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CONTENTS

CHAPTER 5

EVALUATION OF GİRESUN CASTLE RECREATION AREA AFTER USE

Alper SAĞLIK, Yavuz Selim DOMAÇ, Onur KIZILARSLAN 1

CHAPTER 6

RE-TRANSFORMATION OF UNDERGROUND RIVER CORRIDORS IN ANKARA INTO URBAN ENVIRONMENT

Aydanur YENEL 15

CHAPTER 7

CONCEPT ROOF AND VERTICAL GARDEN DESIGNS FOR ERBİL CITY

Onur ŞATIR , Darbaz Pirot MANKURI..... 51

CHAPTER 8

AQUARIUM AS A DESIGN ELEMENT IN HOUSES

Nur Efşan GÖRECI , Deniz DEMİRARSLAN 67

Chapter 5

EVALUATION OF GİRESUN CASTLE RECREATION AREA AFTER USE

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1. INTRODUCTION

The number of people in cities has increased due to developing technology and economic concerns in the 21st century. This increase has led to unplanned settlements in cities. Green areas in and around the city, which people need, are very important for people. Urban open green spaces are places that provide physical and aesthetic value to the city and provide the satisfaction of people's needs such as rest, entertainment, vision and physical activity, and provide physical and aesthetic value to the city. Looking back from the past to the present, the sense of protection started with natural areas and then the protection areas were shaped with differentiated facilities (Sağlık et al., 2020; Sağlık et al., 2016a, Sağlık & Kelkit, 2016b). These areas have a positive impact on human relationships and are very effective in creating a social environment. The Post-Use Evaluation method was used, taking into account the functional and aesthetic evaluation of the space in an impartial and science-based manner (Baird, 2001; Churchman & Ginosar, 1999, Cooper Marcus, Francis, 1990; Karagenc, 2001; Kılıç, 2001; Korkmaz, 2001) The evaluation of closed or open places by users after they become operational is called "Post-Use Evaluation" (KSD) (Preiser, 2002; Baird et al., 1996; Preiser & Vischer, 2005). With this method, new offers are presented to ensure continuity in the quality of services and functional uses offered to users (Preiser, 2002; Pouya, 2016, Pouya & Akıncı, 2019).

This study was carried out with the aim of determining the use and satisfaction of the users in the area by using the Giresun castle recreation area KSD method, which is located in Giresun castle, which is one of the most important historical and cultural places in Giresun province, and to bring solutions to the problems that arise.

2. MATERIAL AND METHOD

2.1. Study Area

This study was carried out in the recreation area located in the castle of Giresun. Giresun province is located in the eastern Black Sea region (Figure 1 & 2). It is surrounded by Trabzon and Gümüşhane to the east of Giresun, Ordu to the west, Sivas and Erzincan to the south, Black Sea to the North, and borders the provinces of Sivas to the south-west (URL1). The climate is temperate and rainy, very rich in vegetation (URL2).



Figure 1. Location of Workspace on Turkey (URL 3)



Figure 2. Location of Workspaces Giresun City Center (URL 4)

2.2. Location of the Study Area

Giresun Castle is a first degree natural and archaeological site. There is not enough information about when this area, which is located on the volcanic rock, was built. This area, known to have been built in the Byzantine period, is located at an altitude of 100 m from the sea (URL 5). This area has been determined as a study area because it has the potential to meet the need for green areas against the increasing urban population and is in a location where people can easily reach the city center. Giresun Castle is located at the highest point of the peninsula that divides the city into two. The area of the area is 10,372 square meters.

Although Giresun is rich in terms of vegetation, there is very little green space in the planning works carried out in the city. This area has been chosen to answer this need. Transportation is provided by 500 meters of parquet and concrete bit road in the area. There is a 20-vehicle 500 m² car park (Figure 3) in the area, but because it is insufficient, people usually park their vehicles to the sides of the road. Children's playgrounds (Figure 5), picnic tables (Figure 7), benches, garbage bins (Figure 6), gazebo (Figure 8), Walkways and viewing points (Figure 11 & 12), waterfall (Figure 4), fountain (Figure 10), water well (Figure 13), restaurants and cafes (Figure

9). There is only one entrance and exit for vehicles in the area. Photos about the area;

The reason for choosing Giresun Castle recreation area is the post-use evaluation method (KSD) method to explain the positive and negative aspects of the area for the users.



Figure 3. *Parking (Original)*



Figure 4. *Waterfall (Original)*



Figure 5. *Children's playground (Original)*



Figure 6. *Rubbish bin (Original)*



Figure 7. *Picnic table (Original)*



Figure 8. *Bower (Original)*



Figure 9. Restaurant (Original)



Figure 10. Restaurant (Original)



Figure 11. Walking paths (Original)



Figure 12. Cruising point (Original)



Figure 13. Water well (Original)

Post-Use-Evaluation Method (KSD);

- Setting an example for similar studies,
- Solving the problems that occur in the field or place with scientific data,
- Strengthening the relationship between the area and the users and ensuring that it is continuous,
- During the design and planning of the area, it is aimed to create areas to be more beneficial to the users before and after use according to the wishes and needs of the users,
- The overlooked details in design and planning will be useful in eliminating the problems during use (Pouya, 2016; Akad, 2007; Bechtel, 1997; Bechtel & Churcman, 2002).

Survey and observation studies will be conducted with the people who use the area with the Post-Use-Evaluation Method (KSD) method. The behaviors of the users were taken into account in the observation study. This study will be conducted to examine the active use of the area and the area-user relationship. In addition, a survey will be conducted in order to determine their age ranges, gender, day and frequency of using the field, their thoughts about the area and for what purpose they use the area. After a detailed literature review, the questionnaire form used in the research was prepared. In the first part of the questionnaire, questions were asked to learn about the demographic structure of the people surveyed. In the other part, questions were asked to determine the importance and usability of the recreation area. Lee Cronbach called the method cronbach Alpha analysis, which he created in 1951 under the name reliability. This method has the most appropriate use in likert-type questions (Ercan & Kan, 2004). Cronbach Alpha reliability analysis is often used in likert-type questions (Table 1). Form of expression;

Table 1. Cronbach Alpha Reliability Analysis

0	<	R_2	<	0.40	Insecure
0.40	<	R_2	<	0.60	Low Reliability
0,60	<	R_2	<	0,80	Reliable
0.80	<	R_2	<	1	High Security

There are different approaches to calculating the method.

- * Analysis of variance
- * Finding item totals

* Achieving covariance and correlation values of substances.

$$R^2 = (1 - k^{-1}) \left(\frac{\sum_{i=1}^k S_i^2}{\sum_{i=1}^k S_i^2 + \sum_{i=1}^k S_i^2} \right)$$

S_i^2 : variance of items, k : number of items, $\sum_{i=1}^k S_i^2$: variance obtained by summing all items (Alpar, 2013)

The survey consists of 2 stages. 1 stage; questions about users' profiles, step 2; They answered a total of 11 questions regarding users' usage related to the area. In the light of the data obtained, it was analyzed with the SPSS 21 statistical package program and Bigsteps program. SPSS 21 program and Cronbach alpha analysis were applied to 11-item questions for Giresun Castle Recreation area. The results were obtained by applying Rasch analysis to the same questions with the Bigsteps program. Results have been compared. In the light of the data, it was found to be 92.4% reliable.

2.3. Method Flow Diagram

The method flow diagram is given in the visual in Table 2.

Table 2. Method Flow Diagram, (Original)

Step 1	Determination of the Research Topic
Step 2	Literature Review on Topic
Step 3	Data Collection in the Field
Step 4	Survey Study
Step 5	Findings
Step 6	Results and Suggestions

3 FINDINGS

3.1 Findings obtained by the method of observation

According to the observation work carried out on the Giresun Castle Recreation Area, it is used more at the weekend and especially at noon. Due to the lack of pergola and picnic tables in the area, people use the grass areas for picnics. One of the biggest problems of the area is that the parking area is insufficient and people use the roadside as a parking lot. The existing equipment and elements (picnic table, bench, barbecue, pergola, children's playground, bridge) (Figure14 & 15 &16) have been deformed due to environmental factors.



Figure 14. Barbecue (Original)



Figure 15. Bridge (Original)



Figure 16. Vehicles Left on the Side of the Road (Original)

As a result of the interviews, the users expressed useful and positive opinions about the field. It was found that this area is a place where fire can be lit in public spaces of Giresun city center and environmental effects are taken into consideration in the design of the area.

3.2 Findings Obtained by the Questionnaire Method

A survey was conducted with a total of 80 people. Since the survey study was conducted during the pandemic period, it was affected by the number of people. The survey was conducted on the web. People were encouraged to participate in the survey via social media and phone messages. In the survey, the profile characteristics of the participants, their access to the area, the status of the parking area for vehicles, the extent of maintenance and repair of the area, whether the landscape equipment and materials are sufficient, how they provide access to the users and whether they can respond to the needs of people were determined according to the answers given in the questionnaire.

3.2.1. Survey data

The table was created according to the questionnaire questions and the results (Table 3 & 4). Looking at the tables, it was found that 57.5% of the users using the field were male and 42.5% were female. People between the ages of 24-48 used the area with a rate of 43.8%. It was determined that 62.5% of the participants in the survey are undergraduate degrees. It was observed that 37.5% of the area was used as the area usage. It has been determined that the landscape equipment and elements of the area are 52.5% and insufficient. The maintenance and repair of the area was found to be inadequate at a rate of 66.2% in the survey. In the survey, it was seen that the car parking lot was insufficient at a rate of 43.7%. In terms of transportation, according to the rate in the survey, it was concluded that 47% was carried out by private vehicles. According to the result of the survey, the recreation area has a positive effect of 65.8%.

Table 3. Profiles of survey participants (Original)

Participant's Profile		Percent
Sex	Male	%57,5
	Female	%42,5
Age	12-24	%30
	24-48	%43,8
	48-65	%25
	65+	%1,2
Education Status	Primary	%3,7
	High school	%12,5
	Associate's degree	%8,8
	License	%62,5
	Master's degree / doctorate	%12,5

Table 4. Rates reached by survey result (Original)

Promenade Area Usage		Percent
Car Park	Enough	%27,5
	Insufficient	%72,5
Transportation	Pedestrian	%25,4
	Bicycle	%1,6
	Special vehicle	%47
	Public transport	%26
Landscape reinforcement and Element	Enough	%47,5
	Insufficient	%52,5

Frequency of use	%57,5	in use
	%22,5	not used
	%10	S/He uses a lot
	%6,3	Never use
	%3,7	I have no idea
Maintenance and cleaning of the area	%66,2	Insufficient
	%16,3	Enough
	%10	Absolutely Inadequate
	%6,3	I have no knowledge
	%1,3	Absolutely Enough
Positive effect on users ' socialization	%65,8	I agree
	%19	Absolutely I agree
	%7,6	I have no idea
	%3,8	I do not agree
	%3,8	I strongly disagree
Addressing the needs of the people	%38,7	I agree
	%41,3	I do not agree
	%5,3	I strongly disagree
	%8	I have no idea
	%6,7	Absolutely I agree

4. CONCLUSION AND SUGGESTIONS

Giresun castle is an important area with natural richness, cultural diversity, historical texture and contribution to the urban ecosystem. In order to improve the user demands of Giresun Castle, it must have a strong image as well as existing values (Temiz et al., 2019).

In the study, based on observations and surveys, the needs and demands of the users of the Giresun castle recreation area bring along confusion and many problems. It has been observed that the parking problem is very important among these problems. Due to the insufficient parking area, users park their vehicles to the sides of the road. The vehicles narrow the road and create difficulties in terms of circulation.

In addition to the opinions of the users and their answers to the questionnaire, as a result of the observations made, the existing reinforcements in the area are inadequate and deformed, causing problems for users. The insufficiency of the pergola, benches and garbage cans causes visual pollution due to the contamination of the waterfall and the deformation of the wooden bridge on it. According to the data obtained from the observation and questionnaire, it was observed that the area was used actively and generally for having picnic and watching Giresun at the

cruise points. It was observed that the area, due to the insufficiency of the existing equipment and elements, could not find an empty pergola in the afternoon. The barbecues in the area have been deformed over time due to environmental conditions and Vandalism. As a result of evaluations, suggestions against deficiencies during design;

- Insufficient number of gazebos and increasing their size
- No work has been done for the use of disabled people.
- There is no system for cleaning the waterfall
- The boundaries of the area are not defined precisely.
- Using too much hard ground in the area and degrading the naturalness of the area

According to the results of the study, problems and deficiencies of the Giresun Castle recreation area were determined using the KSD method. After the designed areas were opened for use, no post-use assessment could be made. It is inevitable that designers will make the same mistake when they do not consider these values.

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Chapter 6

RE-TRANSFORMATION OF UNDERGROUND RIVER CORRIDORS IN ANKARA INTO URBAN ENVIRONMENT

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1. INTRODUCTION

Due to migration from rural to urban starting in the early years of the Republic in Ankara, rapid population growth from the 1950s to the present, and unplanned construction units, the sustainable planning approach in the city center could not be preserved. Stream beds opened to construction have lost most of their natural and historical values due to the housing around them. The lost natural values of Ankara continue to flow quietly, under the surface, covered, under all the traffic burden of the city, and taken underground and in concrete channels.

Streams that are water sources of Ankara, life veins and life source of the city flow underground. Semiz (2019) stated that;

“Those living in Ankara run over at least 20 streams a day. However, streams and other green areas are, unfortunately, also considered within the scope of traffic and infrastructure needs, unwittingly. When the gray layer is removed, it will then be possible to bring the original life under this layer to daylight.”

In his article “Ankara, the City Searching for Water”, Özaslan (2012) mentions that:

“Today, Ankara has turned into a city facing with the problem of the absence of water and green, despite the countless streams flowing under it... The streams of Ankara, which groan under each bored pile penetrated underground on the stream beds that lost their waters, await the disastrous days when they will spill out hatred... In fact, the streams of Ankara, over which boulevards and subways pass and concrete and iron jungles rise today, actually still function as the heart veins of Ankara.” (Özaslan, 2012, p.37).

In his study named “Historical and Current Information on Ankara Streams”, Tamur (2012) underlines that;

“Until the recent years, the riverbanks have been recreation areas of people of Ankara, meeting points with nature, more importantly, health and agricultural basins for thousands of years... In the early periods of the Republic and until the 1960s and 1970s, the surrounding landscape of the Hatip Stream became the most important recreation area where Ankara residents and the resident of new capital spent their weekends... The town-dwellers piling into train, with picnic baskets in their hands, flocked into Mamak and Kayas. Visitors coming from the east were being hosted by the Hatip Stream and they were being accompanied until the Bentderesi and Hacibayram Neighborhood... In the west of the city, on the other hand, the Ankara Stream, where all capillary water veins of Ankara meet, would embrace the guests with an arterial power and deliver them to Akköprü...” (Özaslan, 2012, p.37).

