

EVALUATION OF THE DEVELOPMENT OF LANDSCRAPER STRUCTURES IN
THE HISTORICAL PROCESS



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ABSTRACT

EVALUATION OF THE DEVELOPMENT OF LANDSCRAPER STRUCTURES IN THE HISTORICAL PROCESS

Along with the multi-faceted development of life, new needs and new goals related to it are gradually increasing, rapidly changing both individual and urban life. Naturally, this change is reflected in the physical texture of both the architectural structures and the city, which brings new concepts and new horizons to architecture [1]. Throughout the history of architecture, many concepts have their origins in prehistoric structures and urban settlements. Accordingly, these concepts have changed according to the conditions of social orders. These conditions can sometimes be the challenges of nature, sometimes the need for the protection of hostile societies, and sometimes they need for architectural sustainability. It is seen that Landscraper structures have gained many new functions with the change of these needs over time and the development of technology. In this context, the purpose of the construction of many historical structures and ancient cities plays an active role in the development of today's architectural concepts.

In this study; The development of the concept of Landscrapers, historical structures, and contemporary structures in the historical process is interpreted. The similarities and differences in the purpose of construction of such structures are determined. The development of the concept of Landscrapers and how it affects architectural structures and cities are discussed, taking into account ecological and sustainability values.

ÖZET

LANDSCRAPER YAPILARININ TARİHSEL SÜREÇ İÇİNDE GELİŞİMİNİN DEĞERLENDİRİLMESİ

Yaşamın çok yönlü gelişimi ile birlikte, yeni ihtiyaçlar ve buna bağlı yeni hedefler giderek artmakta, hem bireysel hem de kentsel hayatı hızla değiştirmektedir. Doğal olarak, bu değişim, mimariye yeni kavramlar ve yeni ufuklar getiren hem mimari yapıların hem de şehrin fiziksel dokusuna yansır [1]. Mimarlık tarihi boyunca birçok kavramın kökenleri tarih öncesi yapılarda ve kentsel yerleşimlerde. Buna göre, bu kavramlar, toplumsal düzenlerin içinde bulundukları koşullarına göre değişmiştir. Bu koşullar bazen doğanın zorlukları, bazen düşman toplumların korunmasından ve bazen de mimari sürdürülebilirlik gereksinimlerine duyulan ihtiyaç olabilmektedir. Bu ihtiyaçların zaman içerisinde değişmesi ve teknolojinin de gelişmesiyle beraber Landscrapers yapıların birçok yeni işlev kazandığı görülmektedir. Bu bağlamda, birçok tarihi yapı ve antik kentlerin yapımının amacı günümüz mimari konseptlerinin gelişiminde aktif rol oynamaktadır.

Bu çalışmada; Landscrapers kavramının, tarihi yapılar ile çağdaş yapıların tarihsel süreç içinde gelişimi yorumlanmaktadır. Bu tür yapıların, inşa edilme amaçlarındaki benzerlikler ve farklılıklar belirlenmektedir. Landscrapers kavramının gelişimi, günümüzde ekolojik ve sürdürülebilirlik değerleri de göz önünde bulundurarak, mimari yapılara ve şehirlere nasıl etki yarattığı tartışılmaktadır.

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LIST OF SYMBOLS/ABBREVIATIONS

UNESCO	United Nations Educational, Scientific and Cultural Organization
HVAC	Heating, Ventilating, and Air Conditioning
WWI	World War I
NBC	Nuclear, Biological, and Chemical filters



1. INTRODUCTION

An open land, once filled with sunlight and air, with a distinct relationship to the horizon, becomes a building [2]. The relationship between architecture and nature emerged when human societies began to live in cavities and caves. Accordingly, human societies have started to use the relationship between architecture and nature factors in an interaction, that is, by integrating them. However, when we look at the historical process, progress has been made on this subject with more than one branch such as architecture, urban design, and landscape architecture. For example, when people are building a building, they want to live both inside and outside the life with a sense of belonging, and when they use this environment in an integrated manner with nature, the feelings of longing for the land are added to this feeling.

Today, cities expand vertically and compete with each other by building tall structures. This competition is not only for the height of the structures but also for the new material technologies. Here, Gehler's saying that;

People are the only living being that tries to reach their expectations by constantly changing their environment in line with their evolving needs can come to mind [2].

However, this can also mean that the built structures break their relationship with nature. Of course, despite the rapidly increasing population, it may seem acceptable to reduce land use and prevent horizontal cities, but this will create a gap between humans and nature and will make a lack of natural nature feel.

Unlike tall buildings, low buildings along a street are in tune with the way people move and the way the senses work [3]. According to this expression, low buildings are more harmonious and mobile than tall buildings. In other words, even if there is more than one public space in a place where there are many high-rise buildings, these spaces are often not livable, because human nature does not psychologically want the feeling of shrinkage and narrowness. The higher buildings we build, the more we feel the height and the greater the fear of heights [2]. Such feelings are the result of the relationship between human scale and structure. However, with the development of technology today, the race to build high-rise buildings shows that they act without thinking about the appearance of public spaces and natural scenery. For this reason, structural designs should be made in a way that will not

break the relationship between humans and nature and will be the best in terms of quality of living conditions [2]. From this point on, the author wants to concentrate on the concept called Landscrapers, which can be expressed in a sense as “the sharp intersection between architecture and nature”.

Landscaper is a term first used by architect Antoine Predock. This term presents an alternative idea based on the harmonious movement of the architectural structure and the natural environment, thus improving the relationship between architecture and nature. As Betsky explains;

For some architects, architecture is a collection of already existing thoughts rather than revealing the nature of a place. According to these architects, it simply replaces the land with something new and artificial, as much as any building to be built. However, this concept replaces the contours or appearance of the terrain with something that continues [3].

This architectural understanding will create aesthetic qualities in our environment. On the other hand, If we add ecological and sustainable techniques to these designs, it will create both aesthetic and environmental qualities. In addition, if we consider these in terms of their social aspects, the quality of the design will increase even more [3].

The concept of landscrapers is a phenomenon that has existed since humans began to live in caves, in a sense. When this concept is examined in terms of the historical process, we can see that it plays a positive role in the design criteria between the exterior and interior of a building. For example, feeling like a part of nature from indoor to outdoor without any obstruction is like having the opportunity to walk on top of a building or feeling how complete the harmony of a building and public space is. As a result, it is desired that the study has a content to reveal both the development of the concept of Landscrapers in the historical process and its changes in terms of ecological architecture (sustainable architecture) [3].

1.1. AIM

At the beginning of this research the thesis study; It is aimed to examine how underground structures and cities are formed. In this study, it is investigated how the architectural ties to the historical processes that were effective in the formation of these structures and cities and the contemporary architectural ties intersect. In addition, it has gained importance to reveal the differences and similarities of these structures and cities in terms of architectural and scientific techniques for construction. According to the "Landscape architects" movement, which can be defined as today's underground architecture or architecture integrated with nature, the understanding that the building's interior and shell and human life have been a part of it throughout history can be interpreted as a "return to nature" [4]. Therefore, in this study, it was necessary to determine why and how the concept of Landscape architects emerged and to investigate its approach to architecture in terms of sustainability. For this reason, it is aimed to determine the characteristics of the underground structures in terms of architectural ecological features, aesthetic concerns, the reasons for the human-nature relationship, and environmental protection psychology aspects, based on their historical process. In this context, the thesis study, it is aimed to reveal the reasons for re-applying the underground structures of the past in today's city and architectural designs and to evaluate them by making comparisons of the past and the present. Further, the concept of landscape architects is also intended to protect the knowledge and resources that people have acquired over the generations against possible major disasters.

1.2. SCOPE

Within the scope of this study, the concept of Landscape architects is the grouping of the various underground city and underground architectural structure examples from Turkey and the surrounding geography within the framework of places where there are important historical orders in the world; The evaluation of the underground architectural structures, which started with shelter and protection throughout the history of humanity, according to the class, feature, quality similarities and differences from the past to the present is discussed. In addition, the situation of the human-nature relationship in terms of needs and psychology is discussed. In the study, the purpose of the construction of the sample underground cities and

structures, their technical features, plans, and design criteria are discussed. The samples in the study were compared in terms of ecological design. As a result of all these examinations and evaluations, the similarities and differences between these architectural movements and the examples that emerged with the Landscrapers movement were examined.

1.3. METHODOLOGY

In this study, a four-stage method is discussed. In the first stage of the method followed, a wide literature search was conducted to benefit from books, scientific theses, journals, articles, and electronic resources. Quotations and abstracts obtained from this research were used. In addition, on-site inspection and observation studies were carried out. Then, a general evaluation of historical underground cities and structures was made within the framework of literature research and on-site examples. Based on this evaluation, in the second stage of the method, firstly, the underground structures are grouped under general headings, and then, within the framework of this grouping, the chronology of the historical structures and today's landscaper structures takes place. In the third stage, in terms of architecture and urban settlement, there are comparisons of the underground structures and cities, which have existed throughout history, with the Landscrapers structures, which are contemporary underground structures. A comparison has been made that reveals the similarities and differences in terms of construction purposes and usage functions, structural construction techniques, design methods, ecological design, and social psychology. In the last stage, general conclusions were reached by evaluating the literature, on-site examination, and method analyzes of historical and contemporary underground landscapers, grouping, chronological order, and all comparisons.

2. PRELIMINARY RESEARCH

While conducting the preliminary research studies, verified sources such as academic thesis and books, travel writings, and internet blog pages whose accuracy is not based on direct sources but can be proven were also used. A compilation has been made of all these studies with the effort of "reaching correct and proven information".

In the on-site inspection and observation section, the Dara Ancient City in Mardin Province was examined and observed twice, in 2019 and 2020. In addition, a study based on examination and observation was carried out in the Derinkuyu Underground City in Nevşehir Province in 2021.

2.1. LITERATURE STUDY

In the literature study, brief information is given about the content of some sources that play an important role in shaping the thesis topic. A wide literature search was conducted to benefit from books, scientific theses, journals, articles, and electronic resources.

- **Abu Simbel Temple (Egypt) - Özhan Öztürk**

In this resource about the famous temple in Egypt, there is information about the location, history, structural materials, and the reason for the construction of the Abu Simbel Temple. It is mentioned that the structure was built for the Egyptian gods and the Victory of Kadesh. The subject of the structure being a rock structure was investigated; In addition, it is mentioned that the floods related to the High Dam built in Egypt in the recent past have been moved in case of damage to the temple [5].

- **Kailasa Temple (Kailash) in Ellora Caves - Özhan Öztürk**

It is about the temples and caves of Ellora in the Maharashtra region of central India. An investigation has been made on how the structure was carved from the rock in gigantic dimensions under the conditions of the period. Along with the construction date of the structure, its historical importance has been mentioned. The sculptures and reliefs on the interior and facade of this rock-built structure were examined. It is mentioned that it is on the UNESCO World Heritage List [6].

- **Wind towers 5000-year-old air conditioners – David Zahedi**

The author of the resource shares his detailed examinations of wind towers, which are about 5000 years old, and built-in present-day Iran. Wind tower structures, wind use techniques, and conversion to passive cooling systems are mentioned. There is information that some historical structures in Iran remain at low temperatures during the day at high temperatures [7].

- **Historic salt mines in Wieliczka and Bochnia - Janusz Wiewiórka, Józef Charkot, Krzysztof Dudek & Małgorzata Gonera**

In this resource, information is given about the analysis of the rock structure and mineral use in the salt mines in the Polish town of Wieliczka. Investigating the reasons for the transformation of the salt rocks in the mine into an architectural underground structure is included in the source. In addition, it gives an idea about today's usage purposes and the sections in the building, both in terms of architecture and observation. [8].

- **An Archaeological Underground Settlements and Conservation Problems: Nevşehir Underground Cities (Derinkuyu, Kaymaklı) - Dr. Aziz Cumhur KOCALAR**

This article study is based on field research within the framework of the protection and uses problems of the structures through Kaymaklı and Derinkuyu examples of historical underground settlements in Nevşehir. It also examines the historical significance of this construction and its use by different civilizations. There are also academic suggestions for the protection of the buildings. [9].

- **The Establishment, Rise, Fall and the Last Indicator of Existence of Rome in Mesopotamia: Dara (Anastasiopolis-Iustiniana Nova) – Murat TOSUN**

The source examines the Parthian State, which dominated the region, including today's Mardin Dara Village. The Parthian State was founded by Arsaces between 239-238. It is stated that the ancient city of Dara was founded by Arsaces I, the founder of the Parthian State. It talks about the military and architectural changes of the ancient city of Dara during the Early Roman Period [10].

- **Preservation of Archaeological and Rural Architectural Heritage: The Case of the Ancient City of Oguz/Dara – Ebru HARMAN ASLAN, Cengiz CAN**

The source talks about the history of the ancient city of Dara and the use of the city in the Early Byzantine periods and its changes. In addition, using the archaeological remains of the city, the use of today's rural-urban texture together is examined [11].

- **Tall Buildings and Urban Habitat of the 21st Century: A Global Perspective– Mir M. Ali, Kheir Al-Kodmany**

The review of the article focuses on the history and developments of tall buildings, as well as the positive and negative factors of horizontal and vertical urbanization. In addition, he states that one of the important parts of the study is that it responds to the perceptions and speculations on high-rise buildings [12].

- **Earth-Sheltered House: A Case Study of Dobraca Village House near Kragujevac, Serbia**

In this study, a land-integrated house located in Dobraca Village in Kragujevac, Serbia is compared with an older building with its design, thermal properties, and sustainability principles [13].

- **Doomsday preppers and the architecture of dread – Bradley Garrett**

The study deals with the details of the shelter structure by considering the structure of The Survival Condo through pandemic diseases (COVID -19). It also examines the advantages and disadvantages of shelter structures in the face of disaster situations [14].

- **Neanderthals Built Mysterious Stone Circles – Nadia DRAKE (National Geographic)**

According to the source, it states that the past developments related to underground structures are based on pre-human history and emerged with discoveries and studies. According to the source, remains of Neanderthal structures and vital activities were discovered in a cave in France. It turned out that they built sections and ring structures inside the cave. With the existence of this structure, the existence of pre-human architectural

structures has emerged. The source also gives information about the architectural structure of the stone rings [15].

- **Repair Work among the Monuments of Petra, in Jordan - (The Illustrated London News, March 31, 1962, Page 502/503)**

The Ancient City of Petra, located in Jordan, was written in The Illustrated London News during the restoration work in 1962. It is mentioned that the ancient city of Petra in Jordan was saved when it was about to fall into ruin and that the structure was brought back to life with local materials and opened to tourism [16].

- **Landscrapers: Building with the Land - Aaron Betsky**

Aaron Betsky discusses the links between structure and land. The book examines the possible structure-land association, as well as the links between land and structure. Architectural works, which are designed to be intertwined with the structure and the land, are handled in terms of the concept of "Landscrapers". The book examines the concept of Landscrapers and their importance for the present and the future. It also states that the structures formed with this concept will become a part of human life [2].

- **Derinkuyu Underground City – Demet OKUYUCU**

According to the source, it is stated that during the construction of the underground cities in the region, it was built as a shelter as a result of important factors such as the scarcity of trees in the region and the constant earthquakes. However, in addition to this, the people of the region, who accepted Christianity in history, state that they lived in underground cities for shelter. The source includes details in terms of architectural features from Derinkuyu Underground City. It deals with the changes in the historical processes of the structure and the condition of its existing remains [17].

- **Analysis of the Bearing Elements of the Basilica Cistern – Şehnaz ÖNLÜ**

The source includes the analysis of the bearing elements of the Basilica Cistern and a detailed examination of the column capitals, and information on the construction process of the structure, its history, the use of the cisterns, and the Medusa (Gorgon) capitals in the structure. In addition, the purpose of use of the Cisterns and the importance of the Basilica Cistern in terms of war and protection were examined [18].

- **SKYSCRAPEROLOGY: Tall Buildings in History and Building Practice (1975-1984) - Daniel López-Pérez**

The source, with the thesis "Science of Skyscraper", examines the history of tall buildings and the development of high-rise technology between 1975-1984. In addition, it aims to respond to the criticisms made on high-rise buildings with the concept of "Science of Skyscrapers" [19].

- **Landscrapers -Architecture & landscape in a dialogue – İbrahim ELGHANDOUR**

This thesis, states that the concept of "Landscrapers" was first used by architect Antoine Predock. The source tries to explain the relationship between architecture and land with the concept of Landscrapers. It deals with the combination of building and land elements, and their physical and conceptual relationship through architectural examples [3].

- **A Temporary Dwelling in Times of Extreme Duress – Mana Moradi-Haghighi**

In this thesis, the importance of shelter structures in underdeveloped countries in terms of security is examined. The source mentions the importance of using underground structures as shelter structures in terms of climate crises, lack of shelter in possibly dangerous situations, and security deficiencies. In addition, this study deals with alternative underground city design in times of crisis [20].

- **Wieliczka Salt Mine & Krakow - Nevin SALMAN**

In this blog post, which is used as a source, there are also personal opinions about the Wieliczka Salt Mine, but architectural information about the structure is given based on observations during the trip. It is seen that blogger Nevin Salman, due to her architectural background, tries to be careful about conveying her experiences and architectural details in the structure [21].

- **Matmata - an underground city in Tunisia – Hubpages (Blog)**

An observation-based blog page was preferred as a source. It can be said that the information given is successful in terms of accuracy and architectural observation. According to this; The location of the underground city has been examined in terms of its historical processes

and importance. In the source, information is given about the architecture of the houses carved from the soil in the city, where the underground city was built for both climatic conditions and the purpose of protection and defense from the enemy [22].

- **Naours Underground City, Picardy District - French Favorite Monument (Video Documentary)**

A short youtube video documentary was used as a source. Naours Underground City is known to have been used as a military shelter during World War I. It was understood that the soldiers made paintings, reliefs, and inscriptions on the cave walls that would reflect their daily and war psychology. Along with the use of the structure as a shelter, there are sections added later [23].

- **Petra (Introduction - Research Paper)**

Website research articles were used as a source. Petra's historical and architectural details are extensively covered on the website. Here, it is shown that all this information is based on sources and the research articles are discussed both in terms of the promotion of Petra and tourism [24].

- **Kayseri Underground Structures Inventory – Belağası Rock Settlements and Underground Cities & Ötedere Valley Underground City (Report)**

The report prepared by Kayseri Metropolitan Municipality was used as a source. The detailed history, development stages, and architectural details of Belağası Rock Settlements and Otedere Valley Underground City are given. By mapping these structures in the region, important details were obtained in terms of both history and architecture [25].

2.2. ON-SITE INSPECTION AND OBSERVATION

Examples of the Ancient City of Dara, which is an underground and partial rock garrison city, and Derinkuyu Underground City have been observed. On August 20, 2020, sources were included for the Ancient City of Dara, and on August 28, 2021, for Derinkuyu Underground City, on-site examination and observation were made.

There is information about these two exemplary structures (Derinkuyu Underground City and Dara Ancient City) based on the author's observations and experiences. In these examples in the following sections, information is given within the framework of academic resources.

- **Dara Ancient City – Mardin**

Dara Ancient City is located in Oğuz Village, on the Mardin-Nusaybin highway, in the province of Mardin. Scientific excavations continue in the region. The settlements formed in Anatolian lands throughout the historical process have established their settlements on the remains of previous communities. Thus, it can be said that the remains of more than one civilization can be found in the same areas (Figure 2.1.). With the historical archaeological excavations in the ancient city of Dara, it has been understood that the region has hosted many civilizations throughout history [11].



Figure 2.1. Dara Ancient City, 2020, photograph was taken by author.



Figure 2.2. Dara Ancient City, 2020, photograph was taken by author.

The Ancient City contains structures from the Late Roman Period, Byzantine, Seljuk, and Ottoman periods. This city was established by the Roman Emperor Anastasius as a military garrison city to protect the eastern border of the empire against the Sassanids [11]. The name of the city of Dara is referred to as 'Dara-Anastasiopolis' after the founding emperor [11]. In the ancient city of Dara, dungeons, cemeteries, city walls, inner castles, bastions, churches, water channels, etc. belonged to the Roman and Byzantine periods. structures are both underground and carved into the rocks (Figure 2.2.). In particular, the water channels were built both in the form of large channels and in a sheltered manner in terms of vital importance. There have been constructions such as bridges, ditches, mosques, and residences on and around the ruins by other civilizations [11]. Traditional rural houses have also been built on and around the ruins today. In addition, the underground chambers carved into the rocks were used for housing or animal shelters in different periods (Figure 2.4.). It is stated that these structures can be prisons, grain warehouses, or water cisterns [11].

