kentsel planlama

1. INTRODUCTION

Cities are living spaces that have emerged in an effort to create a cultural asset for people and societies. Cities are ecosystems that contain natural structures and systems, as well as cultural and natural structures, in addition to being places where intensive activities are concentrated. It is possible that urban planning practices address cities where ecosystem functions can continue in a balanced and healthy way (Yaban and Doygun, 2014). Urban areas refer to the environment in which urban people can live, work and live (Oktay et al., 2015). While

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the priorities were shaped to the extent that the urban ecosystem handled, the negative impacts on the natural values and the problems caused by the intense urbanization have had negative effects on the natural life (Chiesura, 2004).

Urban green areas as a result of intense urbanization and restructuring have diminished and urban balance has adversely affected. Another consequence of the reduction of green areas is sudden climatic changes. However, today's cities are not ready for climatic changes. Against the climatic changes, planners have gone to search for innovative, sustainable and effective new approaches. Architects and planners need to create new creative solutions in order for modern cities to adapt to climate change with developing technology. The main purpose of these creative solutions should be in the name of conservation of our lost and irreplaceable water resources due to climate change.

There is a strong relationship between climatic changes and green tissue. Because one of the benefits of green areas is to create a coolness effect in summer and to balance the rainfall by humidifying the air. It is envisaged that the concept of landscaping as a urban infrastructure for water pollution will come into the agenda and it will be successful in the struggle with the climate change in the future as a result of the dense construction of the cities and the decrease of the green areas, the importance of the landscape as an indispensable element (Erkan, 2008). Increase in water-impermeable surfaces in urban areas causes rainwater to pass into surface flow in urban landscapes. The texture of urban structures and the development of urban infrastructure systems are interrelated (Stokman, 2008). In this sense, when water is considered as an urban infrastructure, it is effective in eliminating possible effects due to climate change, such as collecting, directing, accumulating and allowing for different recreational activities.

1.1.Climate Change In Cities-Possible Effects

Climate change is becoming increasingly influential in the hydrological cycle, water resources, their local-regional-global management and distribution. These effects are very slow and will occur during many years and this has made the harmful signals feel like human beings these days (Şen, 2005). As the temperatures increased in the cities, the glaciers began to melt and the rainfall parameters changed and sudden superficial flows formed. Due to the intensity and frequency of extreme weather events, the environmental balance has not changed accordingly. These results cause loss of life and property from the 20th century. The Intergovernmental Panel on Climate Change (IPCC) stated that according to the scenario for the coming years, the temperature will increase by 1-6ºC in 2100, and changes in sea level will occur with heavy precipitation (Erkan, 2008).

1.2. Urban Landscape - Water

Today, water is an indispensable element for the sustainability of ecosystems and life. Water and landscape are formations that have supported each other since the times of different civilizations. However, due to misuse, excessive water consumption due to human activities threatens the life of the ecosystem and all living things (Görer, 2016). Although it is a natural resource that is extremely important in terms of living, unfortunately it is a structure that is not an alternative and can not be produced by mankind. Water plays an effective role in providing both functional and aesthetic requirements to spaces in urban areas. In aesthetically pleasing sound, charm and restfulness, it can create a visual presentation to the city while at the same time giving it an identity (Muratoğlu, 2010) (Figure 1). On the other hand, the place where water is located becomes the focal point with a dominant character. Over time, these areas become harmonized with the texture of the city. Today's urban water system practice is based on the urban drainage and sewage concepts of American and European cities in the 1800s (Delleur, 2003).

Figure 1. Water with city idendity, Vienna and Stockholm (URL-1 and URL-2)

Water cycle in the nature, water is in a loop. The water atmospheres evaporate from the oceans and surface waters and rise to the clouds, rain and land on the earth, and the plants return with their roots or sweating. During this cycle, rainwater collects dirt in the atmosphere and on the surfaces. When these dirts fall on the plants and soil with rain water; Cleaned and removed by vegetation and rocks (Sert, 2013).