Hasan Akyar, a water professional, utters that:

“None of the streams we thought disappeared went anywhere. They are where they have been for centuries! However, we cannot see them. Some of them were enclosed in canals and culverted, since the 1950s, the route of some of them was changed, covered and transformed into a boulevard, and some of them are hosting marketplaces, parks and gardens and parking lots over them. There are more than 70 streams in ‘Ankara Basin’ alone. Every day, you go to your workplace in Çayyolu, Cebeci or Dikimevi. Are you aware that you run over at least 15 covered streams every day, only in one direction? The leading streams among them are as follows: Kutugün Stream, Beytepe Stream, Ağıldere, Yalıncakköyü Stream, Karakusunlar Stream, Söğütözü Stream, Cevizlidere, Kirazlıdere, Dikmen Stream, Ayrancı Stream, Kavaklıdere, Hoşdere, Seyrantepe Stream, Bülbülderesi, Akdere, etc. But today, it is quite difficult to make Ankara residents under the age of 50 believe that Hatip Stream and Bentderesi once flowed openly...” (Görgülü, 2016).

Kazancı, Şaroğlu, and Boyraz (2008) states that;

“When it comes to the streams of Ankara that were covered and disappeared, as we all know, all avenues and streets are flooded, even in moderate precipitation, moreover, we have also been deprived of natural environmental assets. The fact that many vehicles were scrapped recently in the Bağlıca neighborhood as a result of transforming stream beds into roads and parking lots seems to have been forgotten due to repeated floods” (Kazancı, Aytun and Günok, 2018, p.104).

Emphasizing the natural, cultural and spatial necessity of these streams in Ankara; these streams should be regained to the town-dwellers, in a variety to provide transportation and recreation opportunities and within the scope of maintaining the water memory of the city and maintaining its existence.

“Çubuk Stream bears witness to a great history as well because it crosses through Çubuk Plain, where the Ankara War was fought. This stream where souvenir photographs were taken and gondola rides were made once, has now been left to its fate, miserably.” (Tamur, 2012).

“Ankara did not only lose its streams, creeks or its water, but also life sherbet of water; its lush essences, its gardens, vineyards and canyons, too... Ankara has also lost its humanist, dignified, respectful and affectionate life intertwined with water... Ankara has lost its memories, social relations, social gatherings and cohesion... If you talk to anyone who knows Ankara’s 30-40 years of previous history, he will tell you about his numerous memories about the streams...sadly, sighingly, and with eyes filling tears...” (Özaslan, 2012, p.39).

The aim of this study was to determine the past and present uses of waterways, which are the natural heritage of Ankara and whose function was lost during the process, by comparing their effects on the environment. The most effective solution from now on is to propose the environmental and urban planning process for the urban identity and history while preserving these formations. Streams should be regained by removing all the formations on the neglected water systems in Ankara, the capital of our country, and by creating original sections, and they should be brought out again and re-transformed into the urban environment. The river corridors in the city center should be re-conceptualized thanks to urban restoration and renovation works, by making necessary design interventions, without losing the essence of the city.

2. RIVER CORRIDORS OF ANKARA

Ankara is located in the Central Anatolian Region, on a natural threshold belt, morphologically suitable for settlement. The city was established on the eastern slopes of the plain where the Ankara (Engürü) Stream extending in the east-west direction passes, and it is bordered by Karyağdı mountains (1200-1500 m) in the north, Meşe and Hacı mountains in the south and Elmadağ (1800 m) in the southeast. The near-far natural region of Ankara joins the Engürü Plain to the west and the Mürted Plain extending in a north-south direction to the west of Sincan (Tunçer, 2019, p.126) (Figure 1).

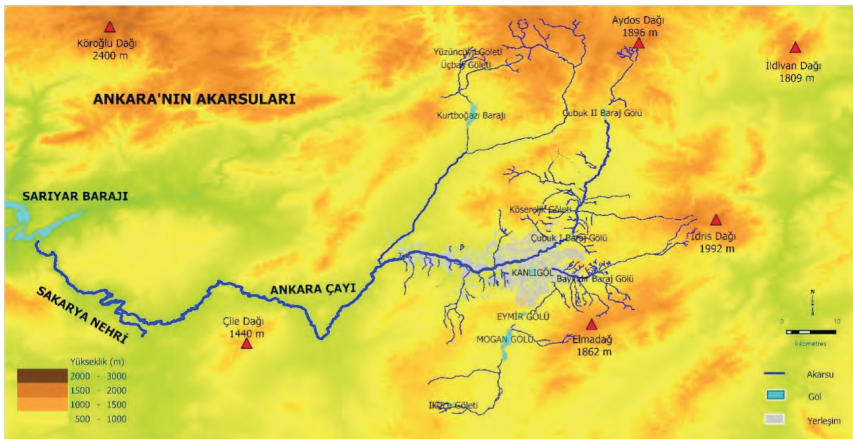


Figure 1. *The main rivers, streams and general topographic structure of Ankara¹ (Kazancı, Aytun, and Günok, 2018, p.102)*

Until 70-80 years ago, there were many large and small streams flowing in their natural courses in Ankara's rural area (Tunçer, 2014). Çubuk Plain, which surrounds the city of Ankara, is a fertile farming area. Ankara Castle

¹ The map in Figure 1 was produced by Kazancı, Aytun and Günok (2018) using 1/25.000 scaled topographic maps of the General Command of Mapping, 2007 edition.

and its foothills have made the region sheltered from enemy attacks in history with its characteristic structure consisting of steep slopes. As the narrow valley of Bentderesi separates the lava hill where the Ankara Castle is located, from the steep side of the plateau dominating the plain, it has created a site of military importance (Günel and Kılıcı, 2015, p.89-90).

2.1. Three Important Creeks of Ankara

The topographic structure of Ankara turns first to the middle of the basin and then to the west with large streams entering Ankara basin from outside and with small streams rising from the surrounding elevations. Three out-of-basin streams flow into the Ankara basin (ABB, 2013, p.64), which are;

- Incesu Stream from the southeast,
- Hatip Stream flowing from the hills of the city in the east,
- Çubuk Stream from the northeast.

Drainage of Ankara surface waters, in other words, collection and flow of rainwater and spring waters happens through Incesu, Hatip, and Çubuk Streams, three main tributaries. The confluence of these streams composes the “Ankara River” (Figure 2). Albeit the existence of only three large streams within Ankara, tributary streams reaching these streams form a highly complex drainage network, despite the fact that most of them are covered today. The urban descent and ascents and some steep slopes in today’s city traffic are the result of this fact (Kazancı, Aytun and Günok, 2018, p.105).

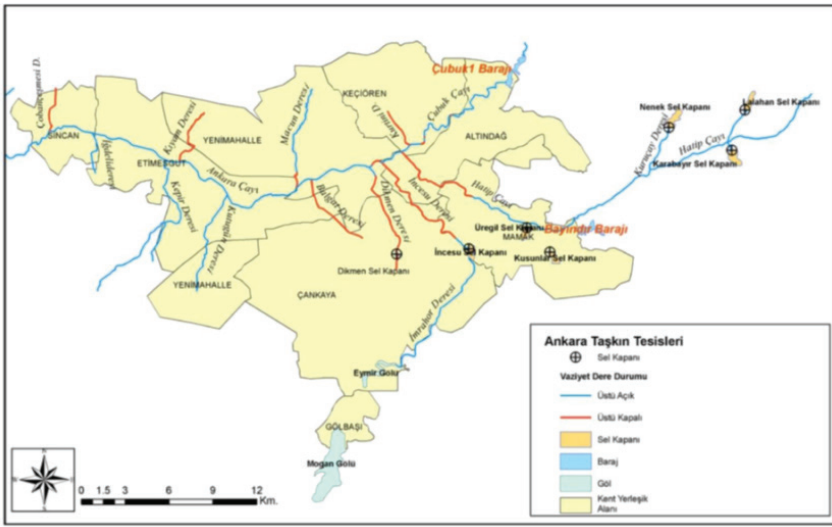


Figure 2. Ankara River and its surrounding landscape (Pekin, 2007, p.112)

The streams in the city, except one (Çubuk Stream), have been covered for various reasons (Kazancı, Aytun and Günok, 2018, p.104). As of the late 1950s, parts of Hatip Creek and Incesu Stream passing through the city were channelized and culverted in stages, the non-functional bridges were demolished and roads were constructed over them (Tamura, 2012, p.12). Their presence comes to mind only when they cause overflows and floods in excessive precipitation. Streams that are covered and transformed into roads, and water basins zoned for housing lose their carrying role in the hydrological cycle and this also threatens the sustainability of the water surfaces they nourish (Tamer, 2015, p.24).

2.1.1. Çubuk Stream

Among the rivers of Ankara, Çubuk Stream is the largest stream in terms of flow rate. Çubuk-1 Dam (1936), the first dam of Turkish Republic, was built on this stream as well. Later, Çubuk-2 Dam (1964) was built for Ankara's drinking water and domestic water needs. Çubuk Stream springs from the foothills of Aydos Hill, turns south from the Çankırı road junction after passing Çubuk Plain and Esenboğa, enters the Bosphorus after passing Çubuk-1 Dam, Şevkat district, Subayevleri, İskitler, Akköprü, Atatürk Forest Farm, Güvercinlik, Etimesgut and Sincan, and continues to the west as Ankara Stream (Özkan, 2010; Kazancı, Aytun and Günok, 2018, p.105).

The most important stream in the Hacıkadın Valley area of Ankara's Keçiören District is Hacıkadın Stream (Figure 3, 4). Bağlum Creek, a tributary of Ulugüney Creek, takes the name "Hacıkadın Stream" when it approaches the Hacıkadın Valley and joins the Çubuk Stream (Yeşilyurt, Kurt and Akaydın, 2008, p. 26). Kurtini Creek, which forms a border with Yenimahalle district in the northeast, is a tributary of Çubuk Stream, most of which are located in Keçiören district (Pekin, 2007, p.117).



2011 Sonbaharı, Hacıkadın Deresi'nden bir görünüş. (Fotoğraf: Erman Tamur)



Ahmet Soyak 20.01.2014

Figure 3. Hacıkadın Stream, 2011 (Tamura 2012) **Figure 4.** Hacıkadın Stream, 2014 (Çelik, 2013, p.69), (Archive of Soyak, 2018)

Hacıkadın Stream goes underground in the North Ankara urban transformation site and flows from the side of Bağlum. Since the confluence point of Hacıkadın Stream and Çubuk Stream was turned into sewer line, most of the stream was channelized in 2017. After all, Hacıkadın Stream is now disappeared (Soyak, 2018) (Figure 5, 6).



Figure 5. Hacıkadın Stream, 2016 (Soyak, 2016)



Figure 6. Hacıkadın Stream in the channel, 2018 (Soyak, 2018)

2.1.2. Hatip Stream

Ankara's second major stream is Hatip Stream, which rises from the north of Hasanoğlan (Kazancı, Aytun and Günok, 2018, p.105; Özkan, 2010) (Figure 7). Hatip Stream comes from Kalecik, rises from Mount Idris, and it has two tributaries: Hasanoğlan and Ced Branches (İldan, 2014; Soyak, 2013).

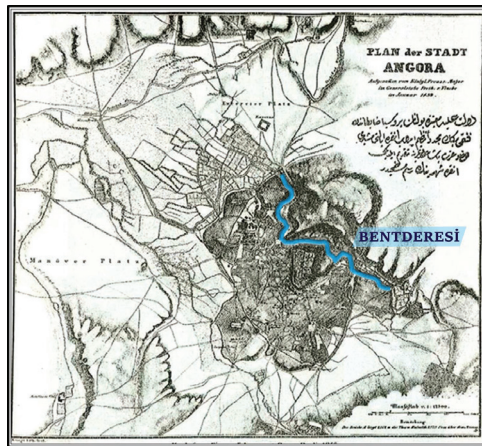


Figure 7. 1839 Von Vincke Map of Ankara (Günel and Kılıcı, 2015, p.88)

Following the low elevations in the south of Lalahan-Kayaş-Mamak-Asri cemetery, it meets with Bend Stream. It passes the Dışkapı bridge and the Mevki Hospital and joins Çubuk Stream in Iskits (Özkan, 2010; Kazancı, Aytun and Günok, 2018, p.105) (Figure 8, 9). Today, a part of Hatip Stream flows throughout open stream beds but it is polluted. An

urban transformation project was carried out on the Hatip Stream in Mamak, whereas a congress center, park and many residences were built on this stream bed (Figures 10, 11).



Figure 8. *Hatip Stream*
(Soyak, 2014)



Figure 9. *Urban transformation project on Hatip Stream, Mamak*
(<https://www.evrensel.net/haber/32937/hatip-cayinda-tehlikeli-donusum>)



Figure 10. *Bend Stream*
(https://twitter.com/zen_saadet/status/792784397258874882/photo/1)



Figure 11. *Ankara Castle and Hatip Stream, 1922*
(<https://tr.pinterest.com/pin/293508100689569968/>)

When passing through the foothills of the Ankara Castle, Hatip Stream is named as “Bentderesi” due to the Roman Period Dam (Özkan, 2010; Tunçer, 2019, p.128) (Figures 12, 13). Romans had brought water to the city from Elmadağ using stone pipes (Sağdıç, 1998, p.13). Underground water was brought thanks to 2.5 km-stone pipes around the meeting point of Kosunlar Valley and Kayaş Valley, also taking Hanımpınarı water near the Üreğil village (Kozanoğlu, 2013, p.78).



Figure 12. Ankara Castle, Bend Stream and Hıdırlıktepe, William Ainsworth's Engraving, 1839 (<https://www.fotoankara.com/arsiv/bentderesi-2/>)



Roma Bendi'nin bilinen en eski fotoğrafı. 1892 yılında Berggren tarafından çekilmiştir. Bent'in dip saksaklarının her ikisinden de su boşalıyor. Su, Bent'in önünde küçük bir gölet oluşturuyor. Bent'in memba tarafında, derentin iki kıyısında görünen yetişkin ağaçlar o yıllarda Bent'in üst seviyelerine kadar su depolanmadığını gösteriyor. Ön planda iki açıklıklı aşıp tabiiyetli bir köprü görünüyor. Bu köprüünün yerine ileriki yıllarda (muhtemelen 1910'larda) iki açıklıklı taş bir köprü, (Çakırlar Köprüsü) inşa edilmiştir. Köprüünün kale tarafında, yol kenarında kemer nişli taş bir çeşme dikkat çekiyor.

(Fotoğraf: Koray Özalp arşivi)

12 Cross, M. Toni & Leiser, Gary (2000), *A Brief History Of Ankara*, Indian Ford Press, Vacaville, California. s.77.

Figure 13. The oldest known Guillaume Berggren Photograph regarding Ankara Bend Stream and Ankara Castle Romans Dam, 1892

(<http://www.eskiturkiye.net/4121/ankara-bentderesi-ve-ankara-kalesi-1870ler-guillaume-berggren-fotografi#lg=0&slide=0>)

The tanner and water mills that existed on the banks of Bend Stream until the 1920s were destroyed and Romans Dam, which first lost its originality with the modifications and additions made in the early 1930s and then was completely demolished, failed to reach the present day (Tunçer, 2014) (Figures 14, 15). The demolition of the Roman Period Dam in Bend Stream is a significant loss of natural landscape and archaeological

value (Tunçer, 2019, p.127). After the flood disaster in 1957, the stream was covered and thus, one more stream that nourishes the Ankara stream has become a ghost stream (İldan, 2014).

