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**ARCHITECTURAL CRITERIA IN UNESCO
WORLD HERITAGE DESIGNATION:
A COMPARATIVE STUDY
OF SELECTED SITES IN TÜRKİYE**

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Master's Thesis

Supervisor

Asst. Prof. Dr. Can UZUN

İstanbul, 2024

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The thesis titled ARCHITECTURAL CRITERIA IN UNESCO WORLD HERITAGE DESIGNATION: A COMPARATIVE STUDY OF SELECTED SITES IN TÜRKİYE prepared by Amina CHOUALHI and submitted on 27/07/2024 has been **accepted unanimously** for the degree of Master of Science in Architecture.

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I hereby declare that all information/data presented in this graduation project has been obtained in full accordance with academic rules and ethical conduct. I also declare all unoriginal materials and conclusions have been cited in the text and all references mentioned in the Reference List have been cited in the text, and vice versa as required by the abovementioned rules and conduct.

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Signature



DEDICATION

I dedicate this modest work to the most important person in my entire life, to the one who taught me everything I know, to my Lover, Dear, Champion, Idol, Supporter and everything in this world. I lost you but I will never forget you, you will be always a part of me.

I love you so much Father.



ABSTRACT

ARCHITECTURAL CRITERIA IN UNESCO WORLD HERITAGE DESIGNATION: A COMPARATIVE STUDY OF SELECTED SITES IN TÜRKİYE

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World Heritage Sites represent the natural, cultural and/or historical background of a specific country or region. Since the announcements of the including of the tangible world heritages (e.g. Buildings) to the World Cultural and Natural Heritage list in 1972, All governments and associations rushed to inscribe their tangible heritages for several reasons. Many selected sites with distinguished vernacular architecture were added to the list; however, the architecture was never the main aspect for the selection. In this thesis, the aim is to examine the impact of architectural features and construction techniques on the selection of three World Heritage Sites located in Türkiye. This will be achieved by assessing whether the settlement pattern, building envelope and structural elements of each site fulfil UNESCO criteria led to their designation as a World Heritage Site. To conduct this study, a comparative methodology was used, relying on data collected from literature. This study confirms that the architectural features and construction techniques fulfilled at least one out of the ten UNESCO's selection criteria. However, we conclude that architecture alone was never sufficient for inscription as UNESCO World Heritage Site; rather, multiple aspects must simultaneously fulfil UNESCO's selection criteria.

Keywords: Vernacular Settlements, Vernacular Architecture, Criteria, UNESCO World Heritage Sites/Lists, Fulfilled, Selection.

ÖZET

UNESCO DÜNYA MİRASI TANIMLAMASINDA MİMARİ KRİTERLER: TÜRKİYE'DE SEÇİLMİŞ YERLERİN KARŞILAŞTIRMALI BİR İNCELENMESİ

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Dünya Mirası Alanları, belirli bir ülke veya bölgenin doğal, kültürel ve/veya tarihi arka planını temsil eder. Somut dünya miraslarının (örneğin binalar) 1972'de Dünya Kültürel ve Doğal Miras listesine dahil edilmesinin ilanından bu yana, tüm hükümetler ve dernekler çeşitli nedenlerle somut miraslarını kaydettirmek için harekete geçti. Seçilen birçok yer, belirgin yöresel mimariye sahipti; ancak mimari hiçbir zaman seçimde ana unsur olmadı. Bu tezde amaç, Türkiye'de bulunan üç Dünya Mirası Alanı'nın seçilmesinde mimari özelliklerin ve inşaat tekniklerinin etkisini incelemektir. Bu, her bir alanın yerleşim düzeninin, bina zarfının ve yapısal elemanlarının UNESCO kriterlerini yerine getirip getirmediğinin değerlendirilmesiyle sağlanacaktır. Bu çalışmayı yürütmek için, literatürden toplanan verilere dayanan karşılaştırmalı bir yöntem kullanıldı. Bu çalışma, mimari özelliklerin ve inşaat tekniklerinin, UNESCO'nun on seçim kriterinden en az birini karşıladığını doğrulamaktadır. Ancak, mimarinin tek başına UNESCO Dünya Mirası Alanı olarak tescil için yeterli olmadığını, aksine birden fazla unsurun aynı anda UNESCO'nun seçim kriterlerini karşılaması gerektiğini sonucuna varıyoruz.

Anahtar Kelimeler: Yöresel Yerleşimler, Yöresel Mimari, Kriterler, UNESCO Dünya Mirası Alanları/Listeleri, Karşılanan, Seçim.

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ABBREVIATIONS

- UNESCO : United Nations Educational, Scientific and Cultural Organization.
- WHC : World Heritage Centre
- CTR : Caravan Trades Route



1. INTRODUCTION

The provision of shelters is paramount concern for humanity. To achieve that need humans were obligated to adapt with the surroundings and to set boundaries to create safe private spaces (Ozorhon et al., 2014). The evolution of private spaces or shelters was due to the accumulated experiences and the capacity to adapt to environmental conditions. In early times the caves were the first type of dwellings, later humans invented new techniques thus cities formed. Humans' need for shelters changed along with the development of the dwellings, the dwellings today must conform many standards and answer many demands unlike the early dwellings where the one and only necessity was a safe place.

The architecture is the expression of the society. Thus, to understand the society's values, beliefs, and to have an idea on people's life style, try to read their architecture. Despite that, the architecture not necessarily related only to human beings, several uncontrollable things affect it also such as the topography, the geography, the weather conditions, natural disasters, and the available materials in the area etc. Therefore, we conclude that architectural identity is not just about the language or touch on the design; it also includes the materials used for the construction and the harmony of the structure with the surroundings.

If the architecture is the expression of the society, the vernacular architecture is the fingerprint of a particular region and its inhabitants. According to Glassie (2000), vernacular in the Historical Dictionary of France Language refers to “Verna” which means “born-home slave” in the Latin language where indigenous or domestic are the meanings of vernaculus (Glassie, 2000). Glassie described the vernacular architecture as contextualised architecture, designed for a specific country, region or geographical area in a very specific period by using locally available materials (Glassie, 2000). While according to Illich the origin of the term vernacular architecture goes back to Indo-Germanic, which means rootedness and abode (Glassie, 2000). Glassie adds, In Latin, “Vernaculum” refers to items locally produced or homemade, contrasting with everything acquired through formal exchanges (Glassie, 2000). Concisely, vernacular architecture refers to the traditional architecture that evolves organically over time; it is unique to a particular region and/or culture. Such architecture reflects the needs and lifestyle of the community, integrating with the natural surroundings. Moreover, this type of architecture utilizes locally available materials and traditional

construction techniques. The architecture that takes on consideration the previous experiences (e.g. learning from natural disasters) and uses locally available materials in harmony with nature known as regional architecture, local architecture, anonymous architecture, spontaneous architecture, traditional architecture or vernacular architecture (Akyildiz, 2020). Bernard Rudofsky, in 1964 introduced this type of architecture to the world for the first time in exhibition of New York “Architecture without architects” (Berkovic & Canan, 2020). Bernard Rudofsky used the word vernacular for the first time in architecture to describe the architecture without architects, which represent the settlements constructed in the pre-industrial era. This architecture include very wide range of construction techniques and types therefore different settlements exist due to relationship between humans and different type of nature. The crafts-men and masons played an important role in this type of architecture, serving as both constructors and designers along with the Mother Nature. The craftsmen are mostly the inhabitants of the region who understood their nature and surroundings very well and translated that on their constructions therefore, this architecture can be described as a genuine climate-responsive as Güleç et al. (2020) refer to (Berkovic & Canan, 2020). Nowadays and precisely after the industrial war, new materials and techniques were invented in addition to the new ideas such as modernism and internationalism which defined the new concepts, and boundaries of architecture. Besides that, numerous vernacular settlements are observable worldwide such as Nzulezu Stilt Settlements in Ghana / Africa and Tana Toraja Traditional Settlements in Indonesia / Asia...etc. The vernacular settlements represent cultural heritages, displaying the historical cultures and civilizations passed by the region. Consequently, it is imperative to preserve this legacy. The preservation require special treatment methods, which the UNESCO can provide in collaboration with the respective countries.

1.1 PROBLEM STATEMENT

Since the inclusion of the tangible heritages to the UNESCO World Heritage List, the selection criteria have addressed many aspects, often disregarding or neglecting the architectural features and construction techniques of the sites. Hence, the impact of the architecture in the selection process has been unclear and moderate. Assessing the selection criteria will shed light on the absence of specific guidelines and criteria addressing

architectural features and construction techniques, which may lead to the underrepresentation or omission of certain sites from the UNESCO World Heritage List.

1.2 AIM OF THE THESIS

The current study aims to examine whether the architectural features and construction techniques of three vernacular settlements located in Türkiye, listed as UNESCO World Heritage sites, directly influence their designation as World Heritage Sites. This objective will be achieved by evaluating and analysing their selection criteria from an architectural perspective.



2. LITERATURE REVIEW

Around the world, numerous previous studies have addressed both the vernacular architecture and UNESCO World Heritage Sites. The goal always was either preserving the past or learning from the past.

Numerous studies have concentrated on conserving historical heritages even before its addition to the UNESCO World Heritage List; these studies propose protocols or solutions aimed at enhancing the preservation of the sites. “*Preservation And Revitalisation Of Historical Settlements: The Case of Bursa-Cumalikizik*” is an example where the authors Giritlioglu & Oruç (2000) evaluated, and gave solutions that increase the success of the project of preservation and revitalisation of Bursa-Cumalikizik (Giritlioglu & Oruç, 2000). While others discussed and analysed the protocols proposed by the governments or associations. Which is the case in Çakıcı’s (2015) paper, where the author was questioning if the theoretical, legal, and organizational procedures are sufficient to understand historical background of conservation issues (Çakıcı, S., 2015). Somuncu & Yiğit (2005) in their paper “*World heritage sites in Turkey: Current status and problems of conservation and management*” highlighted the issues of the World Heritage sites in Türkiye by evaluating the decisions of “*Determination of Current Situation of the World Heritage Sites in Turkey*” project (Somuncu & Yiğit, 2005).

On the other hand, many researches have concentrated on learning from World Heritages Sites. Kızılkıuşak (2019) in her dissertation studied the spatial characteristics, environment, users, materials, construction techniques, economic, and social context in order to understand the context of traditional houses of Türkiye (Kızılkıuşak, 2019). Solmaz (2013) also in his/her paper made comprehensive field surveys based on official drawings, and maps of the settlements to study the construction techniques, and architectural features of Nevşehir traditional houses. where he/she aimed to gather the construction techniques employed in the traditional houses in Nevşehir, with the intention of providing guidance to the future conservation works (Solmaz, F., 2013). Moreover, Akyildiz (2020) in her paper emphasized the importance of the vernacular architecture in Safranbolu as tangible World Heritage, and warned about dense urban population and the unidentified and uniform modern buildings (Akyildiz, 2020).

However, the following two studies questioned the “Authenticity” and “Integrity” of UNESCO World Heritage Sites. Karakul (2016) in the paper titled “*Authenticity as a Sustainable Value of Holistic Conservation: The Case of Turkey’s World Heritage Sites*” took a different path, where he/she aimed to evaluate the authenticity of two World Heritage sites located in Türkiye, the City of Safranbolu and the Archaeological Site of Troy considering tangible and intangible aspects separately. The author constructed its research on Nara Document. The Nara Document on Authenticity was adopted in 1994 in a conference organized by UNESCO known as “Nara Conference on Authenticity”, the document used as a reference in the recognition and conservation of cultural heritage (Karakul, 2016). Karakul (2016) conducted a comparative study in order to prove that the intangible aspects of a site influences its authenticity along with the tangible aspects. And concluded that, both tangible and intangible aspects define the authenticity of a site. While according to Karakul (2016), the tangible aspects represent Form & Design, Material & Substance, and Location & Setting. While the intangible aspects represent Traditions & Techniques, Use & Function, and Spirit & Feeling (Karakul, 2016). Whereas Gullino & Larcher (2013) conducted a research similar to the problem statement of this thesis where they selected 14 rural landscapes from the 2011 UNESCO World Heritage List to analyse the concept of integrity of UNESCO, in the purpose to understand how UNESCO sees the integrity. A comparative study based on a descriptive data was used in their study. Where the descriptive data contained documents that cover historical, rural, and agro-ecological features of each of the selected landscapes. They concluded that the historical features are the most significant in the integrity, besides too many other parameters such as local products, land use, and agricultural practice permanence etc. Lastly, they concluded that the best integrity is when culture and nature are considered together not apart. This paper has more similarities to the current study, where the author aimed to compare sites selected from UNESCO World Heritage List in order to understand their integrity from UNESCO point of view.

The previously mentioned researches in addition to many unstated have been beneficial in constructing this thesis, as our study is based on literature rather than site visits and field experiments. UNESCO World Heritage Sites remain an attractive topic, with some researchers aiming to discuss, criticize, and praise the preservation plans or simply warn, and condemn its misuse. While others have focused on the architectural features and

construction techniques used in the selected sites by isolating the building and their structural elements. Combining those topics prompted the emergence of a gap, leading to the question: is there a direct relationship between architectural features and construction techniques and UNESCO's selection criteria?

2.1 VERNACULAR ARCHITECTURE IN TÜRKİYE

The Turkish vernacular architecture known by its uniqueness that is correlated to the natural characteristics of each city of the Ottoman Empire (Ozorhon et al., 2014) (Figure 2.1). Türkiye has different types of vernacular architecture that survived. Each one of the cities has different architectural style depending on different factors, mainly the natural factors, where Türkiye is known with its splendid nature, with a wide range of materials can be used for construction. In addition to the materials, the inhabitants who experienced their own environment by creating a strong bond with it uniquely invented the techniques of construction. Besides that, the overall appeal of the city where the structure designed in a manner that correlates with the natural surroundings, and supporting it. The timber houses of the Black Sea region are amidst a verdant and dispersed landscape. While the flat-roofed adobe brick houses situated at the source of springs (Ozorhon et al., 2014), or the buildings constructed using a hybrid construction system by crafts-men without any engineering guides (Güneş, 2016). The Turkish vernacular architecture embodies the intrinsic cultural identity and social memory of its origin thereby, rendered it a cultural heritage. Cultural heritage is every tangible or intangible cultural element that stayed from previous generations to many generations after.

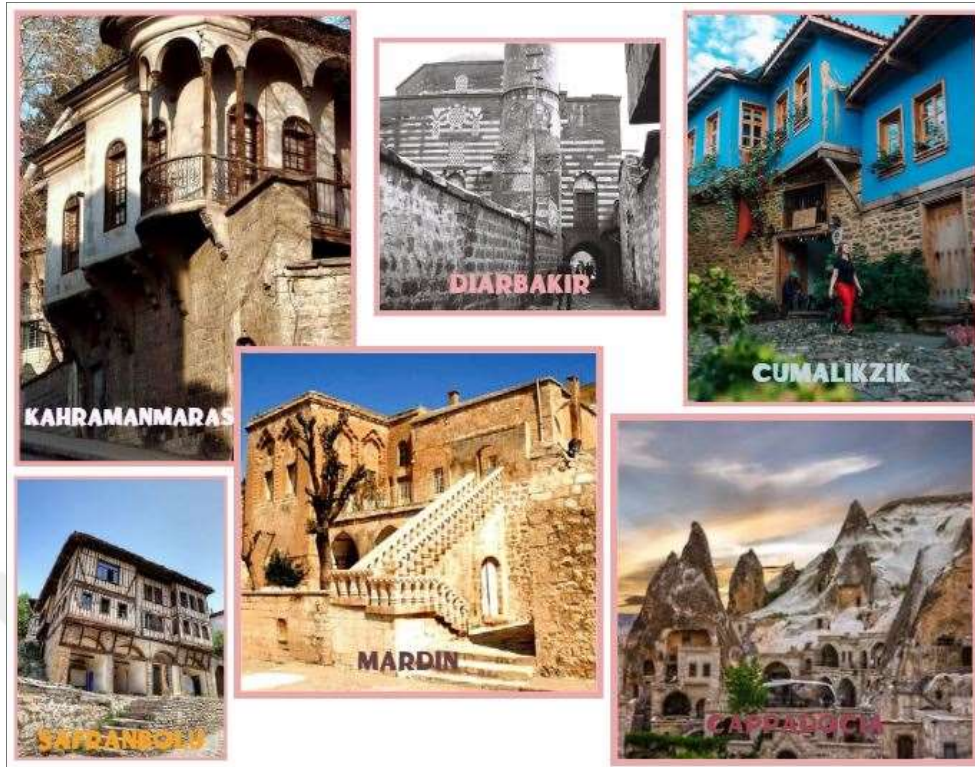


Figure 2.1: Examples of Turkish Vernacular Settlements, Modified from Source (Flickr, n.d).

2.2 UNESCO SITES IN TÜRKİYE

In 1972, the tangible cultural heritages became a part of the World Cultural and Natural Heritage at the 17th General Assembly of the UNESCO (Akyildiz, 2020). The convention included the buildings with exceptional universal values regarding to their architecture, and compatibility in terms of art, history, or science (Akyildiz, 2020). The communities' buildings considered tangible with cultural heritage values that reflect the socio-cultural life style while adapting to nature, and the environment (Akyildiz, 2020). Those tangible cultural heritages mostly considered as vernacular architecture as Akyildiz (2020) explains in the following:

“.... This unique architectural system, which has been shaped by the experience based on the local materials and the manufacturing techniques it possesses, and the previous disaster knowledge there, in harmony with the natural environment, climate, and topography, is referred to by many different names. These are called regional architecture, local architecture, anonymous architecture, spontaneous architecture, traditional architecture or vernacular architecture...” (Akyildiz, 2020).

Preserving vernacular architecture is essential to maintain cultural diversity and promote sustainable development. UNESCO collaborates with governments and local communities to safeguard vernacular architecture, and promote its recognition as a valuable cultural heritage. Through its programs, UNESCO aims to raise awareness of the importance of vernacular architecture and encourage the preservation of these unique buildings for the next generations. However, the selection of world heritage sites is determined by ten (10) criteria six (6) of them are cultural, and the remaining four (4) are natural criteria.

When a site demonstrate an outstanding universal value and meet at least one out of ten selection criteria. Normally, the UNESCO World Heritage Centre (UNESCO WHC) declares its addition to the World Heritage List (Somuncu & Yiğit, 2005). The following Table 2.1 contains UNESCO's Selection Criteria:

Table 2.1: UNESCO's Selection Criteria (The Criteria for Selection, n.d.).

UNESCO Criteria	
Cultural	(i) Represent a masterpiece of human creative genius
	(ii) Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscapes design.
	(iii) Bear a unique or at least exceptional testimony to a cultural tradition or to a civilization, which is living, or which has disappeared.
	(iv) Be an outstanding example of a type of building, architectural or technological ensemble or landscape, which illustrates (a) significant stage(s) in human history.
	(v) Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.
	(vi) Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.
Natural	(vii) Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.
	(viii) Be outstanding examples representing major stages of earth's history, including the record of life, significant, on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.
	(ix) Be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.
	(x) To contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

The last version of the UNESCO World Cultural and Natural Heritage list contains 1199 properties around the world, twenty-one (21) of them are located in Türkiye (Figure 2.2) (UNESCO World Heritage Centre, n.d.). Nineteen (19) of them are cultural sites and two (2) of them are mixed (i.e. cultural and natural sites). The sites that are under the protection of the UNESCO around Türkiye stated in the following Table 2.2:



Table 2.2: Türkiye's World Heritage Sites List (UNESCO World Heritage Centre- World Heritage List, n.d.).

Year	Location	Site	Criteria	Type
1985	Nevşehir Province	Göreme National Park and the Rock Sites of Cappadocia	(i)(iii)(v)(vii)	Mixed
1985	Sivas Province	Great Mosque and Hospital of Divriği	(i)(iv)	Cultural
1985/2017	Istanbul Province	Historic Areas of Istanbul	(iii)(iv)(vii)	Cultural
1986	Çorum Province	Hattuşa: the Hittite Capital	(i)(ii)(iii)(iv)	Cultural
1987	Adıyaman Province	Nemrut Dağı	(i)(iii)(iv)	Cultural
1988	Denizli Province	Hierapolis-Pamukkale	(iii)(iv)(vii)	Mixed
1988	Muğla & Antalya	Xanthos-Letoon	(ii)(iii)	Cultural
1994	Karabük Province	City of Safranbolu	(ii)(iv)(v)	Cultural
1998	Çanakkale Province	Archaeological Site of Troy	(ii)(iii)(vi)	Cultural
2011	Edirne Province	Selimiye Mosque and its Social Complex	(i)(iv)	Cultural
2012	Konya Province	Neolithic Site of Çatalhöyük	(iii)(iv)	Cultural
2014	Bursa Province	Bursa and Cumalıkızık: the Birth of the Ottoman Empire	(i)(ii)(iv)(vi)	Cultural
2014	The Aegean region	Pergamon and its Multi-Layered Cultural Landscape	(i)(ii)(iii)(iv)(vi)	Cultural
2015	Diyarbakır Province	Diyarbakır Fortress and Hevsel Gardens Cultural Landscape	(iv)	Cultural
2015	Izmir Province	Ephesus	(iii)(iv)(vi)	Cultural
2016	Kars Province	Archaeological Site of Ani	(ii)(iii)(iv)	Cultural
2017	Aydın Province	Aphrodisias	(ii)(iii)(iv)(vi)	Cultural
2018	Şanlıurfa Province	Göbekli Tepe	(i)(ii)(iv)	Cultural
2021	Malatya Province	Arslantepe Mound	(iii)	Cultural
2023	Ankara Province	Gordion	(iii)	Cultural
2023	5 cities of Anatolia	Wooden Hypostyle Mosques of Medieval Anatolia	(ii)(iv)	Cultural

Below is the Key for Table 2.2:

Year: refers to the year of inscription in the World Heritage list.

