



Evaluation of Yalova City Center and Çiftlikköy District in Terms of Vertical Garden

Yalova Kent Merkezi ve Çiftlikköy İlçesi'nin Dikey Bahçe Yönünden Değerlendirilmesi

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Abstract

This study was conducted to specify the vertical gardens and potential areas where vertical gardens could be established in Yalova City Center and Çiftlikköy District between October 2020 and May 2021. The number and area sizes of the vertical gardens and potential areas where vertical gardens could be established were identified on-site. Three vertical a garden applications were determined in different places in Yalova City Center. No vertical gardening was identified in Çiftlikköy District. In Yalova City Center and Çiftlikköy District, a total of 13 different areas where vertical garden could be established were determined. Most of these areas were located in public spaces. There are few vertical garden applications in Yalova City Center and Çiftlikköy District. By establishing potential vertical gardens in public spaces, urban open green spaces can be contributed.

Keywords: City center, Green spaces, Green wall, Ornamental plants, Vertical greenery system

Özet

Bu çalışma Ekim 2020-Mayıs 2021 tarihleri arasında Yalova Kent Merkezi ve Çiftlikköy İlçesi'nde yer alan dikey bahçeler ile dikey bahçe tesis edilebilecek potansiyel alanları belirlemek için gerçekleştirilmiştir. Mevcut ve potansiyel uygulama yapılabilecek dikey bahçe alanlarının sayısı ve alan büyüklükleri yerinde tespit edilmiştir. Yalova Kent Merkezi'nde üç farklı yerde dikey bahçe uygulaması belirlenmiştir. Çiftlikköy İlçesi'nde dikey bahçe uygulaması tespit edilmemiştir. Yalova Kent Merkezi ve Çiftlikköy İlçesi'nde toplam 13 farklı yerde dikey bahçe uygulaması yapılabilecek alan saptanmıştır. Bu alanların büyük bir bölümü kamusal alanlarda yer almaktadır. Yalova Kent Merkezi ve Çiftlikköy İlçesi'nde az sayıda dikey bahçe uygulaması yer bulunmaktadır. Kamusal alanlardaki potansiyel dikey bahçeler tesis edilerek, kentsel açık yeşil alanlara katkı sağlanabilir.

Anahtar Kelimeler: Kent merkezi, Yeşil alanlar, Yeşil duvar, Süs bitkileri, Dikey yeşil sistem

1. Introduction

Due to the increasing population, construction is increasing day by day. Increasing construction causes a decline of open green spaces in urban areas (Koç and Güneş, 1998; Eroğlu and Başaran, 2017; Özdemir Taş and Yerli, 2019). In urban areas, it is preferred to construct multi-storey buildings without garden instead of low-rise buildings with gardens. This type of increasing construction is destroying the open green spaces in urban areas. With the buildings replacing the open green spaces, the number and size of the open green spaces where the urban people rest, relax, relieve their stress, and socialize back to nature are

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decreasing day by day. This decline also reduces the amount of green space per person (Bolatoğlu and Özkan, 2013). According to the World Health Organization (WHO, 2010), it is stated that the amount of green space per person should be over 9 m². It is difficult to say that the amount of green space per person in Turkey has reached 10 m² (Gül et al., 2020). Different methods are being researched to increase the amount of green space in urban areas. One of these methods is vertical gardens that allow growing plants in vertical structures (Pérez et al., 2014; Zaid et al., 2018). Plants can be grown vertically with this method on existing vertical structures or newly created vertical structures by establishing special places and environments where plants can grow. The vertical garden is the partial or complete covering of buildings or other vertical surfaces with plants (Lotfi et al., 2020). Vertical gardens can be established both indoors and outdoors (Çelik et al., 2015; Eroğlu and Başaran, 2017). Thanks to this method, new ecological areas can be created in the city. Vertical gardens are supporting elements of urban open green spaces (Chernova et al., 2020). These areas support natural living and besides help to increase and protect diversity (Yazıcı and Gülgün Aslan, 2017; Karakoç, 2019). Vertical gardens have positive effects on reducing the impact of urban heat islands, absorbing dust and noise, creating micro-climate areas, building thermal insulation, and beautifying the urban appearance (Wong et al., 2009, Erdoğan and Khabbazi, 2013; Pandey et al., 2015; Abdullahi and Alibaba, 2016; Ekşi, 2016). Vertical gardens reduce the stress of urban people (Timur et al., 2018). Vertical gardens have disadvantages such as additional load to the structures, installation costs, irrigation and drainage problems, and technical knowledge (Örnek, 2011; Ekren, 2017). Vertical gardens can be classified as modular system, foam based system, mineral wool based system, felt layer based system, metal fence systems and hydroponic systems (Loh, 2008; Ekren, 2017). Climbing plants, scattered shrubs, indoor plants and herbaceous ornamental plants are used in the systems. Plant feeding and irrigation are applied by drip irrigation method (Kahraman et al., 2018).