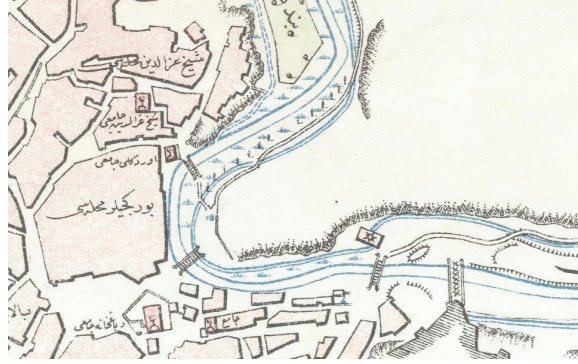


Figure 14. Roman Dam and bridges on Hatip Stream (Bentderesi), 1924 (Tunçer, 2019, p.129)

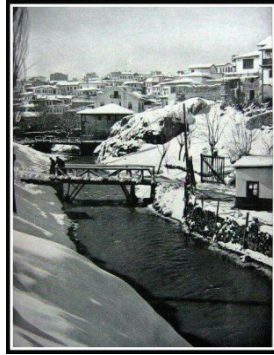


Figure 15. Bend Stream, 1950

(<https://tr.pinterest.com/pin/132645151504673144/>)

When housing that started on the crests of Altındağ and was previously ignored turned the Bend Stream into a dirty flowing stream first and then into a sewer, the valley on which the Castle rises was covered and Bend Stream was transformed into a street. The stream was completely covered in the zoning plan of Ankara and the present road connecting Dışkapı to Cebeci was built (Sağdıç, 1998, p.76; Tunçer, 2015; Tunçer, 2019, p.128) (Figure 16).



Figure 16. *Bentderesi Street, 2015*

(<https://www.fotoankara.com/etiket/bentderesi/>)

After all, Hatip Stream, where Hidrellez (*celebration of the arrival of spring*) is celebrated and people have picnics, and tree texture growing along the stream have disappeared with all their beauty (Tunçer, 2015; Tunçer, 2019, p.128). Bridges and dams on the streams were demolished and the gardens on their banks were destroyed. Thus, tours on the streamside on summer nights, arched stone bridges, women washing clothes behind the mills, flock of ducks swimming in the stream have become dreams from a distant past reflected in photo frames for Ankara residents (Tunçer, 2014; Tamur, 2012).

2.1.3. Incesu Stream

The beginning of Incesu Stream is 5 km west of İkizce Village on the Ankara-Haymana road (Kazancı, Aytun and Günok, 2018, p.105). The water overflowing from Lake Mogan flows from Gölbaşı to Eymir Lake with an open channel. The water overflowing from Lake Eymir passes through Mühye, as an open stream. It is named as “Imrahor Stream” when reaches the Imrahor Valley. After passing under the Doğukent Boulevard overpass, this time, it’s called “Sazlık Stream”. When it enters into the channel, it takes the name Incesu Stream. After collecting Kavaklıdere, Küçükkesat, Seyranbağları (Bülbülderesi), Topraklık and Cebeci waters, Incesu Stream joins Çubuk Stream near Akköprü, through Kolej, Sıhhiye and following the Opera, 19 Mayıs Stadium and Hippodrome (Kazancı, Aytun and Günok, 2018, p.105). Incesu Stream does not uncover until Çubuk Stream. It carries the sewage and rainwater from the zones within the closed channel.

Incesu Stream, Ankara Stream and Kavaklıdere in the greens in Ankara’s 1940s lost the struggle and the struggle ended with the grim dominance of gray over green within twenty years due to the newly planned and rapidly building physical texture of the city. Today, streams have transformed into avenues, creeks into streets and waters into roads (Cansever, 2015) (Figures 17, 18).



Figure 17. *Map of Ankara, 1940*

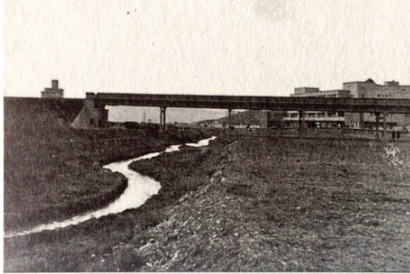
<https://huzurdankale.wordpress.com/2016/02/16/kayip-suyun-izinde/#jp-carousel-927>



Figure 18. *Embassy of Austria and poplar trees, Kavaklıdere, 1940 (Tamur, 2012)*

The Incesu Stream too lost its battle against its housing activities surrounding in 1960s and thus, it was taken underground, covered and transformed into a road. It was hidden like the other waters of Ankara, but it did not disappear. The Incesu Stream, reaching the Imrahor Stream, passes through the center of Ankara. As there are streams under all Kolej area, Sıhhiye Parking Deck, Marmara street, Çankaya Municipality campus and Astroturf facilities are at risk. After flowing in front of Ankara University Faculty of Language, History and Geography, under the section of Atatürk

Boulevard towards Ulus, until the Radyoevi (*Broadcasting House*), Incesu Stream turns north in front of Radyoevi, flows under the area between Talatpaşa Boulevard and Ankara Arena-19 Mayıs Complex, passes under the area between Akköprü Station and AnkaMall, and merges with Çubuk Stream next to the viaduct at the exit of the station and takes the name “Ankara Stream”. Today, a large part of Incesu Stream has been covered with concrete (WOW Turkey, 2009) (Figures 19, 20, 21, 22, 23).



Incesu Deresi ve Sıhhiye Demiryolu Köprüsü, 1930'lar



EskiAnkaraResimleri

Figure 19. *Incesu Stream and Sıhhiye, (<https://tr.pinterest.com/pin/241927811212774925/>)*

Figure 20. *Sıhhiye, Faculty of Language, History and Geography on the right, and Incesu Stream in the shade of green trees, 1950 (<https://www.facebook.com/EskiAnkaraResimleri/photos/>)*



Sıhhiye civarının 1960'lı yılların başında görünüşü. Bugünkü Abdi İpecki Parkı tarafından gelip Atatürk Bulvarı'nı menfez içinde geçen Incesu açığa çıkıyor ve Bulvarın solunda açık kanalda akıyor. Kanalın solundaki yol, "Ambarlar Yolu", Toptancı Hali'ne bağlanıyor. (Karpostal: Erman Tamur arşivi)



Figure 21. *Incesu Stream, 1960 (Çelik, 2014, p.68)*

Figure 22. *Lausanne Square, Sıhhiye (the uncovered state of Incesu Stream) (<https://tr.pinterest.com/pin/542824561323820345/>)*



Figure 23. *Covering works of Incesu Stream, 1960*
 (<https://www.pinterest.de/pin/535787686909925999/>)

2.1.4. Ankara Stream

Merging with Çubuk Stream in the north and heads to the southwest, Hatip Stream joins with the Incesu Stream coming from the south and forms the Ankara Stream (Pekin, 2007, p.121; ABB, 2013, p.119). The confluence of Incesu, Çubuk and Hatip Streams in Etlik forms the Ankara Stream (or known as Engürü Stream). Ankara Stream grows by meeting the Zir Stream, which passes through Dikmen, Söğütlü, Kutlugün, Kepir, İğdeli, Kavaklı, Söğütözü, Kutgun streams from the south, through Macun and Ergazi streams in the north, and through the Mürted Plain in the west of Sincan. Ankara Stream, which crosses through Ayaş, Beypazarı and Nallıhan districts and travels for about 140 km, flows into the Sakarya River. It splits Ankara almost in half (Pekin and Yılmaz, 2018, Çetiner and Şahin, 2020, p.295) (Figure 24).



Figure 24. *Ankara Stream*
 (<https://www.bilgipedia.com.tr/ankara-cayi/>)

Following the Bosphorus, the Ankara Stream merges first with the İvedik Stream, then with the Ova Stream coming from Kazan and Yenikent. The Ankara Stream is the second largest tributary of the Sakarya River after Porsuk and it brings the waters of Central Anatolia to the Sea of Marmara (Kazancı, Aytun and Günok, 2018, p.105). Seven-span Akköprü Bridge on the Çubuk Stream was built during the reign of I. Aladdin Keykubad

(1219-1236) in 1222 by the Architect Bedreddin (Erdoğan, Günel and Kılıcı, 2007, p.168-169) (Figure 25).



Figure 25. *Çubuk Stream and Akköprü, 1990*

(<http://yavuziscen.blogspot.com/p/eski-ankara-fotograflar-1.html>)

Today, parts of Incesu Stream outside the residential area and the Çubuk Stream flow openly (ABB, 2013, p.65). Works to produce concrete solutions for the Ankara Stream transformed into open sewage have not been performed yet. Bottom mud in the stream giving off smell are removed by earth movers (Yapı, 2014) (Figure 26). Establishment of treatment facilities in industrial sites, fine operation of the established facilities, as well as preventing domestic wastewater discharges is needed to protect the Ankara Stream and prevent pollution (Eker and Özkan, 2017, p.217).



Figure 26. *Ankara Stream, 2014*

(http://www.yapi.com.tr/haberler/ankara-cayi-acik-kanalizasyona-dondu_121560.html)

In times when the city did not spread to these regions yet, Ankara had small streams rising from the north and south elevations of Ankara that flow through their natural channels and join the three streams of Ankara or the Ankara Stream, which is the combination of these three streams (Tamura, 2012, p.12).

2.2. Small Streams Originating from Northern Elevations of Ankara

2.2.1. Macun Stream

Starting from the Tabya Bayırtepe in the north of Yakacık village settlement area, it flows into the Ankara Stream next to the Turkish Grain Board. The stream bed is nourished from the tributaries of Kuru Dere-İvedik Stream (Pekin, 2007, p.120). The destruction of Ankara's streams by covering them has continued after the Macun Stream was channelized in 2017 (Soyak, 2017) (Figure 27). Part of the Macun Stream joining the Incesu Stream flows openly today with its highly polluted waters (Tamura, 2012, p.12; Tuncer, 2014).



Figure 27. *Macun Stream* (Çelik, 2014, p.70)

2.2.2. Ergazi Stream

Since it rises up to the low ridge bounding with one of its tributaries in the northeast of Çakırlar Farm, some of its surface waters, in times of flood, flows over the ridge towards that small neighboring valley lying lower elevation (Erol,1963, p.71).

2.2.3. Kıyam Stream

It was reclaimed as a closed section (Pekin, 2007, p.120).

2.2.4. Kayalı Boğaz Stream

Crossing through Meşe Hill, Peçenek Stream, Çimsit Village, it takes the name Kayalı Boğaz Stream and ends with the Ankara Stream (Pekin, 2007, p.120).

2.2.5. İğdeli (Ana Kadın) Stream

Passing through the illegal housing prevention zone no. 2 that starts from the Oytuç location, it crosses through the Marshal Çakmal neighborhood and Sincan-Etimesgut Road, and finally passes through Plevne neighborhood Destek Street and reaches the Ankara Stream (Pekin, 2007, p.121).

2.2.6. Çoban Çeşmesi Stream

Originated in the basin between Belören and Kırklar Hill and colloquially known as the Çoban Çeşmesi Stream, it reaches Ayaş Road

from Gaziosmanpaşa District, passes between Sincan Organized Industry and Kunduracılar Site and joins the Ankara Stream (Pekin, 2007, p.121)

2.2.7. Mürted Plain Rivers

The main stream of the Mürted Plain, located in the northwest of the Hatip Plain is the Ova Stream nourished by Yıldırım and Aydos Mountains from the north. The major tributary of the Ova Stream, which crosses the Mürted Plain from north to south, is the Kurtboğazı Stream. A large number of streams such as Çihirlik, Kilis, Killiközü, Kaptıboğazı, Kestanegölü, İyimir, Ağca, Çelti, Yılğın, Kızpınarı, Kermeliközü, Güvenç, Bağlarıçi join the Ova Stream from the west and east. Most of them are seasonal streams and dry up in the summer months (ÇŞB, 2014, p.13).

2.2.7.1. Zir Stream (Ova Stream)

The old settlement of Yenikent is in Zir Valley. It is also known as Istanos (istanos means the land of river). It is understood that this name was given to the Zir Valley, which has been named Zir since the 1800s, because of the Ova Stream, which still flows today (Yenikent Rehberim, 2018) (Figure 28).



Figure 28. Zir Stream (Ova Stream), 1929 (Yenikent Rehberim, 2018)

Pollution of the Zir Stream, which crosses through the valley, with sewage water caused an environmental disaster. It was noticed that the color of the flowing water in the stream changed. With its both ecological and visual, as well as historical and archaeological values consisting of Hellenic, Turkish, and Armenian cultures, Zir Valley has privileged importance in Ankara’s steppe landscape and is one of the landmarks of Ankara city. Zir Valley is one of the valleys with high potential to meet recreational needs thanks to its close location to the city center (İnternet Haber, 2009; Çelik, 2014, p.71; Çayyolu Haber, 2018) (Figure 29).



Figure 29. *Zir Stream*

(<https://www.hurriyet.com.tr/yerel-haberler/ankara/zir-vadisindeki-cevre-felaketi-buyuyor-40921365>)

2.3. Small Streams Originating from Southern Elevations of Ankara

2.3.1. Dikmen Stream

The Dikmen Stream starts from Dikmen Flood Retarding Dam, crosses the Harp Okulu Street in front of Dikmen Street General Directorate of Land Registry and Cadastre, passes between the Land Forces Command Building and the State Supply Office, north of the NCOS High School for Military Band, is derived to the Kirazlı Stream, passes through the Marshal Fevzi Çakmak Street, Beşevler, and finally ends with the Ankara Stream in the north part of the State Railways Hospital (Pekin, 2007, p.122). Today, the Dikmen Stream flows just under the Cemal Süreya Park in Ayrancı (Görgülü, 2016) (Figure 30).



Figure 30. *Öveçler Stream Bed, 1976 (Archive of Soyak, 2017)*

Dikmen Valley is a South-North flowing valley, geographically adjoining Mogan-Eymir. Its natural flow to the city center as a potential green wedge is largely cut by government buildings at its northern section. This part is completely separated from the rest of the valley by

the construction of Cetin Emec Boulevard on fill, in the early '90s. This boulevard is constructed on a landfill, intersecting the valley east-west, hence completely separating the city center bound section from the rest of the valley. The Dikmen Valley regeneration Project, literally “Dikmen Valley Housing and Environmental Improvement Project” has a continuous open space as its green spine, called “Culture Park”. Dikmen Valley is an important element of Metropolitan Ankara’s urban wind circulation and green corridor (Tunçer, 2014).

In the studies carried out in 2018 to identify the problems caused by floods in Dikmen Valley and EDOK intersection (the land that covers the Ministry of National Defense Nursery School, Turkish Military Academy, and the Ministry of Finance); it was determined that there is a constriction in the wastewater line in the zone between Merasim Street-İnönü Boulevard (ASKİ, 2018) (Figure 31).