Location: refers to the site location.

Site: the title of the site given by UNESCO.

Criteria: the criteria fulfilled by the site according to UNESCO.

Type: type of site according to UNESCO which is either cultural or mixed (i.e. cultural and natural).

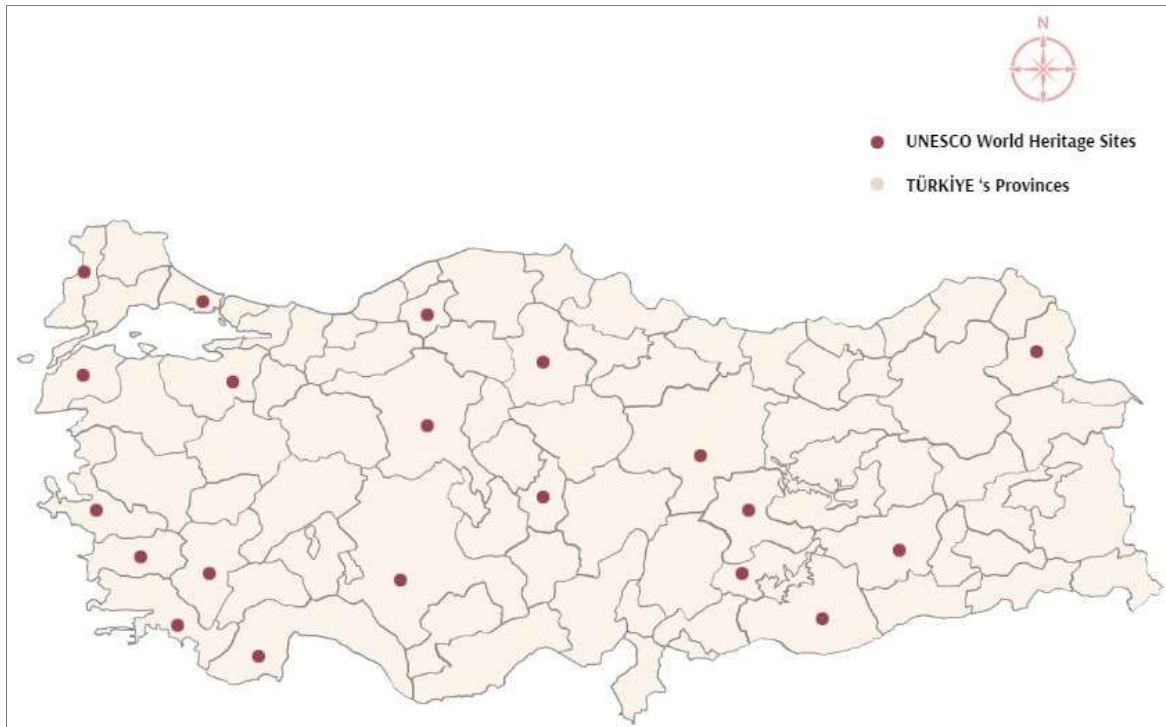


Figure 2.2: The Location of the Preserved Sites on the Map of Türkiye.

Modified from Source (UNESCO World Heritage Centre, n.d.).

3. METHODOLOGY

The current study employed a comparative research method. The steps followed are as follows.

3.1 SITE SELECTION

The selected sites are three locations from the UNESCO World Heritage List situated in Türkiye: Cumalıkızık, Cappadocia, and Safranbolu as illustrated in the (Figure 3.1). The purpose was to select sites with extant human vernacular settlements to facilitate the analysis of their architectural features and construction techniques.

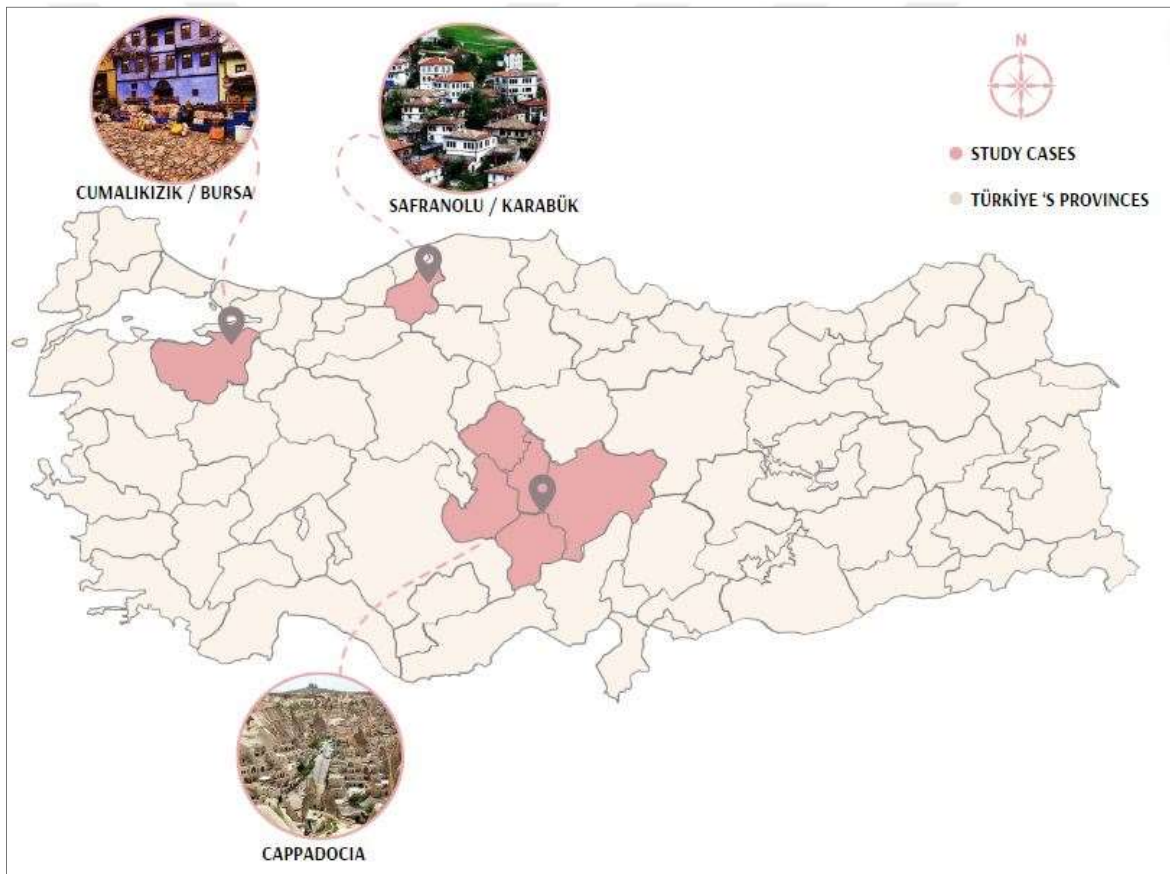


Figure 3.1: The Location of the Chosen Cities on the Map of Türkiye.

Modified from Source (UNESCO World Heritage Centre, n.d.).

3.2 DATA COLLECTION

Following the site selection, we collected data relevant to the problem statement of this study and the selected sites. The descriptive data includes official documents and previous researches including academic papers, published thesis and dissertations, as well as official reports from the UNESCO website. In the following step, I will list few documents utilized in this study.

3.3 DATA INTERPRETATION

In this part of the study, we divided the data into three parts. The first part provides background information on the sites, encompassing their historical and cultural background, as well as natural and geographical features. Several documents utilized as source of information. The following are few utilized documents for each selected site:

For Cumalıkızık, Çakıcı's (2015) paper, Bağbancı's (2016) paper, and Çizakça's (1980) paper provided historical and cultural information, while the population, climate, geography (n.d.) website served as a source for information on its natural features.

For Cappadocia, The historical and cultural background information was sourced from Ateş's (1996) and Görmez's (2002) papers, and the natural features were sourced from Tuncel's (1998) and Ozata's (1998) papers.

For Safranbolu, the historical and cultural background information was sourced from Akyıldız's (2002) papers and City of Safranbolu (n.d.) UNESCO report , while the natural features were sourced from Davis's (1988), Coşkun's (2015) and Örnek's (2019) papers.

The second part comprises information related to UNESCO's selection criteria, for each site we analysed and evaluated the descriptions of their selection criteria in order to highlight the aspects covered by each criterion. Our findings revealed that each criterion encompassed multiple aspects, including historical, natural and cultural aspects, in addition to the social life and the economic aspects. However, architecture also was one of the covered aspects, primarily within the contexts of historical or cultural significance. UNESCO's reports served as the source of this information.

Lastly, the third part covered the architecture of the selected sites. Starting from the development of the region, passing by settlement pattern, building envelope and structural elements. Several documents were utilized as source of information. The following are few utilized documents for each selected site:

The architectural features and construction techniques of Cumalıkızık were primarily sourced from Kızılkışak's (2019) published master's research thesis and Pancaroğlu's (1995) paper, supplemented by our own site visit. For Cappadocia, the architectural features and construction techniques were sourced from Hajirasouli's (2015), Yıldız's (2006) and Aydan & Ulusay's (2003) papers. Where the architectural features and construction techniques of Safranbolu were sourced from Berkovic & Canan's (2020), Cengiz & Aşkın's (2015) and Sowle's (1989) papers.

Ultimately, these three parts helped us to understand the sites better. Enabling us to conduct reliable and fair analysis, and consequently, reliable and fair comparison.

3.4 DATA ANALYSIS

This step primarily focuses on finding the comparables, which includes UNESCO's selection criteria along with the settlement patterns, building envelope, and structural elements. These three architectural aspects were selected based on their potential to provide an external perspective on the studied settlements. For each site I examined the architectural features and construction techniques. Subsequently, I collected all the data in recapitulative tables (Table 5.4), (Table 5.2) and (Table 5.3). Following this, I constructed comparative tables to evaluate whether architectural aspects meet the UNESCO selection criteria.

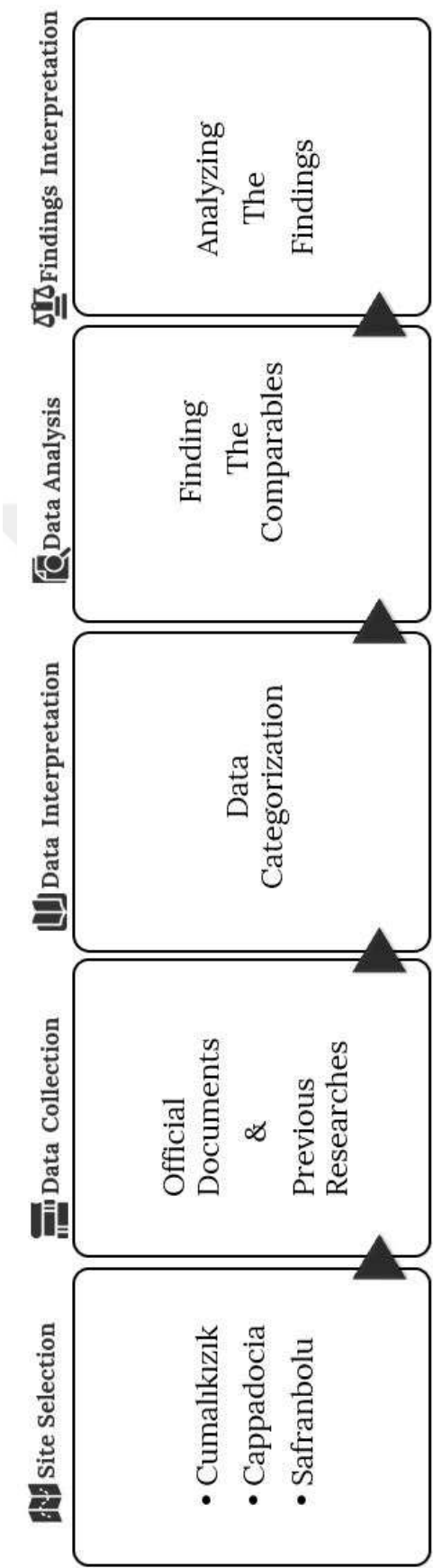
3.5 FINDINGS INTERPRETATION

The final step involved interpreting and analysing the findings, during which a several comparable tables were created. Initially, individual comparative table were created for each site (Table 5.4), (Table 5.5) and (Table 5.6) to assess the fulfilment of the selection criteria through settlement patterns, building envelope and structural elements separately, evaluating their impact on the selection process. Where the settlement patterns, building envelope and

structural elements take place in columns while the UNESCO selection criteria take place in rows. Subsequently, these individual tables were consolidated into one comprehensive comparative study table (Table 5.7) to facilitate integrated comparisons across all sites, marking the final methodological step before proceeding to discussion and conclusion. The following chart provides a graphical summary of all preceding steps.



Chart 3.1: An Organigram Explaining the Steps Taken In This Comparative Study (Author, 2024).



4. UNESCO SITES THROUGH VERNACULAR ARCHITECTURE

This chapter will cover three cities of the UNESCO World Heritage List located in Türkiye (Figure 3.1) to explore the vernacular settlements of each site by highlighting the history, the natural features and, the vernacular materials of construction, in addition to their selection criteria and the settlement pattern, building envelope and structural elements.

4.1 CUMALIKIZIK

The ancient name of Bursa is “Prusias ad Olympium” named after the Bithynian King Prusias I, the name was changed after to “Prusa”; “Prusias ad Olympium” or “Prusa” became a city during Bithynian Empire (Çakıcı, 2015), the exact date of its founding is unknown, but speculation suggests it was established during the period of Bithynian rule (Çakıcı, 2015) (Figure 4.1). The Bithyians migrated to western Anatolia in the beginning of the 7th century B.C.E where they occupied Bursa plain (Çetin, 1994) and (Çakıcı, 2015). Prusa was later conquered by the Roman Republic and became a part of the Byzantine Empire when Romans split into Eastern and Western Empires in A.D. 395 until 13th century (Dostoglu et al., 2004). In 1326, Prusa was captured from the Byzantine State during the expansion of the Ottoman Empire (Çizakça, 1980). Bursa as the Turks call it was incorporated into the Ottoman Empire's territories by the Sultan Orhan the son of Osman Gazi, the founder of the Ottoman Empire and Bursa was the first Capital of the Ottoman Empire (Bağbancı, 2016). The city expanded beyond the Hellenistic walls due to the notable commercial developments (Ahunbay et al., 2014). Until the Ottomans, conquest Edirne in 1361 when Edirne became the second capital of the Ottoman Empire mainly for military and administrative purposes (Pancaroglu, 1995). Then Istanbul (i.e. Constantinople back then) became the new Capital of the Ottoman Empire after the Conquest in 1453 by Sultan Mehmed II (Kuran, 1996). The shifting of the Capital did not decrease or reduce the importance of Bursa (Çizakça, 1980). Bursa maintained its position as the centre of east-west trade due to the shrinking of the Byzantine State and the expansion of the Ottomans (Çizakça, 1980). It was recognized as the administrative centre of many Anatolian provinces (Çizakça, 1980). Concisely, Bursa played a pivotal role as a hub for culture, commerce, and industry, leveraging its abundant resources for silk production and industry until the 19th century and engaging in global trade (Cantimur, 2013).



Figure 4.1: Location of Prusa in the Bithynian Empire (Çakıcı, 2015).

Although, Bursa has rich history and several civilizations passed through Bursa yet the Ottoman vernacular architecture remained the most. Nowadays, Bursa is considered as one of the most important cities that still accommodate the Ottomans vernacular architecture. Hence, during the establishment of Bursa as the capital of the Ottoman Empire many villages were constructed by the Ottoman architectural style. In this study, the village of Cumalıkızık is under focus. Türkiye has 24 wakif villages in total, seven (7) of them located in Bursa and Cumalıkızık one of the villages that were founded in the early 1300s (Hatice, n.d.) and (Bağbancı, 2016). Cumalıkızık is the most authentic and the best-preserved village among all the seven villages (Bağbancı, 2016). According to popular belief, Cumalıkızık has been given this name because it has a mosque with a Minbar (i.e. Minbar, in Islam, the pulpit from which the sermon “Khutbah” is delivered (Britannica, 1998)) where Friday prayer can be performed.

Bursa is a province of The Republic of Türkiye (Figure 4.2). Bursa today is the fourth largest city in Türkiye located in north western of Anatolia and southeast of the Sea of Marmara (POPULATION, CLIMATE, GEOGRAPHY, n.d.). Istanbul, Kocaeli, Yalova and Marmara Sea at the north, Bilecik and Adapazari at the east, Kutahya at the south, Balıkesir at the western boundary of the region (POPULATION, CLIMATE, GEOGRAPHY, n.d.).

Cumalıkızık is a village in the district of Yıldırım in the province of Bursa (Figure 4.2). Cumalıkızık is situated 13 Kilometres east of the historical city of Bursa, settled on the northern slopes of Uludağ (i.e. Mount Olympos). Cumalıkızık is on an altitude of 340 meters above sea level, the area of the village estimated at 1.15 km² (115 hectares). The village is positioned between two creeks Balıklı Dere to the east and Kilise Deresi to the west (Ahunbay et al., 2014).

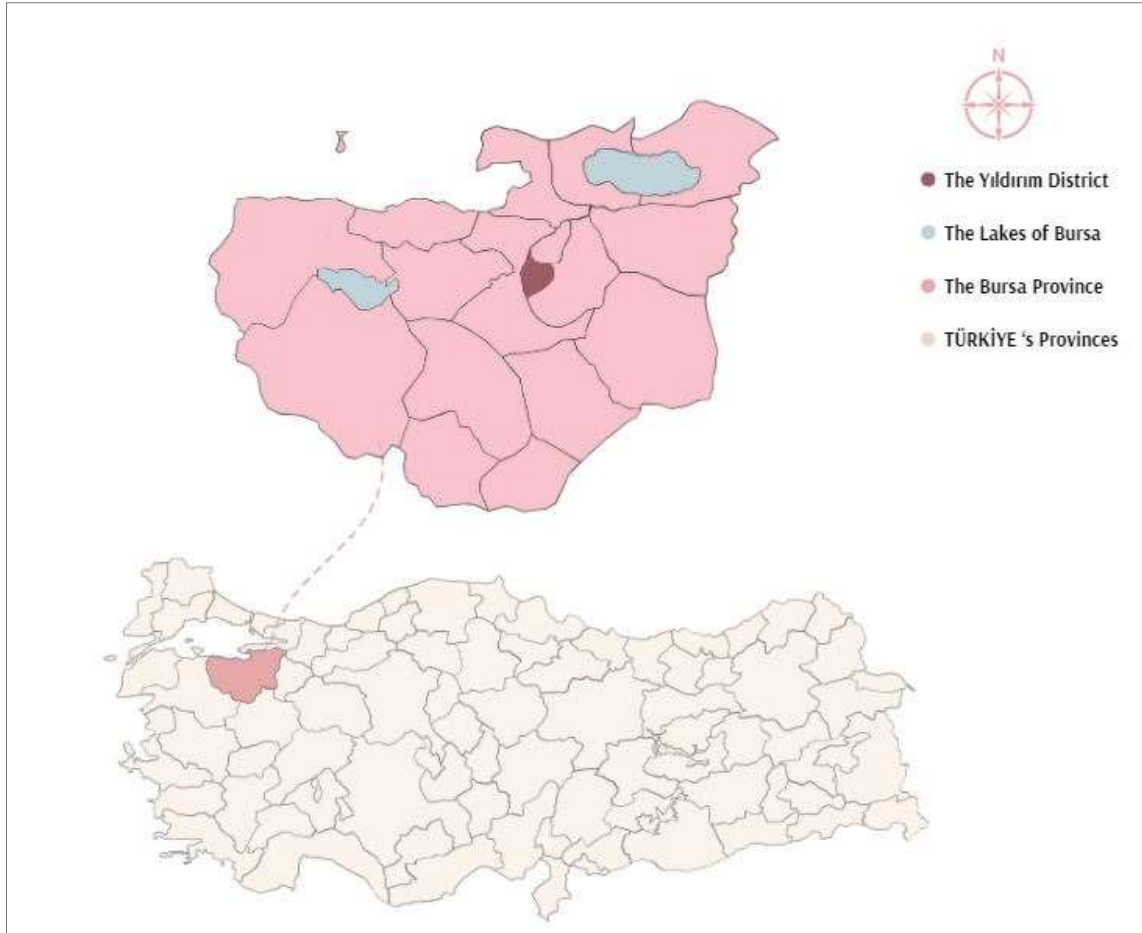


Figure 4.2: The Location of Bursa and Yıldırım District.

Modified from Source ((UNESCO World Heritage Centre, n.d.).