There is an underground structure called a 'dungeon' by the local people. Findings have emerged that the structure belongs to the Late Period Roman Empire. There is a cemetery at the entrance of this structure, which is called the dungeon [11]. There are chambers carved

into the rocks in the structure. Each of the chambers in the structure was used as a dungeon [11]. According to rumors, there is a lower section where criminals or prisoners of war are kept in these chambers and there are heaps of killed human bones.

Today, many deformations have occurred in the structure. It is seen that some of the remains unearthed as a result of archaeological studies are used with contempt by tourists or local people [11]. Figure 2.3. and Figure 2.5. As can be seen, in this structure, human bone piles were tried to be preserved in a way that the upper part was covered with glass. A walkway with glass flooring and glass balustrades has also been added to the structure for display and protection purposes [11].



Figure 2.3. Dara Ancient City, 2020, photograph was taken by author.



Figure 2.4. Dara Ancient City, 2020, photograph was taken by author.



Figure 2.5. Dara Ancient City, 2020, photograph was taken by author.

Another important structure in this ancient city is the section where it was used as a granary after the water cistern. The structure consists of a huge courtyard completely underground and surrounded by high walls. The rocks were cut into small pillars and built into a wall with mortar [11]. There are chambers in some parts of the walls by making gaps at regular intervals. It is also said that some parts of these chambers were used as granaries or prisons in the periods after they were built (Figure 2.6.).



Figure 2.6. Dara Ancient City, 2020, photograph was taken by author.

- **Derinkuyu Underground City**

Derinkuyu Underground City is located in the Cappadocia region of Nevşehir. The Cappadocia region is a rich ancient region with many historical artifacts [17]. Derinkuyu Underground City takes its name from 52 water wells [26]. Many excavations continue in the region. It is the site of Derinkuyu, the most complex underground settlement in the region so far. The size, depth, and how many sections of this structure are not yet known. However, the number of floors opened and open to tourism is 8 and it is assumed to have a size of up to 12 or 20 floors [17]. According to some research, it is thought that this underground city was built by the Hattians, and additions were made to many parts of the city according to its use by later civilizations [17]. Considering the opened sections and floors of the city, it is understood that the city was built with asymmetrical and complex architecture.



Figure 2.7. Derinkuyu Underground City, 2021, photograph was taken by author.

Regarding the purpose of the construction of this ancient underground city, there are hidden entrances and exits and connections between the channels in the city against enemy attacks. There are different entrances to the underground, just below the ground level of Derinkuyu underground city. It is known that the structure has more than one entrance and exit. However, many of these entrances and exits were made secretly for defense and asylum [17].

At the observation point, the vaulted entrance of the underground city, built by later civilizations, leads to the following sections via stairs (Figure 2.7.). Some corridors will reach more than one section in the section opened with stone carved and excavated stairs. Since each floor is interconnected in terms of defense, it is not possible to go to the third floor without going through the second floor [17]. This is to gain time for people fleeing during the defense. In addition, at the beginning and end of the tunnels located here, round stones were made to open and close the tunnels, from the inside to be unidirectional [17]. It has been understood that many additions were made by many civilizations during the construction of Derinkuyu Underground City. It is observed that there are not very wide openings in some rooms, but there are stone and soil supports that will act as columns in certain parts of the sections (Figure 2.8.). Likewise, in some sections, restorations and reinforcements made by later civilizations and arches and vaults made of stone and soil can be seen. It is observed that these were made in the periods of later civilizations, and the entrances of some sections were closed. They were the first Christians to escape from Rome, one of these civilizations [17]. There is a church and a missionary school, which is one of the special structures of this underground city and was built with the cradle vault system by the first Christians who came to escape from the Roman Empire [17]. This shows that this underground city was a construction process that lasted hundreds, perhaps thousands of years.



Figure 2.8. Derinkuyu Underground City, 2021, photograph was taken by author.

It is thought that the niches carved in the walls of many rooms are the places for the equipment that will serve the units such as the kitchen or the warehouse, which meet the needs of the period. It is understood that the first floor was reserved for the tandoor, supply rooms, and fattened animals, as in all other underground cities [17]. The second floor is reached by passing through the corridors going down the tunnels in the section. This floor space is considered to be a "residential area" (Figure 2.9.). Mostly, a system that provides defense was thought of by creating stones that would allow the closing of many doors [17]. There are large areas with defense equipment, animal shelters, and wells used for water supply. There is the deepest part of the structure at a lower level, connected by a long, steep, and narrow passage compared to the previous one, equipped with sudden changes of direction and multiple closing devices [17]. As you go deeper into the city, there are also non-wide and low sections where the interior use of the structure will cause difficulties for human ergonomics. It is thought that these sections opened to secret passages during the escape.



Figure 2.9. Derinkuyu Underground City, 2021, photograph was taken by author.



Figure 2.10. Derinkuyu Underground City, 2021, photograph was taken by author.

The floor system of the structure is not such that it overlaps regularly. There are differences between the areas covered by the floors. The tunnel connecting the first, second, and fourth floors of the structure does not reach the third floor. The third floor is connected to the second and fifth floors, while the fourth floor is associated with the first and fifth floors. The central floor of the structure is the fifth floor [17]. Because this floor is the section where both the starting and ending points of the third, fourth and sixth floors intersect. The tunnel that continues after the fifth floor is the sixth floor, and at the end of the tunnel, there are the seventh and eighth floors. As seen in Figure 2.10. it was understood that the hidden entrances and exits between the tunnels inside the structure were made for defense purposes [17].

Sliding millstones were not found in the outer entrance doors of the structures like in the other underground cities studied. It can be said that a solution was provided in another way because it was understood that it was coming to the second level by passing through one of the entrances and the corridors going down, and some stones would allow the closing of many doors. In terms of defense, it was concluded that a solution was considered in this way. In this section, there are defense equipment, shelters for animals, and water wells. At the lowest level, a steep and narrow tunnel leads to the deep section [17].

3. DEFINITIONS AND A HISTORICAL OVERVIEW

To define the thesis topic correctly, first of all, it is necessary to see the definition of architecture from different perspectives within the framework of architectural history. The Roman architect Vitruvius, who lived in the 1st century BC, argued in his book "De Architectura", which is referenced in every age, that "Utilitas, Firmitas, Venustas" (utility, durability, beauty) factors are necessary for a successful architecture [27]. In the Renaissance, this definition was adopted as Comodita, perpetuity, and Bellezza (usefulness, continuity-permanence, beauty) [28]. In 1581, an English writer defined architecture as the "science of construction", while in the 19th century the English critic John Ruskin argued that architecture was nothing but ornamentation applied to structures [28]. The famous architectural theorist of the 20th century, Bruno Zevi;

A building that creates enthusiasm and admiration with its interior, urban space, economic, social, intellectual, technical, functional, and spatial decorative values is a work of architecture [29].

According to these definitions; It can be thought that the definition of architecture has been shaped by words such as 'usefulness, durability, beauty, continuity-permanence or ornamentation over time. However, this thought would be very incomplete in terms of the definition of architecture. Therefore, it would not be correct to evaluate the concept of architecture in terms of a few words or the meaning derived from the conditions of the day. Perhaps conclusions can be drawn by accurately identifying the root causes of artifacts made in prehistoric times. For this, it is necessary to mention a few sub-definitions of architecture.

3.1. DEFINITIONS

To express the subject of the study well, it is necessary to briefly explain a few basic concepts that are parallel to the subject or that can be considered as a whole with the subject of study. These definitions are important in terms of forming the basic units of the study subject, as well as forming an idea about the study.

- **Landscrapers**

This approach includes both the concept of embedding and the concept of partial embedding. To understand the concept of landscrapers well, it is necessary to examine the underground structures that emerge according to need and time.

Landscrapers is an architectural approach that integrates with the land, aiming at the appearance of a structure in harmony with the surface contours of the soil or rock, instead of the exposed parts and facades of a structure [1].

According to the author, landscrapers is a definition with its own characteristics. It is to unite the prehistoric architecture and the underground architecture that has developed until today under a common denominator. In addition, structure and nature act together. Thus, it states that nature and structure cannot be independent.

Although it is the main subject of the study, it will be examined in detail in the next sections.

- **Structure**

The word structure is defined as the way the parts of something are arranged or put together [30].

“A house is defined as a structure dug into the ground or partially excavated and covered with earth” [3].

Definitions of building or house, on the other hand, refer to a shelter, which can be any structure (natural or artificial) that provides security and also acts as a shelter [3]. Each structure is a whole consisting of flooring, carriers, roof, and wall elements. Structures in nature or underground also consist of these basic architectural components [3]. Although a naturally occurring cave is semi-enclosed, it falls within this definition.

- **Landscape - Land**

The landscape is defined as “all the visible features of a land, often given its aesthetic appeal” [31]. This definition can also be as “a certain area of a piece of land is a set of natural or artificial aesthetic values” [3]. For some architects, the landscape includes everything we see, including the natural features of the land such as farmland, water surfaces, mountains, and hills. It also includes everything made, including buildings and structures, and even

untouched elements such as light, smell, sound, and weather conditions. Apart from the dictionary meaning, artistic definitions of the word landscape have also been made [3]. As Olwig puts it, “A painting representing the image of the natural interior landscape is the art of depicting that scene” [3]. That is, Landscape is the art of showing and representing the environment using both an architectural and a natural element. The landscape is also alive as the elements are vividly represented in nature's scene. The word landscape is used as a landscape according to some sources. According to this meaning, all-natural and unnatural elements are included in this meaning. Everything that creates the shape of the land is included in the landscape, including artificial structures such as caves or buildings on the land. It can be said that the landscape is the result of a relationship between natural or artificial structures. When a building is considered an aesthetic element, it is possible to see that it is one of the main elements of the landscape - the land in which it is located. Because it behaves as a whole [3].

- **Natural Landscape**

The natural landscape is a whole formed by the objects and features that exist in nature and natural life. They are areas where there is little human influence or even no anthropogenic influence, and they are left as they are due to the influence of natural conditions [32].

- **Urban Landscape**

Urban Landscape; It is a type of landscape created by the mass, block, and stone piles caused by the population growth and dense structures in the cities. The continuity of the urban landscape cuts man's relationship with nature. In the urban landscape, independent home gardens, artificial parks, squares, boulevards, and cemeteries can be seen as elements that bring people closer to nature after a while. In other words, both natural and artificial landscapes behave like living things, and over time, such landscape areas gain an aesthetic spirit with human relations [33].

- **Underground structures (Built-in Structures)**

A underground structure is an artificial structure built under soil or ski slopes to meet many physical needs of people throughout history (defense, shelter, storage, etc.). They are man-made underground structures created by the use of many different parts together with their functions [1].

- **Underground City**

They are underground cities built by people using structures with many different functions, under the soil or rocks, due to many physical needs (defense, shelter, storage, etc.) throughout history [1].

- **Archology**

It is the architectural design principles created for high population density, ecologically low impact human living spaces, formed by the combination of the words archeology, architecture, and ecology [1]. The concept of archology was defined in 1969 and was used for the first time by architect Paolo Soleri, who believed that it would provide space for various residential, commercial and agricultural facilities and minimize the individual human-environment impact. This concept has remained largely hypothetical, as an archaeological structuring designed by Soleri himself has yet to be built [1].

3.2. GROUPING OF UNDERGROUND STRUCTURES

To define the concept of Landscrapers, which is the subject of the study, it is necessary to group the underground structures. This process will have an important role in establishing the relationship between the subject of the study and the subjects it is related. While grouping, it is possible to see the changes in the concepts of burying and semi-embedding of human beings in terms of needs and time.

The examples given for the underground structures in the grouping were tried to be chosen in a way that would indicate the main philosophy of the study.

3.2.1. Rock Structures

Before human history, natural caves and hollow rocks were formed over tens of thousands of years in the natural cycles of nature. Throughout the history of humanity, these natural caves and hollow rocks started to function mainly in terms of protection and shelter from nature [3]. Over time, people began to carve natural caves and hollow rocks. These sculpted natural structures have evolved into artificial structures [3]. These structures began to be

used by people as shelters, underground chambers, shelters, water channels, places of worship, warehouses, and tunnels.

In archaeological studies on human life, it is possible to come across many rock structures both in our country and in the world. Examples of these structures are the Abu Simbel Temple in Egypt, the Ellora Caves and Badami Cave in India, and the Petra Ancient City in Jordan. Some examples have not survived. There are no structural remains of the Hanging Gardens of Babylon, which are thought to have been built by the Babylonians within the borders of the present-day Iraq State [3]. However, information about its construction, its name, and structural features are mentioned in many historical quotations [3]. These examples will be explained separately.

- **Hanging Gardens of Babylon - Iraq**

Gardens of Babylon, the ancient city of Babylon in Iraq, BC. 605 and BC Built to please his wife in 562, II. It was built by the king of Nebuchadnezzar [3]. Greek engineer and writer Philo of Byzantium BC. He states in 250 BC;

The Hanging Gardens of Babylon have plants planted above ground level, and the roots of the trees are buried in the upper terrace rather than in the ground. For the technique of its construction, the entire mass is supported on stone pillars. Thus, the carved column bases occupy the entire base area [3].

As can be seen in Figure 3.1, this specimen was not buried underground, but parts of it are said to be buried in rocks. As seen in past texts and pictures, these hanging gardens are structures equipped with green roofs, offering a walkable, in a sense sustainable architecture on a green roof. It was also a palace with a green roof and water fountains. The Babylonian gardens make it possible for people to use the soil as a structural element and show that the boundaries of the soil can be used as a whole with the structure element environment (3).



Figure 3.1. The Hanging Gardens of Babylon [3].

- **Abu Simbel Temple - Egypt**

Abu Simbel Temple, BC. It is a temple built by Ramses II in the 13th century in ancient Nubia, located in the south of Egypt [34]. This structure was made of hewn sandstone rock. It is known that it was built to honor Ramses II. On the facade of the temple are statues of Ramses II wearing the crown of Upper and Lower Egypt [34].

The facades of the temple were designed using the natural surface of the rock, and chambers were created by carving the inside of the rock [5]. The High Aswan Dam was built by the present-day Egyptian government. However, with the help of UNESCO, four monuments of the temple were taken to safety in 1964, based on the thought that the temple might be lost, as the rising waters of Lake Nasser were likely to submerge Abu Simbel. All artifacts were cut into 950 blocks under the control of Polish archaeologist Kazimierz Michałowski [5]. These monuments of Abu Simbel Temple were moved to a higher part of a mountain despite the outbursts [5].

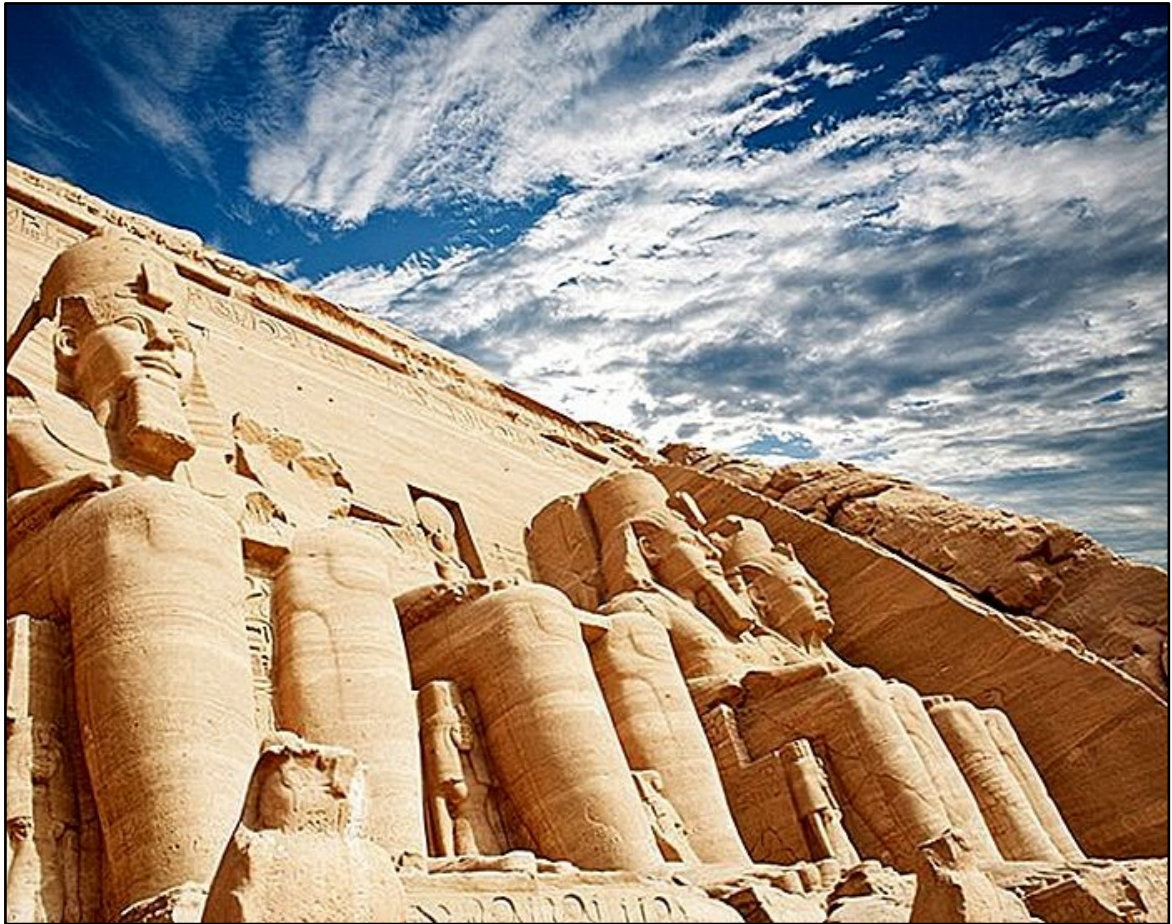


Figure 3.2. Abu Simbel, Egypt [35].

The main entrance of the temple leads towards the 17.7 meters long Hypostyle Hall. Its interiors are divided into sequential corridors [5]. There are sculptures at the entrance of the structure as seen in Figure 3.2. In the interior, in the Hypostyle Hall, there are statues of Ramses II wearing the crowns of Upper and Lower Egypt [5]. In the Hypostyle Hall, there are the treasure room, storage rooms, and eight small chambers. In the walls of some rooms, carved stone table-shaped recesses were made. There are also wall reliefs in the Hypostyle Hall [5].

- **Ellora Caves - India**

Ellora Caves consists of a total of 32 caves. The structures are thought to have been built in the 6th or 8th centuries AD [6]. All of the structures were carved with hammers, chisels, and pickaxes as human products. The structure was built as a result of chipping and digging, preserving the natural contours of the rock [6]. As seen in Figure 3.3, there are large stone

carvings, elephant, lion figures, and statues on the outer walls of the temple. On these carvings are the sacred Hindu texts Mahabharata and Ramayana [6].



Figure 3.3. Ellora Kailash -Kailasa Temple, Maharashtra, 1880 [6].

The majority of the caves are composed of black volcanic rocks. Sculptures in some parts of caves and temples are covered with white plaster. The purpose here is to want it to look like snow. In this way, it is thought that the structures here are intended to establish a relationship with the Himalayan Mountains [6]. The remains of white plaster remained in the form of remnants from the conditions of nature. It is estimated by archaeologists that there are more than 30 million engravings of Sanskrit writings that have not yet been translated [6].



Figure 3.4. Ellora Caves - statue elephants [6].

In addition, more than one animal figurine was carved. As can be seen in Figure 3.4, there are stone statues and carvings of the elephant army on some facades and in front of the temple, and it is said that these figures were made as guardians of the temple. Indeed, elephants surround a 100-meter column that serves as the main structure in the temple complex [6].

There is a temple made of a single rock on the mountainside of a cave in Ellora. Kailasa Temple is considered the largest monolithic work of art in the world [6]. Kailasa Temple covers an area larger than the Parthenon Temple in Athens. This structure was not discovered until 1682 [6]. According to archaeologists, this structure was built between 756 and 773 AD, and it was revealed that more than 200,000 tons of volcanic and basalt rocks were carved by human hands (Figure 3.5.). The interior of the temple has intricate Sanskrit carvings for the gods. The Ellora Caves are on the UNESCO World Heritage List [6].