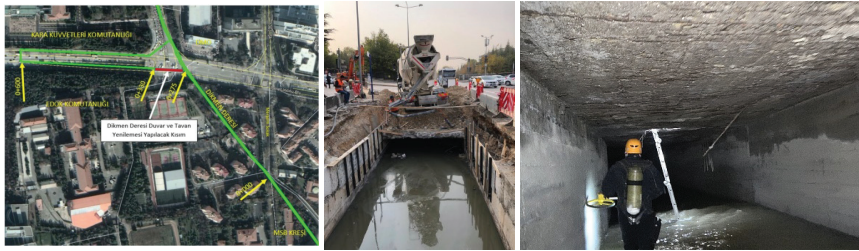


Figure 31. Section renewal and cleaning works at Dikmen Stream, EDOK Junction (ASKİ, 2018)

2.3.2. Kirazlı Stream (Öveçler Stream)

Kirazlı Dere starts from Dikmen ridges, runs between Sokullu and Öveçler, which are located further east than Dikmen Stream, and enters the land of the Turkish Military Academy under Çetin Emeç Boulevard (Tuncer, 2014). Öveçler Stream Bed is shown in Figure 30. This lost stream, which will be named Kirazlı Stream from the borders of the Turkish Military Academy, joins the Dikmen Stream, whose bed between Anıtkabir and Anıtpark was changed, and reaches the Çubuk Stream, near the Coal Distribution Facilities (Soyak, 2017) (Figure 32).



Figure 32. *Dikmen Stream, View of Bahçelievler from Anıtkabir, 1940*
(<https://emekbahceli.blogspot.com/2014/01/1940l-yllar.html>)

Flowing in front of the Undersecretariat for Defense Industries, Kirazlı Stream crosses the military lodgings from the west side of the Headquarters of the Turkish Land Forces Command and moves towards Beşevler under Fevzi Çakmak Street. It crosses over the Beşevler Ankaray Station tunnel in the Tandoğan direction. The area where Sabancı Dormitory for Girls and the additional service building of the Ministry of Justice locates is the natural bed of Kirazlıdere. It leaves the Hippodrome Train Station on the east side of the Gazi Training and Research Hospital (formerly State Railways Hospital) with a one-side closed culvert and continues on its way by flowing openly in the land of Ataturk Forest Farm. It joins the Ankara Stream at the back of the Türk Telekom Facility (WOW Turkey, 2009).

The Kirazlı Stream is also a lost stream of Ankara. Dikmen Stream is the bed where Öveçler Stream and Kirazlı Stream flow to Çubuk Stream. They join around Anıtpark (Soyak, 2017). Before the Marshal Fevzi Çakmak Street was opened, Dikmen Stream was passing through there. After the street was built, the stream was taken under the road. Like many other water resources of Ankara, it continues to flow under the roads even today (Görgülü, 2016) (Figure 33).

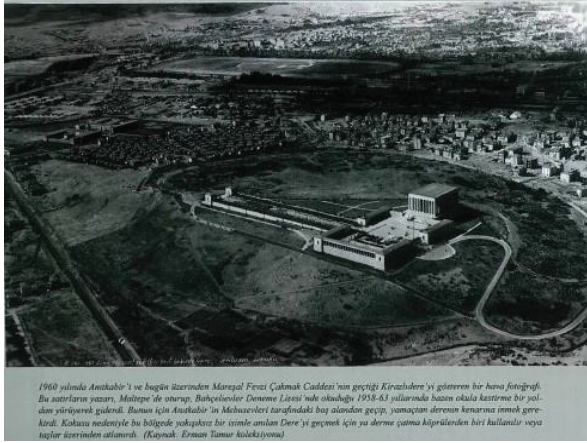


Figure 33. Kirazlı Stream, Anıtkabir and Marshal Fevzi Çakmak Street, 1960 (Çelik, p.70).

2.3.3. Cevzlidere

Cevzlidere is a stream that once ran with a gurgling sound from its hills to its plains, but now just a district name (WOW Turkey, 2009). Due to the zoning movements of Erzurum District, which is an extension of Balgat, the stream remained under the ground and disappeared. While one-fifth of the rainfall on this land reached Cevzlidere indirectly in the past, four-fifths of the precipitation goes directly to the flow and comes to Cevzlidere now (Görgülü, 2016)

2.3.4. Balgat Söğütözü Stream

Balgat Söğütözü Stream continues east of Konya Road by collecting the waters of Konya Road Kepekli Strait. Passing from the Balgat District to the west of Konya Road, it reaches the Ankara Stream after crossing the lands of Traffic Hospital, Söğütözü Recreation Spot, Forest Nursery, Gazi Anatolian High School, and Atatürk Forest Farm, respectively. It embodies the Kuyucak Stream, which is effective in terms of flow rate, as a tributary stream from within the land of Atatürk Forest Farm (Pekin, 2007, p.123). In 2016, the last open section of Söğütözü Stream was channelized (Soyak, 2017).

2.3.5. Alacaatlı-Beytepe Village Streams

It outcrops in Alacaatlı-Beytepe Village Region near Beytepe and Çayyolu Villages, in Bayırköy, Çoraklıktepe, Uzundere, Şeyhleritepe, Beytepe, Turnaçeşme, Kocabayır, Halhal Pınarı, Kudret Pınarı, Çakırlardere, Kocabayır, İkiizleritepe, Kutuğün-tepe, Tahar Tepe, Karadede Tepe, Karkaya Tepe, Kanlıpınar fountain and its surroundings, Sarıkaya Hill, Kızılarmezarı Hill, Çakırlar Stream and Fırınkaya Hill (Deli and Orhan, 2007, p.72) (Figure 34).

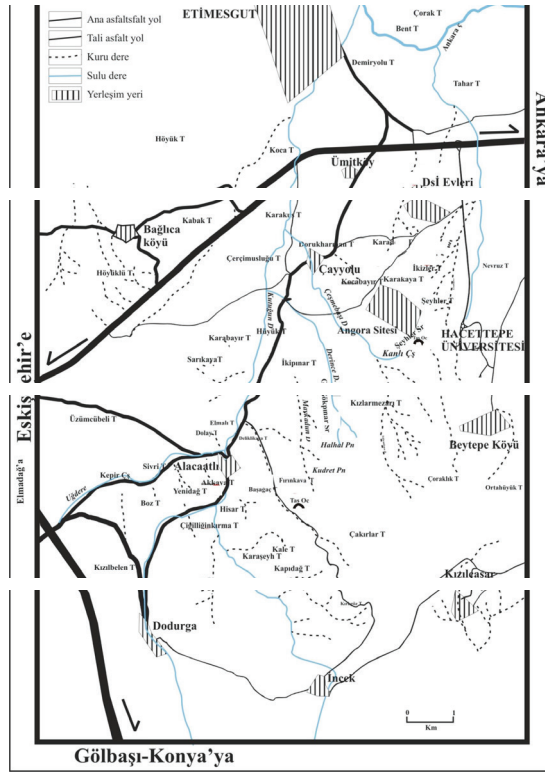


Figure 34. Streams of Alacaatlı-Beytepe Village Region (Deli and Orhan, 2007, s.62).

2.3.6. Kutugün (Çayyolu) Stream

Today's Çayyolu Village, known as Kutugün in the 1950s is a recreation spot where the people of Ankara have a picnic and usually visit on weekends, where fish are caught in the stream that gives the village its name. Kutugün Stream, which gave its name to the region in Çayyolu Region, rises from the Dodurga Village, starts from the foothills of Alacaatlı Village, passes through Çayyolu Mass Housing Settlement Center, crosses the Military Facilities (Armored Forces Division Command) land under Eskişehir Road, and finally flows into the Ankara Stream within the boundary of Etimesgut District (Pekin, 2007, p.120). Starting from İncek Tulumtaş, it passes through Dodurga, Alacaatlı and through the current Park Street, behind the Arcadium, the street in front of the Gordion Shopping Mall and crosses through Çağlayan Military Lodging. In Sincan, it passes through Çağlayan location and joins the Ankara Stream (WOW Turkey, 2009). Flowing downwards, Çayyolu Kutugün Stream once decorated the newly built sites surrounded by 50-60-year-old willow trees on both sides. In 2008, poplars and willow trees along the stream were cut down. Since Çayyolu Stream was reclaimed, nobody can see this stream anymore (Ankara Tarihi, 2010) (Figures 35, 36).



Figure 35. *Kutugün (Çayyolu) Stream (Ankara Tarihi, 2010), (Çelik, 2014, p.70)*



Figure 36. *The reclaimed version of the Kutugün Stream (Ankara Tarihi, 2010)*

2.3.7. Lakes Mogan (Gölbaşı) and Eymir

Mogan-Eymir Basin is defined by the heights that form Haymana Plateau in the west and Incesu (Imrahor) Valley in the south of Dikmen and Çankaya. Its eastern borders are drawn by the heights starting from Haymana Plateau and extending to the north with Beynam and Elmadağ (Günay, 2015, p.57). Rivers, streams, creeks, lakes, and catchments are natural parts of great importance in urban ecology. Lake Mogan and Lake Eymir, two important water surfaces in the urban fringe today, have the characteristic of an oasis for the city with the water network nourishing these lakes. As valuable water surfaces and water drainage basins that give life to rich natural parts, Ankara's Imrahor Valley, Lake Mogan and Lake Eymir are on the brink of a similar construction pressure (Tamer, 2015, p.25-27).

Lake Mogan is a shallow lake located 20 km south of Ankara. The lake is fed by small streams that usually dry out in summer, including Sukesen, Başpınar, Gölova, Yavrucak, Çolakpınar, Tatlım, Kaldırım ve Gölcük streams located in the east-north-west parts of the basin (ÇŞB, 2014, p.14). Lake Eymir, on the other hand, is located 15 km south of Ankara.

The entire lake is located within the land of the Middle East Technical University (METU) (ÇŞB, 2014, p.15). Lake Eymir formed as a result of a tectonic event that occurred where the basin narrowed and entered the Incesu (Imrahor) valley. Lake Eymir continues its existence with this water system and continues on its way to Incesu Stream (Günay, 2015, p.57) (Figure 37).

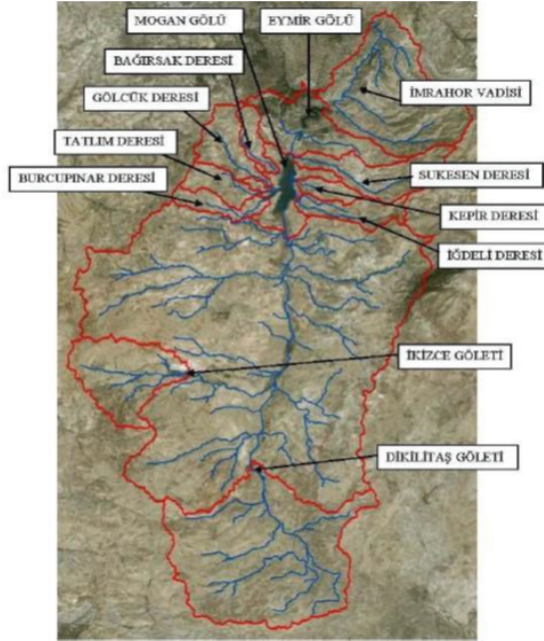


Figure 37. *Gölbasi Basin water system (Çelik, 2014).*

The alluvial layers with a thickness of 10-15 meters between Lake Mogan and Lake Eymir feed the Lake Eymir from the bottom by absorbing the water collected by the Kepekliboğazı Stream and other secondary streams heaving with rainfall. Mogan and Eymir Lakes are interconnected hydrologically. Lake Eymir is fed from Mogan Lake through a wetland area. In 1950s, there was a wide wetland between Lake Mogan and Lake Eymir. In the course of time, most of this area was filled and its feature has disappeared, moreover, a part of this area was partially opened to construction (Tunçer, 2014).

2.3.8. Imrahor Valley

Lake Mogan Basin is a small sub-basin at the southeast end of the Sakarya River Basin and is surrounded by ridges of 1861 m in the north-northeast section, 1280 m in the west and 1404 m in the south (Figure 38). Imrahor Valley is adjacent to the basin's beginning on the north side (Lake Eymir side) and includes the region where the Imrahor Valley, which feeds the basin, joins the Lake Eymir (Tunçer ve Aytekin, 2020). Imrahor

Stream is the water coming from Lake Eymir, which is the main source of Lower Imrahor Neighborhood located in Imrahor Valley. The Sazlık Stream enters the concrete canal after the flood set 500 m below and takes the name of Incesu (Soyak, 2013) (Figure 39).



Figure 38. *Imrahor Valley*

(<https://emlakkulisi.com/imrahor-vadisi-imar-plani-askiya-cikti/371239>)



Figure 39. *Imrahor Stream, Lower Imrahor Neighborhood* (<https://www.youtube.com/watch?v=SGZdryyDhFI>)

Imrahor Valley, which includes Mühye and Karataş Neighborhoods of Çankaya District and Upper Imrahor Neighborhood of Mamak District, covers a significant part of the urban fringe of Ankara city. Imrahor Valley has a crucial role in conserving the ecological balance of city with its landscape and other natural features. The valley has long been considered as one of the most important ecological areas of the city and protecting the valley as part of green system has been a primary objective since the first plan of city. However, the valley has rapidly lost its natural characteristics under the effects of recent planning policies and implementations. The importance of greenbelt regulations, protective land policies and the plan decisions taking into account the upper-scale ecological systems should be emphasized (Özfindık, 2019, p.343) (Figure 40).



Figure 40. *Construction areas in Imrahor Valley*
 (https://www.spo.org.tr/resimler/ekler/3f2f853eea753bb_ek.pdf?tipi=2&turu=X&sube=1)

Studies on Imrahor Valley can become a very important example not only for similar valleys and green areas in Ankara scale, but also for all rural settlements or green belt areas on the shores of metropolitan cities in general. To realize a more permanent and comprehensive project, the valley should be included in the city without losing its attribute of green area. To enhance the quality of life in the valley villages, urban development areas should be planned with a local organization and a multi-dimensional participation model. To ensure the integration of the valley in urban life without damaging the ecological characteristics of the valley and within the framework of sustainability is of great importance for the city of Ankara (Tunçer, 2019).

3. LANDSCAPE PROTECTION AND RESTORE WORKS FOR RIVER CORRIDORS

“The fact that the decisions of management of water resources and/or land use and development affecting water resources are being made independently and that is priority mostly development oriented make it difficult to protect water resources.” (TOB, 2017, p.20; Çetiner and Şahin, 2020, p.299-300).

“Urban green infrastructure is an open area system that allows to maintain interconnected waterways, wetlands, forest areas, wildlife habitats, green areas, parks, protected areas, farms, forests and all natural ecological processes and that protects air and water resources and supports natural life.” (Tapan and Sanalan, 2013; Yılmaz and Ercoşkun, 2020, p.3).