The climate of Bursa is generally mild climate, Cumalıkızık precisely classified as hot-summer Mediterranean climate according to Köppen-Geiger (Climate Bursa, n.d.). The province of bursa has a total surface estimated to 10 819 km². The plains surfaces in the region estimated to only 17% of the total surface, while 35% of the area covered by mountains. The mountains in the Bursa province are forming a chain of mountains directed

from east to west, where Uludağ (i.e. Mount Olympos) is the highest mountain in the province of Bursa with an altitude of 2543 meters. The traveller Evliya Çelebi described Bursa as abundant in water in his book “Seyahatname” (Pancaroglu, 1995). Bursa has several resources of water: lakes, rivers, creeks, streams etc. where Bursa’s two big sources of water are the Uluabat lake with an area estimated at 1134 m² and the Iznik lake with an area of 298 m² (POPULATION, CLIMATE, GEOGRAPHY, n.d.). Bursa contains of several major rivers Nilufer, Göksu, Kocaçay, Mustafakemalpaşa. While many streams of the southern slope of the Uludağ Mountain feeds Koca, Kara and Aksu creeks (POPULATION, CLIMATE, GEOGRAPHY, n.d.). Bursa also known for its healing thermal springs, the thermal baths attracted researchers, historians and travellers because of its healing powers and its architectural features that dated back to centuries (Çakıcı, 2015) (Pancaroglu, 1995) (Eyice, 1996).

The geographical features collectively contribute to the overall appeal and significance of Bursa as a city with a rich history, diverse landscape, culture importance and, unique architectural features. According to Pancaroglu (1995) in his paper, the Ottomans understood two important geographical features the mountains and the plain. This awareness according to him enabled them to effectively leverage the unique location and topography, ultimately optimizing the geographical context of the city (Pancaroglu, 1995).

4.1.1 UNESCO Heritage City Cumalıkızık

Cumalıkızık is the most authentic and the best-preserved village in Bursa (Bağbancı, 2016). Hence, in 2014 Bursa and Cumalıkızık were added to the UNESCO world heritage list under the title “Bursa and Cumalıkızık: The Birth of The Ottoman Empire” (Bursa and Cumalikizik; the Birth of the Ottoman Empire, n.d.).

The UNESCO WHC acknowledged that the criteria (i),(ii),(iv), and (vi) were fulfilled by Bursa and Cumalıkızık (Bursa and Cumalikizik; the Birth of the Ottoman Empire, n.d.). The description of the criteria covers different aspects, the history of Bursa and Cumalıkızık had important impact on the selection process since the city was the first capital of the Ottoman Empire and model for the future cities of the Empire, the empire that was extended from Europe west to Yemen east. The social life of Bursa and Cumalıkızık had an impact on the selection where the city shows the early ottomans traditions, myths, ideas and historical

events etc. Moreover, UNESCO WHC took the effective economic strategy managed by semi-religious organizations to optimize the public endowment system Waqif and commercial activities on consideration. Architecture also had an impact on the selection of Bursa and Cumalıkızık as world Heritage site where the innovative urban system with the fact that Bursa was the model city, in addition to the tombs that created a mystic overall appeal and the architecture that bears witness to civilizations that passed through the region. The following Table 4.1 aims to state the selection criteria of Bursa and Cumalıkızık in an easy manner:



Table 4.1: The Description of UNESCO's Selection Criteria of Bursa-Cumalikzık (Bursa and Cumalikzık; the Birth of the Ottoman Empire, n.d.).

UNESCO Criteria	Description
Criterion (i): "Represent a masterpiece of human creative genius"	- Bursa was created and managed by the first Ottoman sultans. - An innovative and ingenious urban system. - The effective economical strategy managed by semi-religious organizations in order, to optimize the public endowment system Waqif and commercial activities. - The establishment of Kulliyes as nuclei providing all public infrastructure services prior to the creation of neighbourhoods that allowed the empire to expand rapidly.
Criterion (ii): "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town planning or landscapes design"	- Bursa was a reference for the development of later Ottoman cities. - The new urban development approach was based on the construction of public infrastructure complexes outside the existing city core surrounded by walls, and created a new town for non-urban population. - The social, religious, and commercial functions of the new capital (Bursa), mirrors the values embraced by the society, incorporating influences acquired during years of migration from central Asia to the West. - The architectural style of Bursa was reflecting the Byzantine, Seljuk, Arab, and Persians who were attracted to Bursa to leveraging the social, religious, and commercial functions of the new capital.
Criterion (iv): "Be an outstanding example of a type of building, architectural or technological ensemble or landscape, which illustrates (a) significant stage(s) in human history"	- Bursa and Cumalikzık illustrate the first capital of the Ottoman Sultans, rulers of an Empire reaching from Anatolia to Yemen and including parts of Europe and North Africa for hundreds of years - Bursa was the pioneer of distinctive architectural design known as the "Bursa style" or "inverted T plan." the mosques with an inverted T layout, had guest rooms, kitchen and madrasah later the kitchen and madrasah became separate buildings in the complexes. - Kulliyes, as social units, meeting the requirements of the society and facilitating life, shaped the city by taking the multifunctional structure of this plan type as an example. In other words, the multifunctional inverted T plan is an exceptional building type, which illustrates uniquely the city planning system in Bursa. These Kulliyes, with their individual buildings constitute the urban nuclei of this system and characteristically shape the urban landscape of Bursa. While individual architectural components in Bursa can be considered as outstanding examples of architectural type - The khans, bedesten, mosques, madrasahs, tombs, hamams and houses as individual architectural components were the nuclei of the system of Kulliyes in Bursa.
Criterion (vi): "Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance"	- Bursa holds a direct association with significant historical events, myths, ideas, and traditions from the early Ottoman period. - The tombs of early Ottoman Sultans created mystic image of the city. - Bursa used to be the spiritual capital of the Ottoman Empire in the eyes of the Muslim World and the Ottoman leaders who chose their burial to be in Bursa due to their loyalty to their ancestors.

4.1.2 Vernacular Architecture in Cumalıkızık

This part of the dissertation is about the vernacular architecture in the city of Bursa, specifically the Ottoman vernacular architecture in Cumalıkızık. This part consists of the development of the city during the Ottoman Empire, settlements pattern, building envelope, and lastly the structural elements in Cumalıkızık houses.

4.1.2.1 Development of the city

The city was confined within the Bithynian's castle walls; the city was built as acropolis, which is Greek Style (Çakıcı, 2015). Acropolis refers to a high, elevated, or fortified area in ancient Greek cities (Acropolis, n.d.). Bursa as the first capital of the Ottoman Empire was the birth of new urban system (Bursa and Cumalikizik; the Birth of the Ottoman Empire, n.d.). The Ottomans while expanding beyond the city walls invented new urban planning system known as the Kulliye. The Kulliyes are imperial building complexes built by the first five Ottoman Sultans dedicated as wakif (i.e. public endowments) (Bursa and Cumalikizik; the Birth of the Ottoman Empire, n.d.) & (Çakıcı, 2015). Kulliye refers to a complex or to a functional centre of the neighbourhood as Dostoglu et al. (2004) described it, is built on the outskirts of the city walls where the mosque is the main structure surrounded by other interrelated buildings (Dostoglu et al., 2004). Each kulliye consisted of a mosque, madrasa that is a Muslim school, an imaret namely public kitchen in addition to public bath and bedesten that refers to covered commercial centre etc.

Later in the second half of 19th century, the earthquake that hit Bursa in 1862 changed the urban structure of Bursa, where many monumental buildings and houses were demolished. In addition, to the adoption of the Western rules and regularisations in political, social and economic structure by the Ottomans. Thus, the development of the city of Bursa had a new turn (Dostoglu, 2004).

4.1.2.2 Settlements pattern of Cumalıkızık

Cumalıkızık retains its vernacular architecture and natural texture. The narrow streets, the traditional houses and the open squares were built in smooth and harmonious way with natural features in the village. In the present time, the village retains its traditional life style

where 150 houses from 180 remained houses still used as dwellings by the inhabitants of the village (Tas, et al., 2009).

The village consists of an organic street pattern where the narrow curved streets are randomly developed (Kızılküşak, 2019). The direction of the streets from the north to the south of the village are inclined due to the sloppy topography where the streets parallel to the plain area are often flat in the direction of east west. The streets in Cumalıkızık are paved with slate stone; the edges of the streets are connected to the Stone Walls of the ground floor of the traditional buildings. Thus, the buildings and the street form a continuity of stone as shown in the (Figure 4.3).



Figure 4.3: Examples of Cumalıkızık Streets, Photographed by (Author, 2024).

At the intersections often the streets end by corner chamfers in the buildings located on the edges to avoid the sharp turns (Figure 4.4(a)). In addition, the streets of Cumalıkızık contain drinking fountains constructed on the stone walls of some traditional buildings for public use that enriches the streets pattern (Figure 4.4(b)). The Ottomans used a simple efficient way to direct the rainwater by taking advantages of the slope, where they constructed streets inclined towards their middle axis to direct the rainwater alongside to the sewer system that

is located under the rainwater flow which can be easily reached by removing two opposite slate stones (Kızılkıuşak, 2019). The streets in Cumalıkızık are pedestrians because the vehicles are not allowed since the maximum street width is 2.5m, which is too small for vehicles. The streets back then were constructed for human and animal circulation purposes only even the trees have no space to grow. Cumalıkızık narrowest street measured approximately 60 cm named Cin Street (Figure 4.4(c)), some narrow streets with the extensions of the upper floors of two buildings facing each other formed semi-covered streets (Figure 4.3). Furthermore, the traditional ottoman settlements had some streets blocked off at one end (Kızılkıuşak, 2019).



Figure 4.4: (a) Corner Chamfers / (b) Fountain / (c) Cin Street, Photographed by (Author, 2024).

The village of Cumalıkızık is divided into seven wards, which are Eğrek, Okul, Hamam, Orta, Dere, Değirmenyeri, Köyüstü (Figure 4.5). The wards are formed in an irregular manner around the centre ward where the mosque is located, “Orta Mahalle” as the Turk named it, is the oldest settlement in the village, all the alleys lead to the mosque, which makes it the centre of the village (Altunbas & Alptekin, 2004).

Due to the random development of the settlement, the lots exhibit irregular geometries (Figure 4.5). The largest lots are situated on the periphery and are primarily of dedicated for agriculture. In contrast, the lots in the residential area are smaller, with a single building often covering multiple lots. Generally, the lots are narrow on the sides facing the streets with elongated rectangular form (Figure 4.5) (Kızılkıuşak, 2019).

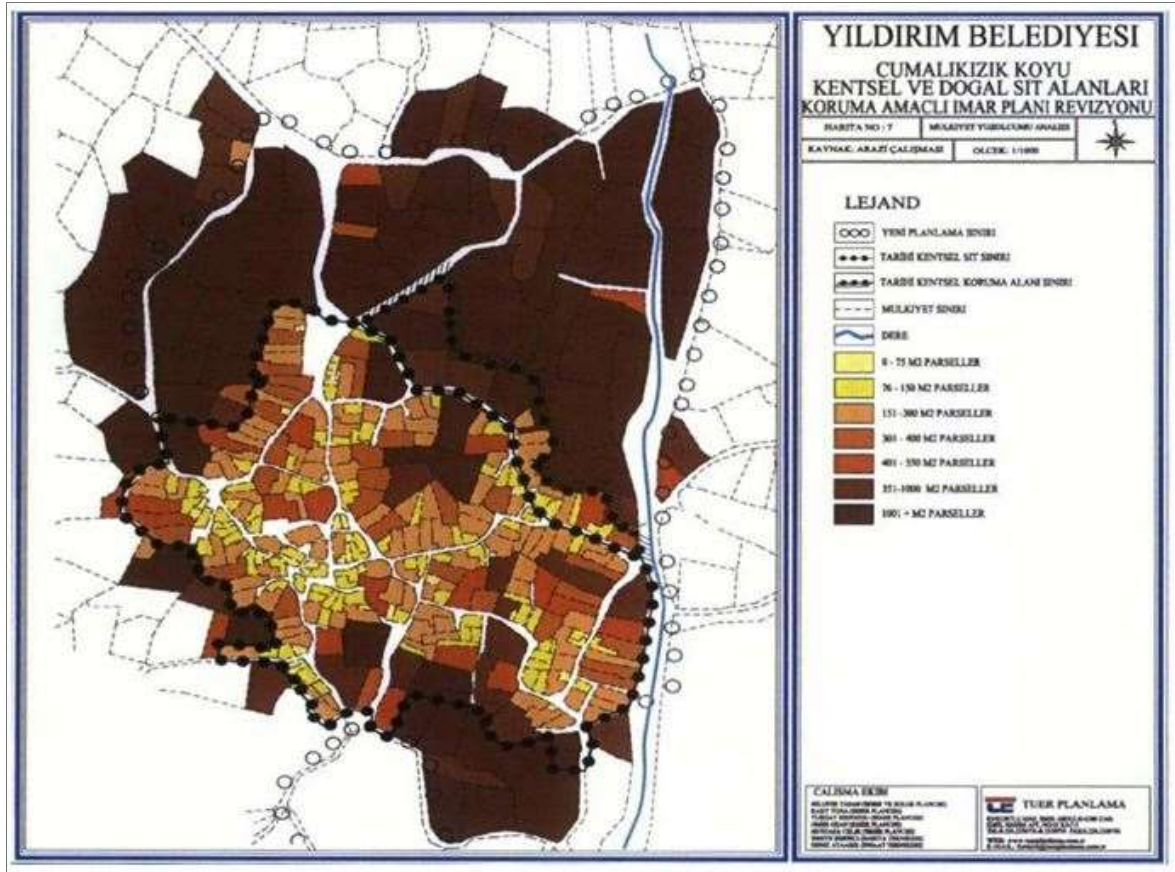


Figure 4.5: Lot Analysis (Kızılkuşak, 2019).

The buildings are generally arranged in adjacent order along the streets, thus located on the edge of the lots as shown in (Figure 4.6 (a)). The majority of the urban fabric in the village consist of residential buildings, while public and commercial buildings, such as mosques, baths, markets, police offices are rarely found (Figure 4.6 (b)). Some village occupants utilize their ground floors, and public open spaces such Eğrek Square and the streets for commercial purposes as illustrated in (Figure 4.6 (c)). In conclusion, the settlements of Cumalıkızık can be described as dense, with semi-open courtyards and main buildings reducing the ratio of open spaces (Kızılkuşak, 2019).



Figure 4.6: (a) The Buildings Arrangement / (b) Cumalıkızık Mosque /(c) Commercial Spaces.

Photographed by (Author, 2024).

4.1.2.3 Building envelope of Cumalıkızık

The Ottoman traditional buildings in Cumalıkızık referred to as Himish (i.e. Hımış in Turkish language). Where Himish according to Cantimur (2014) is as the following:

“The traditional timber-framed buildings, a hybrid construction technique, named himis in Turkish. The main characteristic of this technique is the construction of the ground floor in masonry and the upper floor(s) using the timber-framed technique”. (Cantimur, 2014)

This type of traditional building widely seen in the territories of the Ottoman Empire (Kızılküşak, 2019). The Himish buildings employed a hybrid construction system composed of massive Stone Walls at ground floor and wooden skeleton filled by adobe on the upper floors (Ozorhon et al., 2014). According to Kızılküşak (2019), Cumalıkızık has three types of residential buildings (Figure 4.7) Type-A which is the most famous type in the village, the main building is situated in the façade facing the street, this type if it has a courtyard it will be located in the back, the entrance from the street lead directly to the main building. Type-B of houses both main building and courtyard are in the façade facing the street, but the entrance generally located on the Stone Wall of the courtyard. Type-C of houses has courtyard Stone Wall in the façade facing the street where the entrance is directly from the courtyard while the main building situated on the back of the lot (Kızılküşak, 2019).



Figure 4.7: Type of Buildings in Cumalıkızık, Photographed by (Author, 2024).

The Buildings of Cumalıkızık reflect the lifestyle of their occupants. Generally, the houses are two or three stories. The access to the houses is directly from the street to the ground level through double-winged wooden doors (Figure 4.8 (a)). The ground level is generally composed of the courtyard, which is an entrance to a semi open space called Hayat located under the building mass (Figure 4.8 (b)), composed of blind massive Stone Wall built using rubble stone sometimes framed by wooden skeleton (Figure 4.8 (c)). The upper levels are constructed by skeleton wooden structure filled with adobe, rest on the ground level Stone Wall and wooden posts. Usually plastered by mud plaster and painted using ochre paints (Figure 4.8 (d)). The height of each story vary according to seasonal uses, the second story called mezzanines which is a floor designed with low height ceiling and small windows openings that face the street, the mezzanines is suitable for the harsh winters. While the third story designed as hot summer space with high ceiling and large windows. The foundations constructed by rubble stones and/or rocks collected from the area nearby while the roofs of the village exist in several forms such as pitched or Gambrel constructed using wooden elements.



Figure 4.8: (a) double-winged doors/ (b) Hayat / (c) Stone Wall/ (d) Upper levels walls.

Photographed by (Author, 2019).

4.1.3 The Structural Elements in Cumalıkızık Houses

In this part, the structural elements in the housing system of the vernacular architecture of the village of Cumalıkızık will be discussed from the foundation to the roof.

4.1.3.1 Foundations

The foundational system in Cumalıkızık consists of strip footings along the Stone Wall of the main building, as well as isolated footings beneath the wooden posts situated in the courtyard. The strip footings are constructed using rubble stones and/or rocks, often sourced from the surrounding area. In some cases, large rocks already present on the site are utilized (Figure 4.9). In both cases, the cross-section of the foundations is larger than that of the Stone Wall (Kızılkıuşak, 2019). While the isolated footings are entirely separated from the strip footings and constructed using either one or more slate stones or rubble stones (Figure 4.10) (Kızılkıuşak, 2019).

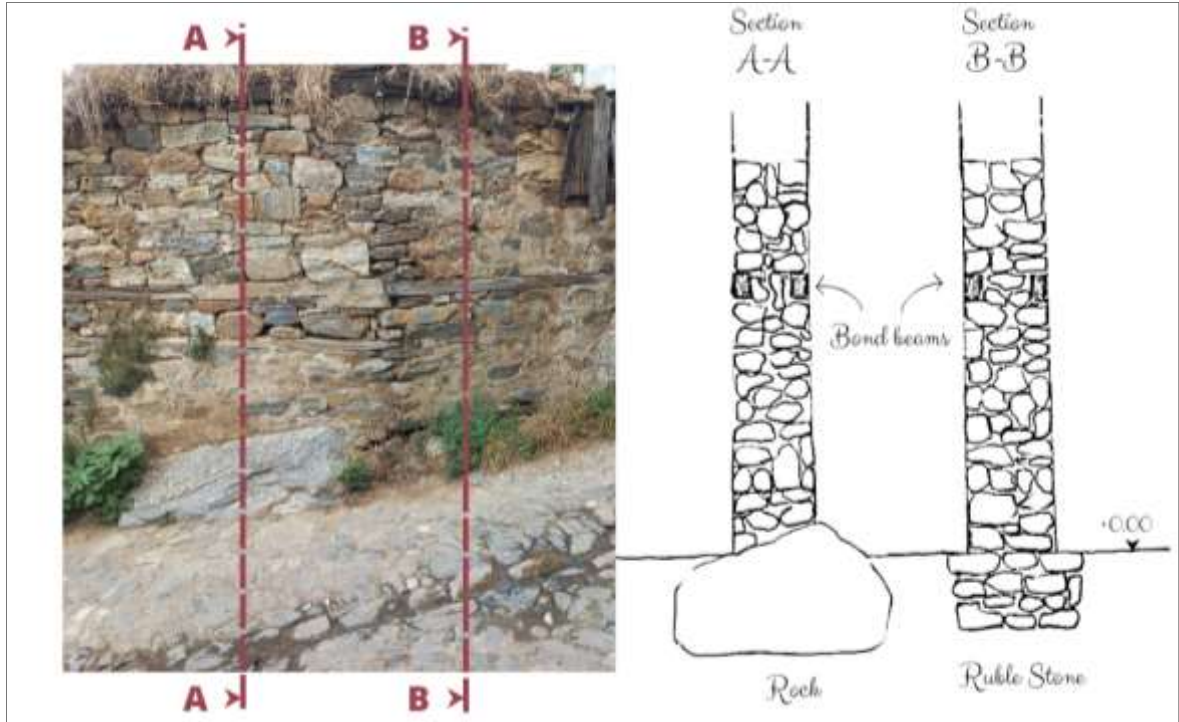


Figure 4.9: Strip Footing in Cumalıkızık Houses.

Modified from Source (Kızılkışak, 2019).