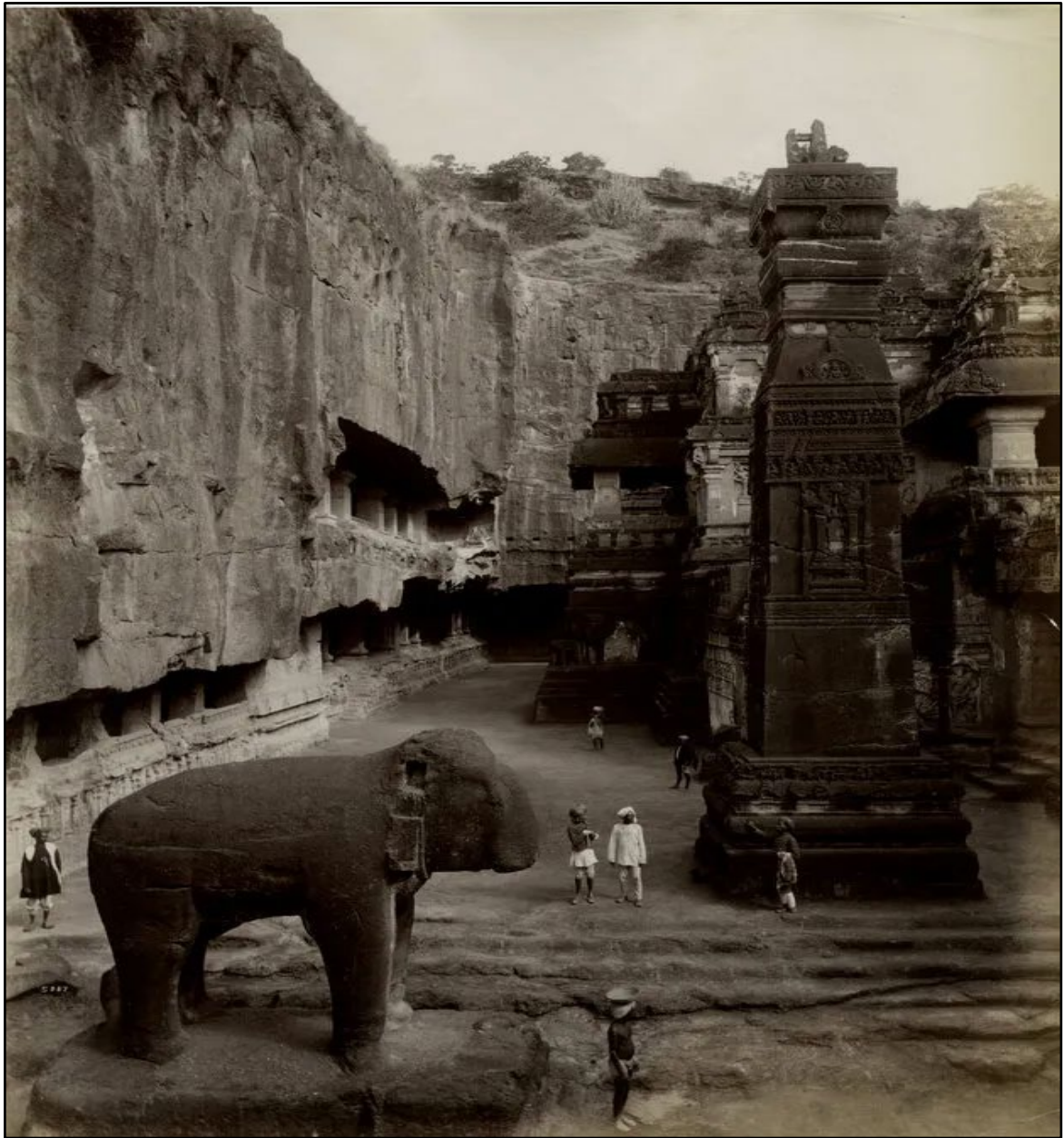


Figure 3.5. Ellora Caves with waterfall [6].

3.2.2. Wind Catcher (Towers) Structures

Both historically and today, underground life has been an indispensable element of human life. Today, large structures in terms of human density, such as many shopping malls and subways, are designed partially or completely below sea level [36]. Although these large today's structures are not as natural as historical underground structures, they have shown positive differences in terms of use with the development of technology. In such structures,

ventilation, insulation, and strong structure are essential, but there are many technologies in terms of sustainable energy. In historical structures, there are both simple and complex solutions for ventilation [36].

Wind catcher structures are built either completely underground or partially buried under the ground. Compacted soil, similar to concrete, was used as a material in historical structures, although not as binding as cement [36]. These structures share many features with traditional adobe construction, and over time, a solution has been created not only to use air circulation but also to cool underground against heat. In such structures, air conditioning effect ventilation structures, hot air, wind, and water are used [36].

There is a traditional architecture used to create cross-ventilation and passive cooling in wind-trapping or trapping structures. Wind catchers come in a variety of designs that can be unidirectional, bidirectional, and omnidirectional. Wind catchers have been widely used in Iran, North Africa, and West Asian countries around the Persian Gulf for the last three thousand years [7].

In general, compared with today's technology; The construction cost of a windbreak ventilated structure is lower than a similar structure with conventional heating, ventilation, and air conditioning (HVAC) systems. Maintenance costs are also lower. Unlike electric air conditioners and fans, wind catchers are quiet [36]. It can power the system with electricity, but it will continue to work when the main power is cut. Wind catchers depend on local weather and microclimate conditions. Wind catchers can vary considerably in height, cross-sectional area, and shape, including internal subdivisions and filters. The "Badghir" structures used in Iran are considered the most typical example in this regard [7].

- **Badghir – Iran**

In today's Iran, in many regions, there are structures with an attachment called badghir. These structures, commonly called wind towers or Badgir, are elements of traditional Iranian architecture [7]. In desert areas, cool air currents are used indoors to cut off the hot air flow and cool it. For this reason, the inhabitants of the region have produced a natural architectural solution for the air conditioning of the environments [36]. These towers can be considered very useful for achieving a sophisticated, fully eco-sustainable ventilation system. It should be noted that the working principle is quite simple, but it contains a lot of engineering knowledge according to the conditions of the time [7]. These sections, which are integrated

into the structures, are made to cool both the above-ground sections and the completely underground sections. As seen in Figure 3.6, these add-ons consist of wind energy, solar energy, and cold air ducts. The air flow moves due to the pressure difference between the tower area, the current is determined by the wind blowing. The heated air moves towards the shafts and the hot air passing through the shafts are cooled by the cold water in the channels or start to blow into it [37].

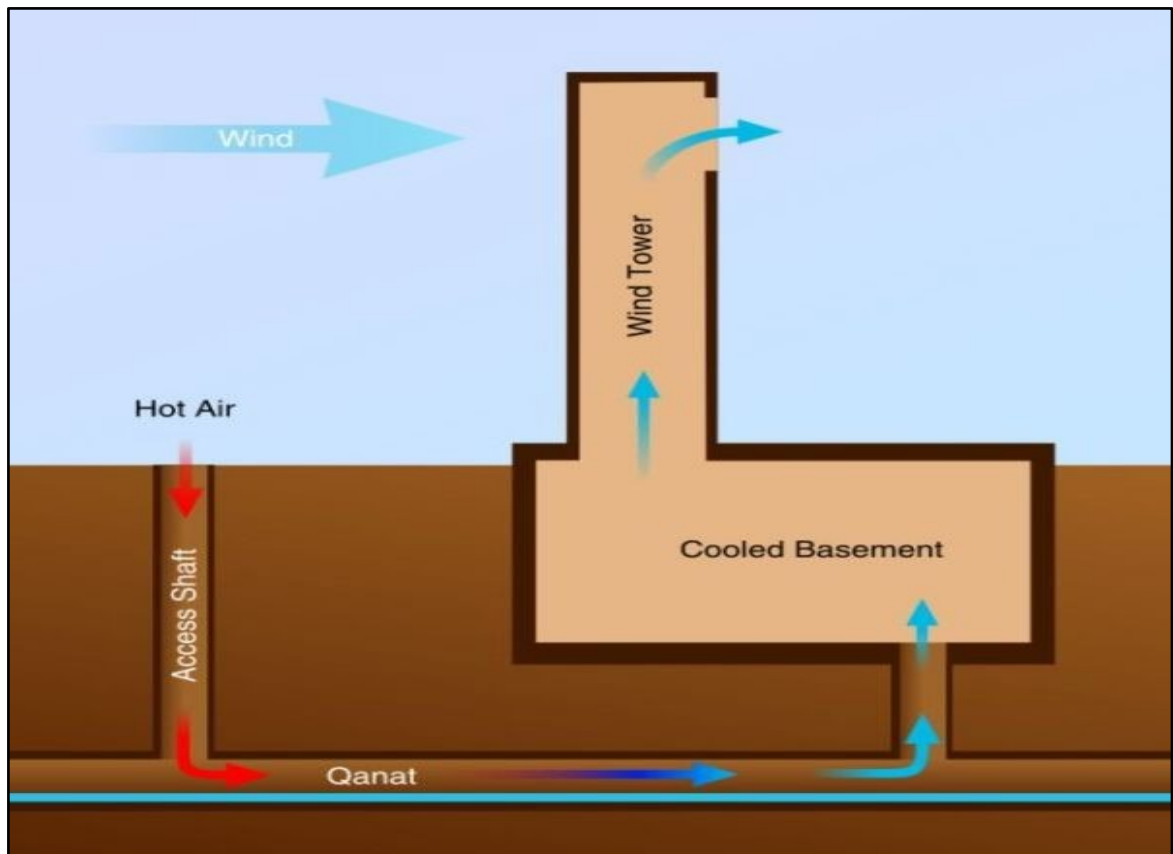


Figure 3.6. A wind catcher and blade are used for cooling [37].

As seen in Figure 3.7, the cold water method is not used in some structures, only hot air flow and wind energy are used [37]. In simpler words, it consists of expelling the hot air from the interior and getting fresh air from the exterior to the interior. In this way, natural ventilation is provided in the structure [37]. The wind catcher assembly is designed to catch winds coming from all directions [37].



Figure 3.7. Badghir – Iran [37].

3.2.3. Carved Structures

These structure types were built in regions with hot climates. They are structures built as a precaution against strong winds caused by hot air currents, desert storms, and hot weather conditions. These structures, which are still in use in prehistoric times and today, were built by carving into the soil and rocks [22].

- **Matmata City - Tunisia**

Matmata is located in Tunisia, about 450 km south of the country's capital [22]. The construction of this ancient city is not known for certain, except for the stories passed down from generation to generation. However, it is said that the underground houses were first built in ancient times and the Roman Empire sent two Egyptian tribes to make their own houses in the Matmata region. Therefore, the local people fled most areas and built their houses in the Matmata region. Therefore, the local people fled most areas and built their houses as shown in the figure by moving them deep into the desert where they could be safe [22].



Figure 3.8. Matmata city – Tunisia [38].

According to another story, about 700 years ago, the people living in the Matmata Underground City built it underground by digging the desert soil in the form of a hollow to protect them from the burning rays of the hot desert sun (Figure 3.8.). The temperature in these primitive dwellings seems to have remained constant between 20 and 22 degrees throughout the year [22].

Of the more than 100 underground houses in Matmata, some were built later. Because it looks like an extra-planetary underground city, the scene in George Lucas' "Star Wars" movie on Tatooine was also shot here [22].

As seen in Figure 3.9, the city of Matmata describes the Terratecture definition in which the structure was made in excavation and the earth was covered. As if creating a semi-private

space with a veranda, public space was created on the roof of the hollow structures in the shape of the moon, on which everyone could walk.



Figure 3.9. Matmata city – Tunisia [22].

3.2.4. Tunnel and Mine Structures

Tunnel structures have been built and used for war tactics, defense, and escape corridors since prehistoric times. Mine structures, on the other hand, were built by people who started digging mine tunnels with the start of mining activities. Such structures have been used with methods based on manpower before technological development, and with the development of technology, mechanical tools, and machines that are not based on human power. It is known that such structures are used for mining, transportation, or defense today. One of the most typical examples is the Wieliczka Salt Mine.

- **Wieliczka Salt Mine - Poland**

The Wieliczka Salt Mine was built in Poland in the late 13th century when mining for rock salt began. It operated for about 700 years. During the mining process, more than 2000 rooms and 200 km long mines were opened [8].



Figure 3.10. Wieliczka Salt Mine – Poland [39].

The Chapel Of St. Kinga is located 101 meters below the ground in Maden, which was built in 1896. Rites and ceremonies are still held here [39]. Today, visitors are accepted in large galleries, and works of art are exhibited (Figure 3.10.).

The Wieliczka Salt Mine has evolved into an underground city architecture over time. In this mine, many units such as memorial rooms, galleries, churches, and storage rooms were created [21]. It is possible to see sculptures made of salt rocks and religious wall reliefs. The Wieliczka Salt Mine was included in the UNESCO World Heritage List in 1978 [39].



Figure 3.11. Wieliczka Salt Mine – Poland [39].

The Wieliczka Salt Mine has galleries and tunnels that expand more than 1000 meters underground. The mine has been flooded at certain times and worker deaths have also occurred. As can be seen in Figure 3.11, the workers working in the mine used the salt crystal beds in the mine when they were not digging for the mine rocks. Workers made the "Last Supper" figures of Leonardo Da Vinci, which is a detailed replicas with carvings. It is also known that many of the workers made a chapel collection, sculptures, reliefs, and chandeliers [39].

3.2.5. Underground Water Cisterns

Underground water cisterns are closed, semi-enclosed, and completely underground structures for war and siege measures, water used for residences, irrigation of gardens, and agricultural products [18]. These structures respond to the purpose of accumulating and storing incoming water with the help of channels opened for rain and snow waters [18].

- **Basilica Cistern - Istanbul**

The Basilica Cistern is located on Yerebatan Street in Eminönü-Sultanahmet, which is a part of the Fatih District today. The structure was built by the Byzantine Emperor Justinian I in 532 as an underground cistern in Istanbul [18]. It is called "Basilica Palace" or "Yerebatan Cistern" by the people because the marble columns in the interior of the structure rise out of the water in countless views. It is also called "Basilica Cistern" because there is a previously existing Basilica at the point where the structure is located [40].

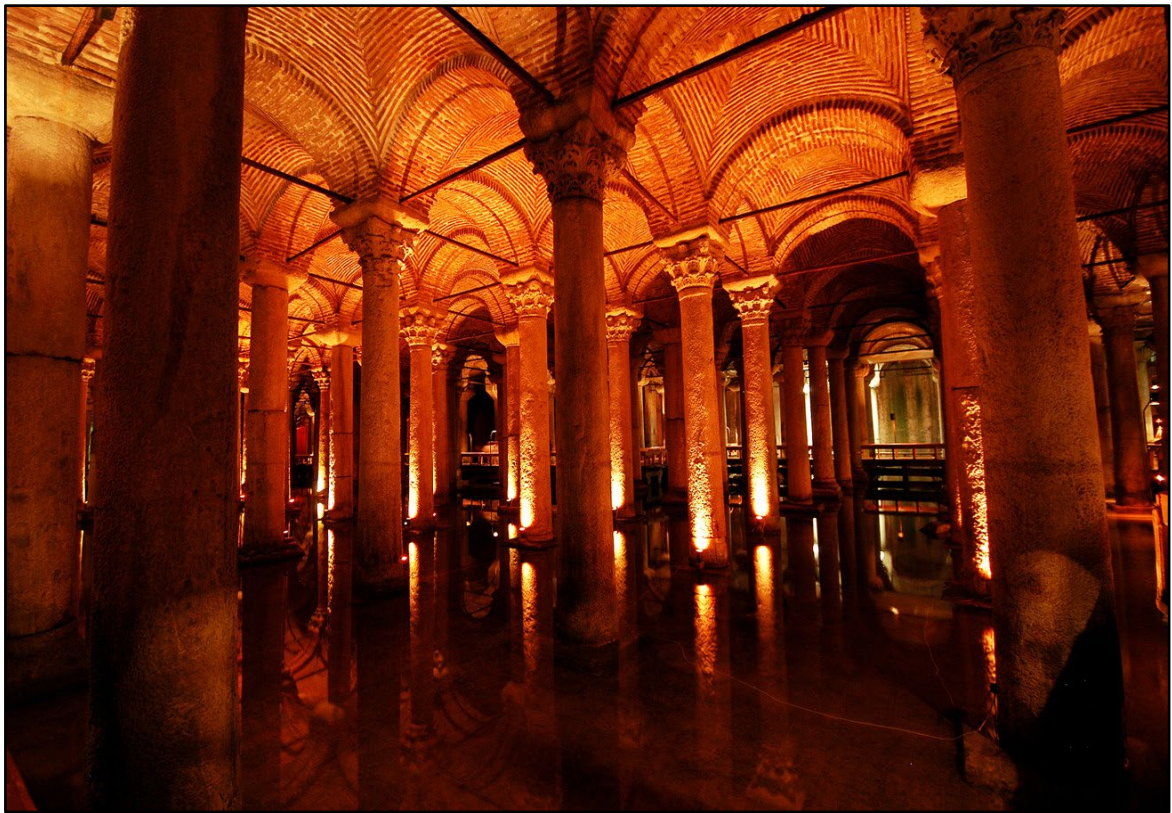


Figure 3.12. Basilica Cistern – there are many carrier columns - Istanbul [40].

The structure covers a rectangular area of 140 meters in length and 70 meters in width. It is known that this structure, which covers a total area of 9,800 m², has a water storage capacity of approximately 100,000 tons [40]. As seen in Figure 3.12, there are many columns, each 9 meters high, in the interior of the Cistern [18].

As it can be understood from the column capitals found in the cistern, it is understood that they were used from the structures that were built before (Figure 3.13.). Some columns of the cistern have been damaged due to the construction works carried out in recent years [18].

The walls of the cistern are 4.80 meters thick and made of bricks. The floor of the structure was laid in bricks and it was plastered with a thick layer of Khorasan mortar and made watertight [18].



Figure 3.13. Basilica Cistern – Different columns used in the structure - Istanbul [40].

The Basilica Cistern was able to meet the water needs of imperial structures, baths, and residents' residences, covering a wide area around it, with the water obtained from waterways and rainwater [18].

Yerebatan Cistern has more spolia carrier elements than other closed cisterns in the region. With the passing of Istanbul to the Ottoman Empire, the use of the cistern continued for a while. The water needs of the gardens in Topkapı Palace were met from this cistern [18].

The Basilica Cistern contains works that have inspired many legends. There are two Medusa Head statues in the northwest corner of the structure (Figure 3.14.). The Head of Medusa is one of the important works of sculpture art in the Roman Period. There is no information about which structures and when these two statues were taken and used here [18].



Figure 3.14. Basilica Cistern – Head of Medusa from a column - Istanbul [18].

3.2.6. Underground Shelter Structures

Since prehistoric times, people have searched for their defense, protection, and escape needs. For this, they developed and used natural and artificial structures or rebuilt them. Especially in the case of war and enemy raids, they designed secret rooms, secret escape routes, secret cities, and high-security shelters in these structures, as they thought that some structures were not sufficient in terms of protection from the enemy. With the development of technology, they have produced new solutions, especially in the field of structure materials, to make the secret parts of the important structures in terms of defense and protection adequate in terms of function.

- **Naours Underground City - France**

Naours Underground City is located in the town of Naours in the north of France. There is no certain information about when it was built, but according to some sources, its construction dates back to the 3rd century AD [41]. It consists of warehouses, ovens, religious sites, rooms, galleries, and escape tunnel networks, built as a shelter carved into a forested limestone plateau to the east of the town (Figure 3.15.). The purpose of its construction was a shelter and to hide against the Barbarian invasions of the people of the

region. This underground shelter spans a width of about 3 kilometers and has a capacity of 3,000 people [41]. The existence of this underground complex was forgotten until it was rediscovered in 1887 when Western Europe stabilized and prolonged hiding in caves became less necessary [42].



Figure 3.15. Naours Underground City – France [43].

This underground shelter was used in many wars. In the 17th century, the Thirty Years' War and the First World War caused severe destruction in the region, but it was understood that the people who used this underground city as a shelter were both preserved and added to the structure [42].



Figure 3.16. Naours Underground City – France [42].

This shelter structure was used as a headquarters by the occupied Nazi forces in the First World War on the Western Front, remaining faithful to the previous form of the network of secret rooms and tunnels that existed within it [23]. Naours Underground City is home to approximately 3,000 examples of graffiti drawn by WWI soldiers (Figure 3.16.). It is thought that 1800 belonged to Australian soldiers, while the others belonged to British, Irish, Scottish, American, and French soldiers [43].

3.3. HISTORICAL DEVELOPMENTS REGARDING UNDERGROUND STRUCTURES

While the author uses the concept of "historical underground structures", he considers all the structures built after the Industrial Revolution, which is known as the turning point of advanced material production and technology, as "contemporary".