This study was conducted to specify the vertical gardens and potential areas where vertical gardens could be established in Yalova City Center and Çiftlikköy District.

2. Material and Method

This study was carried out in Yalova City Center and Çiftlikköy district between October 2020 and May 2021 (Figure 1). The study area was determined using satellite images (Anonymous, 2020) and Parcel Inquiry Application (TKGM, 2020). In order to determine the existing vertical gardens in the research area; first of all the data of Yalova Municipality and Çiftlikköy Municipality Parks and Gardens Directorate were used. After that, the number and size of the existing garden areas were determined in the research area on-site. Photographs of the existing vertical garden applications were taken, and vertical garden type, irrigation method and drainage system were determined. Bridges, underpasses, intersections, streets, roads and building walls were examined on-site for the potential vertical gardens that could be established in the research area. It was aimed to reduce the negative images in these areas by means of vertical gardens. Potential vertical garden areas and their sizes were revealed.



Figure 1. The research area

3. Results and Discussion

According to the analyzes; a total of 721.5 m² vertical garden applications were determined in three different places in Yalova City Center (Table 1). In Çiftlikköy District, there was no vertical gardening application. All of the vertical gardens were established in public spaces. Existing vertical garden applications were located in Yalova City Center Cumhuriyet Square (Figure 2), IDO Vehicle Exit Underpass (Figure 3) and Yalova

Crossroads Interchange (Figure 4). The largest vertical garden application was determined at Yalova Crossroads Interchange. All existing vertical gardens in the research area were the systems created using felt. The plants were irrigated with drip irrigation method, and the drainage water was collected in the canal at the bottom of the vertical gardens. While drying was observed in some plant species in the existing vertical gardens, it was observed that other species developed healthily. Drying plants negatively affected the vertical garden design appearance. It is important in terms of sustainability that plant species in vertical gardens should be selected according to the climatic characteristics, urban conditions tolerant and usage together of plant species. Timur et al. (2018) emphasized the selection of fast growing, low water consumption, drought and urban conditions tolerant plants in vertical garden bridge design.

Table 1. Existing vertical garden application areas

Ownership status	Existing areas	Total area (m ²)
Public	Yalova City Center Cumhuriyet Square	19.5
	IDO Vehicle Exit Underpass	30
	Yalova Crossroads Interchange	672
	Total	721.5



Figure 2. The vertical garden application in Yalova City Center Cumhuriyet Square



Figure 3. The vertical garden application in IDO Vehicle Exit Underpass



Figure 4. The vertical garden application in Yalova Crossroads Interchange

In Yalova City Center and Çiftlikköy District, the areas where vertical gardens could be established in 13 different places were determined (Figure 5, 6, 7). 11 of these areas were public and 2 were private areas. The total size of the potential vertical garden areas in the

research area was determined as 4620 m². Most of these areas were located in public spaces (Table 2). Kahraman et al. (2018) stated that there were many potential areas where vertical gardening could be applied and there was no vertical gardening application in Çanakkale City Center. In this study, 3 existing vertical gardens and 13 areas for potential vertical gardens were determined. Çelik et al. (2015) stated that there were vertical garden applications in İstanbul, Antalya, Balıkesir, Denizli, Gaziantep, Bursa, Kocaeli and Bodrum. Vertical gardens can be used to increase the amount of green space that is insufficient in urban spaces (Ekren, 2017; Lotfi et al., 2020). The vertical garden system and plant species should be chosen very carefully for sustainability. Çelik et al. (2015) suggested the use of native and natural plants in vertical garden applications, so they stated that vertical gardens with ecology compatible, low cost and maintenance could be established. By using native and natural plant species in the potential vertical garden areas determined in this study, both negative images can be masked and the amount of open green space can be increased.