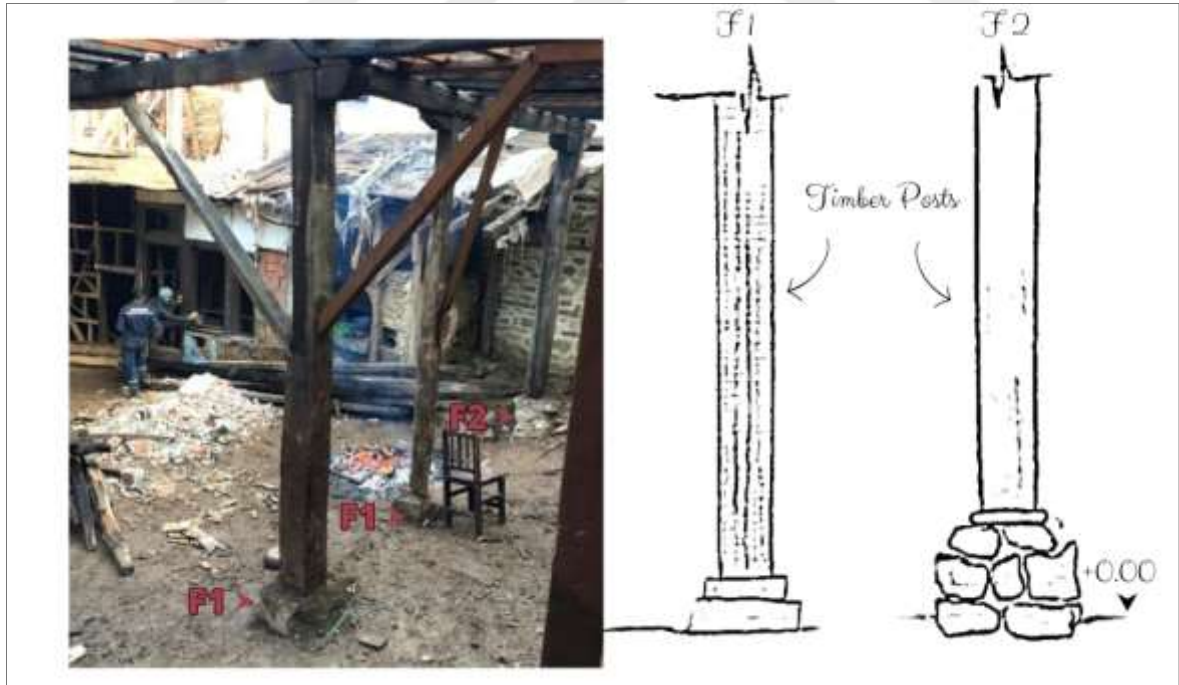


Figure 4.10: Isolated Footing in Cumalıkızık Houses.

Modified from Source (Kızılkışak, 2019).

4.1.3.2 Facades walls

The Himish (i.e. Hıdı) buildings in Cumalıkızık built with two different walling materials, rubble stones for the facades of the ground floor, and a wooden framework filled with adobe bricks for the facades of the upper levels.

Two types of Stone Walls exist in Cumalıkızık: Framed Stone Walls and Unframed Stone Walls. The Framed Stone Walls consist of posts placed at the corners supported by braces forming a frame for the stone walls (Figure 4.11). The Unframed Stone Walls consist of stacked stone around the periphery of the ground level and especially at the corners (Figure 4.12). The stone used to construct the walls is rubble stones collected nearby streambeds such as Kilise, Büyük and Küçükbalıklı streams, the stones generally have no regular geometry and yet, square like and rectangular stones can be observed. The Stone Wall generally armed by bond beams parallel to the ground and repeated several times. The ground floor walls lack of openings (i.e. windows) although some of the occupants provided ventilation openings (i.e. small opening on the walls) with different shapes (Figure 4.13) in the Stone Wall when it was used as a stable (Perker & Akincitürk, 2011). Thus, the openings in the Stone Walls in Cumalıkızık were related to the usage purposes of the floor itself (Kızılkışak, 2019).

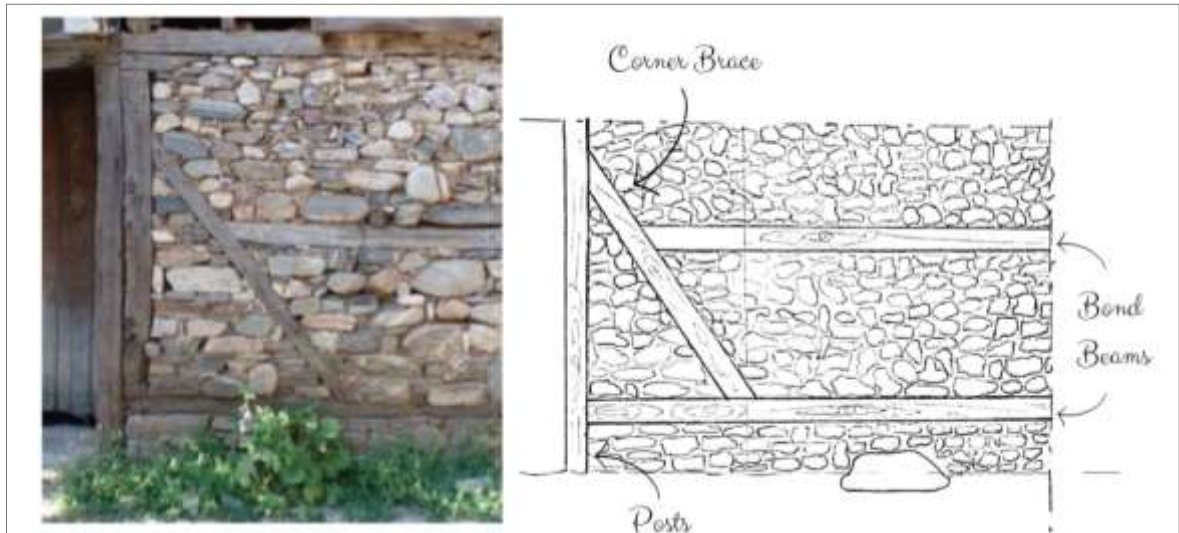


Figure 4.11: Framed Stone Wall, Modified from Source (Kızılkışak, 2019).

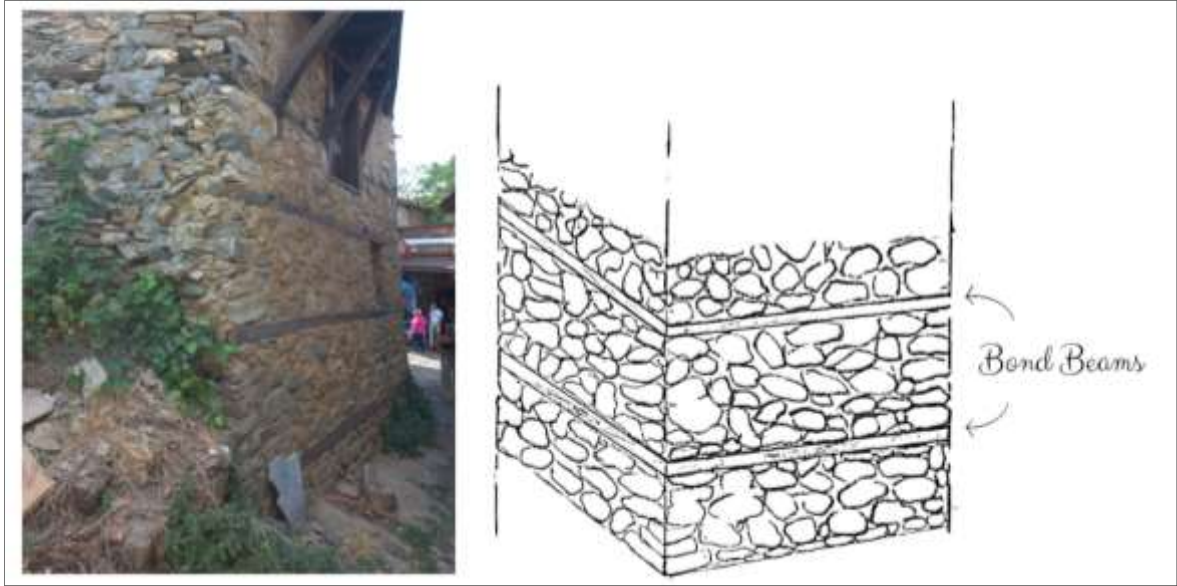


Figure 4.12: Unframed Stone Wall, Photographed by (Author, 2024).



Figure 4.13: Ventilation Openings, Photographed by (Author, 2024).

The main elements of the timber-framed walls (i.e. wooden skeleton) of the upper floors are as the following (Figure 4.14). First element is Plate, in each façade two plates are provided one in the bottom side lay on the slab under and is called soleplate (Figure 4.14) and, one in the top in order to support the roof structure and enclose the rectangular Wooden Skelton and is called top plate (Figure 4.14). The plates (i.e. beam) are placed in each side of the structure and they are linked to each other and laying on the posts under in the corners.

Second element is Posts, main and secondary posts are used in the timber skeleton. The main posts are always the ones placed in the corners and called corner posts (Figure 4.14); the secondary posts are always parallel and placed between the main posts, usually placed along the wall if needed called stud. Third elements are braces, at the corners of the wooden structure; corner braces are applied to the main posts at diagonal forms in both sides to withstand wind and earthquake loads (Figure 4.14). Lastly, usually between main elements of construction, vertical (i.e. cripples) and horizontal wood elements are placed as needed to create windows openings and support the infill materials (Kızılkışak, 2019) and (Perker & Akincitürk, 2011).

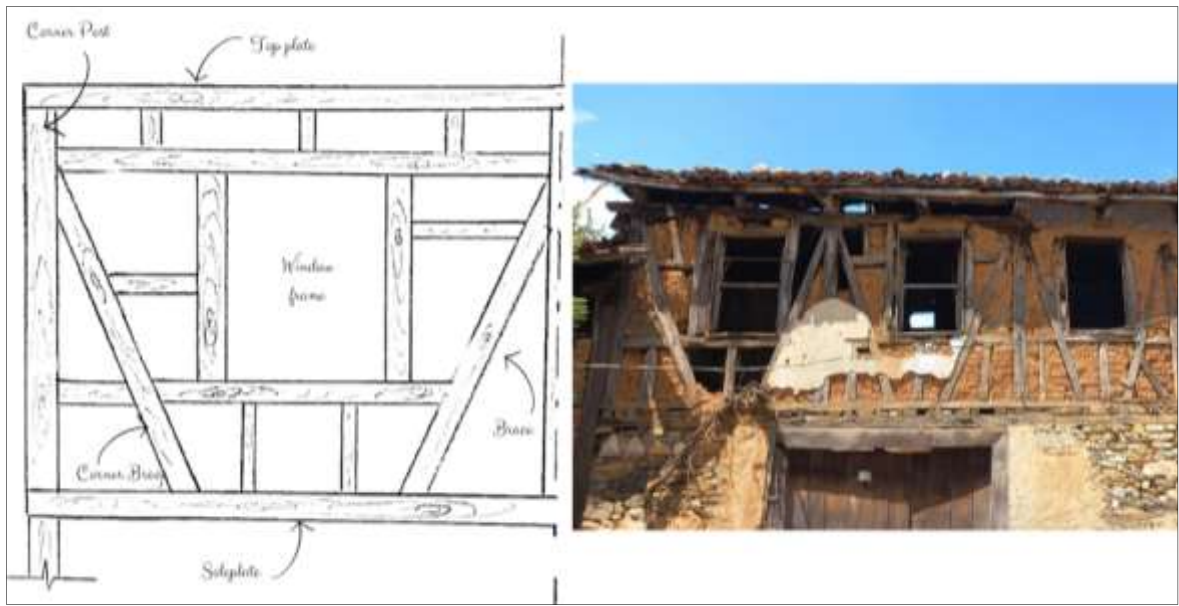


Figure 4.14: The Wooden Skeleton System in Cumalıkızık Traditional Houses.

Photographed by (Author, 2024).

The upper floors walls in Cumalıkızık houses filled by Adobe (i.e. mudbrick). Adobe made from the red soil found in the region mixed with straw and water dried under the sun in wooden moulds. Adobe used to fill the spaces between the wooden skeleton system in either flat or herringbone pattern (Figure 4.15) (kader & Işık, 2023).



Figure 4.15: Adobe Fill Material Between the Wooden Framework in Cumalıkızık Houses.

Photographed by (Author, 2024).

4.1.3.3 Timber posts

The interior part of the main building and courtyard has timber posts and timber frames systems that carry the upper levels (Kızılküşak, 2019). The timber posts are vertical structural elements with square, rectangular or circular cross section.

In Cumalıkızık the height of the posts, depends on the level height and the supported load (Kızılküşak, 2019). When the Posts are excessively tall, knee braces are nailed in diagonally between the timber post and the beams above (Figure 4.16 (a)). Additionally, timber posts with bolsters are also present (Figure 4.16 (b)).

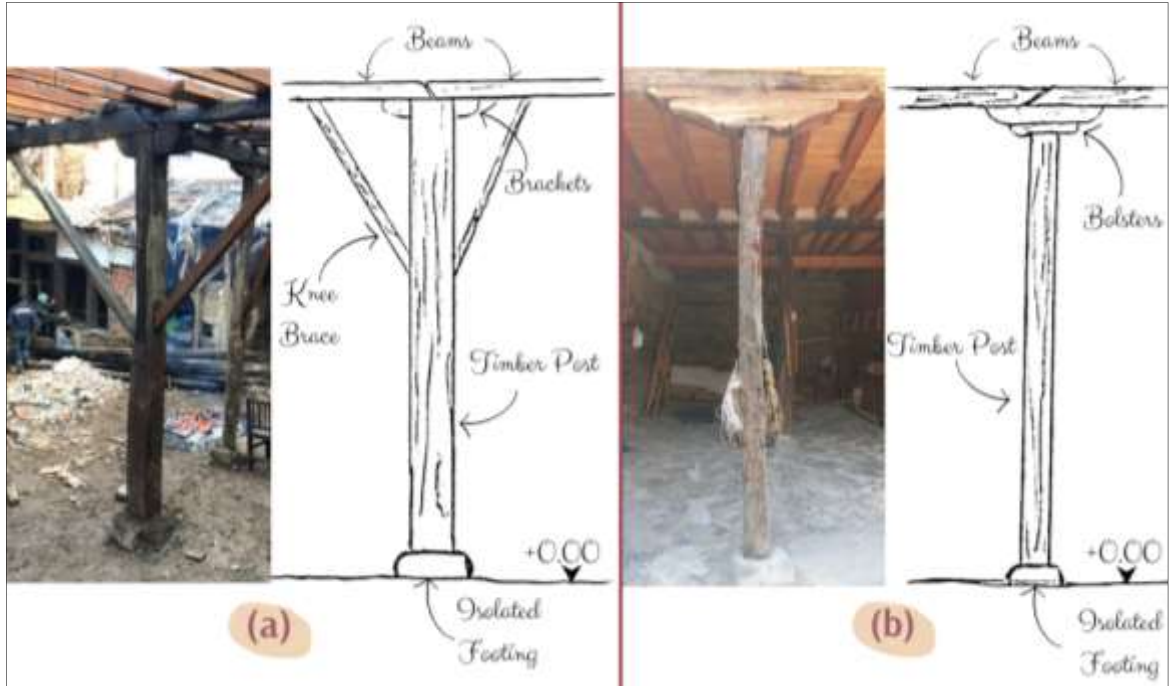


Figure 4.16: (a) Timber Post with Knee Braces/ (b) Timber Post with Bolsters.

Modified from Source (Kızılkışak, 2019).

4.1.3.4 Slabs

In Cumalıkızık, the ground level floors are either paved with stone slate and or left unpaved (i.e. earthen floors) (Figure 4.16). The upper floors slabs structure consist of secondary beams laid along the principal beams (Figure 4.17). The secondary beams generally placed in one direction to avoid their bending, a perpendicular beam is added where the junction point is the location where the upper floor main posts are placed (Figure 4.17).

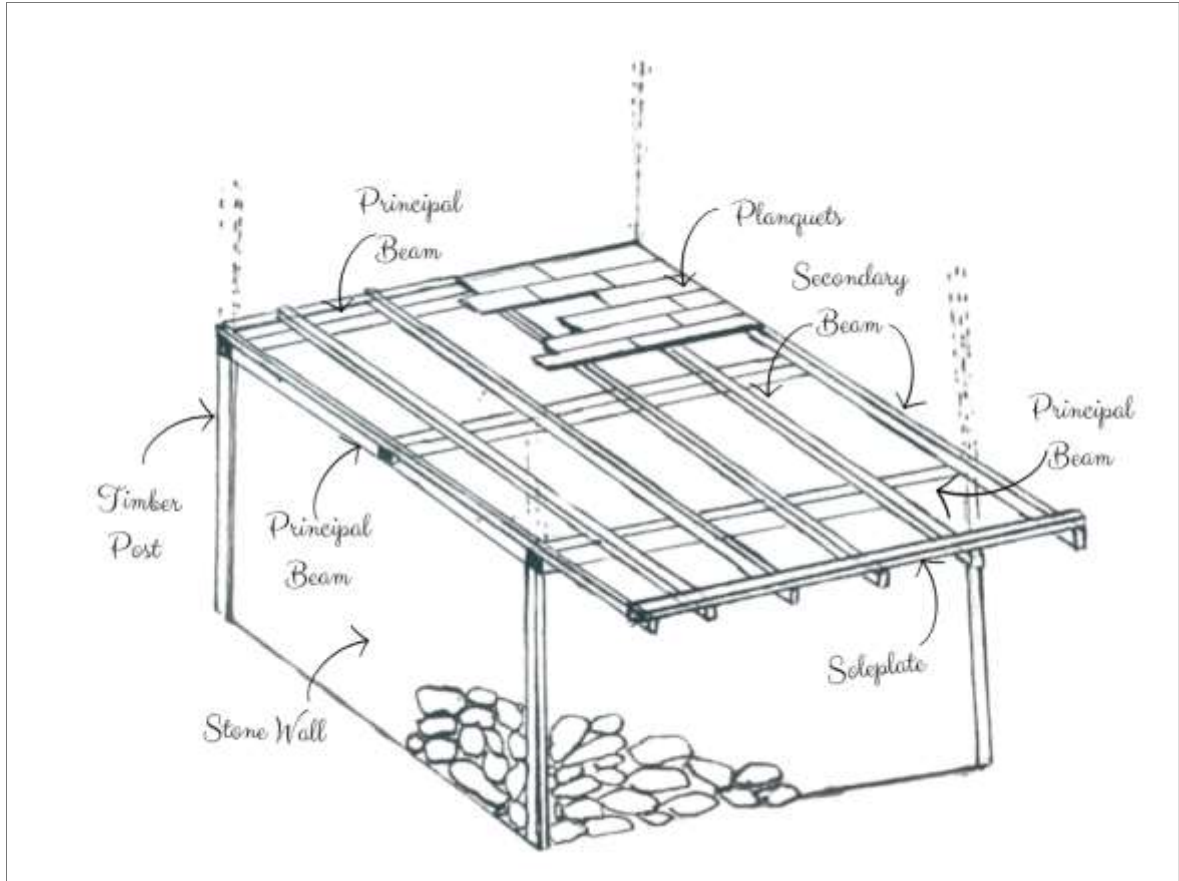


Figure 4.17: The Slabs Structure of Cumalıkızık Houses.

Modified from Source (Perker & Akincitürk, 2011).

The expansions of the upper levels in Cumalıkızık buildings generally has rectangular or polygonal form. The expansion is created by extending the secondary beams of the first level, in the case where the expansion is significant multiple buttress provided to reinforce the slab as shown in (Figure 4.18(a)) (Perker & Akincitürk, 2011).



Figure 4.18: The Forms of the Extensions of Upper Level Floor of Cumalıkızık Houses.

Modified from Source (Perker & Akincitürk, 2011).

4.1.3.5 Roofs

In Cumalıkızık, the upper coverings (i.e. Roofs) are either gambrel or pitched roofs. Are also commonly utilized to a significant extent (Figure 4.19) (Kızılküşak, 2019) and (Perker & Akincitürk, 2011).



Figure 4.19: Aerial View of Cumalıkızık Houses (Perker & Akincitürk, 2011).

The girders, king post, rafters, and battens are the main structural elements in the roofs of Cumalıkızık houses, made totally with wooden timbers. The girders has square or rectangular cross-section and they are the first elements placed above the Principal beams along the shorter side of the building see (

Figure 4.20). The girders are placed perpendicularly (i.e. on the top and it passes by the axis of the main posts) to the main posts. In the middle of the girders the king post with square cross section is placed as (

Figure 4.20 (b)), the roof king post always posed above the middle post of the wall under. Between the Girders and main post in the facade, numerous secondary wooden elements, both vertical and horizontal, are provided to facilitate the insertion of bricks infill (

Figure 4.20 (b)). The rafters are one of the main structural elements, their cross section mostly rectangular form. The elements enclose the frame by connecting the main posts from the top and the roof girders from the bottom and it extends outside the main building (

Figure 4.20 (a)). Battens wooden elements has square cross section placed along the rafters. The Battens connect the rafters and prepare a surface for the boards (

Figure 4.20 (a)) (Kızılküşak, 2019).