Underground structures started at the beginning of human history for the protection and shelter needs of people against external factors. There has been a process from the first people to use only natural caves directly, to the development of these caves, that is, to the construction of add-ons, underground structures, artificial caves, and structural structures. Underground construction can be explained as a set of structures designed to be built partially or completely underground, containing sections for certain needs intended to be used for residential purposes, and designed with natural or artificial infrastructure and ventilation systems.

3.3.1. Prehistoric underground Structures

In line with the research and discoveries made in recent years, certain concrete evidence has emerged about pre-human history. The existence of a pre-human Neanderthal species is known. Evidence of this species' ability to build structure has been found in a cave in Western Europe [44]. Archaeological evidence indicates that the Neanderthal species possessed symbolic thinking, basic knowledge of chemistry, medicine, and cooking, and some capacity for speech. Research continues as to whether Neanderthals may have taught modern humans new craft skills. The known example of underground structures before human history is Bruniquel Cave [44].

- **Bruniquel Cave - France**

Stone circles and stone tools were discovered in a cave in the south of France, built by Neanderthals who lived before Homo sapiens, who are considered the ancestors of modern humans, and about 175,000 years before the Invention of Writing, the beginning of human history [44]. This discovery suggests that prehistoric Neanderthals lived in structures such as caves. As can be seen in Figure 3.17, 3D analysis studies were also carried out inside the cave [44].

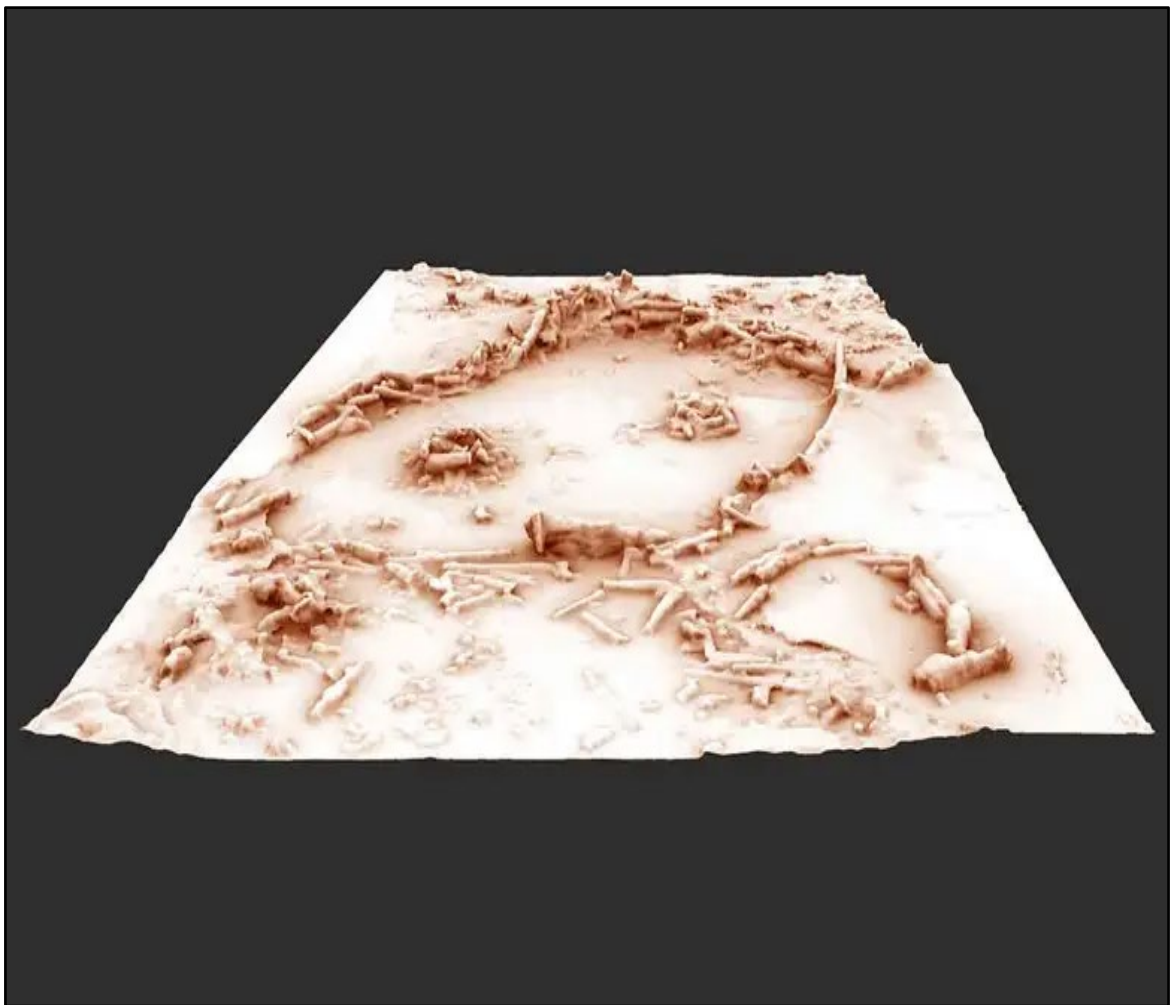


Figure 3.17. 3D reconstruction of the structures in Bruniquel cave– France [44].

Neanderthals were thought to lack complex thinking and behavior, and how the circle structures were built is still under investigation [44]. As can be seen in Figure 3.18, in a room 336 meters from the cave entrance, there are 7-meter-wide circle structures built from stalagmites torn from the cave floor [44].



Figure 3.18. Etienne Fabre/SSAC – France [44].

3.3.2. Characteristics and Analysis of Historical Underground City Examples

General characteristics and grouping of several historical underground cities were mentioned under the headings of on-site investigation and observation. In this title, general technical features such as the purpose of construction of historical underground cities, their importance in terms of human and architectural history, their structural features, and their ecological importance (ventilation, lighting, material use, etc.) will be examined.

3.3.2.1. *Petra Ancient City -Jordan*

- **Historical Process**

The Ancient City of Petra was located in the Nabataean city located between the Red Sea and the Dead Sea, which has been on an important trade route between Arabia, Syria, Egypt, and Phoenicia since prehistoric times. Made of sandstone material, Petra was located in the south of today's Amman City [24].

Petra was originally founded in the 6th century BC by the Nabataean Arabs and Semites, who were interested in trade as far as Syria [16]. It is known that the ancient city of Petra was the capital of the Nabataeans. In 106 A.D., Trajan was annexed to the Nabatean Kingdom as part of the province of Arabia. Arabs occupied this place in 636, but they did not settle here because of its distance from the pilgrimage route in Mecca. A castle was built by the Crusaders in the 12th century. In Petra, trade returned to its former reign [16].

After the 19th century, Petra started to be abandoned by the local people living here. In 1812, Swiss traveler Johann Burckhardt rediscovered this ancient city. With an area of 264 decares, Petra was included in the UNESCO World Cultural Heritage List on December 6, 1985 [45]. Because this city is home to an important culture. The effects of Ancient Eastern traditions and Hellenistic architecture can be seen in the city. It has been included in the World Cultural Heritage List with its architecture or technology, monumental arts, and a city with rare features. In 2007, the Ancient City of Petra was chosen as one of the Seven Wonders of the World [45].

Petra City was used as an important city center for both religion and Nabataeans. However, according to some sources, it is said that the structure is more of a religious city feature. According to these sources, it is said that the city of Petra functioned as the center of pilgrimages and festivals held twice a year, and also as an ancient city. The city was designed to include temples, festival theatre, a monumental fountain, a bath, a holy road, a monumental gate, many pools, and several public structures. Some sources put forward estimates that Petra may have had a population of between 20,000 and 30,000 inhabitants [24].



Figure 3.19. Petra Ancient City – Jordan (Jean-Jacques Gelbart) [46].

- **Architectural Structure**

Petra Ancient City is structurally included in the group of Rock and Cave structures. The architectural reflection of the city; It can be said that it is a view that was carved into the rocks under the influence of ancient Eastern traditions and Hellenistic ornamentation styles. The city has facades and passages carved into red sandstone rocks and is surrounded by mountains. Despite the arid soil structure of the city, which has a structurally correct water management system, it is known that the Nabataeans contributed greatly to the settlement during the Roman and Byzantine periods [45].

Petra Ancient City was a religious center with its extensive and detailed tomb and temple architecture. It made a significant contribution to the city both structurally and commercially. Since the area where the city is located has high hills and mountains, it has a wide network of cisterns and canals that control and protect seasonal rains [24]. Extensive archaeological remains have been discovered in the Ancient City of Petra, including Tunnels, diversion dams and copper mining, temples, churches, and other public structures (Figure 3.19.). It was understood that the Hellenistic architectural decorations on the facades and the traditional Arabian ornaments were synthesized with the carvings made on the rocks (Figure 3.20.). The clearest examples can be seen on the temple façade [45].

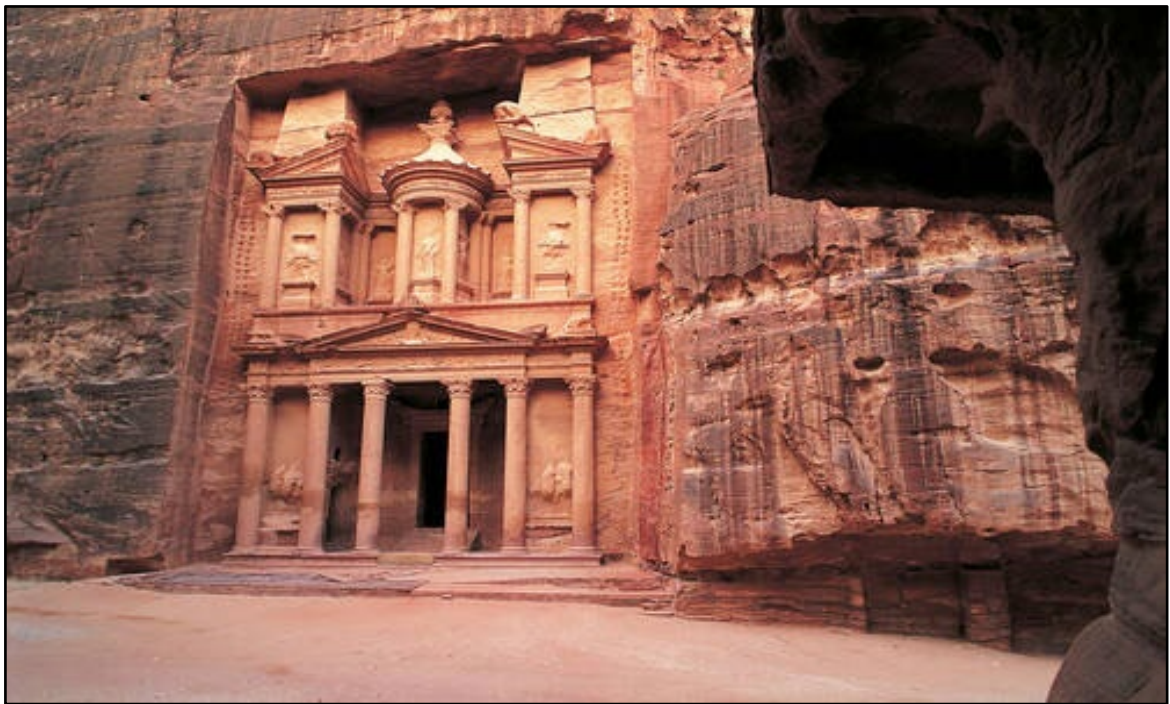


Figure 3.20. Petra Ancient City – Jordan (Jean-Jacques Gelbart) [47].

Red sandstone cliffs, rock-cut monuments, and extensive archaeological remains lie within the boundaries of Petra National Park. Monuments are subject to ongoing erosion by wind and rain [45]. Studies on the protection of structures do not continue every year. Also, this region called “Wadi Musa” has winding mountain roads. Therefore, it was thought that if the waterways were not controlled and protected, the ancient city would be vulnerable to flash flood waters, so all monuments could be submerged [45].



Figure 3.21. Petra Ancient City restoration work [16].

These architectural monuments made of red sandstone cannot be said to be very resistant to degradation, as they are made of delicate material. As can be seen in Figure 3.21, the city underwent restoration in 1962, according to the news magazine *The Illustrated London News* [16].

3.3.2.2. *Kayseri Belağası Underground City*

In Turkey, about 90% of the underground city discovered today has been found in the provinces of Nevşehir, Aksaray, and Kayseri. There are many underground cities carved into the rocks in the region since the rock type in Kayseri consists of volcanic rocks and volcanic rocks can be carved easily [25]. At the same time, the fact that the rocks can be easily carved and excavated has caused the people in the region to build houses made of this rock throughout history [25]. There are rock settlements, underground cities, dovecotes, and water structures in different places in Kayseri [25].

- **Historical Process**

With the easy carving and processing of the volcanic rocks in the region, more than one rock settlement and villages were built in the region over time. Belağası Village is one of them. This is an old Armenian village, and it is understood that the village was built in the 1600s [25]. However, there is no definite information about when the underground city under the village was built [25]. Kayseri Belağası Underground City is also located in this village [25].

- **Architectural Structure**

This underground city was built to protect the small population of the village against short-term raids. It is understood that this structure was built for defense purposes in the rocky sections [25].



Figure 3.22. Belağası Underground City – Kayseri [25].

Underground city structures in Nevşehir and Göreme regions differ from historical underground city structures built on plains or plains. The underground structures in Kayseri were built by carving the rocks [25]. This underground city is divided into two parts. As seen in the planned study in Figure 3.23, this structure, which is the first part, includes a large hall, which is accessed through a stone door and continued through tunnels of 70-90 cm in height, going 42 meters into the interior, and rooms separated from this hall. [25].

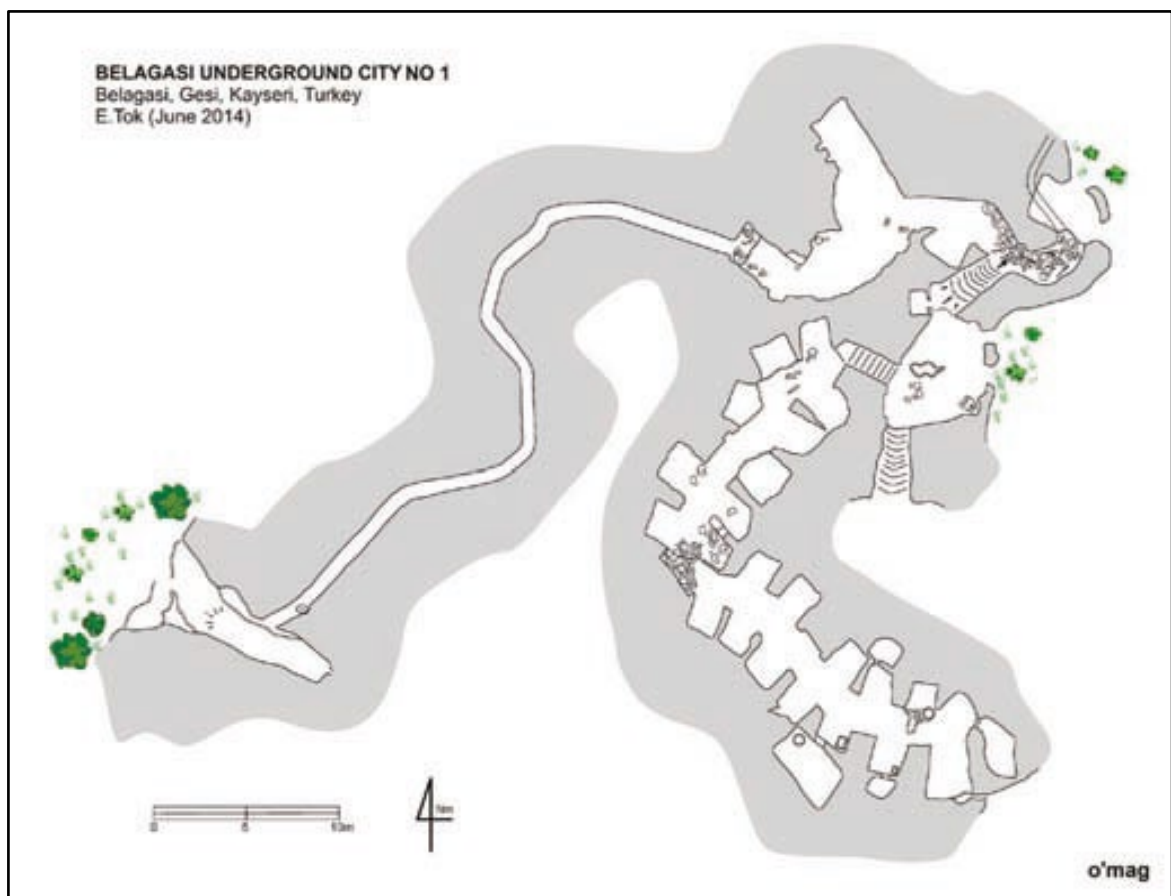


Figure 3.23. Belağası Underground City Part One – Kayseri (drawing E. Tok) [25].

From these rooms, a new corridor with a length of 34 meters leads to 24 rooms arranged on the right and left sides of the corridor. In this last part of this underground city, there is a small observation window, a cistern, and tunnels to the water channels [25].

The second section is located 40 meters southwest of the first section. This section is entered through its back wall made of rock. Like the structure in the first section, the entrance to the structure is provided through a stone door in this section. As seen in Figure 3.24, when opened from this section inwards, 52 rooms carved on top of each other are reached. [25].

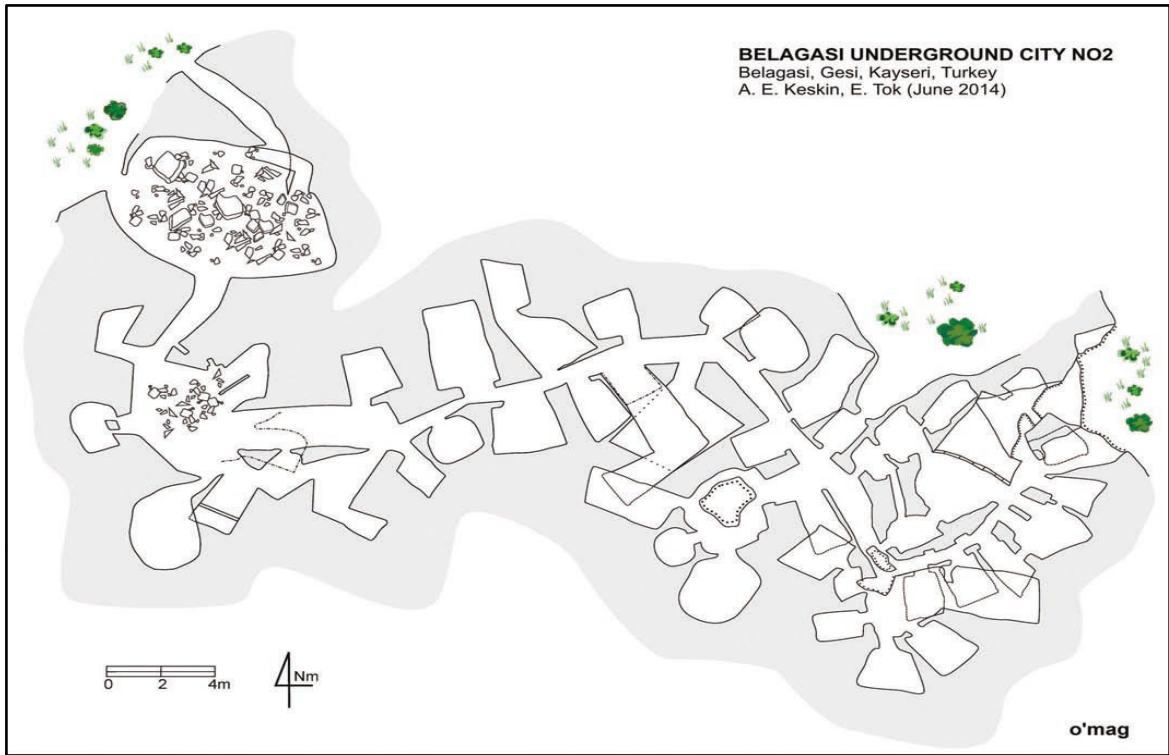


Figure 3.24. Belağası Underground City Part Two – Kayseri (drawing A.E. Keskin and E. Tok) [25].

3.3.2.3. *Kayseri Ötedere Valley Underground Cities*

Kayseri Ötödere Valley Underground Cities in Kayseri are located in the Ötödere Valley (between Belağası and Kuruköprü, close to Gesi) [25]. It is necessary to examine these underground cities under two separate headings. According to the people living here today, it is thought that the underground structures here were the places where leprosy patients were treated when they were built or used. However, there is no definite information on this subject [25].