Figure 5. Potential vertical gardening areas in Çiftlikköy District

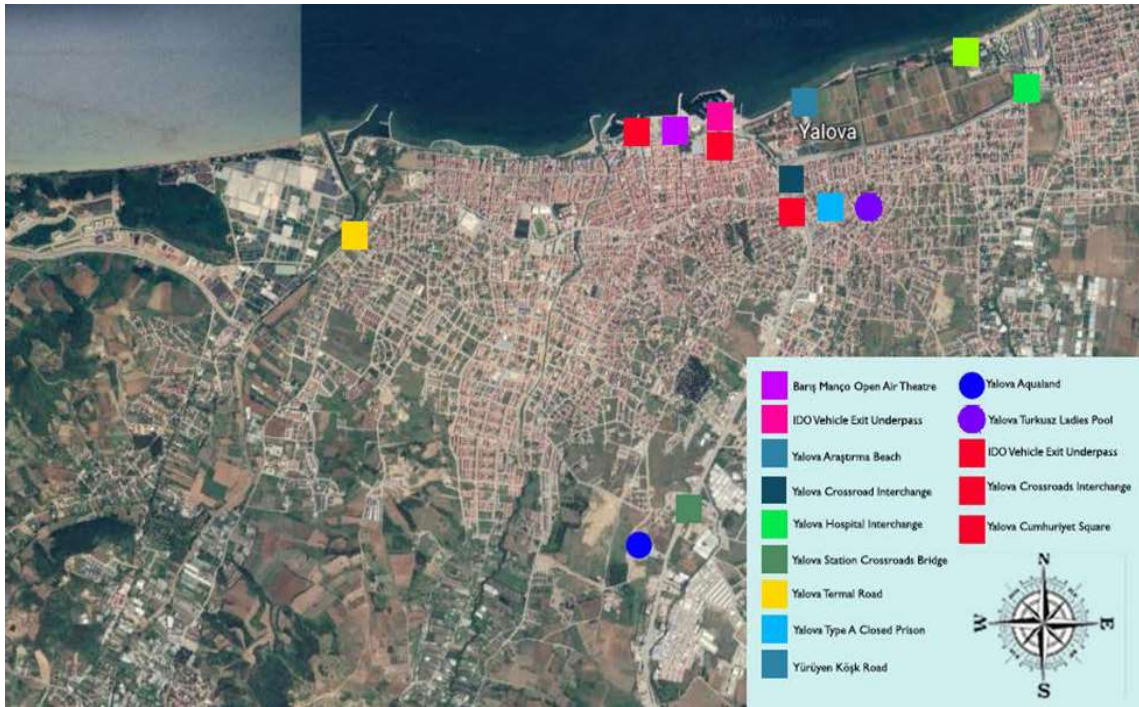


Figure 6. Yalova City Center existing (red color) and potential vertical gardening areas



Figure 7. The potential vertical garden areas

Table 2. Potential areas for vertical gardening

Ownership status	Potential areas	Total area (m ²)
Public (91.34%)	Bariş Manço Open Air Theater	90
	Çiftlikköy Interchange	300
	Çiftlikköy Şevket Yılmaz Street	728
	IDO Vehicle Exit Underpass	120
	Yalova Type A Closed Prison	200
	Yalova Research Beach	1220
	Yalova Crossroads Interchange	100
	Yalova Hospital Interchange	40
	Yalova Station Crossroads Bridge	40
	Yalova Thermal Road	814
	Yürüyen Köşk Road	568
Private (8.66%)	Yalova Aqualand	240
	Yalova Turkuaz Ladies Pool	160
	Total	4620

4. Conclusion

Apart from the 3 vertical garden applications determined in Yalova City Center, 13 potential areas where vertical gardens could be established in Yalova City Center and Çiftlikköy District were determined. The total size of these areas, which was more than six times the existing vertical garden areas, was determined as 4620 m². The establishment of vertical gardens in these areas will contribute to the amount of urban open green space. Thus, both the amount of green space per person and the recognition of the city will be able to increase. The vertical garden system and the choice of plant species are important factors for the sustainability of vertical gardens to be established in cities. Some features should be considered when choosing a vertical garden system and plant species. Vertical garden systems should be easy to find, light, easy to install, inexpensive, resistant to environmental conditions, and long-lasting. The volume of the growing container in vertical gardens should be large enough for plant root development. Planting space should be arranged according to the plant's surface covering feature. The plant species should be suitable for urban ecology and need little maintenance and less watering. Further research on these issues will be beneficial for the sustainability of vertical gardens.

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