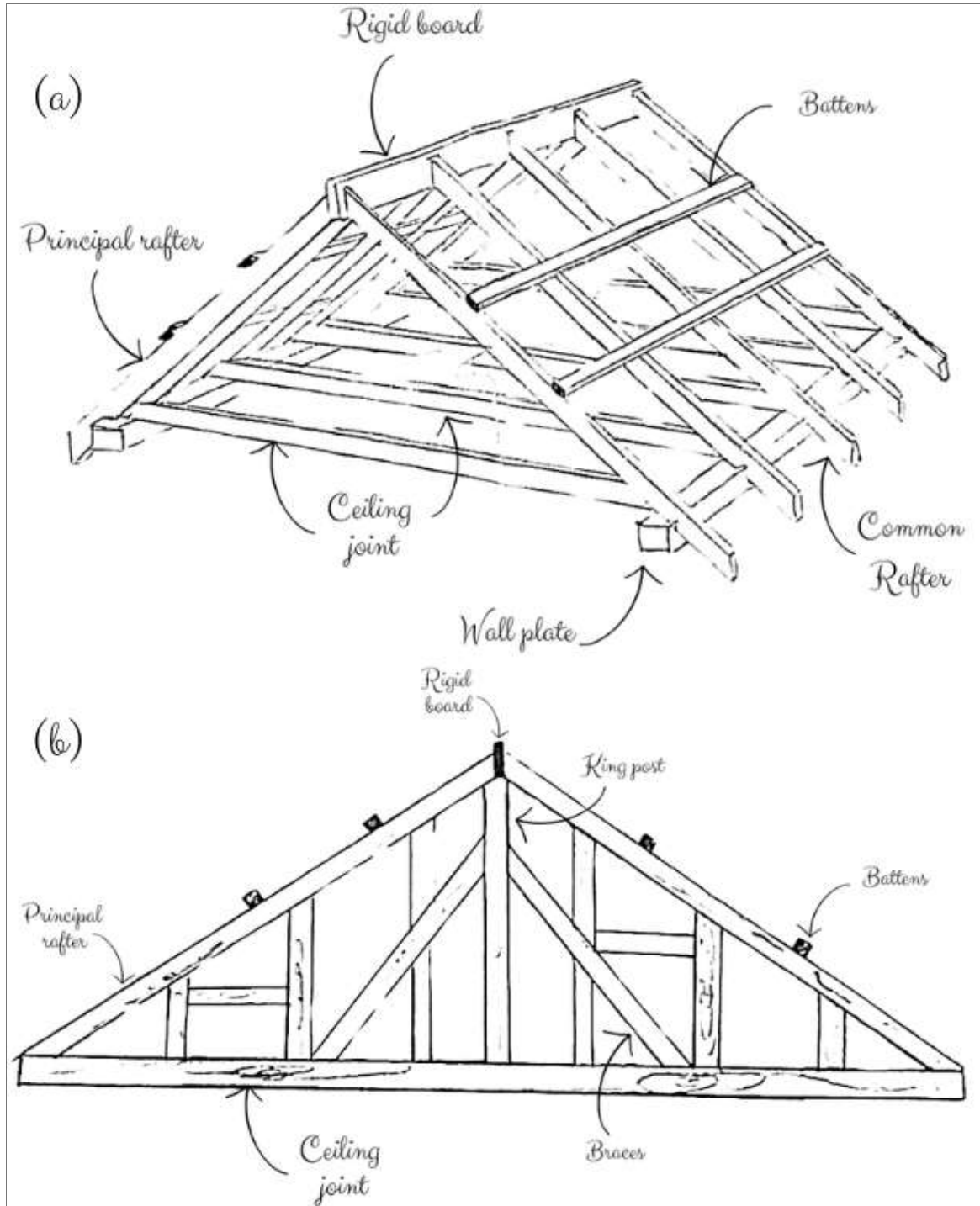


Figure 4.20: Example of Cumalıkızık Roofs Structure.

Modified from Source (Kızılkışak, 2019).

4.1.4 Vernacular Materials of Construction in Cumalıkızık

Vernacular or nonconventional materials refers to the materials locally sourced and readily available in nature. It can be used directly (i.e. raw materials) such as wood and rubble stones, or prepared locally using traditional techniques using some locally available materials such as adobe, mudbricks and mud plasters etc. vernacular materials are classified as sustainable materials (Harries & Sharma, 2019). The following part will cover the vernacular material used to construct Cumalıkızık settlements.

4.1.4.1 Wood

Bursa earned the Turkish epithet “Yeşil Bursa” which means “The Green Bursa” due to its natural features (Pancaroglu, 1995). In addition, the variety of trees and its fertile plains. The botanist Joseph de Tournefort stated,

“Trees there are of a surprising beauty and create a beautiful landscape, intermingling with houses whose terraces look out onto a perfectly delightful view” (Pancaroglu, 1995).

According to Evliya Çelebi, the inhabitants of Bursa were grateful to the greenery where they had the opportunity to enjoy of 366 green open space around the city, the majestic trees (i.e. chestnuts) and, the splendid panoramas views (Pancaroglu, 1995). Bursa had a variety of trees, the occupants of the city were leveraging of this abundance. Bursa as the producer of silk in the Ottoman Empire the Mulberry trees were found in large numbers in the city, where Mulberry trees served as the foundational source for Turkey's silk industry (Stotz, 1939). In the 1950s, the chestnuts trees were considered as the main source of income in Cumalıkızık alongside with agriculture. Furthermore, In Cumalıkızık the trees were the main source of wooden materials of construction. In 1977, Bursa's Trees became under the protection of UNESCO under the category of natural monuments (Çakıcı, 2015). Nowadays, the local economy of Cumalıkızık is no longer depending on the chestnut trees or agriculture as before but Bursa is still a fertile land for a variety of fruits and vegetables (Tas et al., 2009).

4.1.4.2 Stone

In Cumalıkızık Stone was one of the main material of construction in the region where the streets, the ground floor walls and pavements in addition to the foundations were built by

rubble stones. The occupants of the village used to collect stones that are used for construction, from nearby streambeds (Ozorhon et al., 2014). The Stone used for construction in the village of Cumalıkızık has not a specific size nor a regular geometry. However, it is notable that the stones used for Stone Walls are smaller than the ones used as foundation or substructure base. While the stones used for paving the streets and ground level has different geometry.

4.1.4.3 Adobe

In Cumalıkızık houses adobe was used to fill the walls wooden skeleton where the bricks were bound by mud mortar (i.e. Plaster) in vertical, horizontal or diagonal order (Figure 4.21). The occupants prepared the mixture and dried it in the meadow located in the village. The colour and size of bricks were not standardized some bricks were yellow while others turned to be more red due to the ratio of straw in the mixture (Kızılküşak, 2019).

4.1.4.4 Plasters

In the houses of Cumalıkızık, the plasters are used as finishing paste to protect the wooden elements and as binding material when filling the walls by adobe. The plasters used in the village are made locally using vernacular materials including Straw, clay and water (Figure 4.21).



Figure 4.21: Example of the Usage of Plaster and Adobe in Cumalıkızık.

Photographed by (Author, 2024).

4.1.4.5 Paints

The indigo-based paints were used to paint the upper walls of the houses in Cumalıkızık (Figure 4.22). According to Akinciturk & Kilic (2004), Cumalıkızık houses are painted by the indigo colour for both interiors and exteriors walls (Akinciturk & Kilic, 2004).



Figure 4.22: Upper Floors Painting, Photographed by (Author, 2024).

4.2 CAPPADOCIA

The history of Cappadocian settlements dated back to the Assyrian Trade Colonies -Proto-Hittites period in 3000s BCE (Solmaz, 2013). Since back then many civilizations passed by the region. According to “Kapadokya Mevcut Durum Raporu” the region passed by three main epochs, the period between the Palaeolithic and Antiquity, which is the longest period it represent the first epoch, the second epoch is the period of Roman and Byzantine empires where the third epoch is during the Ottoman rules (Görmez, 2002). According to Ateş (1996), the kingdom of Cappadocia was established for the first time in the period of 333 and 323 BCE by the Macedonian king Alexander the Great (Ateş, M. 1996). However, the kingdom did not last long and many conquests passed through the region before and after the establishment. According to Ateş (1996), Cappadocia became the name that refers to the central of Anatolia in the period between 575 and 546 BCE after the Persians conquests of

the area (Ateş, 1996). While the origin of the name of “Cappadocia” have been narrowed to two sources, some researches argue that the first appearance of Cappadocia was under the name of “Katpatuka” which means the land of well-bred horses in Persian language, Katpatuka was carved in the Bisitun (*or Behistun*) inscription (Sevin & Veli, 1998). The inscription is the longest trilingual cuneiform inscription, located in the Zagros Mountains near to Iran, it was authored by the Persian King Daruis I that describes his conquests dated back to 6th century BCE (Sevin & Veli, 1998). While others inclined towards the assumption of the historian “Pliny the Elder” that Cappadocia named after the Kappadoks Stream that is known as Kızılırmak River in the present time (Sevin & Veli, 1998). Although Cappadocia had big and interesting history, Cappadocia always known because of its magnificent natural distinction and its rocky architecture, which represents the integration of human with nature.



Figure 4.23: The Boundaries of Old Cappadocia (Flickr Search — “cappadocia.”n.d.).

Cappadocia geological structure is very special and unique. The formation of Cappadocian geology was million years ago due to the ashes and lava that covered the area after the volcanic eruption of Erciyes Mountain, Hasan Mountain and Güllü Mountain (Tuncel, 1998). The lava flows formed volcanic rock layers such as tuff, and then were naturally sculpted by the forces of wind, rain, and temperature fluctuations. The erosion of the

volcanic rocks over the time created what is known as fairy chimneys, the fairy chimneys have different shapes and dimensions therefore different types such as mushroom shaped, capped, conical, columnar and pointed (Tuncel, 1998). One of the characteristics of the Tuff rock is the softness, the softness of the tuff rock allowed the inhabitants of the area to dig into the rocks to provide dwellings, thereby many underground cities, caves were carved by humans for living, worshipping and storing purposes.

Cappadocia is located in the centre of the present Türkiye. The boundaries of the region have changed throughout history. However according to Ozata (2015), Cappadocia is located on east-central Anatolia bordered from the south by Taurus Mountains Chain and from the north by Kızılırmak River (Figure 4.23) (Ozata, 2015). Nowadays, Cappadocia comprises of five provinces Aksaray, Nevşehir, Kayseri, Niğde and Kırşehir (Figure 4.24) (Şakar & Güçhan, 2018). While Nevşehir province and a valley of Kayseri province are the morphological boundaries of Cappadocia, precisely the location of the fairy chimneys (Ozata, 2015) and (Solmaz, 2013).



Figure 4.24: The Boundaries of Modern Cappadocia.

Modified from Source (UNESCO World Heritage Centre, n.d.).

Cappadocia has a continental climate cold winter and hot dry summers during the day and cool nights, because of the altitude (Ozata, 2015) and (Yıldız, 2006). The region forms a

triangular shape high plateau with an altitude of 1300m to 1400m (Aydan & Ulusay, 2003). The plateau is surrounded by three mountains Erciyes, Melendiz and Hassan Volcanoes. Where Erciyes Mountain is the highest with an altitude of 3917m, than Hasan Mountain with an altitude of 3254m and lastly Melendiz Mountain with an altitude of 2935m (Aydan & Ulusay, 2003).

The water source of the region is Kızılırmak River and its branches, in addition to its main role, “This River with its sub branches was the principal architect of the spectacular morphological features in the Cappadocia Region” as Aydan &Ulusay (2003) described it (Aydan & Ulusa, 2003). The river passed through the north part of the region and it is the longest river in Türkiye with a length of 1151km the river covers approximately 11% of the country's territory (Lekkas, n.d.).

4.2.1 UNESCO Heritage Site Cappadocia

Cappadocia is a site where humans and nature worked in harmony. The natural masterpiece was carved, and then settled by humans, creating an outstanding example of vernacular human settlements. The distinctiveness of a region affords opportunities for garnering both national and international recognition. In 1976, Cappadocia was listed as “Protected area” and then as “National park” in 1986 by the Turkish authorities (Şakar & Güçhan, 2014). Besides that in 1985, the UNESCO selected Cappadocia as World Heritage Site (Özata & Arun, 2018). It was added to the list under the title of “Göreme National Park and the Rock Sites of Cappadocia”.

The UNESCO WHC acknowledged that the criteria (i),(iii)(v) and (vii) were fulfilled by Cappadocia (Gorme National Park and the Rock Sites of Cappadocia, n.d.). The description of the criteria covers different aspects, the existing of several and well preserved rupestal sanctuaries dated to the post-iconoclastic Byzantine art period in addition to stone dwellings, churches and monasteries dated back to the 4th century covers the history of Cappadocia. The natural features of the region also had impact on the selection as world heritage site according to the criteria where UNESCO WHC described Cappadocia as a spectacular landscape, which interacts with the cultural elements.

The following Table 4.2 aims to state UNESCO’s selection criteria of Cappadocia in an easy manner:

Table 4.2: The Description of UNESCO's Selection Criteria of Cappadocia (Gorme National Park and the Rock Sites of Cappadocia, n.d.).

UNESCO Criteria	Description
Criterion (i): "Represent a masterpiece of human creative genius"	▪ The existing of several and well preserved rupestal sanctuaries dated to the post-iconoclastic Byzantine art period.
Criterion (iii) : "Bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared"	▪ Stone dwellings, villages, monasteries, and churches preserve the fossilized essence of a region once part of the Byzantine Empire from the fourth century until the advent of the Seljuk Turks in 1071.
Criterion (v) : "Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."	▪ Because of The natural erosion and tourism, the outstanding example of a traditional human settlement in Cappadocia become vulnerable.
Criterion (vii) : "Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance"	▪ The spectacular landscape of the region, the Göreme Valley and its surroundings provide a great beauty that sculpted naturally due to natural forces, which interact with the cultural elements.

4.2.2 Vernacular Architecture in Cappadocia

The vernacular architecture is traditional architecture built using vernacular materials with traditional techniques and serve the needs of the region occupants as defined in the previous parts. Cappadocia's settlements are considered as vernacular architecture and specifically as rocky vernacular architecture (Haji et al., 2018). Where rocky architecture in Cappadocia is classified as "Cavate" by the archaeologists, which is a type of cliff dwellings. Cavate in English Dictionary is defined as "cut in soft rock: excavated" (Cavate, n.d.) and according to Hajirasouli (2015) Cavates are shelters carved into the cliff itself (Hajirasouli, 2015). The structure that starts from a hole dug in a rock to a space that can be enlarge and expand to serve human needs is rocky architecture according to Asadi (Hajirasouli, 2015). Where the rocky architecture according to Emge is the architecture based on carving rocks or a cliff to create a usable furnished space. The furniture such as shelves and niches are "the elements constructed on the rock and stone walls with various dimensions to put some stuff, tools and things" (Solmaz, 2013) to serve the occupants needs and requirements (Haji et al., 2018). This type of architecture it can be considered as economic due to the lack of material transportation, ventilation and heat fees thus, it is environmentally sustainable architecture (Hajirasouli, 2015).

This part of the thesis is about the vernacular architecture in the region of Cappadocia. This part consists of the development of the region, settlements pattern and building envelope of Cappadocia. Lastly, the structural elements and materials used in Cappadocia settlements.

4.2.2.1 Development of the region

Cappadocia's spectacular and unique landforms is a surviving example of the natural urban plan that humans had settled. The settlements history according to Solmaz (2013) began at the Neolithic period, where the humans started to carve the rocks based on the facts of discovering tools and artefacts that belong to the Neolithic era in the area of Cappadocia (Solmaz, 2013). According to Hajirasouli (2015) the seventh century was the period when the underground cities and troglodyte villages began to be occupied by the Christians and Hermits who took refuge to Cappadocia as Emge and Brockman argue (Hajirasouli, 2015). Furthermore, the "Kapadokya Mevcut Durum Raporu" specified 9th and 11th centuries as the period of carving many monasteries around Goreme and Zelve (Görmez, 2002). Briefly,

Cappadocia was always a safe place for the Christians and Hermits who were under the threats and coercion of, first the pagan Roman and later the Arabs and Sassanid army or from Persecutors as Hajirasouli (2015) describes them (Hajirasouli, 2015). Where the Persecutor in the English dictionary “*Oxford Languages*” refers to “a person who persecutes someone for their ethnicity, religion or, political believes” who used to take the mountains and underground cities as their refuge (Hajirasouli, 2015). Regard the subject, the urban plan in the region of Cappadocia was planned by Mother Nature, humans had only to adapt with the existing landscape. In fact, in early time the need for dwelling was simply solved by carving spaces that conform to their needs either above or under the ground whereas the area has many underground cities. In later periods also due to Human needs, rocks masonry (i.e. carefully shaped and fitted pieces of natural rocks) started to be incorporated to construct extension parts to the old houses (i.e. to the natural formulation such as Fairy Chimneys) where this type of construction is known as mix construction. The last period is when the inhabitants of the region started to construct with masonry only. Consequently, the development of the region was neither regular nor planned; it was random and depended to human needs.

4.1.2.2 Settlements pattern of Cappadocia

The characteristics of settlements patterns of Cappadocia did not conform to the strict design rules. Since the settlements comprise clusters of cave, dwellings dispersed on sloping terrain (Akdağ & Sayar, 2020). According to Hajirasouli (2015), Cappadocia settlements “is identified as settlements created amongst the cliffs and rocks” (Hajirasouli, 2015). The classification of Cappadocian settlements in the previous researches is divided into either two or three categories. Some of them such as Akdağ & Sayar (2020) argue that the settlements of Cappadocia can be classified under three categories: cliff or semi-underground settlements, underground settlements and modern rock structures (Akdağ & Sayar, 2020). While other researches such as Hajirasouli (2015) classified it into two main categories: Underground settlements and semi-underground or cliff settlements (Hajirasouli, 2015) which is more convenient for the current study.

Underground settlements

Cappadocia’s underground cities are unique in their range due to its complexity and variety. The underground cities were long stay settlements that provide the protection to the

occupants and their domestic animals against the enemies and attackers. In fact, the refugees could survive up to 6 months in these cities (Yıldız, 2006). Cappadocia has 22 underground cities as is shown in (Figure 4.25) (Aydan & Ulusay, 2003).

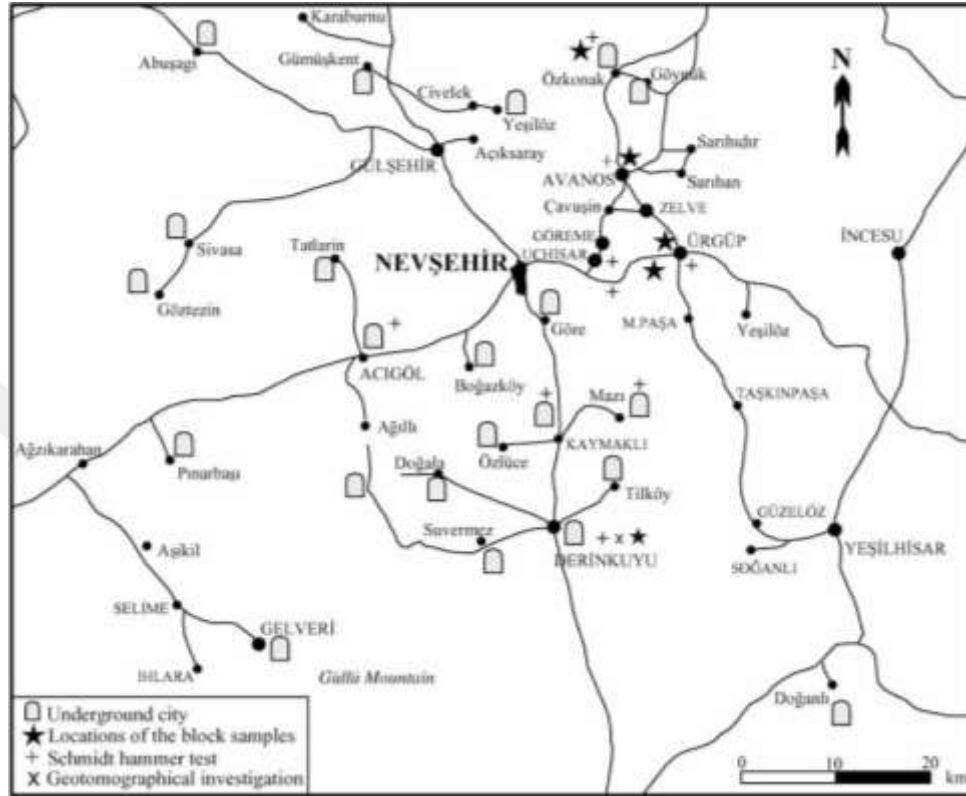


Figure 4.25 : The Location of Underground Cities in the Region of Cappadocia (Aydan & Ulusay, 2003).

The network of the cities was very complex and dense because it is a combination of multilevel structures (Figure 4.26) (Hajirasouli, 2015) and (Aydan & Ulusay, 2003). The houses above had hidden entrances that lead to the underground cities where hundreds of rooms were carved since the cities were made to accommodate thousands of people (e.g. Kaymaklı Underground City accommodated 60,000 people (Aydan & Ulusay, 2003)). The rooms are connected to each other with corridors which were carved long, low and narrow like a labyrinth for safety purposes (Aydan & Ulusay, 2003). The floors were separated by openings that close only from the inside by huge rocks, with a diameter of 1 to 1.5m and thickness of 30 to 35cm (Aydan & Ulusay, 2003). The depth of the cities varies from city to another for instance Kaymaklı Underground City has a total depth of 85m from the ground surface (Aydan & Ulusay, 2003). The system of ventilation of the underground cities is based on shafts that connect all floors starting from the lowest floor, furthermore these shafts

allowed the occupants to communicate (Aydan & Ulusay, 2003). The most known underground cities are Derinkuyu, Kaymaklı, Mazi, Tatlarin and Özkonak (Aydan & Ulusay, 2003).