Urban green infrastructure planning, on the other hand, is prepared at different scales from parcel scale to regional scale. Green corridors, a component of the urban green infrastructure, make the all urban green system meaningful by connecting them each other (Chou, 2016, p.2). Green and blue corridors that support and complement the urban ecosystem should

be planned as part of green infrastructure to contribute to the establishment of ecological balance and the creation of sustainable cities (Yılmaz and Ercoşkun, 2020, p.3).

It is seen that certain importance is given to the open green area system in all plans that direct the urban development of Ankara. In the Jansen Plan, which is the first plan of Ankara, the first steps towards the establishment of an open green space system were taken. While the implementation method of the Yücel-Uybadin Plan is thought to not protect the green areas envisaged in the Jansen Plan, 2015 plan showed that an open green area system was determined for Ankara and that a greenbelt around the city was aimed to create with this system. “2023 Open Green Space System Plan” was prepared within the scope of the 2023 Capital Ankara Master Plan. It is seen that this system plan consists of green wedges and greenbelts that are connected with roads, and the valleys are considered as an important part of the urban open green space system (Orsan and Karadeniz, 2019, p.6). Greenbelt suggestions were included also in the 2038 Ankara Environmental Plan (ABB, 2017b) (Figure 41).

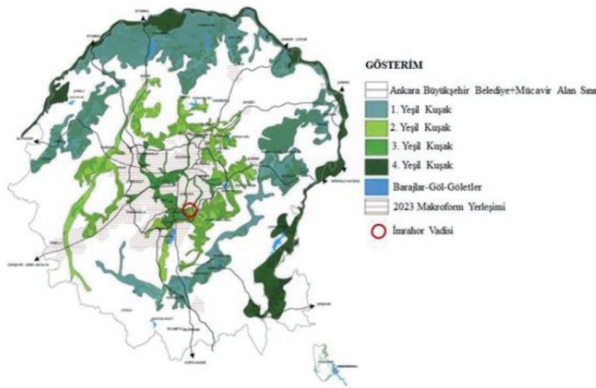


Figure 41. 2023 open green space system plan (2007 Master Development Plan) and Imrahor Valley (Orsan and Karadeniz, 2019, p.6)

Environmental Plan, Master Development Plan and Implementary Development Plan are strategic tools that will ensure that river and basin systems are integrated with the city in regional and urban planning activities. While the integration of rivers in basin and micro-basin scale planning studies is ensured by Environmental Plans, Master Development Plan and Implementary Development Plan have strategic importance in the urban macroform and the integrated planning of rivers, at lower scales. Interaction of the river with natural and nature-identical ecosystems at the upper scales may increase the contribution of rivers to the city and urban-dwellers in multiple ways. This approach ensures both the use

of ecosystems for human benefit and the prevention of disturbing the ecological balance. Linear open spaces like streams make significant contributions to urban life, especially the function of creating corridors within the city (Zülkadiroğlu, 2015).

Factors such as prevention of opening fertile lands to construction, preserving of rich groundwater areas, the exclusion of the valley bottoms from settlement, etc. should be evaluated in a scientific manner for the use of natural land (ABB, 2017a). In all plans to be drafted, it should be emphasized that the valleys should be seen as a part of the urban open green space system and that construction should not be allowed in the valleys (Orsan and Karadeniz, 2019, p.8). The protection of ecological values should be at the forefront in the landscape protection and restoration works of these river corridors. As a component of urban green infrastructure, streams should be transformed into multifunctional open spaces with restoration projects. Thus, sustainable water management will be ensured and ecological integrity will be preserved as well (Yılmaz and Ercoşkun, 2020, p.3).

Natural water resources within the cities in Turkey are, too, very important in terms of ecosystems, but these resources, unfortunately, could not be effectively protected with the sustainable planning approach, and they have lost much of their natural value. This problem still continues even today. There is no concrete implementation example made in the appropriate theme for the transformation of stream corridors which were taken underground in the urban area and were covered in the past, into the urban environment.

In the world, on the other hand, urban design projects are implemented for the streams that are taken under the transportation systems. For example, in “The Madrid Rio Project” commenced in 2004 in Madrid, Spain, the zone alongside the river into green areas to make the city eco friendlier. Urban spaces have been re-conceptualized and links to green spaces and water trails have been provided (Yapı Dergisi, 2019) (Figure 42).



Figure 42. *Madrid Rio Restoration Project: Before and After Transformation Photos (Yapı Dergisi, 2019)*

Another project is the restoration project completed in 2005, which was planned for the 8.5-km-long Cheonggyecheon Stream, which splits Seoul, the capital of South Korea, in the north-south direction. After flowing through the city, it joins the Jungnangcheon Stream and meets the Han River, finally, both streams end with the Yellow Sea. In the project, the natural environment was not damaged at all and the historical texture was completely preserved (Liste List, 2017; Aydemir, Yılmazsoy and Turgay, 2018, p.39) (Figure 43).



Figure 43. *Cheonggyecheon Stream Restoration Project: Before and After Transformation Photos - road demolition and stream restoration procedure (Liste List, 2017) (Seo and Kwon, 2018, p.4)*

4. CONCLUSION AND RECOMMENDATIONS

Several factors such as natural land use potential of Ankara, rapid developments that are getting complex by changing with today's demands to enhance our living standards, migration waves of 1950s parallel to the development of industrialization, population increase, rapid urbanization, expansion of settlements have led to the occurrence of an intense environmental threat with different claims in land use. Out-of-control urban developments raise various problems, including disturbed environmental balance, reduction of important water areas and natural habitats, and residential areas.

Reinterpreting past social structure, constructions and urban elements in today's Ankara and reestablishing the urban link network is a significant heritage that we will leave to the next generations. Ankara needs urban, semi-rural and rural living environments with increased quality of life that are compatible with sustainable development policies.

The aim of this study was to redesign conceptual recreation areas and bring them to the city with the combination of open green spaces and settlements, by preserving the ecological living environments of Ankara, planning streams, rivers, valleys and green road networks that have been neglected from the centers of nature, and protecting and developing river corridors in urban areas.

Accordingly, a restoration project should be prepared for the effective and active preservation and management of the Ankara Stream ecosystem. The outline of creating a river corridor-based conceptual green road plan should be set forth for the Ankara Stream. As performed in the Madrid Rio and Cheonggyecheon Stream Restoration Projects, the sustainability of the existing green systems of the city should be ensured by using both the transportation infrastructure and the urban fabric for the Ankara Stream as well. As carried out in transformation projects; urban green axes will thus contribute to ecological planning as a solution to improve the environmental conditions and urban life quality against urban problems, thanks to transforming stream corridors back into the urban environment in the urban planning process.

In the conclusion, in order to benefit from natural resources most efficaciously and most economically without disturbing the natural and cultural environment and but with preserving environmental quality; water should be recycled by removing all formations on the neglected water systems and the lost natural values should be transformed back into the urban environment. Regaining of urban metabolism should be ensured thanks to the urban transformation projects in which the large-scale urban restoration and renovation works and the disciplines of architecture-conservation, urban planning-design, and landscape architecture and engineering are organized together.

We should regain our streams to the city, which once flowed very clean within Ankara, but later transformed into open or closed sewer lines either partially or completely. Local authorities should bring the streams of Ankara back together with Ankara, and the people of Ankara, thanks to a holistic approach in conservation and restoration works of natural and urban areas.

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Chapter 7

CONCEPT ROOF AND VERTICAL GARDEN DESIGNS FOR ERBIL CITY

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Introduction

Urbanization is one of the top environmental issues in the world. Particularly in developing countries. Almost half of the human population is living in the cities today (UN, 2018). Urban green areas are got importance more than before because of dense built up areas. Green areas in urban ecosystem have many significant effects to urban ecology such as developing human and environmental health, enlarging green areas mitigates the many negative effects caused by urbanization (Myeong et al. 2006; De Ridder et al. 2004).

Increased urban population has been caused a big conflict between urban and green areas especially in lands that is included limited suitable places for built up. New designing approaches started to discuss to support urban green ecosystem and services. Roof gardens, facades, and wall gardens are provided good opportunities in this point (Rogers, 2008). Green roof term is not a new term and approach. Some of the examples can be seen in the well-known history. The oldest green roof, apparently, is a ziggurat of ancient Mesopotamia, built from the fourth millennium to 600 BC. (Groninger et al. 2011). It was built to show the civilization ability for a royal purpose. However, it is different now. Today, air and visual pollution, aesthetic requirements, human wellness and limited green spaces inside the cities are our main reasons to create new solutions like roof and vertical gardens.

Grass roofs have been a feature of the vernacular architecture of certain geographic regions notably Scandinavia and The Fertile Crescent, areas of Turkey, Iraq, Iran, and neighboring countries during the many years. Flat, mud-covered roofs often become colonized with grasses, producing the turf-roof effect. The combined soil and grass on Scandinavian roofs helped reduce heat loss during the long, dark winters (Dunnett and Kingsbury, 2008). Traditional Kurdish turf roofs serve to keep in heat during the winter and keep out the burning sun in summer months. Scandinavian immigrants to the United States and Canada brought these ideas with them, and for some time, grass roofs were used on settler log cabins (House, 2009).

Today, high and steep surfaces are too many in the cities. The question is that can we use these surfaces to contribute urban green ecosystem? One of the detailed study has been done by the Blanc (2015). In his study, he reviewed some of impressive applications starting from his home (laboratory). According to the research, some vertical gardens in the world were covered the whole walls. However, some of them was covered only a part of columns or beams. Also, plants didn't have to connect to a wall or vertical surface. They can be used as dangled form from a roof or beam (Figure 1).



Figure 1. PAMM Museum Miami (on left side) and One Central Park Sydney (on right side) (Blanc, 2015).

Purpose of this paper was to design vertical and roof gardening concepts for Erbil City that is located in Northern Iraq. In this context, three places were selected for concept designing in the city center. Whole selected areas were modeled, and contribution to the city was evaluated by the experts.

Study Area

Erbil City that is the most populated city in Northern Iraq was selected for this study because of lack of quality green areas inside the city, and historical importance. According to UNESCO (2012), historically Erbil is considered one of the oldest uninterruptedly dwelled in cities in the world. It is believed that the urban life in Erbil is dated back to at least 6000 BC. In 2008, population of Erbil was around 1.025.000 (Rasul and et al 2016). The surface area of Erbil is approximately 130 km² and elevation is around 426m. Erbil's climate is hot-summer Mediterranean (Csa) according to Köppen climate classification, with very hot summers and cool wet winters. January is the wettest month, there is rain in winter more than summer in Erbil. The average temperature is 20.2 °C, and average precipitation is around 543 mm.

Three area were defined to design in the city to be; The Mayor Office Building, Machko tea shop, and Erbil tower hotel. All these locations were selected according to pavement, tourist and transportation routes, green

area requirement and applicability of the designs by the experts.

The Mayor Office building

This building is located in Erbil city center closed to the citadel. It is also located near local market which is one most crowded area in city (Figure 2).

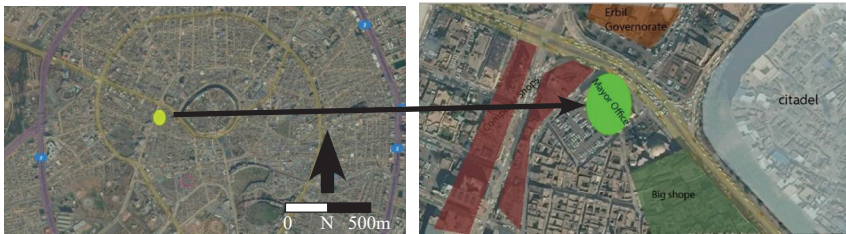


Figure 2. Shows the location of Mayor Office Building

This governmental building was constructed in 1921. It is a historical building which consist of two floors. It has usually been used for administration works for the locals (Figure 3).



Figure 3. Shows Mayor Office Building in different time periods

Machko Tea Shop

The second building that has been studied in this research is Machko café. This building is located in the city center of Erbil precisely next to the main entrance of Erbil citadel and surrounded by a big marketplace (Figure 4).

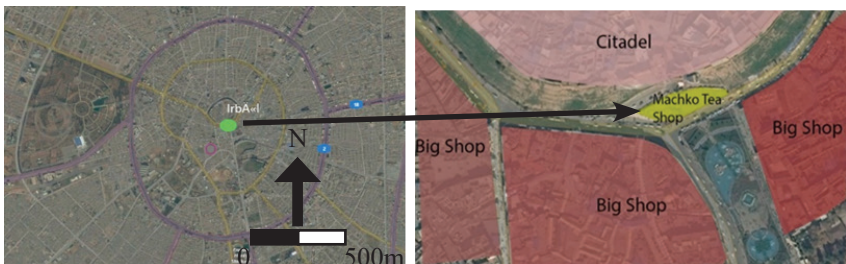


Figure 4. Exhibits the location of Machko Café

Currently, this building is considered a part of citadel its traditional tea shop usually is full of tourist and other people. This historical building was constructed in 1940. It consists of two floors with big balcony (Figure 5).



Figure 5. Shows Machko Café (Photo by Rawen Pasha)

Erbil tower hotel

The third and the last building in this research is the Erbil Tower Hotel. This building is located in city center in highly busy area near to citadel and Doctor’s Street in Erbil (Figure 6).

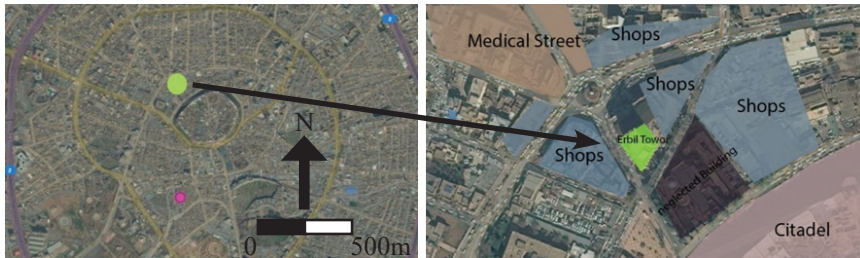


Figure 6. Demonstrates the location of Erbil Tower

This building is composed of eight floors which divided into three different sections. The first or the ground floor is used as market. Furthermore, the second floor is mainly utilized as an office floor. Finally, the remaining floors (six floors) are employed as a hotel. This old hotel was built in in the late 1950s (Figure 7).



Figure 7. Shows the Erbil Tower

Software

Basic CAD and 3D designing softwares were used to complete whole models. AutoCAD 2015, 3DMax 2015 and Lumion student edition were used in a combination. AutoCAD and 3D Max were created by Autodesk Company, and they have been used more than 20 years in architectural designing. Lumion is another rendering software like 3D Max. However, it is less professional than 3D Max. It has user friendly tools especially for landscape designing.

Method

Method is of two main stages as; area selection and concept designing (3D modeling). In area selection stage, all designed places were defined by the 15 experts who are living in Erbil. Architectures, city planners, market owners and, some of the officers were in this group. Three location was detected according to the touristic, green area requirement and applicability factors. In this context, Strength, Weakness, Opportunity and Threat (SWOT) analyses were completed by the experts.