Water cycle in the city, is affected negatively by the increase of impervious surfaces. When the results of the studies are examined, the population density and the impermeable surface ratio are directly influenced (Arnold and Gibbons, 1996). When the natural landscape is covered with impermeable surface, it disrupts the water cycle and directly affects the transmission and storage of water (Sert, 2013). One of the most important reasons for the increase in daily temperature differences in the urban area is low sweating and evaporation rate. In cities covered with impervious surfaces, less surface water can be held on the surface for sweating and evaporation because the water is rapidly drained from the impermeable surfaces. This affects the urban energy balance (Grimmond and Oke, 1991). As can be seen in Figure 2, the rate of underground penetration decreases by falling rain falling to urbanized concrete, while the portion passing through the stream is 55% out of 10% (Silkin, 2014).

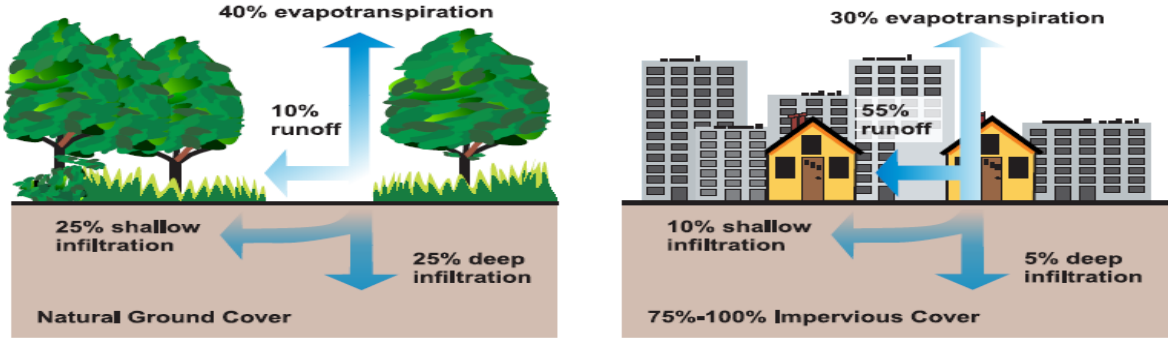

Figure 2. The difference of evaporation amounts between natural ground cover and imperivous cover (Silkin, 2014).

2. APPLIED WATER PROTECTION SYSTEM IN URBAN DESIGN POJECT

Urban design practices have been on the way in recent years due to the climatic changes that have resulted in water conservation in water resources. In this context, different and up-to-date landscaping concepts have been developed the classical landscaping such as water-wise use, water-smart use, low-water use and natural landscaping under the general heading of water-efficient landscaping (Aklanoğlu, 2009). The philosophy of all of these concepts is to make plans using water rationally. One of the planning approaches is "Landscape arrangement". In order to create natural environments by using water at a minimum level, water conservation can be saved (Bayramoğlu and Demirel, 2015). Figure 3 gives examples of xeriscape landscape arrangements.

Figure 3. Sample example of xeriscape (URL-3)

The only point to note in this regard is that water conservation in the cities is provided only by acquiring new resources and relating them to urban development policies and land use decisions in the name of protection of insoluble water. Today, the concept of water-sensitive city forms new approaches by directly shaping the city. Urban design based on water sensitivity approach leads to support healthy ecosystems ans sustainable living and livelihoods through intelligent management of all water types (Figure 4). Water-sensitive urban design (WSUD) is an approach to planning and designing urban environments that support healthy ecosystems, living and livelihoods through intelligent management of all waters. In this approach, water management is sensitive

to natural hydrological and ecological cycles. In short, it is an approach that integrates the management, conservation and conservation of urban water cycle with urban planning (Görer, 2016).


Figure 4. Sample of Water-sensitive urban design (WSUD) (URL-4 and URL-5).

For this purpose, it has been developed "Water Sensitive Urban Design" (WSUD) in Australia, "Sustainable Urban Drainage Systems" (SUDS) in the UK and "Low Impact Development (LID) have different water conservation approaches known. The general aim in this regard is to build natural drainage channels by imitating nature without disturbing the natural water cycle. It aims to increase the infiltration of soil, to ensure that rainwater reaches groundwater, to reduce the amount of surface flow and flow rate, to reduce the amount of surface pollutants, and thus to improve the hydrological functions of urban areas (USEPA, 2012; Butler and Davies, 2004). To this end, the American Environmental Protection Agency (USEPA) describes infrastructure elements serving this purpose as "green infrastructure". Examples of green infrastructures are rain gardens, green roofs, permeable floors, rain ditches, infiltration devices, ponds and planted filter lanes (Butler and Davies, 2004).