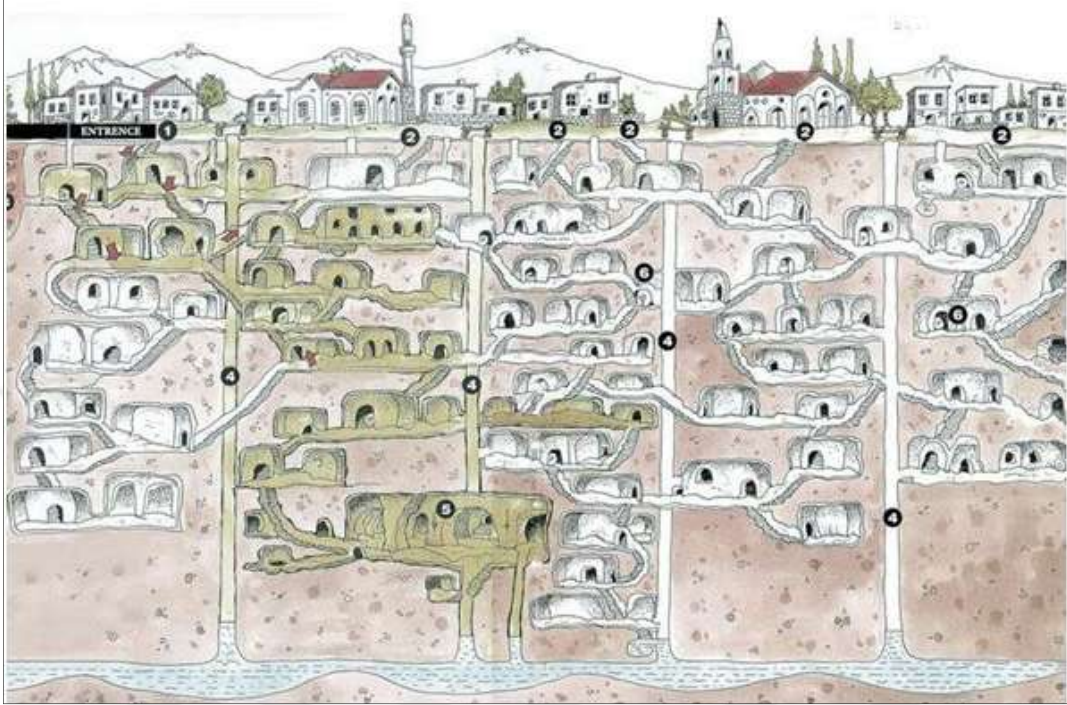


Figure 4.26: Underground Cities in the Region of Cappadocia (Hajirasouli, 2015).

Above the ground or semi-underground settlements

The cave settlements were formed naturally due to natural forces and later due to human intervention became places to dwell (Figure 4.27). These settlements located along the valleys and hills such as Nevsehir, Zelve, Göreme and Lhlara valley (Aydan & Ulusay, 2003). In the early periods, humans used the caves as living, storage, worship, burial and hide spaces (Akdağ & Sayar, 2020). This type of settlements has vertical array of rooms where 30 to 60m is the height of a typical cone-shaped dwelling in Goreme valley (Haji et al., 2018) and (Hajirasouli, 2015). The caves had also corridors and steps carved into rocks that insure connection to other caves or underground cities if needed (Akdağ & Sayar, 2020). The streets in Cappadocia have an organic pattern, where it conforms to the topographical features. The streets are narrow with a width convenient to humans and animals usages and often are dead-end streets open on one side and closed on the other side (Akdağ & Sayar, 2020). Semi rock-cut & masonry dwellings began in the period Post-Tanzimat around 19th century. This type of settlements simply based on incorporation of rocks masonry as an

extension for many reasons such as increased population, expanding the houses, facades decoration, and function changes etc. (Akdağ & Sayar, 2020).



Figure 4.27: The settlements of the Region of Cappadocia (Yıldız, 2006).

4.1.2.3 Building envelope of Cappadocia

The building envelope in the region of Cappadocia is totally different of these in Anatolia region. The abundant of soft rocks in the region was reflected in its vernacular architecture (Ozata, 2015). Actually, the natural formulation such as cones cannot be considered as buildings yet dwelling. In fact, the region has two types of dwellings, underground cities and fairy chimneys. Each of these types is constructed by the same technique, which is rock-carving technique. Rock-carved or caves are the earliest settlements that can be found in valley slopes, fairy chimneys and underground cities (Şakar & Güçhan, 2014). Fairy chimneys are formulated in a natural way due to certain natural factors as explained before in details. The shape and size of the cone varies from one to another. Thus, the interior is related to the shape and size of the cone itself. While the exterior walls must be very thick to prevent collapse and maintain standing (Haji et al., 2018). The layout and number of stories varies from a dwelling to another. Despite that the majority of dwellings had at max two stories, dwellings with more than two stories exist yet rare. External stairs carved into the cone itself, where each level have direct connection to the exterior, connecting the stories.

The exterior walls have small windows that provide lighting and ventilation (Figure 4.28) (Haji et al., 2018).

The second type of dwellings known as underground cities. Moreover, since the city is totally in the ground, the dwelling envelope (i.e. Building envelope) which include the components that separate the interior from the exterior, does not exist in this type of dwellings.



Figure 4.28: The Fairy Chimneys Envelope (Flickr Search — “cappadocia.”n.d.).

4.2.3 The Structural Elements in Cappadocia Dwellings

This part is about the structural elements in Cappadocia dwellings. The following information is stated and categorized in a consistent way as the previous sites. Besides that, the uniqueness of the Cappadocian dwelling may lack some or most structural elements.

4.2.3.1 Foundations

In the case of Cappadocia’s vernacular settlements, underground cities are foundations free since the whole cities are carved under the ground level. The fairy chimneys are results of natural rock erosions, thus the foundation and the upper part (i.e. the part above the ground of the fairy chimney) used to be one rock mass. Thus, the foundation is totally merged into both the ground under and the cone itself therefore, it cannot be considered as foreign

element implanted into the ground as the other types of foundations but, in fact, it is indeed an integral component thereof.

4.2.3.2 Facades walls

The fairy chimneys exterior walls are different from the regular walls. The construction of walls defines the interior space, which is the opposite in the dwellings where rock-carved technique is employed. The interior space size and shape defines the exterior walls shape and dimension. In the case of chimneys, the exterior walls are required to be thick for structural purposes already mentioned before (Haji et al., 2018), the following figure shows the irregular shape, non-uniform dimensions and the continuity of the façade walls of the fairy chimneys dwellings (Figure 4.29). In the case of underground cities, the facades walls are not existent. In other words, they cannot be visually perceived or observed.

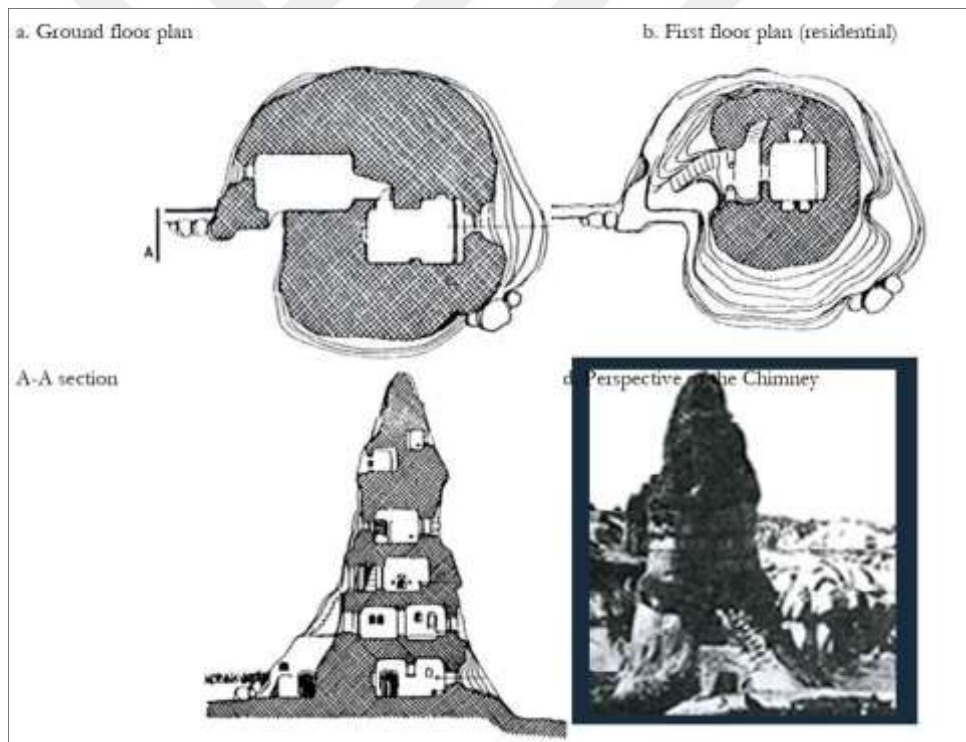


Figure 4.29 : Example of Cappadocia Fairy Chimneys Plans (Hajirasouli, 2015).

4.2.3.3 Pillars

The slabs and the roofs in Cappadocia's dwellings are forming a unit with the walls or hollowed rock mass without the need to add any additional structural elements (e.g.

columns). Both fairy chimneys and underground cities pillars or columns are imitation of the byzantine architecture where it has no structural role in fact its only decorative elements (Figure 4.29) & (Figure 4.30) (Haji et al., 2018).



Figure 4.30: Pillars Located in Kaymakli Underground City (Aydan & Ulusay, 2003).

4.2.3.4 Slabs

The slabs describe the floors, ceilings and flat roofs. In the case of Cappadocian, dwellings for both fairy chimneys and underground cities the slabs are flat or curved thick rock carved manually, the ceiling slabs precisely have two forms either flat or curved intentionally or due to the incorporated arches (Figure 4.31).



Figure 4.31: Ceiling Forms Samples in the Region of Cappadocia (Flickr Search — “cappadocia.”n.d.).

The dimensions of the slabs in the same dwelling are not identical necessarily in term of length, width and even thickness (Figure 4.32) and (Figure 4.29). As the fairy chimneys

ascend, their dimensions typically decrease due to the base of the cone frequently being larger than the apex (Figure 4.32).

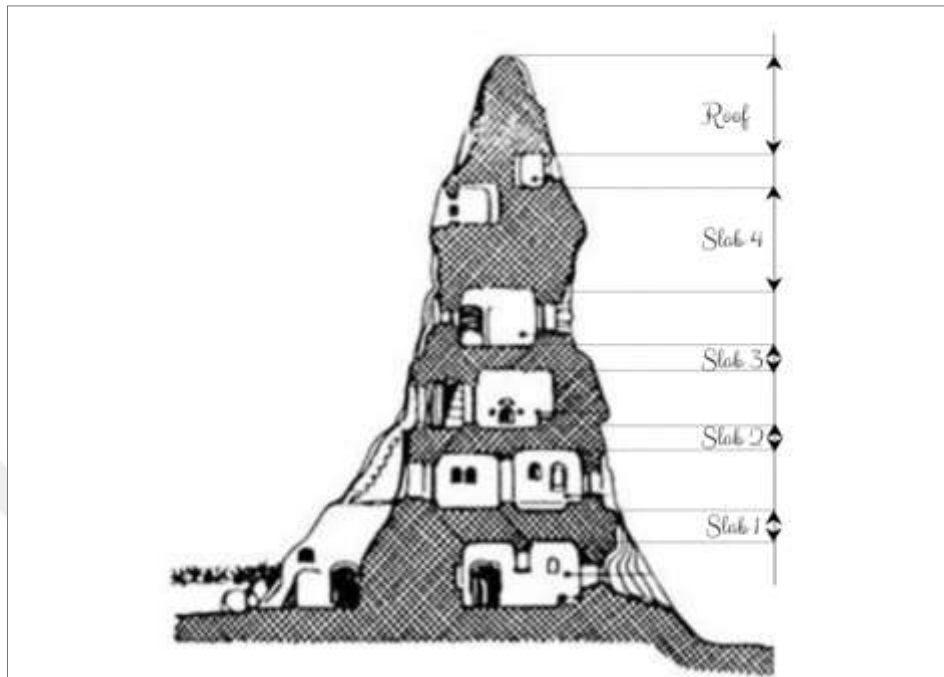


Figure 4.32: Examples of Slabs Thickness, Form and Dimensions Variations (Hajirasouli, 2015).

4.2.3.5 Roofs

In the case of underground cities, the roof is one of the missing elements where the top covering of the underground cities is the earth surface (Figure 4.26). Unlike the fairy chimneys where the roof is the uppermost section of the cone, which is naturally shaped like the rest of the structure (Figure 4.32). It is also shaped and sized from the underside during the excavation process beneath it (i.e. while creating the space under). Since the fairy chimneys exist in nature in different shapes and sizes, the roofs also have different shapes and sizes as shown in (Figure 4.33).



Figure 4.33: Some Examples of Fairy Chimneys Roof Shapes and Size (Flickr Search — “cappadocia.”n.d.).

4.2.4 Vernacular Materials of Construction in Cappadocia

In the region of Cappadocia, especially the rock carved settlements, Tuff is the main material of construction. Where the Tuff is an igneous rock that forms from the ash of volcanic eruption (King, n.d.). According to Le Pennec et al. (1994) the Tuff layer is approximately 60m above the ground with an area of 4200 km² (Le Pennec et al, 1994), while Solmaz (2013) tuff layer thickness is more than 400m (Solmaz, 2013). The formation of this type of rock takes a million years, due to the natural factors in the region such as wind, rain and sharp changes of temperatures that caused erosions thus, created Tuff Cones known as fairy chimneys, which in later time became shelters for humans. The density and hardness of the Tuff rock convenient for rock-carved architecture, where the softness and fine-grained composition of the Tuff facilitated carving (Solmaz, 2013). Furthermore, its porous structure provides thermal and noise insulation, resulting in elevated humidity levels when filled with water (Solmaz, 2013). The Cappadocian tuff rocks are found in various shades dirty white, grey, and pink. (Aydan & Ulusay, 2003).

4.3 SAFRANBOLU

Safranbolu history dates back to 3000BCE where many civilizations passed through the region such as Hittites, Phrygians, Lydians, Persians, Hellenistic Kingdoms, Romans, Seljuks, Çobanoğulları, Candaroğulları and Ottomans respectively (Akyildiz, 2020). During the Ottoman Empire, Safranbolu was named after Saffron Flower that grows in the region (Akyildiz, 2020) and (Sowle, 1989). Although the region hosted several civilizations, the Ottoman civilization was the only one that left an urban legacy since the region under the Ottoman rules period experienced economic and cultural expansion. Safranbolu was on the Caravan Trades Route (CTR) that links Europe to Orient (City of Safranbolu, n.d.). Its location is one of the main reasons of its development where it was considered as a station or as a Denel (1989) refers to by "break of bulk point". The caravan route was important in the period of 17th century thus Safranbolu as consequence became important at the same period of time, the commercial development caused an urban development due to the need of settlements to accommodate the passengers by the region. Where the most known example according to Denel (1989) is the Cinci Hoca Inn which had the capacity of sixty rooms, storage and stable (Denel, 1989). Since the region was ruled by the Ottomans at that time the settlements were typically Turkish, developed with harmony with nature. Therefore, Safranbolu is a surviving example of the Turkish vernacular architecture that reflects the living style of ancient Turkish community, during the Ottoman Empire.

Karabuk Province is located in the northwest of Türkiye (Figure 4.34). Bordered by Bartın and Kastamonu Provinces in the north, Zonguldak and Bolu Provinces in the west, Çankırı Province in the south and Kastamonu Province from the east. Karabuk Province situated in western part of the Black Sea region (Coşkun, 2015). The province has six districts Merkez, Eflani, Eskipazar, Ovacık, Safranbolu and Yenice.



Figure 4.34: The Location of Karabuk in Türkiye’s Map, Modified from Source (UNESCO World Heritage Centre, n.d.).

Safranbolu is a district located in the Karabuk Province (Figure 4.35), with an area of 750 km², where the residential area estimated at 9.73 km² (Yetiş & Kayili, 2021). Safranbolu is located in the northern part of the province, approximately 9 km north of the city of Karabük and 65km away from the Black Sea (Celikyay et al., 2010) & (Ceko & Beqiri, 2022).

The geological characteristics of the city are distinctive. Where Safranbolu is the meeting point of three canyons Düzce, Sırçalı and Sakaralan merge in Konari Village and then they merge with Kirpe Canyon near to Yazıköy village and then flows to pour in Araç Stream that is considered as the receiver of the most of water resources that is born in the city (Safranbolu, the city of canyons. n.d.). In addition to canyons, the city has rivers that flows constantly through the city such as the Bulak River along the west border, the Akçasu River in northeast and, Tokatli River (Davis, 1988). Bolu, Köroğlu Mountains and some extensions of Küre Mountains surround the region. While Safranbolu is located in basin “Karabük-Safranbolu basin” as Coşkun (2015) refers, where basin in geography is defined as: “A large or small depression in the surface of the land or in the ocean floor (Basin, 2024)” (Coşkun, 2015). The dominant land types in Safranbolu are brown forestlands and alluvial plains

(Cengiz & Aşkın, 2015). Safranbolu has continental climate where the winters are very cold, the summers are dry, warm, and cool in the spring (Örnek, 2019).

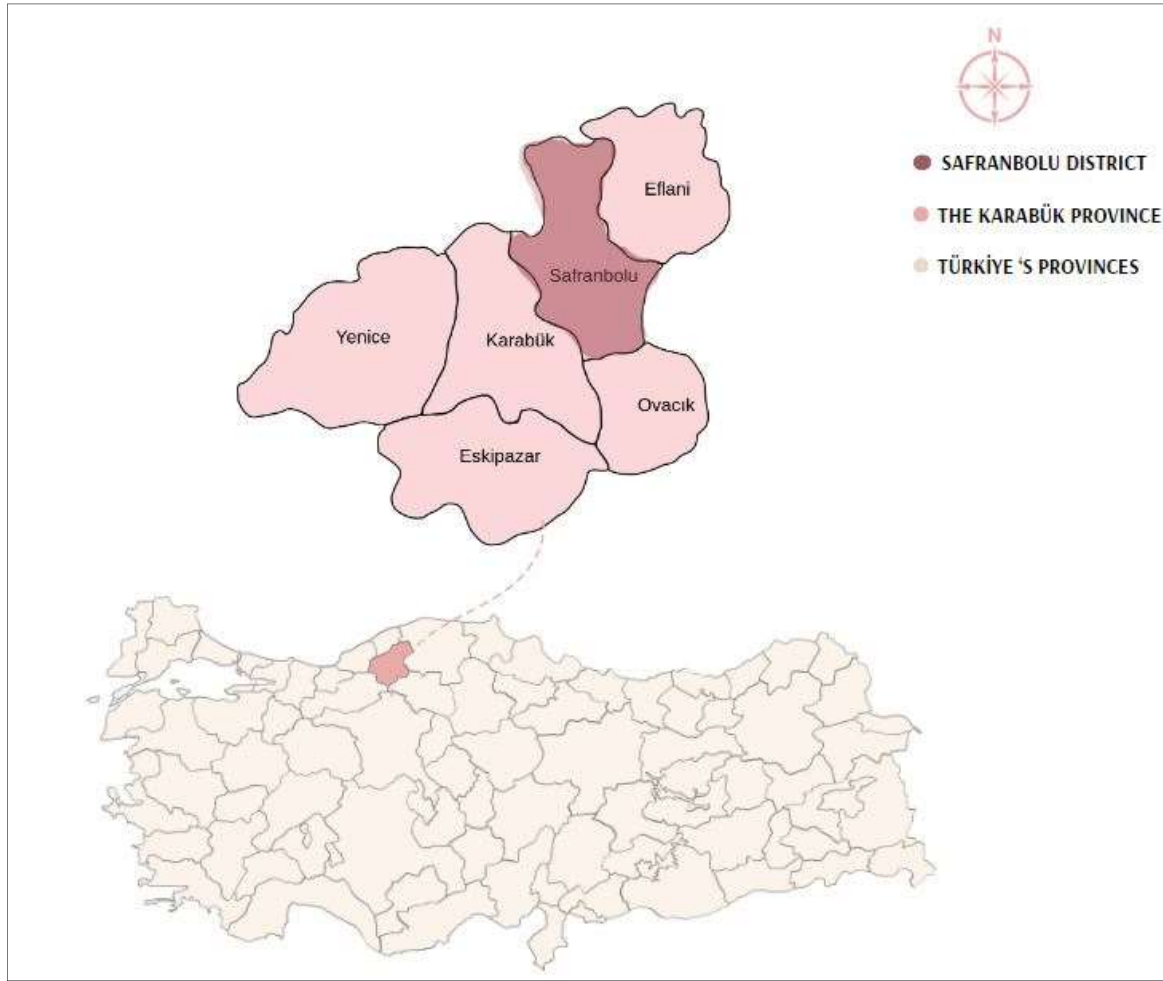


Figure 4.35: The Location of Safranbolu.