In second stage, roof and vertical garden designing concepts were studied. In this point, plant list, materials and designing approaches were argued. Concepts were defined based on location and usage purpose of the areas. A simple before and after survey was applied to the experts who are lived in Erbil to obtain main conclusions.

Results and Discussion

Three landmark areas were designed based on roof and vertical green system planning. Two of them decided to design as roof garden (The Mayor Office Building and Machko Tea Shop), and one of them designed as vertical garden (Erbil Tower Hotel Wall).

Concept Design of the Mayor Office Building Roof

This building is constructed with big columns using 1930s concrete system. So, it is very strong and old building. This can be used as museum

or tourism information center in the future. According to the site selection criteria, this building can be modify for a touristic purpose and it is pretty close to the main culture center of the city like Citadel. Roof of the building has a great landscape view and there is no too much high building around. Unfortunately, city governors are not interested enough with old buildings and its modifications. So, this building is also under the risk of demolition instead of modification. This project can be contributed building regeneration. A simple SWOT diagram that was prepared by the experts was showed importance of the selected area (Table 1).

Table 1. SWOT diagram of The Mayor Office Building

Strength	Weakness
<ul style="list-style-type: none"> * The location of the building is very important as it is close to city center and located in very important street that connects the city center to another important sector * The building has rugged constructed which mainly constructed from stone and concrete that is suitable for applying intensive garden roof * The building is historic and also located in a historical district * Closeness to the Erbil citadel, make the building precious element in area 	<ul style="list-style-type: none"> * Crowded area. * Crowded traffic. * Because it is directly located on the street, it has less security and privacy of building. * Less of site landscape (except roof)
Opportunity	Threat
<ul style="list-style-type: none"> * The building can be used as a museum in future. * The building can be used to revive that areas because it is close to historic areas. * It can be used as a tourism attraction because it is very close to the Erbil citadel 	<ul style="list-style-type: none"> * Not paying attention to old buildings. * Destroying building and changing it to new commercial building. * The historic buildings in this area are neglected.

Roof of the building has a regular rectangle form. There are two vent and light holes from roof to main ground in square form. Main design concept was selected for short time recreation. This building can be used to be a starting point of a touristic tour, and roof area may be used as introduction of the historical places from the roof by the guiders.

This building has formal lives: Therefore, informal designing approach was preserved, first at all, requirements of the people who are a sign this building was considered. In this extent short time recreation places were established. Light structural material was preferred like light tiny stones, poplar wood, natural stone and thin marble, tenth cover, and a small fiber cascade pool were used in the roof (Figure 8).

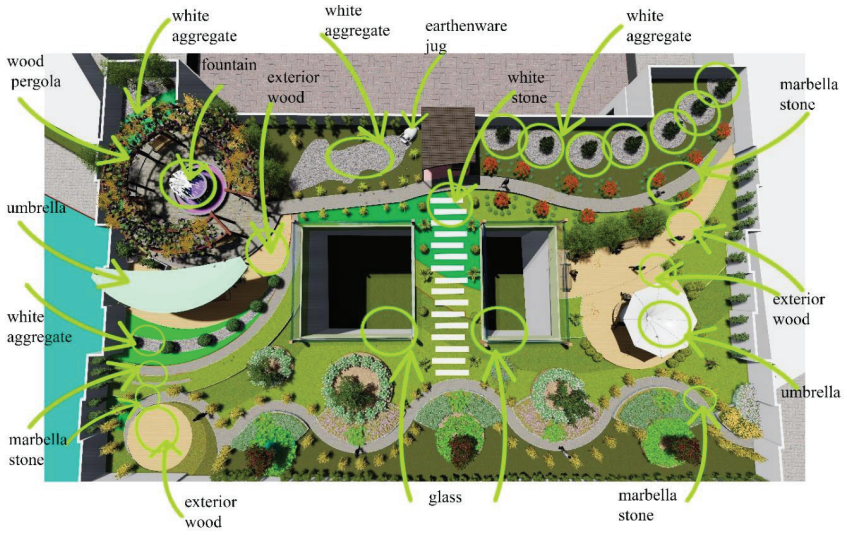


Figure 8. Structural materials and main project of the Mayor Office Building roof

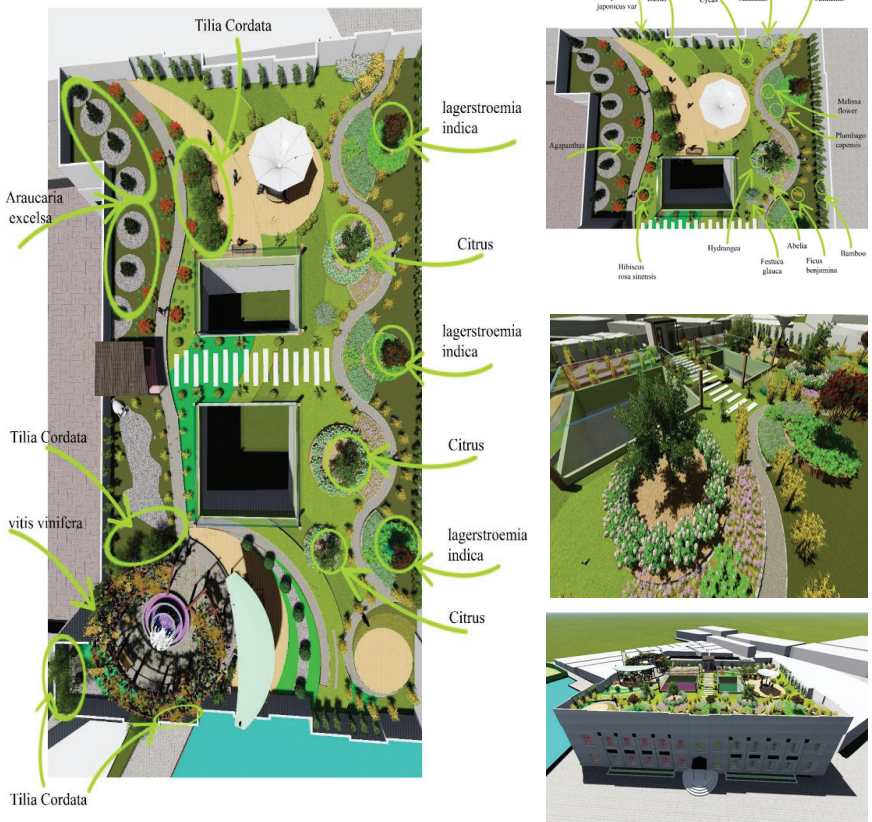


Figure 9. A; Tree plantation areas, B; shrub groups, C; general view of the designed roof and D; a detailed sketch from the roof.

In general, a small pool, shady areas, sitting areas, city view places and plants were used in the roof. In plantation stage, fringe rooted trees were preferred according to the climatic requirements. Only one type of big tree used to be *Tilia cordata* (linden tree) in small form and in deep portative wooden pots. Other trees were small (max. 2 or 3m high). Small and flowering shrub groups are used (Figure 9).

Concept Design of the Machko Café Roof Area

This area is located next to the historical citadel entrance. There is no waiting, meeting and photo point in this place. So, concept of the design must be included these elements. Because, this place is one of the most important area in Erbil City on tourism. A SWOT analyze was performed by the experts to improve the green structure of the area (Table 2).

Table 2. Machko Café SWOT analyze

Strength	Weakness
<ul style="list-style-type: none"> * Machko café is very famous in Erbil * The location of Machko is very important as it is located in front of citadel gate and regarded as a part of citadel. * Currently, the building is recognized as a cultural café and almost all tourists visit the area. * The building has historical heritage 	<ul style="list-style-type: none"> * Crowded area because it is close to the market (bazar). * The Structure of the building is not very strong. * Neglecting the roof of building and using it for water tank, electrical generators and wastes.
Opportunity	Threat
<ul style="list-style-type: none"> * It can be used mainly as a part of citadel. * The building can be used like a tourist attraction. * The roof of the building can be use the green roof to attracting more tourists for the building and the citadel. * The roof or the building can be used as a resting area for the people visits the citadel. 	<ul style="list-style-type: none"> * The roof of building is used for water tank and electric generator which have dangerous impact on the building. * The structure of the building requires rehabilitation or renovation to keep it safe. * The location contaminated and crowded.

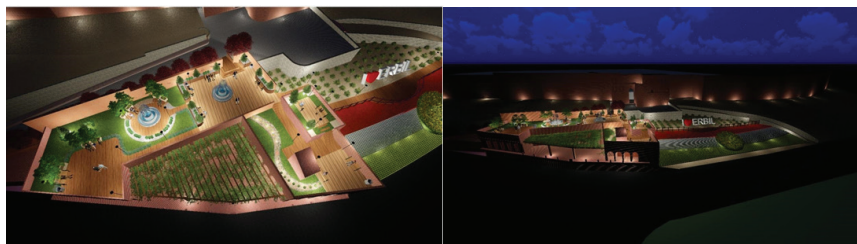




Figure 9. Night and day perspectives of the suggested concept project

The circle space is designed as sitting area that shaded by trees and a fountain. This circle symbolizes the shape of Erbil city that all districts are located around citadel and the citadel is located at the middle of city center. The other sitting place is designed at lower level that has a good view to Shar' park. New roof has been added to the store so that it does not impact the project. The new ceiling and the seating area are designed. Two photograph's areas are designed, the first one has a sitting area shaded by trees. The second one is designed with straight bridge to taking pictures with I ♥ ERBIL' and other views. The Kurdish regional government flag is designed in the slope with the Turf block and grass. Writing I ♥ ERBIL and the governmental flag make an attractive photograph point with Citadel view for the tourists (Figure 9).

Prunus cerasifera pissardii nigra' plant was used straight outside wall of the building as this plant is suitable for Erbil whether. It has red color which balances with color of citadel and plays a good role in attracting people to the project. *Cupressus arizonica*' was planted around sitting area of main space and around sitting area in store roof. This plant was characterized by its suitability in green roof projects. *Buxus sempervirens*' plant was used between two *Cupressus arizonica*' plant and around circle space, the shape of the plant is made balance between planter and *Cupressus arizonica*'. *Juniperus horizontalis*' was planted in slope around I ♥ ERBIL symbol because this plant is covering soil horizontally and protecting the soil from erosion. *Robinia pseudoacacia*' was planted in circle space and photography area for shading because it is provided a good shading especially in the afternoon. *Hedera helix*' was planted at the wood pergola of the balcony of Machko's Cafe.

Dry garden was planted in below roof. In this part, plants that have the ability survive in dry or arid weather like an *Opuntia ficus-indica*' and *Trichocereus pachanoi*' at the middle *Echinocactus grusonii*' and *Gymnocalycium*' are planted. *Lavandula sp.*' with purple color is planted around the main space and photography area, which make the project more attractive. *Euryopsis sp.*' flower is planted in the sun symbol of regional flag inside Turf blocks (Figure 10).

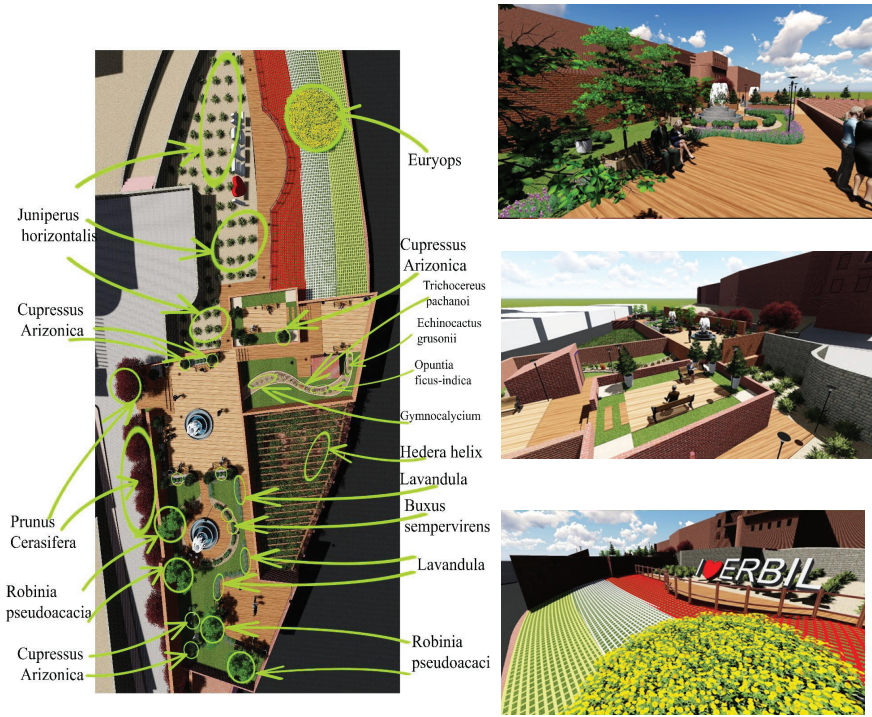


Figure 10. Plantation and some sketches of the concept project

Concept Vertical Garden Design on Erbil Tower Hotel Wall

The Erbil Tower Hotel is located in old part of the city, and one of the symbol building around the location because of visibility. One of the wall is included less window than other sides, and it is very available for vertical garden designing. Experts are suggested that whole side can be designed as a green surface so that a wall of the hotel can be contributed city aesthetic value significantly. A SWOT analyze of the design has been done by the experts to see the effects of the vertical green application on city life presented in table 3.

Table 3. Erbil Tower Hotel SWOT analyze

Strength	Weakness
<ul style="list-style-type: none"> * Erbil tower is one of the highest building in the city center * It is a famous building. * It can be seen from almost every place in Erbil city. * It is located in very important location, near the Erbil citadel. * It is characterized by its historical architecture. 	<ul style="list-style-type: none"> * Very crowded area. * Roads around the building are narrow and crowded. * The building does not have any gardens or green spaces, and it is directly located on the street.

Opportunity	Threat
<ul style="list-style-type: none"> * The building is one of the historical building in Erbil. * It is located near the Erbil citadel and the museum which is planned to be built in the near future. * It has an old architecture style. * It can be considered as a part of the Erbil citadel. * It can be used like historical place for attracting tourists. 	<ul style="list-style-type: none"> * It will be the 1st application in the region, and constructors have no experience in application. * Living material has always some adaptation risks. * Old building wall might be a problem.

The green face and green wall are designed for the tower. While green wall technique is applied for balconies, green facades are applied to the other parts. The designing concept consists of different layers that present different nationality and different civilization who have lived in Iraq or Mesopotamia land. Different layers with different colors and plants are combined on one plate reflecting a long and peaceful live together. Two lines are referred two rivers, and green covers are referred various nations and productive agricultural fields between two rivers (Figure 11).