○ **Underground city -1**

This underground city is located on the rocky wall on the facade facing the valley. As can be seen in Figure 3.25, many openings of the structure are visible on the façade facing the valley. Before the structural analysis, the fact that the city has a large number of openings overlooking the valley creates the idea that this structure was built in terms of the settlement, and when it is examined as an interior solution, it can be seen that there are also measures taken for defense [25].



Figure 3.25. Ötedere Valley Underground City – Kayseri [25].

- **Architectural Structure**

Structurally, it is seen that there are two stone gates from the tunnels to close the tunnels. There are two more tunnels running in two different directions from the room that opened after entering the structure (Figure 3.26.). The existence of stone doors to close the entrances of the tunnels in the interior also creates the idea that the structure was built for defense. There are stairs and a gallery carved from the rock in the interior of the structure. The entrance of the tunnel that continues from the gallery remains closed. A tunnel that continues from the same gallery opens to rooms facing the Ötedere Valley, followed by a large hall [25]. The hall in the structure is connected by lower and upper tunnel roads and the staircase system is included in this structure. It turned out to be slightly different from the underground city structures in the region [25]. It is an important difference that all the openings of the structure face the valley and that the hall in the structure is designed to be supported by columns. There are also half-sections in the structure, such as underground passages that have been excavated but left unfinished. On the face of the structure facing the valley, there is a wall of approximately 4-5 meters high, properly woven from stones. It is not known for what purpose this wall was built [25].

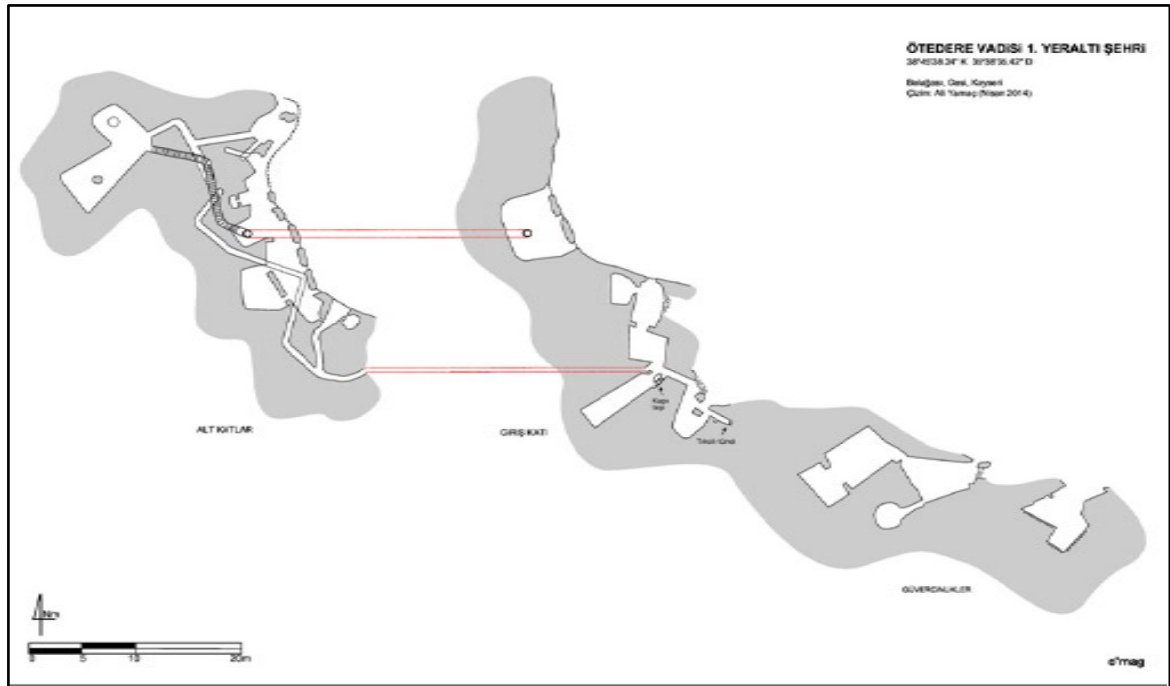


Figure 3.26. Ötedere Valley Underground City 1st structure – Kayseri (drawing A.Yamaç) [25].

○ **Underground city -2**

The entrance of this structure faces the eastern slope of the Ötedere Valley. There are also tombs near the entrance carved into ancient rocks. This structure is located about 600 meters from the other underground city [25].

• **Architectural Structure**

This structure is entered through a tunnel carved into the rock. There is a large stone door at the entrance of the tunnel. From the tunnel to the interior there is a staircase neatly carved out of the rocks. While approaching the end of the tunnel, a gallery is reached [25]. After proceeding from the gallery towards a tunnel, it is seen that the stairs carved from the rock can reach a lower level than the entrance level. From here, different galleries are passed through different tunnels, and a different-sized gallery is reached with a staircase (Figure 3.27.). It seems that the structure is divided into many sections with different elevations. [25].

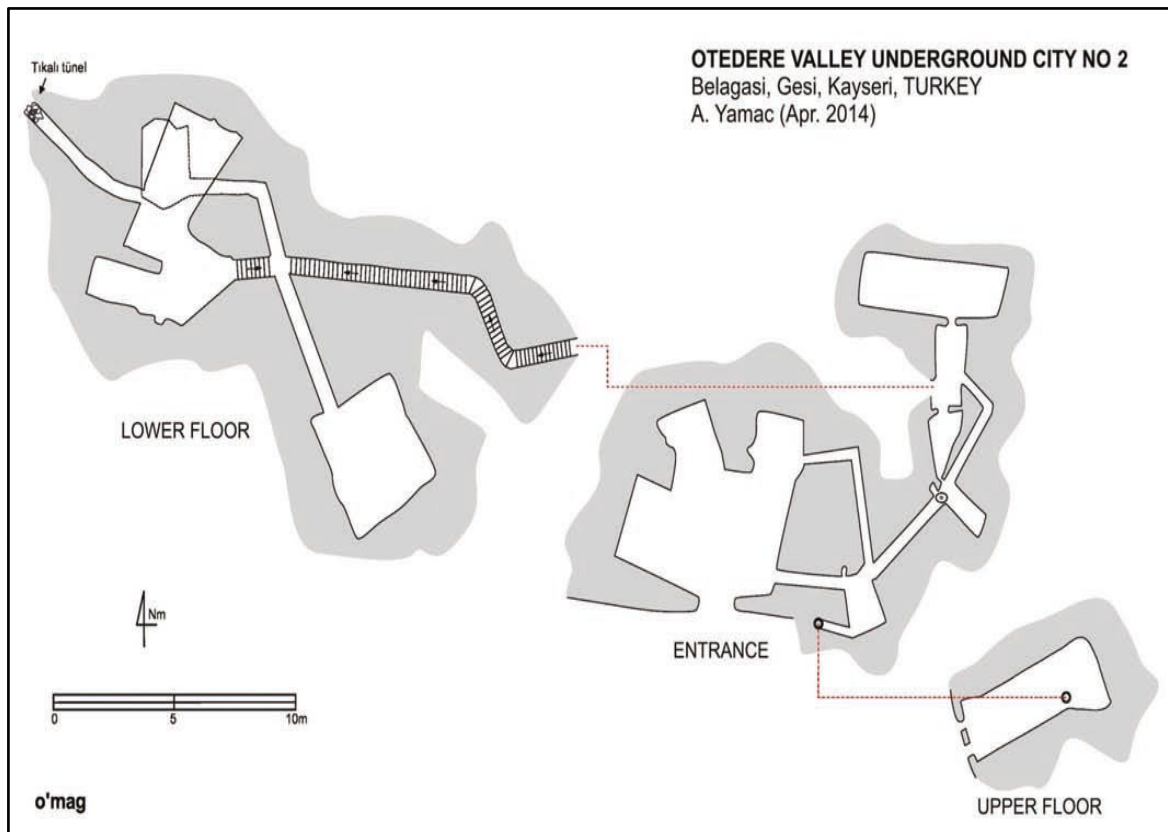


Figure 3.27. Ötedere Valley Underground City 2st structure – Kayseri (Drawing A. Yamaç) [25].

As a result, it is clearly understood that this underground city structure was built to be protected from the enemy with different tunnels and elevations in terms of defense. (Fig. 3.28.). Despite the different elevations between the tunnels and galleries, the holes carved into the rocks between the tunnels are thought to be for communication purposes [25]. There is no ventilation shaft in the structure. It is thought that the structure was approximately 160 meters long, and it is open to debate whether it was used for both defensive purposes and as a settlement, although it is close to the valley. [25].



Figure 3.28. Ötedere Valley Underground City 2st structure – Kayseri [25].

3.3.2.4. Nevşehir Kaymaklı Underground City

The soil and rock structure of Nevşehir is similar to the soil and rock structure of other provinces in the region, and they can be easily scraped and carved [9]. Nevşehir is home to many underground structures. However, in this study, only Nevşehir Kaymaklı Underground City and Derinkuyu Underground City are discussed. Detailed information about the region in terms of its history and the use of structures has been examined under sub-headings [9].

- **Historical Process**

Nevşehir Kaymaklı Underground City is located in Nevşehir Province of Turkey. Kaymaklı Underground City is the second best-known underground city in the region and has undergone many restorations (Figure 3.29.). Kaymaklı Underground City is named after Kaymaklı Town, which is located in the region and 20 km away from Nevşehir. The structure, BC. It has been revealed that it started to be made in 3000 years. It has been revealed that Kaymaklı Underground City was structurally expanded in different ways during the Hittites, Roman, and Byzantine periods [9].



Figure 3.29. Kaymaklı Underground City – Nevşehir [9].

- **Architectural Structure**

It is thought that the structure was built with 8 floors during the Hittites Period, and evolved into a complex underground structure during the Roman and Byzantine Periods [48]. The structure was built by carving and excavating tuff rocks. It turned out that the structure was designed to meet the housing conditions of the period. At the outer entrance of the structure, there are sliding stone doors from the inside (Figure 3.30.). Kaymaklı Underground City has corridors, rooms, halls, wine tanks, kitchens, water cellars, water wells, supply tanks, and ventilation shafts in its interior [48].



Figure 3.30. Kaymaklı Underground City – Nevşehir [48].



Figure 3.31. Kaymaklı Underground City – Nevşehir [48].

Kaymaklı Underground City has hosted many civilizations. It has been determined that it was used for defense with traces from the Roman and Byzantine Empire Periods, together with traces from the Assyrians, Hittites, and Phrygians [9]. The tunnels inside the structure are connected as narrow and long (Figure 3.31.).

It has been understood that such structures were used more and more as the Muslim Arab States broke the influence of Christianity in this region and occupied the regions. Arabs who attacked this region made changes in the historical structure here to prevent Christians from living here [9].

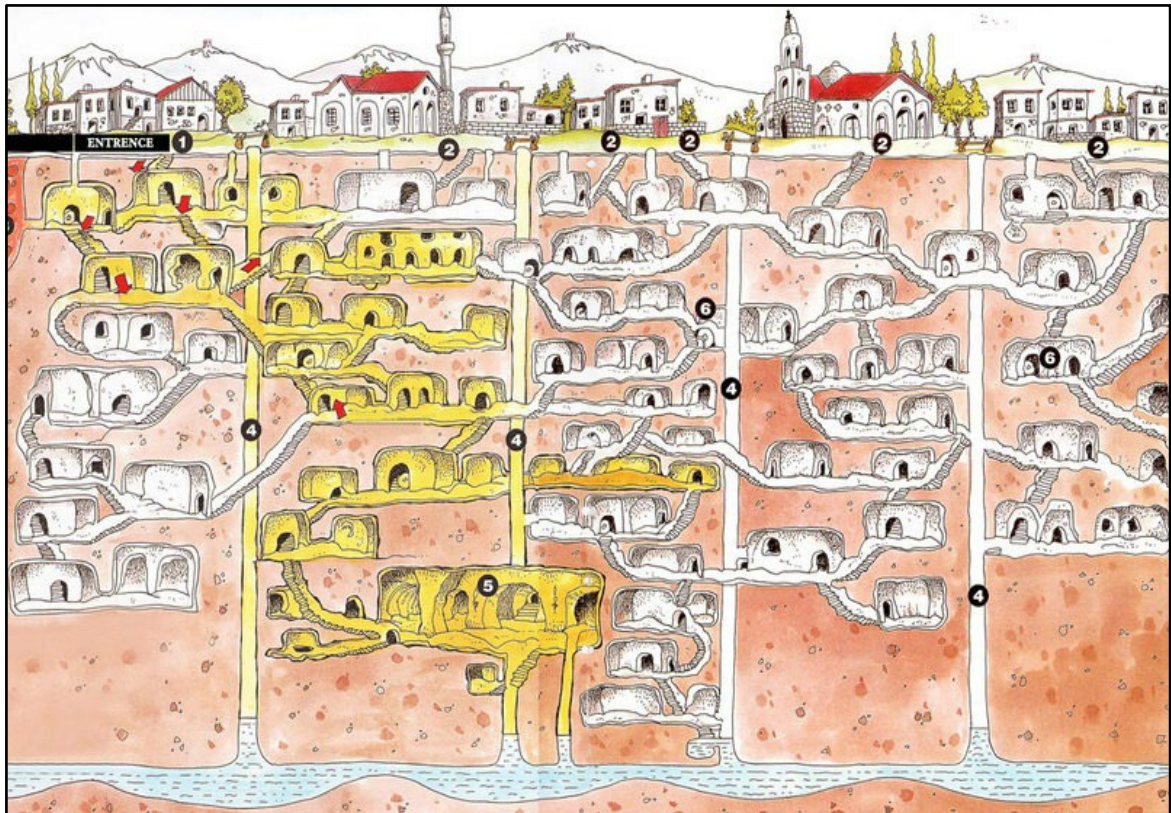


Figure 3.32. Kaymaklı Underground City – Nevşehir [9].

The structure consists of an eight-story underground city (Figure 3.32.). Today, however, only four floors of this structure have been opened to the public. On these floors of the structure, there are bolt stones, cider houses, a well-resolved ventilation system according to the conditions of the period in the narrow corridors, a church, kitchens, and food warehouses. Thanks to the ventilation system, it has been made suitable for the accommodation of approximately 5000 people. It has been determined that lighting oil lamps in the niches and small cavities on the tunnel walls, provide the necessary light for indoor lighting [48].

It has been determined that these bolt stones are an important factor since the people who lived here were able to control them in terms of defense thanks to the heavy bolt stones in the structure. It has also been determined that the people living in this structure made a living from animal husbandry. Because the first floor of the structure was used as a barn and food warehouse [48]. On the second floor are the church, the baptismal stones, and the cemetery. The third floor contains dining areas, basic food hiding places, wine cellars, and here air shafts. It is possible to reach the fourth floor through a narrow tunnel, and it is understood that the purpose of the construction of this narrow tunnel is to slow down the enemy in case

of war and defense the people who built the structure [48]. On this floor, there are supply warehouses, a kitchen, a tandoor, and a ventilation duct (Figure 3.33.).



Figure 3.33. Kaymaklı Underground City – Nevşehir [48].

3.3.2.5. *Derinkuyu Underground City*

- **Historical Process**

Derinkuyu Underground City is located on the Nevşehir-Niğde highway, 30 km from Nevşehir [26]. It is not yet clear what Derinkuyu's real size, depth, or how many parts consist of. Excavations are continuing in the region and it is estimated that the depth of the sections revealed as a result of the studies is 85 meters [26]. It is not known when Derinkuyu Underground City was built, but the Hittites were used during the Roman Empire and the Byzantine Period. It is stated that it dates back to the 3000s [17].

There was no settlement in the region where the structure was located until the 1830s. The structure was discovered in 1963. The structure has different inputs (Figure 3.34.). The structure was named after drinking water wells and air shafts in the region [26]. Archaeological excavations of the structure are continuing. The structure was discovered in 1963. From an area of 4 kilometers, only 2.5 square kilometers of the area was cleaned 8 floors and opened to service [26]. The depth of these 8 floors is 50 meters. If all the floors

of the excavation area are opened, the structure depth is 85 meters and it is expected to reach up to 12-13 floors [26].



Figure 3.34. Derinkuyu Underground City - Nevşehir [9].

In general, Derinkuyu Underground City has stones carved stairs, long, narrow, steep hidden tunnels, stables for animals, supplies warehouses, food-eating areas, a church, a winery, and ventilation systems [17].

- **Architectural Structure**

The floor system of the structure is not regularly overlapping. There are differences between the areas covered by the floors. The tunnel connecting to one of the first, second, and fourth floor of the structure does not reach the third floor. The third floor is connected to the second and fifth floor. The fourth floor is connected to the first and fifth floor [17]. The fifth floor is the center of the structure. The fifth floor is the part where both the start and end points of the three, four, and sixth floor intersect. After the fifth floor, the tunnel, which continued, reached the sixth floor and the seventh and eighth floors at the end of the tunnel [17]. It was understood that these tunnels were made of defense for defense between the tunnels in the structure (Figure 3.35). Like other underground cities, sliding mill stones could not be found in the outer entrance doors of the structure. In another way, it can be said that the solution has been achieved, because with one of the entrances, the second level is passing through

the corridors that go down, where there are stones that will enable many doors to be closed, and it is understood that this solution is considered in this way [17]. In this section, there are defense equipment, shelters for animals, and water wells. At the lowest level, the deepest section is reached with a steep and narrow tunnel [17].

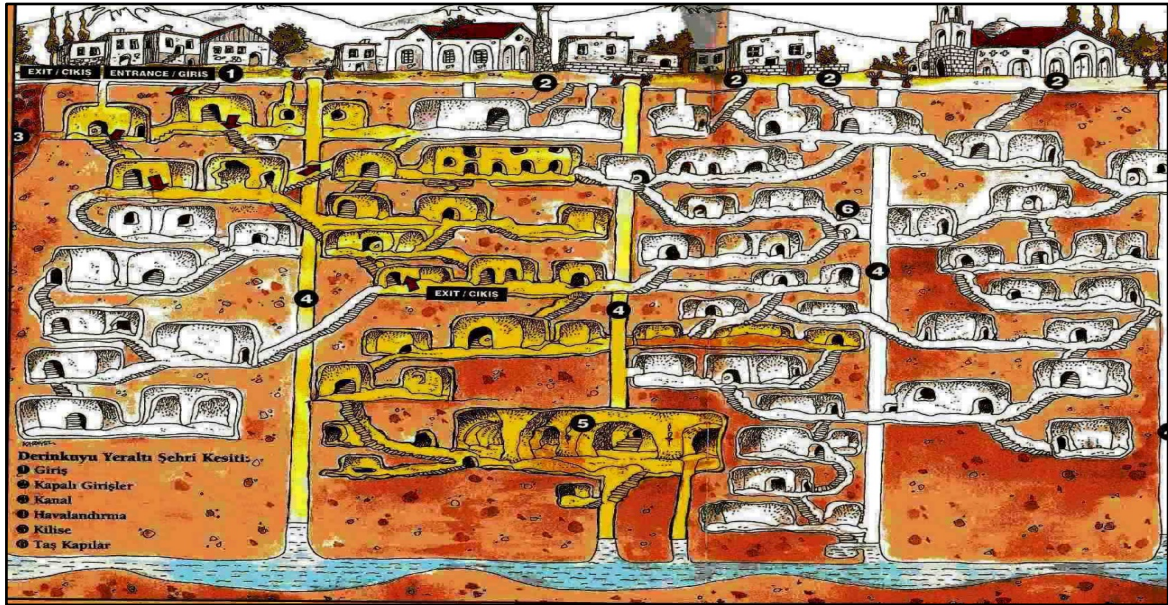


Figure 3.35. Derinkuyu Underground City Floor Section - Nevşehir [17].

3.3.2.6. *Dara Antique City*

- **Historical Process**

Dara Anastasiopolis) is located in the Nusaybin district of Mardin. This city, which was a small settlement in the period it was found, was founded by the King of Parth I. Arsakes (239-238 BC) according to the first historical records [49].

The ancient city of Dara, a small settlement in the Early Roman Period, became a garrison city called Anastasiopolis during the Emperor Anastasius period. After the establishment of this garrison city, it is thought that the Romans were used as the first and last defense place in the region against the Sassanids, which continued their presence in Mesopotamia [10].

In Figure 3.36. the remaining structuring of the city, the remains of natural resources, and the historical structures unearthed were examined and the map of the city was created. [11].