Modified from Source (UNESCO World Heritage Centre, n.d.).

4.3.1 UNESCO Heritage City Safranbolu

Safranbolu represents a typical Ottoman City (City of Safranbolu, n.d.). Therefore, in 1994 the UNESCO selected Safranbolu as World Heritage Site (Somuncu & Yiğit, 2005). It was included in the list under the title of “City of Safranbolu” (City of Safranbolu, n.d.).

The UNESCO WHC acknowledged that the criteria (ii),(iv), and (v) were fulfilled by Safranbolu (City of Safranbolu, n.d.). The description of the criteria covers different aspects. Architectural aspect is observed within criterion (ii) and (iv) where they described the impact of safranbolu’s architecture standard in both public and domestic, on the urban development

of the Ottomans. And about the preservation of the buildings in their original form to a remarkable extent. In addition to the new socio-economy due to the steelworks along with the history of the city as an important trade, station also had impact on its selection as world heritage site.

The following Table 4.3 aims to state UNESCO's selection criteria of Safranbolu in an easy manner:



Table 4.3: The Description of UNESCO's Selection Criteria of Safranbolu (City of Safranbolu, n.d.).

UNESCO Criteria	Description
Criterion (ii): "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design."	▪ Safranbolu set a standard in public and domestic architecture that had impact on the urban development of the Ottomans due to its important role in the caravan trade for many centuries.
Criterion (iv): "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history."	▪ Along the caravan trade that connected Orient to Europe, route towns with unique characteristics grew up yet in 19th century most of the towns lost their uniqueness while adopting to new economic bases due to the new railways. Contrary to Safranbolu that preserved its original form and buildings to a remarkable extent. ▪ Safranbolu was effected by the collapse of the caravan besides that Safranbolu had new socio-economic role due to the steelworks. Yet the region still facing external pressures that needs continuous efforts to preserve the traditional townscape.
Criterion (v): "Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."	▪ Safranbolu is a typical Ottoman city that displays an interesting interaction between its topography and historic settlement.

4.3.2 Vernacular Architecture in Safranbolu

In 1964, the term “Vernacular Architecture” was invented by Bernard Rudofsky, in the ‘Architecture without architects’ exhibition in New York City (Berkovic & Canan, 2020). In fact, the architecture without architects is the tangible result of human needs expressed while adopting to their environment besides preserving their social, economic and cultural features (Denel, 1989). Anatolian vernacular timber construction systems developed without architects (e.g. Craftsmen) and, it does not conform to design regularizations. However, today in Anatolia approximately 2000 traditional houses are still standing (Akyildiz, 2020). Despite all the challenges such as the natural disasters (e.g. earthquakes, floods etc.), the development of new technologies, and the seek for houses that align to today’s life style (Akyildiz, 2020). Safranbolu as an Anatolian city also has distinctive architectural style built around 17th and 18th centuries. The next part will be covering the characteristics of Safranbolu Vernacular Architecture.

4.3.2.1 Development of the region

The structure of Safranbolu City according to Canbulat & Arch (2011) is typical Seljuk City structure as “the housing region formed with dead-end streets and established on a slope, the lack of a structured street system and squares and industry settled at the point where water leaves the city” (Canbulat & Arch, 2011). In fact, the region had previous settlements before the Ottoman conquest, which have been vanished for several reasons such as wars and natural disasters. However, the settlements protected by the UNESCO in Safranbolu belong to the Ottomans. The city developed as a trading centre due to its location on the Caravan Trades Route (CTR) and as mentioned before, it became an important station around the 13th century. Moreover, many researches agreed that the period between 17th and 18th century is the prosperity period for both the Caravan Trades Route (CTR) and the city, respectively (Cengiz & Aşkın, 2015) and (Canbulat & Arch, 2011).

4.3.2.2 Settlements pattern of Safranbolu

The settlements in Safranbolu developed in a harmony with the environment where, the climatic conditions and topographical features divides the settlements into two, settlements located on lowest altitude of the region exactly on the hill sides of the valleys are for warmer residential areas used in winters. Where the settlements located on high altitude of the region

are for cooler residential areas used in summers (Ceko& Beqiri, 2022) & (Celikyay et al., 2010). Hence, winter settlements and summer settlements where the settlements are on two parallel hills opposing to each other (Cengiz & Aşkın, 2015).

The settlements are dense and compact in order to reduce open spaces thus exposition to the wind and sunlight (Berkovic & Canan, 2020). The commercial area where most of the shops are found since the shops are rare to be found in the traditional Turkish houses was connected to the residential area (i.e. Çarşı the centre of the city). “Bağlar” was considered as summer settlements for the families who lived in Çarşı at the wintertime. The inhabitants of the city used to have houses in both Çarşı and Bağlar. If this indicates anything, it would indicate that the city was mostly occupied by wealthy families with rich living style reflected on the buildings (Cengiz & Aşkın, 2015) and (Bayazıt, 2014). The buildings in Safranbolu as the Turkish traditional buildings designed in manner that does not interrupt the neighbours buildings, sunlight and view, the buildings respect the surrounding trees, street etc. and, prioritize the privacy where the windows do not face each other (Akyildiz, 2020). Safranbolu settlements are oriented to the south and shielded from the north by the hill to provide natural protection with natural ventilation and sunlight for all the buildings (Figure 4.36) (Cengiz & Aşkın, 2015).



Figure 4.36: Safranbolu City Silhouettes (Flickr Search — “safranbolu.” n.d.).

Vernacular materials locally available such as wood, rubble stones etc. construct the buildings of Safranbolu. The lots in the city has irregular shapes despite that the upper floors of the houses have square or rectangular shape (Bayazıt, 2014). The streets follows the topography while, the buildings are aligned along these streets in adjusted order. The streets are narrow usually end by a mosque or a house (i.e. dead end streets); at the intersections of the streets corner chamfers are integrated. The streets in Safranbolu paved by cobblestone connected to the Stone Walls from both sides, creating an impression of continuity. The streets are inclined towards their central axis to facilitate the drainage of rainwater flow (Figure 4.37) (Akyildiz, 2020). According to Berkovic & Canan (2020), the organic pattern of the streets in Safranbolu resembles to branching tree (Berkovic& Canan, 2020).



Figure 4.37: Example of Safranbolu Streets (Flickr Search — “safranbolu.” n.d.).

4.3.2.3 Building envelope of Safranbolu

The buildings in Safranbolu has hybrid construction system. All the buildings in the city form a chain along the streets where the boundaries of the building starts exactly at the edge of the street. The buildings in Safranbolu are often 2 or 3 stories, where the ground floor wall is blind stone masse (i.e. stone wall without windows) facing the street contains one entrance with a double wing door that allowed the circulation of the occupants and their domestic animals. Some of the buildings have small openings in the Stone Wall for ventilation and air movement purposes. The stables are either located in the ground level of the main building or in a separate structure in the garden (Denel, 1989). The upper floors are laying on the ground level Stone Walls, the area of the upper floors are usually bigger than

the ground floor area and with square or rectangular plan layout thus, extended slabs are seen. The upper levels walls built with timber frames filled by either adobe or limestone bricks than plastered and painted by white colour that create a contrast with the wooden windows, the windows in the upper floors are double winged either bay or lattice windows that add a unique charm to the buildings (Akyildiz, 2020). The windows have a rectangular form with proportion of 1:2 (Figure 4.38) (Sowle, 1989). The roofs are hipped roofs constructed by wooden frame covered by semi-cylindrical clay traditional tiles (Bayazıt, 2014) and (Sowle, 1989). This type of roofs provide long shadows that can cover the narrow streets easily (Berkovic & Canan, 2020). The Summer Houses has balconies made by wooden frames and decorated by latticework generally located on the south part of the building (Sowle, 1989).

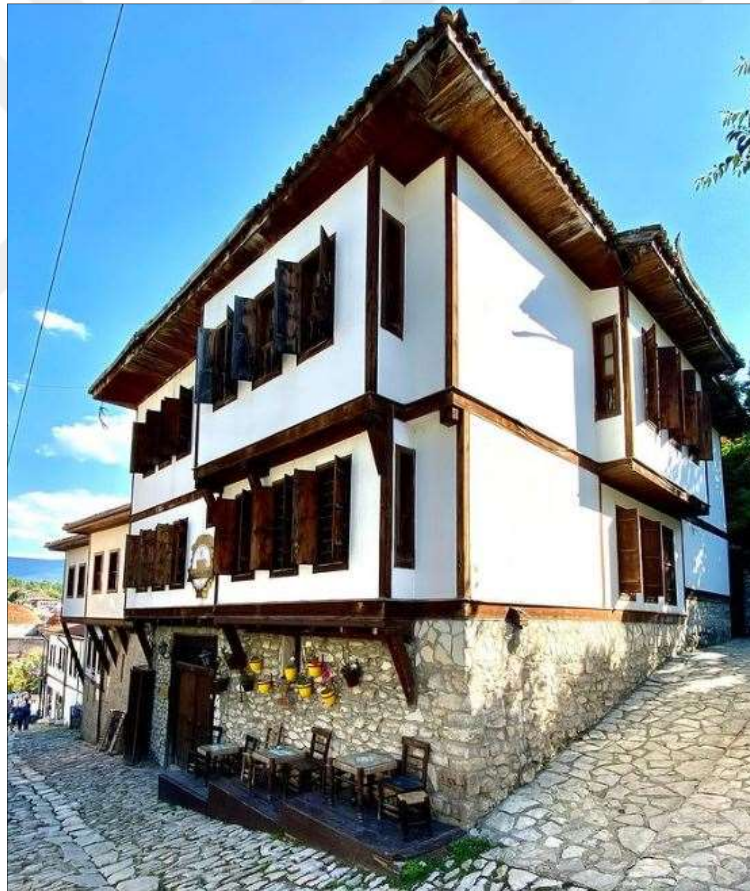


Figure 4.38: An Example of Safranbolu Traditional Houses (Flickr Search — “safranbolu.” n.d.).

4.3.3 The Structural Elements in Safranbolu Houses

This part of the dissertation will cover structural elements of Safranbolu settlements. In fact, while searching for previous studies that cover the structural elements of Safranbolu a lack of studies was really clear and noticeable which created a limitation for the present study. However, in this dissertation some of the structural elements will be highlighted based on the digital data on the internet. Shortly, based on the pictures some of the structural elements such as the façade walls of the upper floors will be explained in the following part.

4.3.3.1 Foundations

The foundation system in Safranbolu contains Strip Footing under the masonry Stone Wall, constructed by limestone collected from the area nearby. The cross section of the foundation is larger than the wall above (i.e. Stone Wall) with a depth that varies between 0.5 to 1m according to (Güneş, 2016). The isolated footings are the second type of foundations, situated at the ground level under the timber posts. A stack of rubble stones placed atop of each other or sometimes on one big stone, placed above the ground level floor. This type of foundation is independent or isolated from the other ones where each post can have its unique foundation in terms of size, dimensions and type.

4.3.3.2 Facades walls

Safranbolu has two types of façade walls. The underground walls are constructed by rubble limestone collected from the stream beds nearby, the stones are placed in dense manner above each other, thus the walls has a thick cross section due to their major role, which is carrying the structure above. The Stone Wall follows the street and is connected to the garden wall (Sowle, 1989). The Stone Walls as mentioned before often lack openings for security and privacy reasons, in addition to weather factors. Yet some of the buildings have few small openings closed by Lattice Work or left unframed and open since their size is too small to cause problems. The wall of the ground level rise up to the mezzanine floor, where the mezzanine floor is located in the upper part of the ground floor walls with few openings decorated by Lattice Works (Sowle, 1989). The floor might occupy the entire area of the ground level by laying on the Stone Wall only, or covers a part of the ground level total area thus, lays on the Stone Wall from two or three sides and on timber posts on the other sides (Sowle, 1989). The mezzanine floor is the floor where daily life takes place especially in winter due to the low ceilings height.

The upper floors main structural element is the wooden frame structure. Safranbolu had three additional materials used to fill the Skelton adobe bricks, limestone and wood, see the wooden structure shown in (Figure 4.39) where it has main elements and secondary elements. The posts placed on the corners of the structure and sometimes in the middle are main elements, reinforced by braces on each side where the secondary elements are posts placed along the walls at fixed distance crossed by horizontal elements in a discontinuous manner that creates the windows openings. The beams on the bottom and upper sides are also main elements.



Figure 4.39: The Wooden Frame of Safranbolu Upper Floors (Flickr Search — “safranbolu.” n.d.).

The wooden structure in Safranbolu traditional houses filled often by adobe in horizontal or vertical or diagonal order are always plastered from inside and outside (Figure 4.40 (b)) (Aksin & Karaş, 2021). Some other buildings generally the ones constructed after 18th century in Bağlar region, used limestone and porous light stone (i.e. Kukunk or Küfünk) obtained from the caves nearby as filling material (Güneş & Şengün, 2015), lime mortar and mud mortar were used as binder, where the lime mortar was obtained from blue limestone in the region. The number of horizontal and vertical secondary main wooden elements increase in this type of filling material (Figure 4.40 (a) & (d)) (Aksin & Karaş, 2021). The wooden Skelton filled by wood is very rare, the main idea was to recycle the wooden frame

of already destroyed houses and use it in random ways as filling material (Figure 4.40 (c)) (Aksin & Karaş, 2021).



Figure 4.40: Examples of Facade Walls in Safranbolu (a) & (d) Stone Filled Walls, (b) Adobe Filled Walls, (c) Wood Filled Walls (Flickr Search — “safranbolu.” n.d.).

4.3.3.3 Timbers posts

The timber posts have the same characteristics in term of usage, size and section to the timber posts used in Cumalikizik while the type of wood used is different since the trees such as Fir Trees, Pine Trees and Walnuts Trees are locally available in Safranbolu. The timber posts are found in the ground level exactly in the semi-open space (i.e. Hayat).

4.3.3.4 Slabs

The only information available that concern the slabs is their material of construction, which is Pine Wood as Berkovic & Canan stated (Berkovic & Canan, 2020). Due to the lack of researches that cover the structural elements and architectural techniques used in Safranbolu traditional houses. The slabs precisely have clear absence.

4.3.3.5 Roofs

The roofs in Safranbolu are hipped roofs constructed by wooden frame structure where mainly the type of wood used is Pine Wood according to (Berkovic & Canan, 2020). Since the roofs are the most distinguishing feature of the Turkish houses as Sowle (1989) stated (Sowle, 1989), the frame structure is basically the same in the Turkish houses, Güçhan defined the roof frame structure as the following:

“The timber-framed roof structure is set on the main roof girders, which are placed along the axis of the ridge purlin over the ceiling beams. The corner and king posts are placed along the full length of the ridge purlin, and tied to the ridge purlin. The ridge purlin is tied to the corners of the structure with the angle rafters determining the slope of the roof, and the opening between the ridge and the rafters is horizontally divided into equal intervals by the purlins. Laying of the rafters across the roof purlins completes the roof structure. Roof boards of 2.5–3cm thickness are placed on the rafters and the over and under type tiles are laid down on the roof board. The roof is finished with the timber cladding of the eaves”. (Güçhan, 2007).

However, Wooden boards called “Podagra” covered the frame structure of Safranbolu roofs before the fire that hit the region in 19th century where the wooden boards were replaced by semi-cylindrical clay traditional tiles (Figure 4.41) (Örnek, 2019) and (Bayazıt, 2014).



Figure 4.41: Safranbolu Roofs (Flickr Search — “safranbolu.” n.d.).

4.3.4 Vernacular Materials of Construction in Safranbolu

The vernacular architecture specifically has a direct positive connection with nature. In Safranbolu the builders and owners had an access to various locally available materials of construction. The following is about the main material of construction used in the historical city.

4.3.4.1 Wood

Wood is one of the main materials of construction used in Safranbolu traditional houses due to its availability in the region. Wood, unlike other materials of construction in Safranbolu has a vast utilization, where it is used as a frame system for the upper floors, beams and posts, slabs and roof frame structure, windows and doors. In some structures the walls are 100% made by wooden elements (i.e. wooden frame filled by wooden elements (Figure 4.40(c)). The trees that supplied Safranbolu houses are Fir Trees, Pine Trees and very rare and popular Walnuts Trees (Örnek, 2019).

4.3.4.2 Stone

Stone is natural material that can be found in its final stage and used directly, and sometimes need to be extracted and shaped manually. The characteristics of stones differ from one type to another depending on the region in which the stone is sourced. The stone is known with its durability thus, does not require constant maintenance. The stones used in Safranbolu dwellings are mainly white limestone and black stone (Berkovic & Canan, 2020). The usage of the stone also was vast where the stones are used for foundations, ground floor walls, and sometimes to fill the wooden frame structure in the upper floors.

4.3.4.3 Adobe

The preparation manner of adobe bricks is always the same the only difference is the type of the soil used in addition to the amount of each ingredient due to the lack of standard production instructions. Adobe was used in Safranbolu buildings as filling material, where the upper floors walls wooden frames are filled by the adobe bricks mostly in horizontal order (Figure 4.40 (b)).

4.3.4.4 Mortar

“mortar is a mixture of sand, water, and cement or lime that is used to fix bricks or stones to each other when building walls (Mortar, 2024)”. According to Langenbach (2003) Safranbolu most used mortar type is lime mortar. Yet in some rural areas mud mortar was used (Langenbach, 2003).

4.3.4.5 Plaster

The plasters types, usage purposes and preparation manner were discussed previously in this thesis. The plasters in Safranbolu as the (Figure 4.40 (b)) shows are essential and frequently used. The coating used is mostly to protect the upper floors wall materials (i.e. wooden frame and adobe bricks) additionally, contribute to achieving smooth finishing appearance.

4.3.4.6 Cobblestone

Cobblestone is a natural building material coddled (i.e. rounded) naturally in different sizes and shapes where its size vary between 6 to 25cm larger than a pebble and smaller than a boulder, mostly used for paving and construction (Cobblestone, 2024). The cobblestone can be founded in the mountain valley streambeds. The streets in Safranbolu are paved by cobblestone. Since the city is located in a valley near to many water source such as rivers, streams and canyons as stated in previous parts, the inhabitants had a direct access to cobblestone.

5. COMPARATIVE STUDY FINDING

The settlements pattern of each site according to the data collected has unique features. The wards of Cumalıkızık for instance were formed in irregular manner around the centre ward where the mosque is located, while Cappadocia lacks wards. All the sites has organic street pattern dedicated for pedestrian only. The streets in Cappadocia and Cumalıkızık were paved by stone, forming continuity with Stone Walls, and inclined towards their central axis to facilitate the drainage of rainwater flow. The streets in Cumalıkızık were directed towards the centre, while in Safranbolu, they formed branching trees. The buildings in both Cumalıkızık and Safranbolu form a chain along the streets in an adjacent order. The urban fabric in all sites is mostly residential where in Safranbolu precisely a commercial area connected to the residential area existed. Cappadocia has two types of settlements: above the ground and under the ground. Therefore, the characteristics differ. The underground cities have dense and complex settlements pattern, with streets replaced by narrow corridors. Conversely, the above ground settlements are naturally formed with irregular shapes, where the streets are, in fact, passages and tunnels carved manually between the cones.

The buildings of Safranbolu and Cumalıkızık were Himish buildings. Generally with 2 to 3 stories where the ground floor is constructed using rubble stones in Cumalıkızık and limestone in Safranbolu, in both sites the Stone Walls lack windows, the upper floors are constructed using wooden frame filled by adobe in Cumalıkızık and either adobe or limestone bricks in Safranbolu. Hence, hybrid construction system. The exterior facades of Cumalıkızık were plastered and painted by ochre or indigo while In Safranbolu the buildings were painted with white colour that create a contrast with the wooden windows. Roofs in Cumalıkızık and Safranbolu are constructed using wooden frame covered by wood planquets in either pitched or gamble forms. The facades and roofs of Cappadocia's dwelling are naturally formed, yet humans incorporated some openings and carved steps on the exterior of the cons. The structural elements of Cumalıkızık and Safranbolu are identical and typically Turkish architectural style. The structural elements of all sites testimony to the Byzantine civilization.

All the collected information was summarized in the following recapitulative tables for each site separately Table 5.1, Table 5.2 and Table 5.3.

Table 5.1: Cumalıkızık Recapitulative Table (Author, 2024).