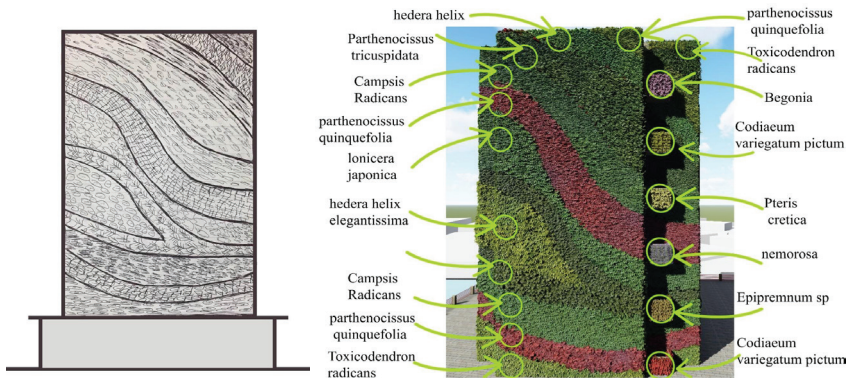


Figure 11. Draft sketch and final plantation design of the southern wall

Details of the wall was designed based on Safikhani et al. (2014). They described a classic wall planting detail for the similar projects. It is included a flexible growing media cover in first layer, connected with a light grid trellis (cage) system in second layer, and green cover in last layer. Perspectives and sample construction detail was presented in figure 12.

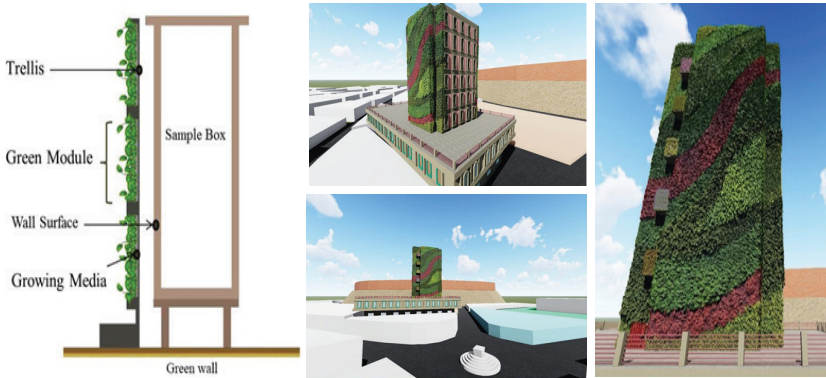


Figure 12. Main constructive details and perspectives of the suggested concept green wall

Conclusions

In this paper, three concept green roof and wall designs were suggested for Erbil City to increase the urban ecosystem service values such as aesthetic, inspiration, carbon reduction ability, and urban biodiversity. Application locations were selected according to the applicability, visibility, and green area requirements aspects for Erbil City. According to the experts who are living in Erbil City, if these concept designs were applied, citadel areas would be more attractive, particularly for the tourists that want to visit Erbil. A simple visual before and after survey was applied to the experts to understand the effects of concept designs to the city. The main findings of suggested designs were:

- i) When the mayor office building was modified to be tourism information center of the old city and small museum with roof garden, it can be a landmark and starting points for a trip of citadel and old city.
- ii) The Mochka Café is very important because of location, and roof place of the café is next to the Citadel entrance. Unfortunately, there is no attractive meeting point or waiting point in here. Suggested concept design can be make this place more visible, and it may satisfied to the people who are visited here as a waiting, meeting and landmark points for photograph.
- iii) The Erbil Tower hotel is located one of the most crowded points of the city. There is not enough green area in there, and a vertical green landscape, can be supported Ecosystem Service (ES) values against, carbon emission, air pollution, urban heat island, and aesthetic value loss.

It can be said that the last conclusion was also valid for all designs. This paper is showed that if the vertical and roof garden applications were placed in required positions in the city, we would take cost effective results to support urban ES values. Particularly, vertical garden applications in big surfaces might be expensive. However, it is a way to contribute green cover and ES in dense built up areas. So, application area selection is important to create an attraction point on cost and benefit.

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Chapter 8

AQUARIUM AS A DESIGN ELEMENT IN HOUSES

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1.Introduction

Humans have had a close relationship with fish and water since ancient times. However, before the 18th century, the oceans were a feared, unpredictable, and dark place for humans. The desire of biologists to study the ocean has resulted in discoveries. The formation of new aquariums has started with the design of glass tanks to allow good observations, and the dreaded creatures of the sea have been apparent up close and without risk. People's fascination with sea creatures has developed, and some have begun to feed fish in glass containers at home. The ocean world is now on display in all sizes of spaces, from small glass containers to massive public aquariums. It's been one of the most common hobbies among people all over the world as a way to de-stress. Aquariums in the house have evolved into a design feature and a focal point.

The act of watching fish in water-filled vessels dates back to ancient times. The Sumerians were raising fish in artificial ponds about 4,500 years ago. Again, fish were raised in artificial ponds in the gardens of Ancient Egypt's wealthy homes and temples (Figure-1). The Chinese and then the Japanese started to raise ornamental carp in ponds in the 1000s BC. Goldfish were once considered pets in China and were very common. In 1369, the Emperor of the time, Hung Wu, had porcelain bathtubs adorned with dragon and cloud motifs made for fish (Brunner, 2012). The first recognized marine aquarists were the ancient Romans, who fished for food and leisure and created ponds fed by fresh seawater from the ocean (Figure-1). They often kept these fish in tanks made of marble. While goldfish were successfully housed in glass containers in England in the mid-1700s, aquarium treatment, oxygen, and the relationship between animals and plants were not well developed until a century later became recognized (URL-1, n.d.).



Figure 1. Fish Were Raised in Artificial Ponds in The Gardens of Ancient Egypt's Wealthy Homes, A Tomb- Painting, British Museum (Strudwick, 2006); A Roman Fish Ponds (Kersting, 2014).



Figure 2. A Glass Freshwater Aquarium from *The Book of the Aquarium and Water Cabinet*, by Shirley Hibberd, 1856 (URL-1, n.d.) (Hibberd, 1856); *The Goldfish Bowl*, is an Oil Painting by William Daniels, Dated 1868 (URL-2, 2019).

People's need to interact with nature has grown as a result of urbanization and the difficulty of their lifestyles. As a result of this need, upper-class people began to reconstruct natural settings and participate in the animal collection. Samuel Pepys, famous for his 1665 diaries, described paradise fish kept in a glass container in London (Rehbock, 1980). Fish were raised in glass bowls and ponds of water from lakes or streams before the 1850s in many countries (Figure- 2). A self-sufficient systematic aquarium design emerged in England in the 1850s. Robert Warington has published articles on freshwater and saltwater aquariums. Aquariums became popular thanks to the book "The Aquarium" by Philip Henry Gosse (Kisling, 2000). After ornate aquaria in cast-iron frames were displayed at the 1851 Great Exhibition, it became popular. In 1853, the first public aquarium building was opened in London. Raising fish in houses was one of the most common painting themes during this period. Robert Warington has written on both freshwater and saltwater aquariums in his publications. The "aquarium principle" was discovered by Warington, who pointed out that plants introduced to water in a tank would give off enough oxygen to sustain animals, so long as their numbers do not grow too high. His observations were published in the *Quarterly Journal of the Chemical Society of London* in 1851, and his study is credited with establishing modern aquaria (Grier, 2008). The book "The Aquarium" by Philip Henry Gosse helped to popularize aquariums. Gosse discussed his observations of coastal life and how to build a miniature ocean at home in this book. He arranged and introduced this to the public by planning drawings that were uncommon at the moment to make the book more successful when expressing that it is possible to recognize underwater animals without having to dive deep (Figure- 3). The popularity of the aquarium grew as a result of the book's success, spreading from England to the European continent and then to America (Brunner, 2012). Besides that, the New York

Aquarium Journal, first published in October 1876, is considered to be the world's first aquarium magazine.

In the Victorian era in the United Kingdom, a common design for the home aquarium was a glass front with the other sides made of wood (made watertight with a pitch coating). The bottom would be made of slate and heated from below. More advanced systems soon began to be introduced, along with tanks of glass in metal frames (Sandford, 1999).

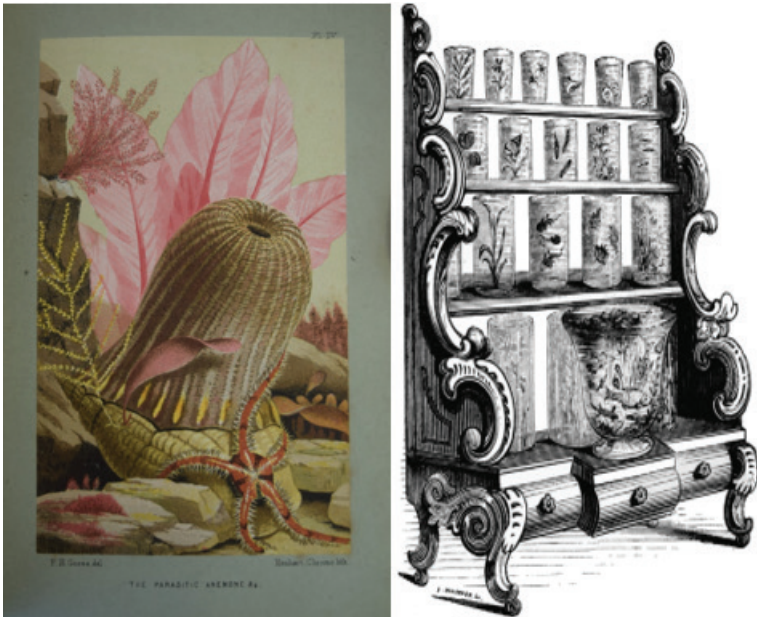


Figure 3. A Drawing from *Under the Sea* by Gosse's Wife (Gosse P. G., 1856); Cabinet Design for Aquarium, 1856 (Hibberd, 1856).



Figure 4. An Aquarium from Gosse's Book (Gosse P. H., 1856); A Hand Made Reproduction of That Aquarium (URL-3, n.d.)



Figure 5. Aquarium in a Victorian House (Wijgerde, n.d.).

Even though the time and effort required to maintain an aquarium has decreased people's interest in them over time, aquariums have evolved and continue to thrive in our lives. Aquariums today range from a small glass bowl at home to huge public aquariums. The beneficial effects of aquariums on human health have been discovered by experiments over the years. Aquariums have become common indoors due to their beneficial effects and visual richness. This research aims to find out how aquariums are used indoors and what advantages they provide for humans.

2.What is Aquarium?

“Aqua” is Latin for “water”, and “rium” is Latin for “hobby”, “pleasure” and “enjoyment”. A transparent (mostly glass) aquarium is an artificial pool filled with water ranging from a jar to massive water tanks (Genç, 2018).

The Aquarium is defined as “Containers or tools in different structures and forms used to keep or reproduce freshwater or sea creatures outside their natural habitat.” (Denizcilik/ Akvaryum Kurma, 2009). Since aquariums are used to house aquatic living creatures, the whole floor must be made of a water-resistant substance that does not spill water and does not obstruct vision. Water is stored in aquarium tanks consisting of glass or acrylic. These tanks may take the form of rectangular prisms, cubic tubes, or a variety of other forms. Aquarium lighting, filtration systems, water temperature, pH level, and water flow are all critical for the survival of the aquatic species that live in the aquarium. Nowadays, thanks to technological advancements such as filtration systems, automatic feed machines, and lighting methods, it can be used in all types of interior spaces for decoration, especially in houses, without requiring extensive energy usage for maintenance.

Aquariums vary in size from small home aquariums with goldfish to large public aquariums that simulate the habitats of diverse regions for display and entertainment. According to the salinity stage, aquariums are classified into three groups (Denizcilik/ Akvaryum Kurma, 2009) (Genç, 2018): Freshwater aquariums, saltwater aquariums, and brackish- water aquariums. Aside from these, Biotope Aquariums are also available.

2.1. Freshwater Aquariums

Freshwater aquariums may be used for decoration or research in freshwater animals. It's a habitat where freshwater animals are kept for controlled life or breeding. Fish found in a freshwater aquarium can also be cold-water fish or tropical fish species. Freshwater aquariums may also be used to build community aquariums with these animals (Genç, 2018). For people living in areas far from the sea, saltwater had to be supplied during the period when interest in aquariums was intense. People's interest was drawn to natural resources such as lakes and rivers during this process, and the use of freshwater aquariums began (Brunner, 2012). Because of its ease of maintenance and low cost, it is now one of the most common aquarium types.

2.2. Saltwater Aquariums

This aquarium is a saltwater aquarium with a lot of sea and ocean creatures in them. It provides more plant and fish diversity than freshwater aquariums. Its cost is higher than a freshwater aquarium. It can also be named a marine aquarium and need a very large space indoors. It cannot be applied in small spaces.

Saltwater aquariums are classified into two categories: Fish aquariums and reef aquariums. Reef aquariums are a type of aquarium with little or no fish. It shelters corals and other invertebrate species. Because these species are sensitive, they require careful aquarium care. However, it is one of the costliest aquarium types to set up. Reef aquariums offer visual richness thanks to the color diversity of corals.

2.3. Brackish- Water Aquariums

This aquarium is an aquarium species that contain semi-salt water. It contains brackish- water creatures. Brackish- water aquariums are an increasingly popular hobby among aquarists¹. This aquarium includes animals that live in deltas where streams flow into the sea, such as molly fish, Florida flag fish, chromides or Black-jaw tilapia, monos spp, scats, archerfish, pufferfish, goby fish, flatfish, and several species of lepisosteiformes (Nizioka, 1980).

¹ Fishkeeping is a popular hobby today that focuses on fish farming in a pond at home or elsewhere. An aquarist is anyone who participates in the aquarist hobby.

2.4. Biotope Aquariums

Biotope aquariums are man-made habitats developed in homes or exhibitions using data gleaned from studying a natural biotope (Labutov, n.d.). Geographical environments, a region's environment, or the living conditions of a certain species may all be reproduced in biotope aquariums. A specific region, such as the Black Sea or the Amazon River, can be replicated, or a suitable biotope for piranha species to live in can be established. While this is a style of aquarium commonly used in public aquariums, aquarists² are increasingly asking for these aquariums to be built in their houses.

While examining the aquarium subject in the interior, it is necessary to mention the concept of aquascaping. Aquascaping has evolved as a result of the widespread use of indoor aquariums, and aquariums with rich visuals have taken their place in indoor spaces, especially in residences. Aquascaping is the use of natural materials to create marine or underwater habitats with plants, rocks, stones, mosses, timber, and other objects. There are underwater designs that cover all phases such as installation, preparation, decoration, and maintenance, as well as providing visual enjoyment to the observer (Farmer, 2020). It is a plant-oriented design. Aquascaping designs aim to provide visual integrity and balance by paying attention to concepts such as golden ratio, rule of thirds, perspective, focal point, as in interior architectural designs (URL-6, n.d.).