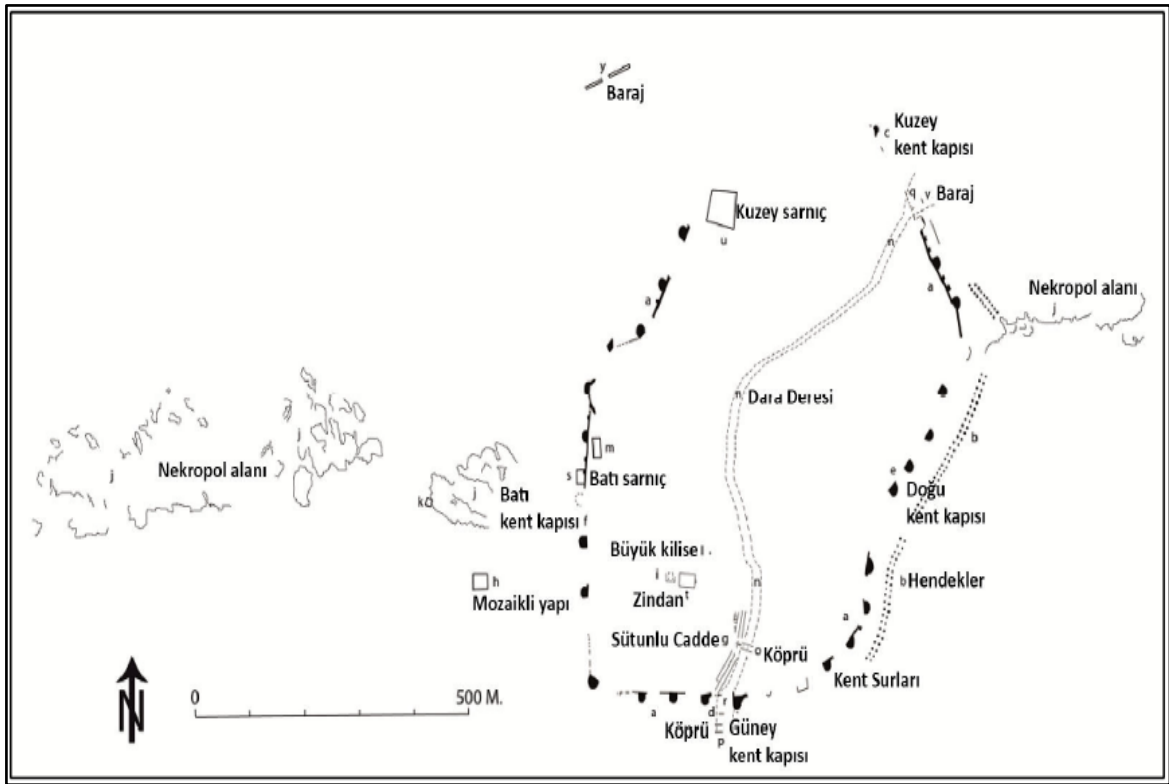


Figure 3.36. Map of archaeological residues of Dara Antique City [11].

The city was captured by the Sassanid Empire about 70 years after it was founded by the Early Roman Empire. The city was very important for these two empires [10]. At the end of the 6th century and early 7th century, this city was included in the regions occupied by the Arabs. Dara city has maintained its importance for many years due to its location, both its military-strategic quality, and its natural resources exist. Many researchers that the city is used as a garrison agrees in this regard [10]. During the period when the city was used as a castle, there were churches, cereal warehouses, water channels, water cisterns, houses from stones, carved rooms, above ground, and underground structures [11]. For this reason, in the light of the existing ruins, it is seen that the fortifications that can resist the Sassanid attacks in the process of becoming a garrison are sufficient [10]. It was understood that Dara (Anastasiopolis), the garrison feature ended with the Sassanids and Arab raids [11].



Figure 3.37. Dara Ancient City, 2019, photograph was taken by author.

- **Architectural Structure**

It is possible to see most of the remains in Dara Ancient City as the structures of the early Byzantine, Late Roman, Byzantine, Seljuk, and Ottoman periods [11]. According to the on-site observation, underground water cisterns and supplies warehouses, city houses carved into the rocks or warehouse units, columned streets and agora ruins, city walls ruins, large church ruins, underground dungeons, foam ruins, tombs and tombstones, sets and there are both Byzantine or Roman and Islamic tombs and tombs (Figure 3.38.).



Figure 3.38. Dara Ancient City, 2019, photograph was taken by author.

In the ancient city of Dara, there are structures carved into the rocks and structures used for multiple underground purposes. Archaeological excavations of the city are partially continuing. Dara Ancient City, today with archaeological excavations about 30% of the day has come to light and the rest is still under the ground [50].

According to the investigations in the region, it is understood that all structures, including today's settlements, were built on archaeological foundations. It was understood that there was an architecture with traditional materials using old ruins in the structures in the region and that stones and columns taken from the castle and old structures were used on the walls of traditional village houses or garden walls [11].

The structure, called a dungeon, is one of the nearby village houses nearby. It is thought that the remains of the wall, the blacksmith, and the belt, which appear places in places, belong to the structure of the large church (St. Bartholomeo Church). Some decorated blocks thought to belong to this structure were used in the construction of village houses; A marble baptism pool was found in the courtyard of a house [11].



Figure 3.39. Dara Ancient City, 2019, photograph was taken by author.

When the city is examined structurally; Necropolis (cemetery) and the Great Gallery, called the grave, consist of partially underground sections where the rock mass is carved [11]. On the façade where the entrance of the structure is located, the reliefs made with chipped are seen (Figure 3.39.).

There are walls around the city that protect an area of about 4 kilometers. There are 4 main gates and 28 towers on the walls of the ancient city [11]. The city has Agora Street, which is furnished from large stone blocks. It is thought that trade caravans entered here. In addition, channels are extending from bridges and water structures to the cisterns in the city. It is thought that dams were built in 577 to cut and control the water resources of the city on the river passing through the city when the city of Dara was besieged by the Sassanids [11].

As a result, the civilizations in the establishment of this ancient city have produced important architectural solutions such as carving from rocks and underground structures, especially water channels and cisterns. It is thought that there will be many historical residues with the continuation of the archeologic studies of this ancient city. Archaeological studies have been temporarily stopped. The majority of the remains of the city are under private property. Therefore, the great ruins of Dara Ancient City could not be reached [11].

3.3.3. General Evaluation of Historical Underground Cities and Structures

Natural structures in nature are used by living forms based on housing and protection. In addition to the natural architecture of most living forms in nature with the interior motive, the addition and extraction of natural structures have been made with the presence of smart creatures based on Neanderthals. These living things have tried to use and develop nature in line with their own needs. With the existence of humanity, techniques of using nature have developed. In different periods, sheltered structures and cities integrated with nature have started to be built by using different techniques. Nowadays, with the discovery of these structures, much new information has been made in terms of history. Especially in terms of architecture. In many countries of the world, the historical cities and structures of different civilizations have been discovered.

Discovered historical underground cities and historical structures are of much importance in terms of history, science, and architecture. However, as of the subject, evaluations in terms of history and architecture were made and the methods of use of structures and structure development methods were investigated. If these historical structures are evaluated in terms of use-related function; It can be stated that it has been built for purposes such as defense, housing, eating and drinking areas, and protection from harsh climatic conditions. Although the structures are used in line with basic needs, it is understood that it is also included in the structures for religious beliefs.

It is understood that the architectural designs and artistic effects of their period have emerged due to the use of long vital activities by different civilizations in many structures. Cave and rock structures, tunnel mineral structures, underground water cisterns, and shelter structures are used in addition to additional structures, and in the following periods, many different architectural elements such as belts and vaults are added. It is also observed that the carvings and sculptures on the walls, flooring, and facades of these structures are made, especially in religious terms, have art anxiety.

4. CONTEMPORARY DEVELOPMENTS

Nature has played an important role in the basis of the contemporary developments of architecture. It can be said that natural environmental architecture is based on a process that begins with the transformation of prehistoric architecture. It can be accepted that the knowledge, scientific information, and architectural technical knowledge gained by prehistoric experiences in the formation of contemporary developments.

Especially with the reinforcement of contemporary developments in architecture, more than one currency based on 'nature and architecture' and the ideas of urban models that emerged with the spread of these currents has emerged. It is possible to say that these current and urban models have more than one advantage and disadvantage. These architectural ideas emerged to contribute to their contemporary architectural development. The development of these ideas means that the previous idea was insufficient depending on the new technical and social developments that occurred over time or the formation of ideas that claim otherwise.

Horizontal or vertical architecture can be evaluated from different angles and two architectural ideas can have their own positive or negative aspects. However, if a comparison is made between these two ideas, it is possible to see in the current and urban models in the next section that vertical architecture can be preferred under certain advantageous conditions. However, in these urban models, sustainable vertical architectural ideas are taken as the basis. In the cities that are due to irregular migration from rural areas to large cities, sustainable energy use and regular city planning, low structures, and high structures are seen irregularly. It can be clearly said; There are many conceptual complexities similar to this situation.

With the sustainability principles of vertical architecture in the urban models; the Reinterpretation of Multiple Multifunctioning of Horizontal Architecture to protect nature and prevent the formation of environmental problems Prepared the ground for the emergence of the Landscapers. With the emergence of contemporary developments and many structures and urban design ideas with the principles of Landscapers began to form.

The Dixia Cheng underground city in Beijing, China, Dobraca Village House in Serbia, Sancaklar Mosque in Istanbul, Earth House Estate Lättenstrasse in Switzerland and The

Survival Condo Underground Structure in the US state of Kansas are examples of Landscraper.

4.1. NATURE AND STRUCTURE RELATIONSHIP

It can be said that nature and architecture become closer to each other in different periods with the problems that grow over time. Especially in the formation of contemporary developments, the process that started with the industrial revolution that leads to the process of material knowledge and the positive and negative reflection of the development of technology can be considered. In addition, migration to large cities is connected to the increasing irregular population, infrastructure deficiencies in settlements, lack of transportation, cost of living, energy requirement, environmental pollution, and irregular urbanization. It is possible to see that many factors such as a decrease in green areas are negative in relations between architecture and nature. New currents and urban models have emerged to solve these problems. Some current and urban models have not yet gone beyond the idea of design.

Some current and urban models have been examined to establish the relationship between nature and structuring in a way that is directly proportional to the study issue. In Green Architecture, New Urbanism, Smart Growth and Landscapers movements; Ecocity (Green City), Slow City, Low Carbon City, Compact City, Understandable City, Arcology City, and Smart City are described as urban models.

- **Green Architecture**

Green Architecture is the concept of sustainable architecture with ecological, low-rise structures, skyscrapers, or mega structures with plants with economic, respecting nature, reducing energy consumption or green tissue on the roof [1]. This movement has basic features such as being responsible for the ecosystem, which is compatible with nature, does not produce waste materials, is responsible for the ecosystem, and complying with the specific conditions [1].

- **New Urbanism**

This movement emerged at the New Urbanization Congress in Alexandria, USA, in the US state of Virginia. This movement is an approach to redesigning all cities and settlements into gradual qualifications to increase the quality of life [1].

- **Smart Growth**

This trend was put forward by Paris Glendening, the heir of Maryland to prevent the spread of cities. In this movement, there are many principles such as creating cities suitable for walking distances, reducing economic costs, creating various transportation options, and preventing the construction of agriculture and natural areas [1].

- **Ecocity (Green City)**

This city model is an approach that emerged with the slogan of "Not according to the car, but the city according to human". The term "Ekokent" was first used in 1987 in the book Ecocity Berkeley 'published by Richard Register. This approach has features such as access to edible energy sources, reducing waste production and access to recycled materials, avoiding high structures, producing cities as much as the consumption of cities, and developing green structures [1].

- **Slow City**

According to Doğan Hasol, the Turkish equivalent of the concept of Cittaslow can be expressed as "Slow City" [1]. This city model was adopted in 1999 by Francesco Guida, Stefano Cimicchi and Domenico Marrone, Paolo Saturnuni, and Slow Food President Carlo Petrini, who were the mayors of the four small cities of Italy in 1999 in the urban dimension [1].

In the city model in this approach; Lower than 50,000 population, the preservation of traditional structures and renewal of structures with historical value, reducing traffic in cities, orientation to non -motorized vehicles transportation, the use of local products specific to the city, and encouraging organic production, spreading edible energy in cities, instead of fast-food restaurants with Slow Food thought increasing local food restaurants, prevention of noise pollution in cities and maintaining air cleaning [1].

- **Low Carbon City**

The Low Carbon Urban Model has emerged to ensure energy conservation in cities, reduce the amount of carbon dioxide (CO₂) released and comply with the low carbon economy, increase ecological awareness, and develop nature-compatible technologies [1].

The model has features such as expanding the awareness of the conservation of energy, increasing the structures with energy conservation and using appropriate materials, protecting efficient land and agricultural areas by making the density determinations of the cities, and the development of green urban systems [1].

- **Compact City**

The Compact City Model is a new urban approach to ensure that all elements such as structures and roads that make up the city are compact and continuous, intertwined, and the maximum density that the development limits can be lifted [1].

This approach model has regular land use, high structure-related densities, urban development limited to the surface area, intertwined buildings and roads, compacts, centralization, and mixed land use [1].

- **Understandable City**

The Understandable City indicates that the city is adopted by the citizens in every sense and that all the systems belonging to the city are compatible with those living in the city [1]. The slogan of this understanding is, “if the city lives, can live in people living in the city”. The city can be understood, utilized, controlled, and managed by all the elements and systems in the city by the citizens [1].

The Understandable City, participation in all decisions of the city by the citizens, the integration of everyone living in the city as a city, the development of the city within the framework of integrity with nature, quality management services, emphasizing the identity of urban identity by the citizens, it has features such as the development of urban information systems and correct use of resources of the city [1].

- **Arcology**

The Movement of Arcology was introduced in 1969 by Paolo Soleri. Paolo Soleri proposed the construction of mega-Structs to protect nature and provide a sustainable future. The word ‘arcology’, which is used by architect Paolo Soleri, is based on the unification of the concepts of ‘Architecture’ and ‘ecology [1]. Soleri stated that for mega-structural structures, each one will have a population exceeding millions, all the needs of people could be met here, and the rest of the planet would remain unrelated, wild nature [1].

- **Smart City**

This city model includes an understanding of creating cities based on the transfer of technology to urban space designs by using the technology to show high performances to show high performance of a city. Smart cities have many features based on sustainable principles such as the development of information and communication infrastructure with well-resolved technologies and the integration of renewable energy technologies into the city [1].

4.2. TODAY'S DEVELOPMENT OF VERTICAL STRUCTURES

Throughout the history of civilization, both city-states and states that have reached great empires have built high structures for religious, symbolic, or power indicators. Many examples can be given such as Egyptian Pyramids, Ziggurats, Pagodas, churches, and mosques. Primitive high-rises built by the first civilizations were underdeveloped in terms of both structure and materials and architectural construction techniques [12]. With the beginning of contemporary developments, structures with strong structures and advanced architectural techniques have emerged with the developing technology [19]. These developments; glass technology, high-strength concrete and steel, reinforced composite materials, elevator systems, heating-cooling systems, water pump systems, ventilation systems, etc. These developments are stated; It has provided a great opportunity for the development of high-rise structures [12].

It can be said that there are differences in understanding between the purposes of construction of high-rise structures built after contemporary developments and the purposes of historical civilizations. Among the main reasons for this understanding and differences

are; There are many reasons, such as preventing the horizontal scattering of cities, protecting agricultural areas or fertile lands, and controlling high population densities [12].

4.3. THE EMERGENCE OF THE LANDSCRAPERS MOVEMENT

The higher we build, the more we feel the height and the greater our fear of heights [3].

Betsky's words; reveal the psychological effect of the relationship between structure and human scale and dimensions [3]. This psychological relationship problem can have negative consequences in many ways. However, it can be said that the gradual development of technology can cause harm to the user in a psychological sense by increasing the feeling of 'getting away from natural life' between man and structure. However, here, the author has discussed not only the negative aspects of the developing technology on the structure and humans but also the positive aspects of sustainable architecture. The Movement of Landscrapers has emerged as a solution with the help of developing technology, which will not break the relationship between man and nature, improve the quality of living conditions and not have a negative impact on the natural landscape.

The author described this concept, called Landscrapers, as "the sharp intersection between architecture and nature".

Landscrapers emerged as a trend, especially in architectural and environmental design [1]. Landscrapers is an architectural approach that integrates with the land, aiming at the appearance of a structure in harmony with the surface contours of the soil or rock, instead of the exposed parts and facades of a structure [1]. Landscaper is a concept first used by architect Antoine Predock [3]. According to this concept, the architectural structure and the natural environment will be formed in harmony, so that the structure contours and natural contours will act as a whole. Betsky explains;

For some architects, architecture is a collection of already existing ideas rather than revealing the nature of a place. According to these architects, the land is simply replaced by something as new and artificial as any structure to be built. But this concept replaces the contours or appearance of the land with something that perpetuates it [3].

Landscrapers are a way of integrating the process that started with prehistoric cave life and the architectural processes that have developed until today. According to Landscrapers, the

design criteria between outdoor and indoor are compatible. The structure should feel like a part of nature without any barrier between its interior and exterior, and it should provide opportunities for use and walking areas, including the top of the structure [2].

According to the author, this architectural understanding will create positive reflections between nature and the structure in terms of aesthetic qualities. Integration of a structure with the main criteria of this concept with ecological and sustainable architectural concepts depending on the developing technology, as well as the positive aspects of the natural environment on human psychology, will significantly increase the architectural quality of the designs to be revealed.

○ **The relationship between the concept of “Landscrapers” and the concept of underground structures**

Are there any fundamental differences and similarities between the Concept of Landscrapers and a underground city or structure? To start with the question, first of all, the basic knowledge of cave structuring dating back to pre-human history and the basic knowledge of ancient civilizations that started with human history and the creation of natural underground and rock structures by taking advantage of the limited advantages given to them by nature should be specified. Along with contemporary developments, improvements or new built-in structures have been built on these old structures with the use of advanced materials. Functions such as defense - protection, shelter, and reflecting religious influences, which are the main reasons for the formation of buried structures, are also included in the movement of Landscrapers.

According to the author, it can be said that these two concepts seem to be a whole in terms of similarity. However, there are reasons why this is insufficient. Because, although the basic reasons for both concepts are similar, Landscrapers aims to bring together the reasons for the construction of both old and contemporary structures under a common denominator and to create a city or structure concern integrated with nature.

4.4. EXAMPLES OF CONTEMPORARY LANDSCRAPERS

In the study, examples were examined in terms of the reasons for the formation of historical structures, their historical importance, and architectural use. With the start of contemporary

developments, especially as a result of the use of new materials in technology and architecture, both the concept of "embedded structures" and the term Landscrapers will be considered together. Thus, it will be tried to examine the examples that can best describe the Landscrapers Movement.

4.4.1. Dixia Cheng Underground City – Beijing, China

Dixia Cheng underground city is located in Beijing, the capital of China. It is in the form of interconnected tunnel networks, generally consisting of white colors, located under the city (Figure 4.2.). This underground city was started to be built in 1968 [20]. The structure was designed as a secret shelter against a possible Soviet attack. This underground structure has many entrances and exits. The purpose of the structure was to make against nuclear weapons, air attacks, and possible city invasions, which are the negative effects of developing technology. The entrances and exits at many points of the city are connected to the houses of the residents of the city [20]. The structure was excavated between 8 and 18 meters underground, with a total length of approximately 35 kilometers and a total area of approximately 85 square kilometers. In addition, since the structure is designed as a giant shelter, 300,000 people can be accommodated for about four months [20].

The structure has a well-resolved ventilation system and waterproof gas caps for protection against radioactive attacks. In case of a siege of the city after possible enemy attacks, restaurants, playgrounds for children, barber shops, storage areas, and special areas were created for the cultivation of plants that do not need sunlight.

The structure has been transformed into a tourism center since it has never been used in the face of these scenarios [20].

The fact that the entrances and exits are built with obscure and hidden integrity between the land or street contours brings to mind the term Landscrapers (Figure 4.1.).



Figure 4.1. Secret entrance to Dixia Cheng Underground City [51].



Figure 4.2. Tunnel of Dixia Cheng Underground City [51].

4.4.2. Dobraca Village House - Serbia

This example is included in the category of the land-integrated and partial underground structure and has been studied by the author as it covers the important features of the concept of Landscrapers.

This building is a village house integrated with the soil and has many design criteria in Dobraca Village, Serbia (Figure 4.3.). This house embodies many features of ecological and sustainable architecture [13]. The exterior of the building has facade contours integrated with the soil, and the interior has many features such as providing the most suitable heat conditions for human life thanks to its thermal comfort [13].