Rain gardens; Rain gardens are described as "rain gardens" or "bioretention" to shallow pit areas where plants can be raised by directing the waters of the earth without any treatment [23]. Rain gardens are of great importance for sustainable rainwater management. Increases the rate of evapotranspiration by feeding groundwater (Demir, 2012) (Figure 5).


Figure 5. Sample of rain garden (URL-6 and URL-7)

Green roofs; The green roof coverings are planted with a thin layer of green, allowing people to live and use them. It is an important component in reducing the heat island effect, especially in urban areas, and in a better environment for urban people (Bayramoğlu et al., 2017).


Figure 6. Sample of rain garden (URL-8 and URL-9)

3. CONCLUSION

Today, as a result of the climate change, in parallel with modern technological developments, the increase of the hard floor coverings and the decrease of the green areas have affected the quality of life of the urban people. The living spaces of the city people have decreased and the places where they have realized their social and physical activities have begun to decrease and the urban people have started to move away from each other. Planners who have a say in planning and designing green areas should adopt climate policies for the coming years by adopting new principles instead of classical regulations that have been going on for years. These climate scenarios should be done by creating 5 to 10 year planning strategies within the scenario of today's climate data and future weather forecasters.

Urban open spaces should be designed by evaluating the climate of the region where they are located. Accurate interpretation of climatic data makes it possible for urban people to make outdoor spaces more usable. The designs should aim to make these areas more comfortable for the user by reducing the adverse effects of the climate. Climatic factors affecting design principles in urban areas are well known and more rational solutions can be provided. Sustainable sense of future energy conservation should also be defined in the designs made.

For this purpose, the main decisions of planning for the protection of existing areas should be taken especially in order to increase the green touch in the urban areas which are undergoing much intervention today. When green areas are created, attention should first be paid to the use of native species specific to the region. Because the natural species can easily adapt to the extreme climatic conditions of the region. In addition, it contributes to soil fertility and reduces the effects that may be caused by surface flow in case of excessive rainfall due to climate change. At present, aesthetic solutions must be made at the same time by improving the water cycle that is created by creating green infrastructural systems.

For these reasons, sustainable water use strategies should be introduced to ensure that the environment is compatible with the environment where a single drop of water is not wasted. When we think that the majority of the world's population lives in the cities where we live, the places we design today will affect future generations.

REFERENCES

Aklanoğlu, F. 2009. Sustainability of traditional settlements and ecological design: a case study on Sille, Konya, PhD Thesis, Ankara University, Landscape Archştecture, Ankara, Turkey.

Arnold, C. L., Gibbons, C. J. 1996. Impervious surface coverage-the emergence of a key environmental indicator. APA Journal Spring, Cilt 62, Sayı.2, Sf. 243-258.

Bayramoğlu,E., Demirel, Ö., 2015. "Xerophytic Landscape", in: Environment and Ecology at the beginning of 21st century, Efe R., Curebal Ġ., Bizzarri C., Nyussupova G., Eds., St.Klıment Ohrıdskı Unıversıty Press, Sofia, pp.180-189, 2015

Bayramoğlu,E., Demirel, Ö., Kurdoğlu, B.Ç., Düzgüneş, E. Demir, S, Cındık, Y., Kurt, S. 2017. Kentsel altyapı sistemi olarak sürdürülebilir peyzaj: Trabzon Sahili örneği. KTÜ BAP 06-Projesi.

Butler, D., Davies, J. W. 2004. Urban Drainage, 2nd edition, Spon Press Taylor & Francis Group, London and New York.

Chiesura, A. 2004. The role of urban parks for the sustainable city. Landscape and Urban Planning, 68, 1, 129-138.

Delleur, J. W. 2003. The evolution of urban hydrology: past, present and future. Journal of Hydraulic Engineering ASCE, Sayı 129, Sf. 563-573.