3. Indoor Aquarium and Human Effects

People want to have nature indoors and be in contact with nature as a result of the urbanization effect of getting away from nature. Aquariums are also another element that is carried indoors for this function. Through watching fish and their lives and listening to the sound of water, aquariums encourage people to connect with nature. The benefits of having an indoor aquarium include having an enjoyable hobby², education, relaxing features, being a stress reliever, enchanting beauty, and increasing the humidity of the air according to Genç (2018). It was discovered that by seeing the fish in the aquarium for a few minutes per day, the tension level decreased significantly. Studies have found that watching the fish swim decreases anxiety in a way that is close to what hypnosis can do. Many hyperactive children have been shown to slow down while they are surrounded by a fish aquarium, according to studies. It has also been discovered that when the lights are turned out, these children sleep well and feel safer. Aquariums increase children's curiosity while also providing them with a lot of enjoyment as they learn about their local wildlife. It has also been shown

2 When a study of hobbies was undertaken around the world, it was discovered that aquariums are second only to photography in terms of popularity (Hekimoğlu, 2006).

that it inspires them to learn more about nature in general. For example, according to the Montessori education system, including an aquarium in a kindergarten is encouraged because of these characteristics (Vuslat & Köksal Akyol, 2006).

There are several advantages of providing an aquarium for elderly people with Alzheimer's disease; it calms them down, makes them happier, and is said to minimize hostile behavior. It provides a comfortable sleep environment as it reduces the stress level. A stable living climate should have humidity levels of 35 percent to 50 percent (average 45 percent). The surfaces of organs such as the nose and respiratory tract dry out when the humidity falls below 30%. The nose and throat, in particular, can feel dry. The aquarium, on the other hand, causes the indoor environment's humidity level to be balanced. The effects of aquarium observation on human psychology have been revealed as a result of numerous experimental studies, and the aim is to improve aquarium use based on the findings. The existence of an aquarium in most medical offices and dental clinics has been shown to reduce pain during operations, resulting in the use of fewer painkillers by not just dental patients for non-decorative reasons. For example, it was mentioned in a study on the anxiety that subjects who watched an aquarium during dental surgery were more relaxed and less nervous than those who did not (Çakıcı, 2019). Aquariums are used indoors for calming and aesthetic uses in hospitals, dental clinics, medical clinics, restaurants, offices, and houses for these reasons. Human health benefits from the close relationship between design principles like biophilic design and Feng Shui and aquarium use in housing interiors.

3.1. Biophilic Design and Aquarium

According to the biophilia theory, most people have an inherent love of nature (Gillis, 2018). As a result, biophilic design is a solution used to satisfy this love for nature by incorporating natural elements and processes into the built environment (Açmaz Özden, 2019). "Nature in Space", understanding of the biophilic approach; promotes the clear incorporation of natural resources into the built environment. In addition to natural resources such as trees, animals, and water, the breezes, smells, and sounds sensed in the room should be present (Browning, Ryan, & Clancy, 2014). Thus, it would be possible to provide plurality, natural versatility, and emotional relationships in space by creating direct and concrete relations with natural elements in space (Browning, Ryan, & Clancy, 2014). As previously said, an aquarium has a positive impact on both physical and mental health. Since biophilic design is called "healing design" due to its features, it is anticipated that the aquarium is being used as a biophilic design element in all interior spaces, including residential interiors.

3.2. Feng Shui and Aquarium

Feng Shui, which translates as “wind and water”, is an ancient Chinese teaching that shows how to activate the life energy found in nature in living spaces. The Feng Shui teaching is considered to be a way of arranging living spaces that is appropriate for human existential characteristics, allowing us to live a healthy life, have happier relationships, advance in our careers, and benefit from personal development. Within the sense of using life from nature indoors, an aquarium is one of the nine essential aspects of feng shui (Lauher, 2011). In terms of Feng Shui, an aquarium in a house is not only a beautiful interior feature but also a producer of family well-being and material prosperity. The placement of fish and aquariums, according to Feng Shui rules, may have a significant impact on a variety of factors. Their placement in the right place is thought to bring prosperity and good energy; but, if it is placed in the wrong place, it is thought to bring negativity and poor luck.

4.Types of Aquarium Usage in Housing Indoor

There are many different ways to use the aquarium in residential areas. These ways of use are briefly explained below with examples.

4.1. Use as aquarium only

It is the simplest use of aquariums. In terms of design and connection, it is a form of aquarium that can be set up for hobby purposes independently of the place.

4.2. Use as a Restrictor

The aquarium has been seen as a restricting element because it has an attractive visual presence in residential spaces and because it is unique. For eg, in Figure- 6, an aquarium was used to create the garden wall of a house, and an aquarium was used to divide the private property area of the house from the street, creating a visual effect in the urban space. Not only the household has benefited from the aquarium’s beneficial impact on human health; citizens in the general neighborhood have also benefited. The aquarium was also used as a mezzanine railing in a loft-style apartment.



Figure 6. Garden Wall Made of Aquarium, Izmir- Turkey, (URL-7, 2011) (URL-8, 2020) (URL-14, n.d.).

4.3. Use as a Separator

Since aquariums are made of glass or acrylic, they can be used as a divider while not blocking sunlight. The aquarium was used as a decorative separator dividing the hall and the entry in the minimalist architecture of a reef aquarium made in Milan. During the day, the aquarium allows the natural light from the hall windows to illuminate the reception room. It provides a different environment at night by using LED lighting to illuminate both the hall and the entry. To fit the space's colors, the aquarium was designed with a white structure (Figure-7).



Figure 7. Usage of Aquarium as a Separator (URL-9, n.d.).

Another example; an aquarium that has been installed in a contemporary house in London to showcase the sea creatures brought by the host from his travels. This aquarium serves as a separator between the cinema and

the library. The sense of open space is retained thanks to the transparency effect, and light is distributed evenly across space without being sliced. The library has been designed to provide a relaxing and peaceful atmosphere for reading and sleeping. To fit in with the rest of the room, the aquarium is installed in a walnut cabinet (Figure-8).



Figure 8. Usage of Aquarium as a Separator (URL-10, n.d.).

4.4. Use as a Focal Point in Space

As previously discussed, the colorful and fluid effect produced by moving fish, aquatic creatures, rocks, and water provides a visual focal point in the space by positively supporting visual perception. Through examples, this subject would be easier to understand.

The specially designed aquarium in the living room designed in Lugano has been placed in the focal point and turned into a pleasant wall to watch. This aquarium was designed in a special geometry that was first straight then curved following the shape of the wall in the space and placed in the space (Figure- 9).



Figure 9. Usage of Aquarium as a Focal Point in Space (URL-11, n.d.)

Another example from London was the placement of a reef aquarium with the Red Sea ecosystem as the focal point of the space. It provides a clear, uninterrupted view in the living room, which is furnished with a minimalist style and concealed on the wall (Figure-10).



Figure 10. Usage of Aquarium as a Focal Point in Space (URL-12, n.d.).

Another example is the aquarium that serves as a focal point in the living room of a Tokyo open-plan house on the ground floor. The circular aquarium, which reaches from floor to ceiling, also helps in perceptual separation of the kitchen, dining room, living room, and service volumes (Figure- 11).



Figure 11. Tokyo Luxury Aquarium house (URL-13, n.d.).

4.5. Decorative Use

Although many people keep aquariums in their homes as a hobby, they often add a decorative element to the room. Because of its decorative influence, some people also pay attention to the decorative design of the aquarium's interior. In the example in the picture, a freshwater aquarium

has been prepared for an art collector's living room. Among the Pop-Art style pictures, the aquarium has been carefully selected to create a sufficient explosion of color, to make it stand out. Thus, an image integrated with works of art has been obtained. It has been paid attention to have minimum equipment, noise level, and energy consumption (Figure-12).



Figure 12. Decorative usage of Aquarium (URL-14, n.d.).

4.6. Use as a Furniture

While the aquarium as furniture is a very rare example, there are a few others. Despite the fact that some of these examples are kitschy, interesting views can be seen in housing interiors. Robert Kolenik, an interior designer looking for new kitchen concept designs, created an aquarium kitchen cabinet named “Ocean Kitchen.” By putting a kitchen counter on top of the aquarium, he was able to achieve this style. The bench will lift at the touch of a button thanks to a hydraulic mechanism, allowing for aquarium maintenance. It has a cutting-edge feeding and filtering system. Once a month, clean and restock the food in this manner. Within, this aquarium was built in an L-shape, with storage areas for kitchen appliances. The placement of specially chosen fishes creates a relaxing design (Figure-13, 14).



Figure 13. Use Aquarium as a Furniture (URL-15, n.d.).



Figure 14. Aquarium Bed (URL-16, n.d.).

4.7. Creating a Space with an Aquarium

It is now possible to build spaces by using the aquarium to create the planes that shape the room, such as walls and ceilings, as a result of advancements in aquarium technology and materials used in aquarium construction. It was also possible to construct buildings. In the figure, a dining room with an aquarium has been built in a wide living space of a house (Figure- 15).

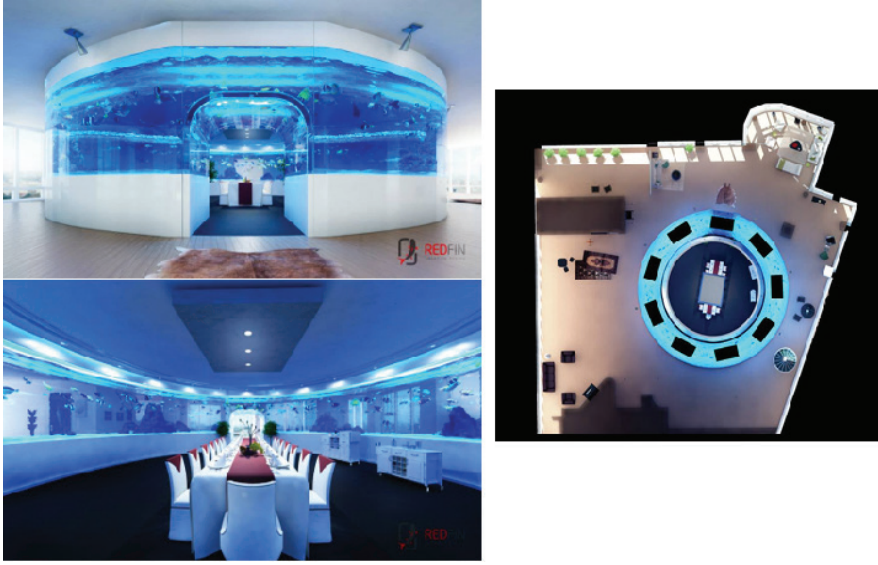


Figure 15. Creating a Space with an Aquarium (URL-17, n.d.).

4.8. Using the Aquarium in Other Ways

Aquariums are used in houses for a variety of purposes, including restricting, separating, focal point, decorative, furniture, and room construction. These various uses have been made possible by the advancement of aquarium construction techniques. Also, the designing and installation of aquariums based on their types, as well as the development of their interior decorations, generated a new design branch known as aquarium design. Aquariums can be used in a variety of forms in the house, such as a pool, window parapet, stair railing, washbasin, and doghouse (Figure-16).



Figure 16. Using the Aquarium in Other Ways (URL-17, n.d.) (URL-18, n.d.).

5. Settlement Features of the Aquarium

Direct sunshine has a negative impact on the organisms that live in aquariums. If the aquarium is positioned in a location that absorbs a lot of light and is continuously exposed to sunlight, and no appropriate filtration scheme is created, the aquarium can quickly transform into green water due to the rapid growth of green algae. If it is too close to the glass, outside temperature variations will be expressed in the aquarium. In this case, a highly sensitive thermostat and a powerful heater are needed. Generally, if possible, it is best to take it to a place that will receive 1-2 hours of sun per day. However, in today's aquariums illuminated with fluorescent lamps, this issue may not be important, especially for amateurs (Alpbaz, 1984).

The aquariums should be located near the seating area in the living spaces so that the organisms in the aquarium can be seen and the predicted physical and psychological effects can be generated. The height of the aquarium from the ground is 90 cm (Figure-17). Thus, it is possible to watch the aquarium with a vertical viewing angle from the place where you are seated. Electric and motor parts of aquarium stand placed independently from the location should not create visual pollution and necessary arrangements should be made (Bahar, No date). Aquariums should be constructed in accordance with other space elements in terms of features such as material, form, and perception if they are considered an aspect of the space in terms of

interior architecture. The best location in the room should be determined by the organisms to be used in the aquarium, as well as the aquarium type and requirements (Figure-18). Freshwater aquariums can be built in all sizes and can be used in places of all sizes, while saltwater aquariums require more technical equipment, so the location of the aquarium must be accurately determined in advance. Saltwater aquariums should be applied in large spaces due to their equipment, maintenance features, and perceptual features.



Figure 17. The Height of the Aquarium Stand (Bahar, No date).



Figure 18. Viewing Angle, Aquarium Size and Harmony with the Environment (URL-17, n.d.).

6. Conclusion

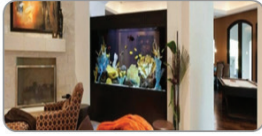
One of the most basic ways to get nature into our homes is to get an aquarium. It is possible to feed all marine species, not just fish in aquariums. As a result, a connection to nature can be created by projecting a portion of the ocean or a lake demo on the interior of the houses and apartments. In the indoor spaces where people spend their lives, this interaction is critical. Because man is an integral part of nature, man does not exist in isolation from nature. Biophilic architecture and Feng Shui are two design principles that are used in today's interiors to ensure that humans have a positive interaction with nature in space, and aquariums are an integral aspect of these designs. An aquarium can be set up in any location and any manner. As long as the requisite technological information for the aquarium's creation and maintenance can be acquired. Aquariums are becoming an increasingly important feature of modern living spaces. If the aquarium is used to establish users' relationships with nature in interior spaces, interior designers must be knowledgeable about aquarium design and incorporate this aspect into their designs. A table summarizes aquarium styles specific to housing interiors usage patterns in the space, and many beneficial effects on humans (Table-1).

Table-1: Types and Usage of Aquarium in Housing Indoors



AQUARIUM TYPES USED IN HOUSING INDOOR AREAS

- FRESHWATER AQUARIUMS
- SALTWATER AQUARIUMS
- BRACKISH- WATER AQUARIUMS
- BIOTOPE AQUARIUMS



USAGE TYPES OF AQUARIUM IN HOUSING INDOORS

- USE AS AQUARIUM ONLY
- USE AS RESTRICTOR
- USE AS SEPARATOR
- USE AS A FOCAL POINT IN SPACE
- DECORATIVE USE
- USE AS A FURNITURE
- CREATING A SPACE WITH AN AQUARIUM
- USING THE AQUARIUM IN OTHER WAYS

INDOOR AQUARIUM AND HUMAN EFFECTS



- Enjoyable hobby
- Encourage people to connect with nature
- Educational material
- Relaxing features
- Comfortable Sleep
- Calming effect
- Happiness enhancer
- Anxiety reducer
- Being a stress reliever
- Reducing the feeling of pain
- Increasing the humidity of the air
- Enchanting beauty
- Decorative object
- Visual effects
- Developing the dream world
- Usage feature as a space and space element

The relevance of this research is enhanced by the fact that there are few published references on the indoor use of the aquarium and aquarium, which has evolved into a construction branch today. It is hoped that this research will serve as a foundation for future interior design research.

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