Figure 4.3. The village house is integrated with the ground [13].

This structure was designed and built-in 2008 by the principles of sustainable architecture. This village house in Dobraca, together with the Neolithic period Lepenski Vir House in the region, took part in the comparison studies with the sustainability criteria. In Figure 4.4. the plan similarities of the Neolithic Age Lepenski Vir House and the Dobraca Village House, which are based on the principles of contemporary sustainable principles, can be seen [13]. In the comparison studies between the two structures; There are detailed solutions on many subjects such as temperature measurements required for thermal comfort, sunshine duration, and making the most of the wind [13].

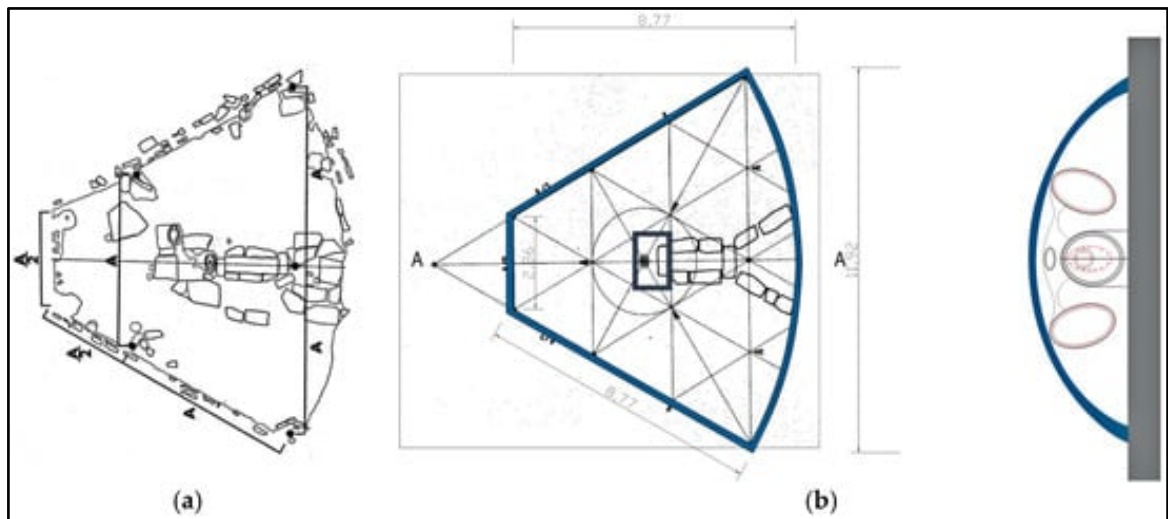


Figure 4.4. (a) Lepenski Vir Neolithic House: plan; (b) Dobraca Village House plan and section [13].

When Dobraca Village House is examined from a structural point of view; It is seen that it has a bitumen insulated concrete shell, a green and walkable roof compatible with the contours of the land, a well-solved ventilation system that provides its electrical energy with a wind turbine [13].

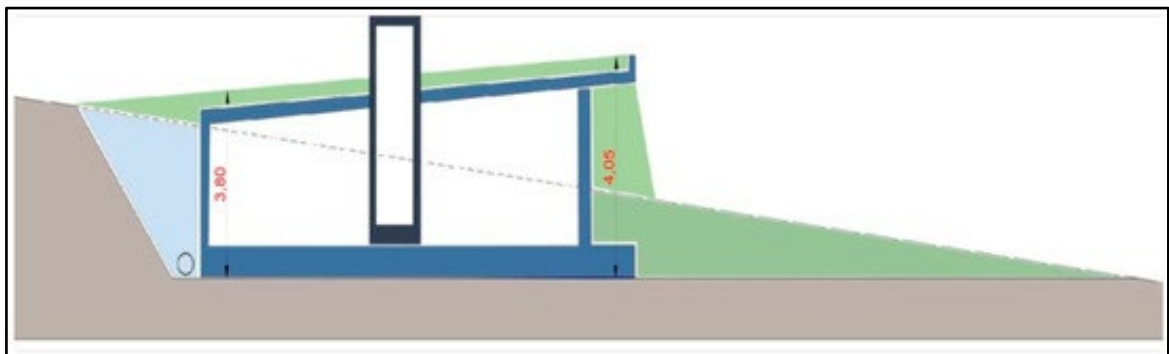


Figure 4.5. Section of Dobraca Village House with soil cover [13].

Underground structures are designed about their location, typology, and climate zone [13]. Looking at Figure 4.5. Dobraca house was built on sloping land. The slope plays a role in the thermal temperature of the building with the soil, and it is effective in determining the directions of rain or snow waters so that the green roof remains stable with a certain thickness [13].

4.4.3. The Survival Condo - USA

Bradley used the following expressions for The Survival Condo;

“The sharper our consciousness of the eternity of the world, the sharper our awareness of our own finitude” [14].

In Kansas, there is a shelter under concrete boxes surrounded by military fences, hidden in the natural topography, hidden from view among the cornfields, positioned on an earthen mound when viewed closely [14].

The Survival Condo structure was built in the state of Kansas, USA. The structure, which was built in 1960, has walls of high-strength (epoxy-added concrete) material that descends underground to form a concrete structure. The structure was designed with the concept of survival against possible disasters [52].

The structure appears to be in harmony with the contours of the land and integrated with the land. The structure has a metal door with high strength and security (Figure 4.6.).



Figure 4.6. The Survival Condo Terrain Gate – USA [52].

According to the author; The literal meaning of the concept of Landscapers can be expressed as "the sharp intersection between architecture and nature" or "the one that pierces the ground."



Figure 4.7. Floor section view of The Survival Condo – USA [52].

As seen in Figure 4.7. the structure consists of many floors that go underground. There are full and half-floor layouts in the structure. Full-floor layouts are designed for 6 to 10 people, and half-floor layouts are designed for 3 to 5 people [52]. As the structure is designed to withstand disaster scenarios, special sections have been created for foods with a shelf life of more than 20 years. The Survival Condo has a ventilation system that can make nuclear, biological, and chemical filters [52].

Hidden parts of the structure, water channels from different sources, treatment systems, storage systems, backup electricity sources, sensors, infrared cameras, etc. It has many top-secret military defense system-level units. In addition, there are facilities for the cultivation of fresh vegetables, fish, and other food products in the structure [52].

4.4.4. Sancaklar Mosque - Istanbul

The building is located in Istanbul. The building was designed by Emre Arolat Architecture [53]. The building is designed to be plain and unadorned, and at the same time it is in harmony with the contours of the surrounding land [53]. The building is positioned inclined to the land. A harmonious harmony with the building is provided with the stairs around it. Green areas have been made on both the roof and stairs of the building (Figure 4.8.). In this way, ecological and sustainability are considered with the understanding of architecture [53]. The building consists of plain and reinforced concrete partitions and stone walls. A floor design has been made to be layered [53].

As can be seen in Figure 4.8. It is seen that the design of the building in harmony with the contours of the land covers an important feature of Landscrapers. At the same time, there are slits on the roof of the building in terms of light balance and design [53]. Thus, the lights located in the slits in the ceiling in the interior provide a soft lighting in the interior. Since the building was built as a mosque, there are necessary areas for worship [53].



Figure 4.8. Ground-integrated facade of Sancaklar Mosque – Istanbul [53].

4.4.5. Earth House Estate Lättenstrasse (Vetsch Houses) - Switzerland

Earth House Estate Lättenstrasse is also known as "Vetsch Houses" in different sources. These houses were designed in Dietikon, Switzerland, to be integrated with the surrounding land. The structures were built in 1993 [54]. As seen in Figure 4.9. the structures are connected by stairs and covered with a green texture in harmony with the land. These structures consist of nine houses. The structures are designed with insulation against wind, extreme heat, and cold, resistance to water, and abrasion [54].



Figure 4.9. Earth House Estate Lättenstrasse – Switzerland [55].

Earth House Estate Lättenstrasse consists of houses with a different number of rooms, with an artificial lake in the center, an underground car park, and suitable sections for plant areas [54]. The structures are designed to provide energy conservation and have natural insulation. According to Swiss Peter Vetsch, architect of Earth House Estate Lättenstrasse, “Putting a box on nature is not architecture; architecture is to integrate with nature” [54].

It is thought that Vetsch realized this project based on disasters in nature. According to the Swiss architect Peter Vetsch;

The main problem in natural disasters is putting boxes on the ground. Therefore, instead of putting the structures on the ground; If structures that are compatible with and integrated with it are built, the source of the problem will be significantly corrected [54].



Figure 4.10. Earth House Estate Lättenstrasse House under construction – Switzerland [54].

While the structures are being built, the carrier is established on the metal skeleton. As seen in Figure 4.10, the sections where the wall and ceiling are located were constructed in such a way that curved lines are formed with metal mesh and concrete is sprayed on the metal mesh. The structure shell is covered with insulation materials so that there is no gap on the structure surface after concrete spraying. After the insulation stage, it is covered with a layer of soil [54].

5. CHRONOLOGY OF UNDERGROUND STRUCTURES – COMPARISON

The history of the underground structures started from the ring structures made in Bruniquel Cave, made by Neanderthals in France in 173,000 BC [44]; It has a period that continues to the present day. In the study, a chronological list of underground structures built at different times from prehistory to the present is shown in Figure (5.1.) and Figure (5.2.).

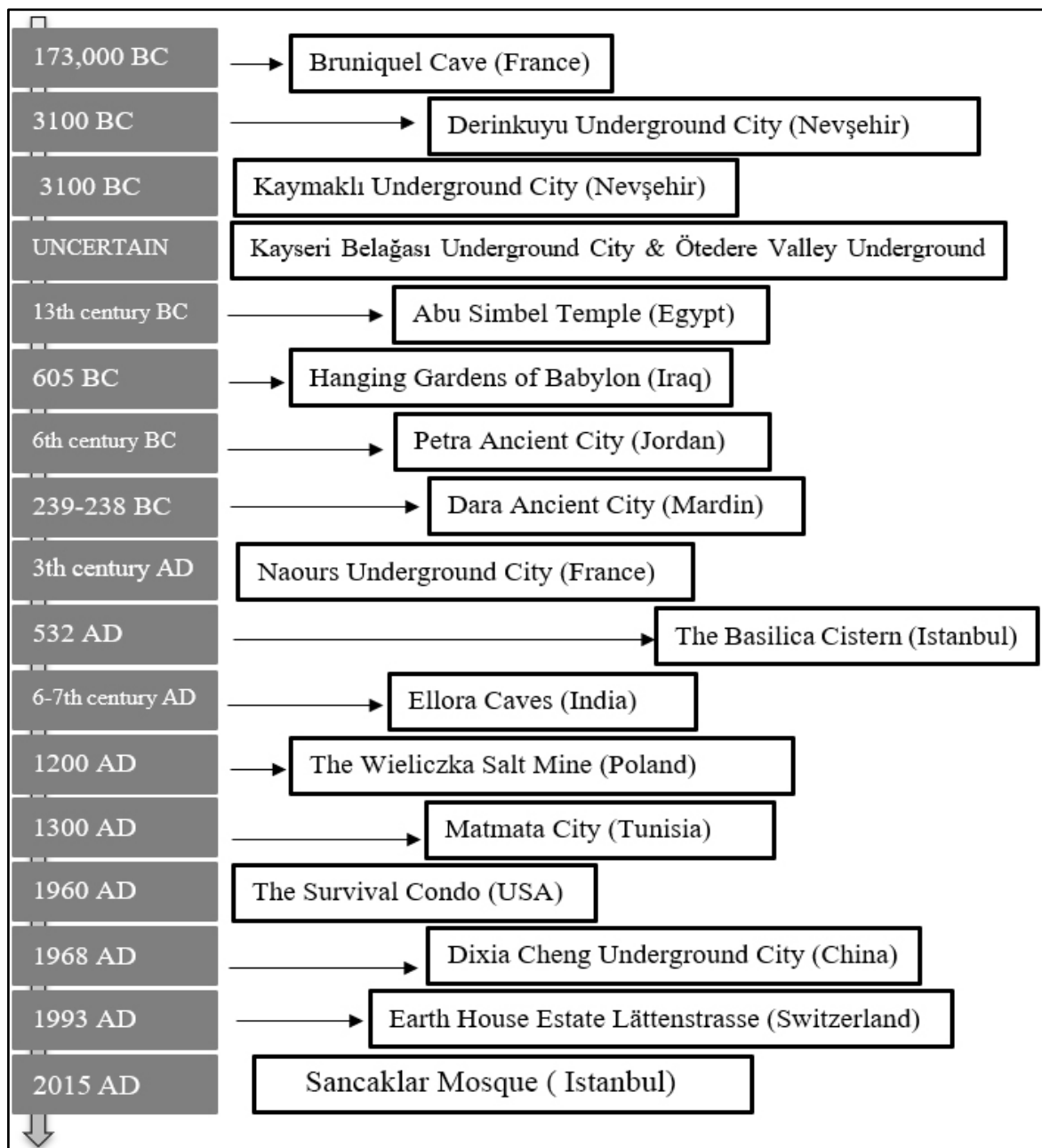


Figure 5.1. Historical Chronology of Study Samples, created by the author.

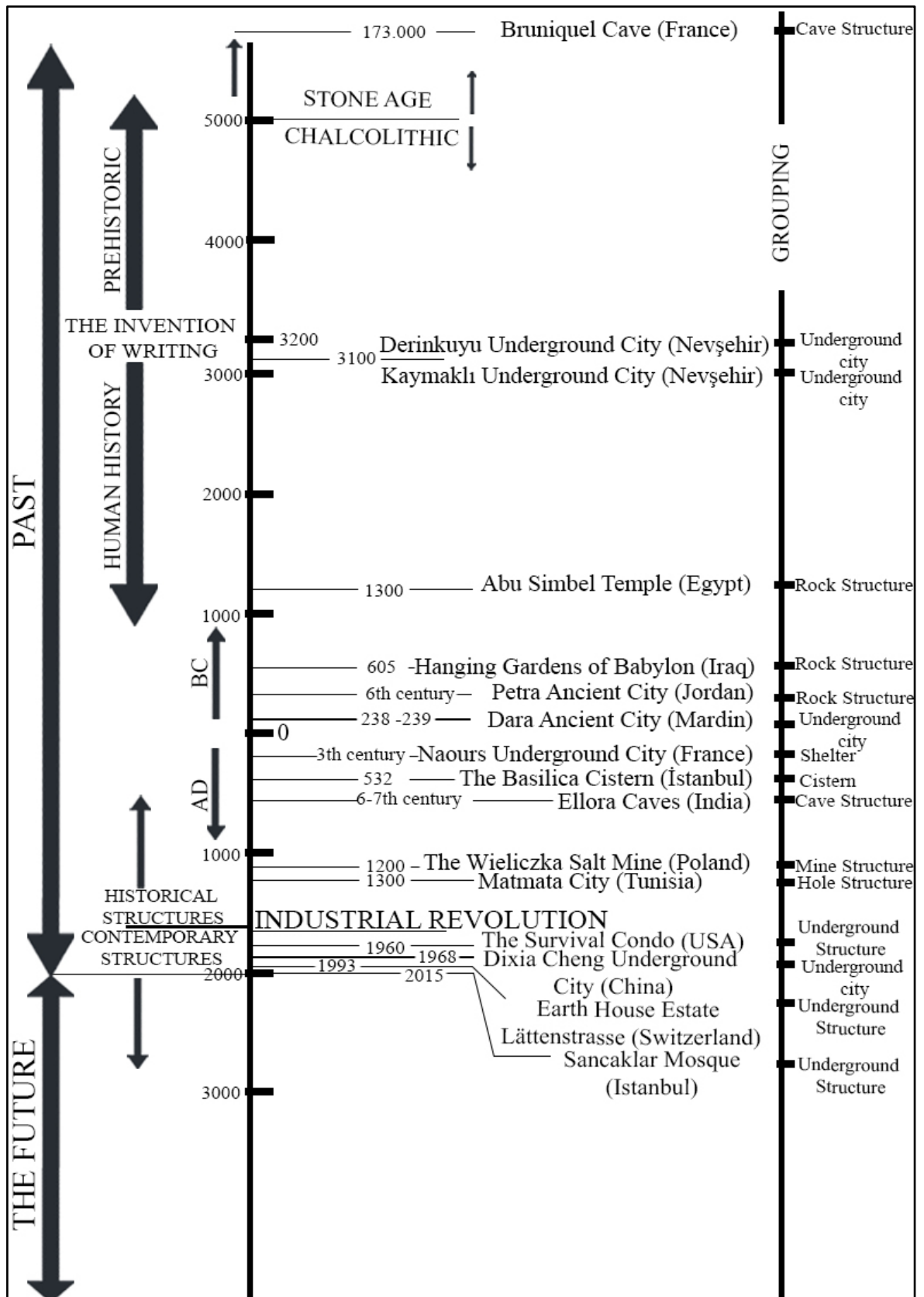


Figure 5.2. Detailed historical chronology of the examples included in the study, created by the author.

It can be seen from the chronology that the examples of Landscrapers that are close to the present day, new construction techniques have been used with the emergence of sustainable and ecological architecture. They are generally built as underground structures that fall into the buried structure group without the need for other underground structure groups. According to the chronology, examples from every group can be seen up to 1300 AD. rock structures, cave structures, mine structures, etc.

Again, according to the chronological index, it is understood that the transformation of underground structures into underground cities has developed since the history of humanity, which started with the invention of writing.

Based on the existence of examples dating back to 173,000 years BC, the caves dating back to the prehistoric human ancestors' Neanderthals can be considered the first underground shelters to integrate with nature [44]. If this subject is considered in terms of all subsequent developments and today's Landscrapper structures, it can be interpreted that the sense of belonging to nature is also present in our ancestors before human history.

According to the author, in this section, which constitutes the main purpose of the study, the historical and contemporary underground concepts are brought together with common denominators and united under the "Landscrapers Movement", which aims to create a city or structure concern that integrates with nature. However, realizing this aim can only be possible by evaluating the historical process of historical and contemporary structures under the "Landscrapers Movement" from different aspects.

In the previous sections, examples of historical structures and examples of contemporary structures, which contain the defining features of the Landscrapers Movement, were examined. In the study, the general features of Derinkuyu Underground City in Nevşehir and The Survival Condo underground structure in Kansas, USA were examined. In this section, the similarities and differences of the architectural features of these structures in terms of the concept of Landscrapers will be examined.

5.1. THE SIMILARITY AND DIFFERENCES BETWEEN HISTORIC UNDERGROUND STRUCTURES AND CONTEMPORARY LANDSCRAPER STRUCTURES ACCORDING TO THEIR CONSTRUCTION OBJECTIVES AND USAGE FUNCTIONS

The similarities and differences between the historical underground city, Derinkuyu Underground City, and The Survival Condo, which is considered a contemporary Landscapers structure, will be examined within the framework of the "Landscapers Movement", according to their construction purposes and useful functions.

- **In terms of Construction Purposes;**

The basic construction purpose of both structures was to be a safe shelter, and a protection area (shelter) to be protected against any natural or unnatural situations that may come from the external environment. At this point, there are basic similarities between the two structures. However, it can be said that there are sub-production purposes in which both examples differ according to the technological conditions and needs of the age.

Derinkuyu Underground City is known to have hosted many civilizations. It turned out that the city was built for defense purposes. The fact that the sections in the underground city are connected with narrow tunnels and that there are stone doors that can only be opened from the inside strengthen this thesis [17]. It is known that the structure was used by the first Christians who escaped from the Roman Empire in the following periods and that additions were made [17].

The Survival Condo was designed as a structure with high-security materials to be used for shelter, with the idea of "long-term survival". The structure has been designed as a residential concept and as a facility that will offer individual ownership. The Survival Condo was also built against deep economic crises, natural disasters, nuclear wars, and global climate changes that may occur in the world [52].

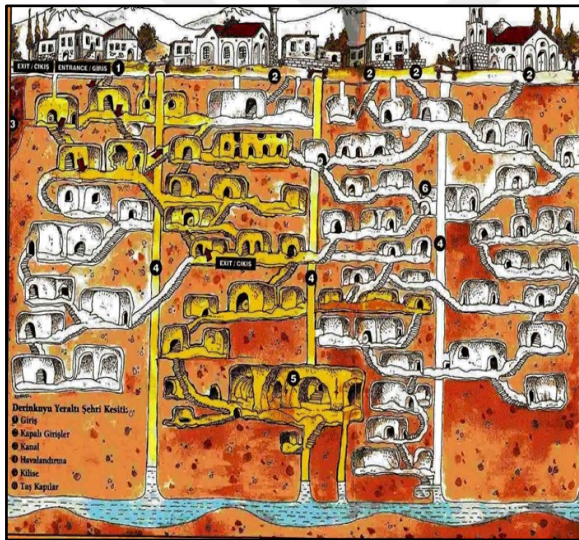
- **In terms of Usage Functions;**

Although there are similarities between Derinkuyu Underground City and The Survival Condo in terms of usage functions, it can be said that many factors such as developing construction technology, scientific developments, and architectural ecological awareness

increase the functions of contemporary structures. The usage functions of these structures were shaped according to the defense needs of the period in which they were built.