Demir, D., 2012. Konvansiyonel yağmursuyu yönetim sistemleri ile sürdürülebilir yağmursuyu yönetim sistemlerinin karşılaştırılması: İTÜ Ayazağa Yerleşkesi örneği. İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Çevre Mühendisliği Anabilim Dalı, Yüksek Lisans Tezi, İstanbul.

E.H. Oktay, R. Erdoğan, F.B. Oktay, 2015. Kent ve Su, İnönü Üniversitesi Sanat ve Tasarım Dergisi, 5:119-125.

Erkan, V., 2008. İklim Değişikliğinin Yerleşik Düzen, Kentsel Yapı Üzerindeki Etkileri ve Çözüm Önerileri. İstanbul Teknik Üniversitesi, Peyzaj Mimarlığı Bölümü. İstanbul.

Görer T.N. 2016. Bugünden Yarına Kent ve Su Planlaması, Kent ve Kentliler için Planlama Seminerleri, A.Ü. Siyasi Bilgiler Fakültesi, 2 Haziran 2016.

Grimmond , C.S.B., Oke, T.R. 1991. An evapotranspiration-interception model for urban areas. Water Resources Research. 27:7:1739-1755.

http://www.treehugger.com/green-architecture/green-roofs-are-changing-architecture-science-hills-komatsu.html

Müftüoğlu, V., Perçin, H., 2015. Sürdürülebilir Kentsel Yağmur Suyu Yönetimi Kapsamında Yağmur Bahçesi. İnönü Üniversitesi Sanat Ve Tasarım Dergisi, 5(11): 27-37.

Muratoğlu, G., 2010. Peyzaj MimarlıĞında Su Kullanımı, Ankara Üniversitesi, Peyzaj Mimarlığı Anabilim Dalı, Yük.Lisans tezi.134.

Şen, Z. 2005. İklim Değişikliği Ve Su Kaynaklarına Etkisi, 22 Mart Dünya Su Günü,"İklim Değişikliğinin Su ve Enerji Kaynaklarımıza Etkisi"Paneli.

Sert, E., 2013. Enerji Etkin Kentsel Peyzaj Tasarımında Yağmur Suyu. İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Peyzaj Mimarlığı Bölümü, Peyzaj Mimarlığı Bölümü Anabilim Dalı, Yüksek Lisans Tezi, İstanbul.

Silkin, H. 2014. İklim Değişikliğine Uyum Özelinde Bazı Uygulamaların Türkiye Açısından Değerlendirilmesi, Orman ve Su İşleri Uzmanlık Tezi, Ankara, 2014.

Stokman, A. 2008. Water purificative landscapes-constructed ecologies and contemporary urbanism. Proceedings of the 45th World Congress of the International Federation of Landscape Architects IFLA 2008, Wageningen, Baluwdruk / Techne Press, Sf. 51-61

USEPA, 2012. Encouraging Low Impact Development, LID Barrier Busters Fact Sheet Series, United States Environmental Protection Agency, Office of Wetlands, Oceans, and Watersheds 1200 Pennsylvania Avenue, NW, Washington, DC 20460 EPA 841-N-12-003G.

Yaman, G., Doygun, H. 2014. Yeşil Alanların Kent Ekosistemine Katkılarının Kahramanmaraş Kenti Örneğinde incelenmesi. II. Ulusal Akdeniz Orman Ve Çevre Sempozyumu "Akdeniz ormanlarının Geleceği: Sürdürülebilir Toplum Ve Çevre" 22-24 Ekim 2014 – Isparta.

URL-1. https://tr.wikipedia.org/wiki/Venedik

URL-2. http://phonebookoftheworld.com/sweden/city/city-of-stockholm.asp

URL-3. http://simpsonlandscape.com/our-services/xeriscape/

URL-4. http://www.designflow.net.au

URL-5. http://swccnrm.org.au/events/retrofitting-for-wsud/

URL-6. http://www.cameroncd.org/ConservationAtHome/RainGardens.html

URL-7. http://www.3riverswetweather.org/storm-water-green-solutions/stormwater-bmps/rain barrels -rain-gardens

URL-8. http://www.3riverswetweather.org/storm-water-green-solutions/stormwater-bmps/rain barrels -rain-gardens

URL-9. http://www.3riverswetweather.org/storm-water-green-solutions/stormwater-bmps/rain barrels -rain-gardens