Derinkuyu Underground City has multiple narrow tunnels between floors and sliding stone doors that can only be opened from the interior [17]. The Survival Condo structure, on the other hand, features advanced technological innovations and multiple blast doors designed to withstand large explosives [52].

Looking at both structures in terms of door defense, it is understood that the entrance doors, especially in the interior sections, were designed in detail in the face of possible attacks against the structures. It can be said that the defense and protection methods of Derinkuyu Underground City and The Survival Condo are different in terms of technological developments. It is also seen that the floor systems are different (Figure 5.3.).



(a)



(b)

Figure 5.3. (a) Derinkuyu Underground City, Nevşehir [17]. (b) Floor section view of The Survival Condo, USA [52].

Derinkuyu Underground City is not such that the floor system regularly overlaps. Not all floors of the structure are regularly connected [17]. The tunnel connecting the first, second, and fourth floors of the structure does not reach the third floor.

The third floor is connected to the second and fifth floors. The fourth floor is connected to the first and fifth floors. The fifth floor of the structure appears to be in a central location.

The tunnel that continues after the fifth floor has the sixth floor, and at the end of the tunnel, there are the seventh and eighth floors [17].

In the floor system of Derinkuyu Underground City, there are connections through more than one narrow tunnel on some floors; some floors were built in such a way that they do not have any relation to each other. The main reason for this is that if the enemy invades the structure, it is thought that such a design is followed so that escape is possible [17].

The entrance of The Survival Condo is concealed and integrated with the topography. The structure was designed using an old Atlas missile silo outer shell and was built as 15 floors, with the floors of the structure overlapping [14]. The high-speed elevator in The Survival Condo provides access to all floors [52].

In Derinkuyu Underground City, there are stairs carved from stones, secret passages, stables for animals, food warehouses, niches for kitchen and storage units for the dining hall, church, winery, water wells, and shaft systems for ventilation [17].

There are production facilities such as The Survival Condo, residential apartments, communal swimming pools, entertainment areas, dog walking park, gym, range area, medical facilities, market, and aquaponic farm for fresh food production (Figure 5.4.). In addition, special storage areas are designed for foods with a shelf life of more than 20 years, as they are designed against disaster scenarios [14].



Figure 5.4. The Survival Condo, Aquaponic production facility, USA [56].

In addition, it has many secret military defense system-level units such as a ventilation system capable of nuclear, biological, and chemical filters, water channels, purification systems, storage systems, backup electricity sources, sensors, and infrared cameras [52].

5.2. THE SIMILARITY AND DIFFERENCES BETWEEN HISTORIC UNDERGROUND STRUCTURES AND CONTEMPORARY LANDSCRAPER STRUCTURES IN TERMS OF STRUCTURAL CONSTRUCTION TECHNIQUES AND DESIGN METHODS

The similarities and differences between the historical underground city, Derinkuyu Underground City, and The Survival Condo, which is considered a contemporary Landscrapers structure, will be examined according to the structural construction techniques and design methods within the framework of the "Landscrapers Movement".

- **In terms of Structural Construction Techniques;**

It cannot be said that there are similarities between Derinkuyu Underground City and The Survival Condo structures in terms of structural materials and techniques. It can be said that both structures are the results of the technological development of their respective periods. Therefore, if we need to evaluate it according to the conditions of the period; It can be said that both structures have thick walls.

Derinkuyu Underground City can be easily scraped or carved due to the soil and rock characteristics of the region. Therefore, it is known that both additions and subtractions were made by many civilizations [17].

There are no wide openings in the sections within the Derinkuyu Underground City. however, there are stone and soil supports in these parts of the structure for support purposes (Figure 5.6-a). It is possible to see arches and vaults made of stone and earth made by later civilizations (Figure 5.6-b)



(a)



(b)

Figure 5.5. (a) Derinkuyu Underground City, 2021, photograph was taken by author.

(b) Derinkuyu Underground City, 2021, photograph was taken by author.

The Survival Condo has high strength (epoxy reinforced concrete) concrete structure material and walls [14]. The outer shell of the structure consists of an old Atlas missile silo. As a structure, the structure was built in such a way that it can be protected against nuclear attacks [52]. The wall thickness of the structure is between 76.2 and 274.32 cm (Figure 5.6.). The walls are designed as carrier elements [52]. There are more than 600 tons of high-strength construction steel in the structure [52].



Figure 5.6. The Survival Condo, high-strength thick walls, USA [56].

- **In terms of Design Methods;**

Derinkuyu Underground City, archaeological excavations continue. The structure is currently 8 floors open [17]. Considering the opened sections and floors of the city, the city has an asymmetric and complex underground city design. Derinkuyu Underground City was built using primitive tools and tools, using carving and digging methods. It is understood that additions were made to the structure by many civilizations [17]. There is a church and a missionary school built by the first Christians who escaped from the Roman Empire and came to this underground city [17]. In this case, it shows that Derinkuyu Underground City was a construction process that continued for hundreds of years. There are many hidden entrances and exits between the floors in the structure [17].

It can be said that The Survival Condo was designed by the definition of Landscapers, with the logic of being placed under the ground in terms of building design. The structure has 15 floors and all floors are symmetrical and regular. The Survival Condo has been developed within the framework of many sustainable designs (Figure 5.7-a). The building includes elements designed with sustainability principles such as a wind turbine, generators, high protection ventilation systems, food and aquaculture production farms, and a high-speed elevator [14].



Figure 5.7. (a) The Survival Condo, vegetable and fish production facility, USA [56]. (b) The Survival Condo, giant dome, USA [56].

The Survival Condo consists of a missile silo and is designed to be covered with a giant dome (Figure 5.7-b). This giant dome of the structure was built to withstand 500 MPH wind speeds, including tornadoes [56].

5.3. A COMPARISON OF HISTORIC UNDERGROUND STRUCTURES AND CONTEMPORARY LANDSCRAPER STRUCTURES IN TERMS OF ECOLOGICAL DESIGN COMPONENTS

The historical underground city example Derinkuyu Underground City and The Survival Condo, which is considered a contemporary Landcrapers structure example, will be compared in terms of ecological design within the framework of the "Landscrapers Movement". However, before making a comparison between the two Derinkuyu Underground Cities and The Survival Condo, it is necessary to clarify the basic principles of sustainability and ecological design in architecture.

According to the 1987 Brundtland report of the European Union;

Sustainability is a development that meets the needs of the present without compromising the ability of the city of the future to meet its needs [4].

According to this definition, sustainability in architecture stands out with three main criteria [4].

- Energy saving
- Being economical
- Increasing the quality of life

Ecology: It is the protection of the living resources of the natural environment and its harmony with nature [4]. The ecological and sustainable architectural approach should be addressed with the following basic principle [4].

Passive Ecological Basic Design Principles:

- The duration of the building to benefit from the sun
- Taking the necessary measures to reduce the heat loss of the building: Insulation and use of quality materials
- Building in harmony with nature: Providing natural ventilation, compliance with climate and topographic conditions, evaluation of building waste and garbage

- Optimization in the use of materials in the building
- Optimization in infrastructure systems of the building

When the comparison between Derinkuyu Underground City and The Survival Condo structure is handled through the principles of sustainability and ecological basic design, it is important to consider the technological developments of the period in which both structures were built. In this context, the comparison to be made in terms of ecological design; was deemed necessary to make it under the sub-headings of "Ventilation and Water Supply System", "Lighting and Heating System" and "Material Usage".

5.3.1. Ventilation and Water Supply System

The depth of the ventilation shafts of Derinkuyu Underground City is not known for certain. However, with the studies carried out, it was understood that the ventilation shaft located at the point where the entrance of the city is located is at a depth of 40 meters (Figure 5.8.). The depth of the water well on the seventh floor reaches 85.00 meters [17].

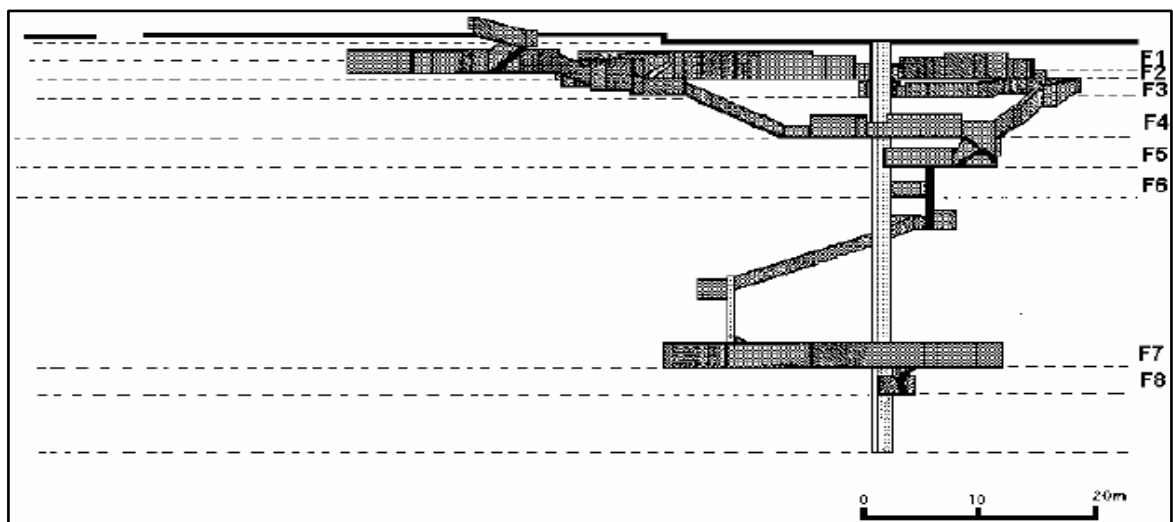


Figure 5.8. Derinkuyu Underground City North-South Section [17].

Derinkuyu Underground City is thought to be between 40 meters and 85 meters deep according to the ventilation and water wells. The ventilation system of the structure has a resource of between 3000 and 5000 people [17].

Although there is no detailed information about the ventilation system, The Survival Condo states in the sources that it has a high-security quality [52]. The ventilation system of the entire facility is filtered by nuclear, biological, and chemical (NBC) filters. The physical air inlets of the system are protected by explosion valves. Explosion valves have systems that prevent the excessive pressure air wave created by a nearby explosion from entering the facility and harming the people living in the structure [52].

The Survival Condo features the Facility's three-source water storage system. There are also two backup water reservoir sources. It has a reservoir system that includes an advanced treatment system that ensures that the water resources that are sheltered within the structure are safe for consumption [52].

5.3.2. Lighting and Heating System

It cannot be said that there are similarities between Derinkuyu Underground City and The Survival Condo structures in terms of lighting and heating systems. Both structures do not change the fact that they were designed with the technological advances of the period in which they were built. From an ecological point of view; While Derinkuyu Underground City uses natural lighting and passive heating methods, it is understood that artificial lighting and heating system is used through the developing technology in The Survival Condo structure.

Small niches were made in the walls of long corridors and other sections with the lighting needed for Derinkuyu Underground City, with the technological conditions of the period. In these niches, oil lamps and candles were used to illuminate. Linseed oil obtained from linseed was burned in oil lamps and used both as a source of heat and light [17].

Derinkuyu Underground City, in addition to its functions such as protection, hiding, or a temporary shelter in the event of an attack, the soft volcanic soil, which is the rock structure on which the structure is built, assumes the role of natural heat regulator. Derinkuyu Underground City has a temperature of 12°-15° in summers and 7°-8° in winters throughout the year. The temperature decreases as you go underground [17].

The Survival Condo Facility has three sources of electricity to meet the lighting, heating, and similar energy needs, two of which work as a backup. In addition to using the resources

of the building, the local electricity grid, there is a wind turbine and diesel generator to feed the entire structure [52].

5.3.3. Material Usage

Derinkuyu Underground City has its unique features. The structure consists of natural volcanic rock and soil materials [17]. Areas such as sections, tunnels, and niches were built by carving and excavating with primitive tools. There are sliding doors made of natural stone material located at the security entrances of the narrow tunnels of the building [17].

Traces of wooden doors were found in the building to determine the boundaries of private property in the sections where the rooms are located [17]. In many parts of the building, there are stone or soil column systems made for support purposes.

The outer shell material of The Survival Condo structure consists of the Atlas missile silo. These silo structures are designed to be resistant to a direct nuclear attack. The upper part of the silo has 274.32 cm thick epoxy reinforced concrete walls. The building has been designed in such a way that 75 people can live away from the outside world for more than five years [14].

5.4. A COMPARISON OF HISTORIC UNDERGROUND STRUCTURES AND CONTEMPORARY LANDSCRAPER STRUCTURES IN TERMS OF SOCIAL PSYCHOLOGY

The historical underground city example Derinkuyu Underground City and The Survival Condo, which is considered a contemporary landcrapers building example, will be compared in terms of social psychology within the framework of the "Landscrapers Movement".

It has been understood that the underground structures, hollow structures, rock and cave structures, wind catcher structures, cisterns, tunnels, and shelters, which are included in the concept of underground structuring in the study, were built both due to compulsory needs and under the influence of religious beliefs.

The concept of underground structuring has been identified with the concepts of compulsory need, protection, and religion in the face of negative situations in the past. However, nowadays, in addition to the obligations such as shelter and protection, entertainment, social and ecological architectural design criteria are designed together with the developing technology. It is thought that individuals who have experience in these structures provide a positive approach to the idea of underground structuring [57].

It can be said that underground structuring and built areas have limited capacity, their relationship with the earth is cut off within a certain period and it is a closed environment [57].

If it is necessary to evaluate the example in the study; It may have caused the individuals living in Derinkuyu Underground City to have a feeling of lack of knowledge about the situations on earth. However, there may have been negative situations in the Derinkuyu that could cause a feeling of entrapment, restlessness, and claustrophobic effects. However, even though it has a limited capacity, we see that these situations are taken into account in the structures built today to eliminate the negative situations in the underground structure. In the underground structure, The Survival Condo has provided entertainment areas, walking parks, communal pools, areas that will provide sustainable food production, and areas with high security and comfortable accommodation.

In addition to the comparison between these two examples, it is known that today, underground city models are designed in a complex that can change the concept of "having limited capacity" [57]. There is an expected interest in underground structures with the developing technology and ecological designs today, and it is necessary to make designs that will support social psychology to reduce the negative situations in underground structures. The psychosocial situations included here show that they can cause both negative and positive effects on the underground structure [57]. Table 5.1 shows a comparison chart between contemporary landscaper structures and historical underground structures.

TO COMPARE RELATIVITY	HISTORICAL UNDERGROUND STRUCTURES Example of Derinkuyu Underground City	CONTEMPORARY LANDCRAPEPERS STRUCTURES - Example of The Survival Condo
CONSTRUCTION PURPOSES and USAGE FUNCTIONS	* Protection from adverse natural conditions * Shelter * Defense	* Conservation with the least damage to nature * Protection from natural disasters * Being prepared for possible disaster scenarios * Overcoming deep economic crises * Feeling safe in nuclear wars * Protected and sustainable living against global climate changes * Enabling human and nature to get closer to each other thanks to underground structuring * With appropriate designs, transferring today's civilizations to the future with heritage
STRUCTURAL CONSTRUCTION TECHNIQUES and DESIGN METHODS	* Thick walls * Stone and soil bearing structures made by carving and digging method for wide openings * Arches and vaults created over time, made of stone and soil * Irregular (asymmetrical) multi-storey underground structure	* Thick walls * High strength concrete structured materials * Above-ground-external shell missile silo * All walls are carriers (1-3 m thick) * More than 600 tons of high strength rebar * Regular and multi-storey underground structure
ECOLOGICAL DESIGN COMPONENTS	* Natural ventilation chimneys * 85 m. deep water well system * Natural lighting and heating system (Candles and oil lamps in niches) * Sustainable architectural equipment made with natural volcanic rock, earth, natural stone and partially wood materials	* Ventilation system with nuclear, biological and chemical filters and safe techniques * Three separate water tanks and purification system * Artificial lighting and heating system * Local electricity grid, wind turbine and backup diesel generators * Concrete walls (Epoxy reinforced and insulated thick walls) - Atlas Missile Silo * Sustainable food production facilities
SOCIAL PSYCHOLOGY	* Claustrophobia * Feeling of being away from the earth * Feeling of being trapped * restlessness	* Made against negative psychological effects; playgrounds and entertainment areas, walking areas, pet walking track, communal pools, gym and shooting range for defense training...

Table 5.1. Comparison Chart, created by the author.

6. GENERAL EVALUATION AND DISCUSSION

- Landscapers structures are at the forefront of the construction measures to be taken to protect nature and our planet and to reduce the impact of natural disasters on human life.
- In periods when construction techniques were not very developed, shelter from atmospheric events could be provided by carving and digging underground. Today, with the development of construction techniques, above-ground building constructions are preferred. The addition of arch and column building components to the stone-earth-supported carving-digging structural methods of cave structures in the following periods can be considered a sign of this orientation.
- Historical underground structures can be considered underground cities because they contain multi-story deep and wide areas underground for long-term shelter, protection, and living purposes and because they contain openings suitable for many life functions that are transitional to each other. It can be said that today's Landscaper structures, although they are mega-structural structure configurations, generally develop as single building structures with newly developed technical functional equipment.
- Historical underground structures can also be thought of as the prototypes of the establishment of aboveground cities.
- If the examples that can be examined in the study can be evaluated together with many different examples from around the world, it is stated that underground cities, caves, and rock structures were the majority in human history before history; It can be interpreted that with the development of civilization along with the history of humanity, it can turn into more complex structures with different functions such as underground cities, temples, and cisterns.
- To inherit the architectural designs made with the concept of Landscapers, how important nature, ecological and sustainability are in terms of living life to future civilizations. Moreover, the concept of landscapers can also be said to be the purpose of protecting the knowledge and resources that people have acquired over the generations against possible major disasters.

7. CONCLUSION

- In today's architectural and urban design, it is important to research technological innovations for the development of underground structures instead of above-ground structures.
- To examine, evaluate and interpret underground structures from the past today, they should be grouped as rock structures, wind catcher structures, carved structures, underground water cisterns, tunnels and mine structures by taking into account their properties such as time, function, structure, and material.
- Today's structures, built under the influence of the Landscrapers movement, basically show a parallel development with the underground structures in the historical process. Naturally, underground structures have gradually developed to be more qualified, more modern, and serve many purposes, based on civilizations that change over time, and based on scientific and technological developments. The buildings, which are the representatives of the landscapers architectural movement that emerged as a result of this development, now carry the function and usefulness of almost all above-ground structures, which are architectural products.
- Historical buildings were built according to the needs of the period for basic purposes such as shelter, protection from natural atmospheric events and disasters, and defense and storage. Contemporary recessed landscaper structures, on the other hand, can meet all these purposes at the same time.
- While the main purpose of historical underground structures is to defend against all kinds of environmental effects and enemies, the main purpose of contemporary Lanscrapers structures is to protect nature and ecological balance through the sustainability trend.
- It has a structural structure that can provide its defense function against the destruction level of wars belonging to the historical underground structures periods, by using natural and local materials, by carving and digging underground, inside caves and rocks. However, structures that can serve as a defense against nuclear, biological, etc., which are very developing and changing war methods belonging to contemporary

periods, should also have a highly developed structural technical structure. In this context; It can be concluded that the fact that Landscraper structures are equipped in this way, thanks to new technology and materials, allows them to be used for defense purposes, and it can also carry this potential to the future in the same parallel. For the same reason; Ecological needs such as heating, ventilation, lighting, and water supply in Landscraper structures can also be met in a healthier and more beneficial comfort.

- Some of the inconveniences caused by being underground and buried in the land, contrary to human psychology, can mostly be eliminated using technological applications and details in contemporary landscraper structures. This situation, gradually reveals the fact that sustainability can be achieved in the future based on these structures.
- Considering that the protection of our planet today is based on the protection of nature, it can be concluded that landscapers, which minimize the destruction of nature through structuring by the contours of nature, by directing buildings and settlements to underground buried structures, will be a very important step in the history of the world, ensuring the sustainability of the future.

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