Cumalıkızık	Type	Characteristics	Materials	Construction Techniques
Settlement Pattern	Streets	- Organic street pattern - At the intersections often the streets ends by corner chamfers - The streets of Cumalıkızık contains fountains - They constructed streets inclined towards their middle axis to direct the rainwater alongside to the sewer system - The streets in Cumalıkızık are pedestrians - The traditional ottoman settlements had some dead end streets	Slate Stones	The streets developed in organic manner follows the topography yet constructed by human
	Urban Fabric	- The wards are formed in irregular manner around the centre ward where the mosque is located - As the settlement in Cumalıkızık has an organic pattern because of its random development the lots in the other hand has irregular geometries - The buildings are generally in adjacent order along the streets - The buildings are located on the edge of the lots - The majority of the urban fabric in the village are residential buildings - The settlements of Cumalıkızık can be described as dense	- Rubble stone, Wooden elements and adobe for the buildings - Slate Stones for the streets	- Hemish (i.e. Hınıs) construction technique constructed by human - The streets developed in organic manner follows the topography yet constructed by human
Building Envelope	- The building has 2 to 3 stories 3 different types of residential buildings - TYPE A: the main building is situated in the façade facing the street. - TYPE B: both main building and courtyard are in the façade facing the street. - TYPE C: courtyard stonewall in the façade facing the street where the entrance is directly from the courtyard while the main building is situated on the back of the lot.	Hybrid construction system	- Rubble stone for ground level walls - Wooden elements and adobe for upper levels walls	- Hemish (i.e. Hınıs) construction technique - Constructed by human
	- Foundation 1: Continuous foundation along the Stone Wall. - Foundation 2: Discontinuous foundations under the wooden post in the courtyard.	- Foundation 1: constructed along the Stone Wall / Its cross section is bigger than the Stone Wall cross section. - Foundation 2: Its totally isolated from the continuous foundation / Its placed above the ground level	- Foundation 1: Rubble stones and/or huge rocks - Foundation 2: Rubble stones or slate stones.	Constructed by human except in the case of huge rocks
Structural Elements	- Ground level facade walls: Stone masonry wall - Upper levels facade walls: Wooden frame system filled by Adobe	- Ground level facade walls: massive blind Stone Wall - Upper levels facade walls: hybrid thinner walls / contains openings/ plastered from inside and outside	- Rubble Stone - Wooden elements filled by Adobe	- Hemish (i.e. Hınıs) construction technique - Constructed by human
	The timber posts are vertical structural elements	- Made by raw material - Square, rectangular or circular cross section - In some cases reinforced by braces	Wood	Raw material formed and shaped by human
	- Slab 1: The ground level slab - Slab 2: The upper levels slabs	- Slab 1: / - Slab 2: lays on either Stone wall or the wooden structure under / The extension of the upper floor is created by extending the slab beams of the ground floor wall.	- Slab 1: slate Stones or non-paved wood - Slab 2: wood	Constructed by human
	- Gambrel roofs - Pitched roofs	Wooden structure compose of several elements covered by wooden planques	Wood	Constructed by human

Table 5.2: Cappadocia Recapitulative Table (Author, 2024).

Cappadocia	Type	Characteristics	Material	Construction Technique
Settlement Pattern	• Fairy chimneys: Vertical array of rooms carved in cones shaped dwelling connected to each other by passages and carved steps on the exterior side	• Natural urban plan • Random and irregular • Depenies on human needs	• Tuff	• Formed naturally in the nature due to several natural fractures such as rain, wind and temperatures, yet carved by human from inside
	• Underground Cities: Under ground rooms connected by long, low and narrow corridors	• Organic pattern • Non permanent settlements yet are long period settlements • Complex and dense network • Combine multilevel structures	• Tuff	• The under ground is natural soil carved by human
	• Fairy chimneys: Cone shaped elements	• Exist in several types: mushroom shaped, capped, conical, columnar and pointed • The shape and size of the cone shaped dwellings varies from one to another • Organic pattern	• Tuff	• Formed naturally in the nature due to several natural fractures such as rain, wind and temperatures, yet carved by human from inside
Building Envelope	• Underground Cities: are cities built inside the soil	• Lack of components that separate the interior	/	• The under ground is natural soil carved by human
	• Foundation of Fairy chimneys	• The foundation is totally marged into both the ground under and the cone itself therefore, it cannot be considered as foreign element implanted into the ground as the other types of foundations but in fact is a part of it.	• Tuff	• Created naturally
	• Facade walls of fairy chimneys: are rocky thick walls on the exterior	• Thick • Non-uniform with irregular shape and size • Continues (i.e. lack of obstacles or joints)	• Tuff	• Formed naturally but carved and shaped by human from inside
Structural Elements	• Pillar of fairy chimneys: Vertical element / Rectangular or square cross section	• Rock mass • Non structural element (i.e. decorative)	• Tuff	• Carved and shaped by human
	• The slabs of fairy chimneys: The slabs are Rocky thick flat elements that separate stories	• Thick flat element • Carved from the bottom side intentionally or due to the incorporated arches • The size of the slabs decrease while going up due to the cone shape • No pavement	• Tuff	• Carved and shaped by human
	• Roofs of fairy chimneys: Roofs shapes are Hat / Conical / Mashrom shape/ Pointed ...	• Naturally shaped	• Tuff	• Formed naturally but carved and shaped by human from inside
	• Foundation of underground Cities	/	/	/
	• Facade walls of underground Cities	/	/	/
	• Pillar of underground Cities: Vertical element / Rectangular or square cross section	• Rock mass • Non structural element (i.e. decorative)	• Tuff	• Carved and shaped by human
	• The slabs of underground Cities: Rocky thick flat elements that separate stories	• Thick flat element / • No pavement • Carved from the bottom side intentionally or due to the incorporated arches • Various sizes and dimensions	• Tuff	• Carved and shaped by human
	• Roofs of underground Cities	/	/	/

Table 5.3: Safranbolu Recapitulative Table (Author, 2024).

Safranbolu	Type	Characteristics	Material	Construction Technique
Settlement Pattern	• Streets	• Organic street pattern "like tree branching" • At the intersections often the streets ends by corner chamfers • The streets of Safranbolu contains fountains • They constructed streets inclined towards their middle axis to direct the rainwater alongside to the sewer system • The streets in safranbolu are pedestrians • The traditional ottoman settlements had some dead end streets	• Cobblestone	• The streets developed in organic manner follows the topography yet constructed by human
	• Urban Fabric	• Two types of settlements : summer settlements and winter settlements. • The Turkish buildings designed in manner that does not interrupt the neighbours buildings, sunlight and view • The buildings are generally in adjacent order along the streets • The buildings are located on the edge of the lots • Lots with irregular form located on slopy area • Residential areas are isolated from the commercial ones • The majority of the urban fabric in the village are residential buildings • The settlements are dense and compact in order to reduce open spaces thus exposition to the wind and sunlight • Safranbolu settlements are oriented to the south and blocked from the north by the hill itself	• Cobblestone, Wooden elements and adobe for the buildings • Cobblestone Stones for the streets	• Hemish (i.e. Hirms) construction technique • Constructed by human • The streets developed in organic manner follows the topography yet constructed by human
Building Envelope	• The building has 2 to 3 stories • Mostly the main building is situated in the facade facing the street.	• Hybrid construction system	• Cobblestone for ground level walls • Wooden elements for upper levels walls filled either by adobe, limestone or woodland	• Hemish (i.e. Hirms) construction technique • Constructed by human
Structural Elements	• Foundation 1: Continuous foundation along the Stone Wall . • Foundation 2: Discontinuous foundations under the wooden post in the courtyard.	• Foundation 1: constructed along the Stone Wall / its cross section is bigger than the Stone Wall cross section. • Foundation 2: its totally isolated from the continuous foundation / its placed above the ground level	• Foundation 1: Cobblestone and/or huge rocks. • Foundation 2: Rubble stones or slate stones.	• Constructed by human except in the case of huge rocks where it is founded insitu
	• Ground level facade walls: Stone masonry wall • Upper levels facade walls: Wooden frame system filled by either by adobe, limestone or wood	• Ground level facade walls: massive blind Stone Wall • Upper levels facade walls: hybrid thinner walls / contains openings / plastered from inside and outside	• Ground level facade walls: Cobblestone (limestone) • Upper levels facade walls: Wood elements filled either by adobe, limestone or wood	• Hemish (i.e. Hirms) construction technique • Constructed by human
	• The timber posts are vertical structural elements	• Made by raw material • Square, rectangular or circular cross section	• Wood	• Raw material formed and shaped by human
	• Slabs	/	• Wood	• Constructed by human
	• Pitched roofs	• Wooden structure composed of several elements covered by wooden planquets	• Wood	• Constructed by human

The following part of the comparative study findings is based on the interpretation of the data collected in the previous part. Where the previous information was used to create comparative tables for each site separately. The goal was to determine, based on the collected data, whether the settlements pattern, building envelope, and structural elements of each site could fulfil the criteria that contribute in the selecting the site as World Heritage separately. In order to examine the impact of architectural features and construction techniques of vernacular settlements on its selection as world heritages sites. The following are the results of the comparison conducted for each site separately where the construction of the tables will be explained in a detailed manner followed by the table respectively.

Cumalıkızık according to UNESCO fulfilled four criteria of ten, the criteria are (i), (ii), (iv), (vi) (Bursa and Cumalikizik; the Birth of the Ottoman Empire, n.d.). In the following, each of the four criteria will be examined to determine if it is fulfilled by settlement pattern, building envelope, and structural elements.

Criterion (i): described as “A masterpiece of human creative genius” (The Criteria for Selection, n.d.).

- a. The settlements pattern can be considered as human genius creativity due to the unique and innovative urban planning, since Bursa was the model Ottoman city because of the new urban approach introduced by the early Ottoman Sultans.
- b. The building envelope and structural elements architectural style was reflecting the Byzantine, Seljuk, Arab, and Persian style. Thus, perceived as lacking in human creativity.

Consequently, the settlements pattern fulfilled the criterion (i) while the building envelope and structural elements Unfulfilled the criterion (i) as (Table 5.4) shows.

Criterion (ii): described as “Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design” (The Criteria for Selection, n.d.).

- a. The interchange of human values is evident in the settlements pattern, where Bursa was pioneer city, which inspired the future Ottoman cities and the neighbours.
- b. The interchange of human values on the developments in architecture can be seen in the building envelope and structural elements where the prior civilizations reflection is present.

Consequently, all the three (3): settlements pattern, building envelope and structural elements fulfilled the criterion (ii) as shown in (Table 5.4).

Criterion (iv): described as “Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history” (The Criteria for Selection, n.d.).

- a. The settlements pattern of Bursa was innovative and unique thus, an outstanding example of an architectural ensemble of the first Ottoman Capital.
- b. The building envelope and the structural elements of Himish buildings used in Cumalıkızık considered as outstanding type of building.

Consequently, the criterion (iv) is fulfilled by the three (3): settlements pattern, building envelope and structural elements as shown in (Table 5.4).

Criterion (vi): described as “Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance” (The Criteria for Selection, n.d.).

- a. The new settlements pattern introduced new living traditions and ideas represented by Kulliyes, which held universal significance.
- b. The building envelope and structural elements were not associated to living traditions, ideas or beliefs of outstanding universal significance.

Consequently, the criterion (vi) is fulfilled by the settlements pattern and unfulfilled by the building envelope and structural elements as shown in (Table 5.4).

Table 5.4: Cumalıkızık Comparative Table (Author, 2024).

Selection Criteria	Settlement Pattern	Building Envelope	Structural Elements
	Criterion (i): "Represent a masterpiece of human creative genius."	-	-
	Criterion (ii): "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design."	Bursa and Cumalıkızık incorporated elements from Byzantine, Seljuk, Arab, and Persian architectural styles, reflecting a significant cultural exchange and the fusion of diverse architectural traditions	
	Criterion (iv): "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history."	The settlements pattern of Bursa was innovative and unique thus, an outstanding example of an architectural ensemble of the first Ottoman Capital.	The Himish construction technique that was used in Cumalıkızık considered as outstanding type of building. Due to its seismic resistance which led its widespread adoption and appreciation for this purpose
	Criterion (vi): "Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance."	The new settlements pattern introduced new living traditions and ideas represented by Kulliyes, which held universal significance.	-

"-" symbol: Indicates unfulfilled criterion

Cappadocia according to UNESCO fulfilled four criteria out of ten, the criteria are (i), (iii), (v), (vii) (Gorme National Park and the Rock Sites of Cappadocia, n.d.). In the following, each of the four criteria will be examined to determine if they are fulfilled by settlement pattern, building envelope, and structural elements.

Criterion (i): described as “A masterpiece of human creative genius” (The Criteria for Selection, n.d.).

- a. The settlements pattern of the underground cities in Cappadocia represent a masterpiece of human creativity.
- b. The building envelope of the fairy chimneys was naturally formed without human intervention. While the structural elements were carved by humans but do not demonstrate human creativity.

Consequently, the criterion (i) is fulfilled by the settlements pattern and unfulfilled by the building envelope and structural elements as shown in (Table 5.5).

Criterion (iii): described as “Bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared” (The Criteria for Selection, n.d.).

- a. The settlements pattern of Cappadocia is naturally formed, hence lacks testimony to other civilizations.
- b. The structural elements in Cappadocia vernacular settlements were an imitation of the Byzantine architectural style, where the building envelope was also naturally formed.

Therefore, the structural elements fulfilled the criterion (iii), while the building envelope and the settlements pattern unfulfilled the criterion (iii) as shown in (Table 5.5).

Criterion (v): described as “Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change” (The Criteria for Selection, n.d.).

- a. The settlements pattern, building envelope and structural elements of Cappadocia represent an outstanding example of land use and human interaction with the environment. Besides that Cappadocia, became vulnerable due to several reasons such as tourism and natural factors etc.

Consequently, the three (3) settlements pattern, building envelope and structural elements fulfil the criterion (v) as shown in (Table 5.5).

Criterion (vii): described as “Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance” (The Criteria for Selection, n.d.).

- a. The settlements pattern and building envelope exhibit exceptional natural beauty.
- b. It is necessary to mention that this criterion is a natural criterion therefore; the elements created by humans such as structural elements cannot be considered.

Therefore, settlements pattern and building envelope fulfil the criterion (vii), where the structural elements unfulfilled the criterion (vii) as shown in (Table 5.5).

Table 5.5: Cappadocia Comparative Table (Author, 2024).

Selection Criteria	Settlement Pattern	Building Envelope	Structural Elements
	Criterion (i): "Represent a masterpiece of human creative genius."	The underground cities represent a masterpiece of human creativity	-
	Criterion (iii): "Bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared."	-	The structural elements were an imitation of the Byzantine architectural style.
	Criterion (v): "Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."	The settlements pattern, building envelope and structural elements of Cappadocia represent an outstanding example of land use and human interaction with the environment. Besides that Cappadocia, became vulnerable due to several reasons such as tourism and natural factors.	
	Criterion (vii): "Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance."	Naturally formed and exhibit exceptional natural beauty.	-

"-" symbol: Indicates unfulfilled criterion

Safranbolu according to UNESCO fulfilled three criteria of ten, the criteria are (ii), (iv), (v) (City of Safranbolu, n.d.). In the following, each of the three criteria will be examined to determine if they are fulfilled by settlement pattern, building envelope, and structural elements.

Criterion (ii): described as “Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design” (The Criteria for Selection, n.d.).

- a. The city of Safranbolu was an important station in the Caravan Trades Route where the settlement pattern of the city was related to the commercial developments, which can be considered as interchange of human values on developments in architecture and town planning.
- b. The building envelope and structural elements of Safranbolu exhibit interchange of human values, the architecture of the city developed over the time, where the craftsmen (i.e. the builders) used their life experiences to develop their architecture.

Therefore, this criterion (ii) is fulfilled by the three (3) settlements pattern, building envelope and structural elements as shown in (Table 5.6).

Criterion (iv): described as “Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history” (The Criteria for Selection, n.d.).

- a. The winter settlements and summer settlements of Safranbolu illustrates the wealthy Ottomans settlements in a specific period.
- b. The building envelope and structural elements also shows outstanding example of a type of building which illustrates the Ottomans architectural style.

Consequently, the criterion (iv) is fulfilled by the three (3) settlements pattern, building envelope and structural elements as shown in (Table 5.6).

Criterion (v): described as “Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change” (The Criteria for Selection, n.d.).

- a. The settlements in Safranbolu were divided into two categories: winter settlements and summer settlements reflecting the human interaction with the environment and the land use
- b. The building envelope and structural elements do not meet this criterion

Consequently, the criterion (v) is fulfilled by the settlements pattern, where building envelope and structural elements unfulfilled the criterion (v) as shown in (Table 5.6).

Table 5.6: Safranbolu Comparative Table (Author, 2024).

Selection Criteria	Settlement Pattern			Building Envelope		Structural Elements	
	Criterion (ii): "Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design."	The architecture and town planning developed as trade centre. Hence, exhibit an important interchange of human values.		The building envelope and structural elements of Safranbolu exhibit interchange of human values, the architecture of the city developed over the time, where the crafts-men (i.e. the builders) used their life experiences to develop their architecture.			
	Criterion (iv): "Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history."	The winter and summer settlements of Safranbolu illustrates the wealthy Ottomans settlements in a specific period.		The building envelope and structural elements also shows outstanding example of a type of building which illustrates the Ottomans architectural style.			
	Criterion (v): "Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change."	The winter and summer settlements reflecting the human interaction with the environment and the land use.		-		-	

"-" symbol: Indicates unfulfilled criterion

Table 5.7: Comprehensive Comparative Study Table (Author, 2024).

UNESCO Criteria		Cumalikizik			Cappadocia			Safranbolu		
		SP	BE	SE	SP	BE	SE	SP	BE	SE
Cultural	(i) Represent a masterpiece of human creative genius.	+	-	-	+	-	-			
	(ii) Exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design.	+	+	+				+	+	+
	(iii) Bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared.				-	-	+			
	(iv) Be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history.	+	+	+				+	+	+
	(v) Be an outstanding example of a traditional human settlement, land use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change.				+	+	+	+	-	-
	(vi) Be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance.	+	-	-						
Natural	(vii) Contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.				+	+	-			
	(viii) Be outstanding examples representing major stages of earth's history, including the record of life, significant, on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.									
	(ix) Be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.									
	(x) Contain the most important and significant natural habitats for in situ conservation of biological diversity, including those containing threat ened species of outstanding universal value from the point of view of science or conservation.									

Finally, the comparative tables of each site were combined into a single comparative table (Table5.7), in order to evaluate and compare the findings.

Below is the Key for Table5.7:

SP: Settlement Pattern

BE: Building Envelope

SE: Structural Elements

"+" symbol: Indicates fulfilled criterion

"-" symbol: Indicates unfulfilled criterion

Grey filling: Represents criteria unfulfilled by the sites according to UNESCO.

We conclude from the Table 5.7, that the settlements pattern fulfilled almost all the criteria thus; the settlements pattern has a direct impact on the selection as world heritage in all the sites. In contrast, the building envelope and structural elements exhibit an average impact on some criteria and no impact perceived on others criteria.

6. DISCUSSION

The results of this study sheds light on the impact of architectural features and construction techniques of settlement pattern, building envelope and structural elements of three (3) vernacular settlements Sites located in Türkiye, namely Cumalıkızk, Cappadocia and Safranbolu on their selection as World Heritage Sites.

In order to conduct this comparative study, the differences in the selected sites were accepted and managed in a manner that ensure that all the sites were studied in a fair and a liable manner. In fact, the result of this study was quite unpredictable, since the selected sites have different cultural, historical and natural features.

For the purpose of comparing the vernacular settlements through UNESCO's criteria. The comparative table of the selected sites (Table 5.7) was interpreted and evaluated. The most notable result is the impact of the settlements pattern, where all the criteria of all the sites were fulfilled. Except of the criterion (iii) in the case of Cappadocia, which can be explained in a logical way in the following. The settlements of Cappadocia have special characteristics, which are unique to the region, where the entire settlements were naturally formed due to natural features. Therefore, without human intervention. Hence, lacks of exceptional testimony to a cultural tradition or to a civilization. Consequently, the unfulfillment of the criterion (iii) can be neglected or at least taken into consideration the uniqueness of Cappadocia's settlements.

Building envelope and the structural elements for both Safranbolu and Cumalıkızk fulfilled the criteria (ii) and (iv) which is logical considering these are the only criteria that address the architecture and type of building in a clear manner, both settlements exhibit an interchange of human values of culture during a specific period of time. Moreover, both of them show a unique invented urban planning. In addition, to the outstanding type of buildings that shows deep understanding of the environment. Unlike the criterion (i) that focuses at the creativity of human beings in creating a masterpiece, where either Cappadocia or Cumalıkızk's building envelope nor structural elements exhibit level of creativity or a masterpiece. The building envelope in the settlements of Cappadocia both fairy chimneys and underground cities fulfilled the two criteria (v) and (vii), Because it's an example of interaction of human with environment and land use moreover, the settlements of

Cappadocia have exceptional natural beauty with superlative natural phenomena. Regarding the structural elements used in the vernacular settlements of Cappadocia and according to many previous studies stated previously in this thesis, the criterion (iii) and (v) are fulfilled since the structural elements testament to the Byzantine Civilization and demonstrate an outstanding example of land use and the interaction of human and environment.

The building envelope and structural elements fulfilled some of the criteria. However, the goal of this study was to assess whether the settlement pattern, building envelope and structural elements met all the criteria that led to the sites' selection as UNESCO world heritage site. This is not the case for building envelope and structural elements of vernacular settlements. As conclusion, the settlement pattern of the vernacular settlements have direct impact on the selection of those sites as UNESCO world heritage sites. Unlike building envelope and structural elements.

This study promotes many questions that might not have a certain answer, but for sure have reasons why the answer is considered as it is. For instance, some may question why the settlements of Cappadocia were included, since the dwellings were not artificially constructed. In fact, we all concur that the dwellings were naturally formed due to natural features without human intervention. Nevertheless, what if we consider the settlements as settlements were constructed in an opposite manner? In other words, the conventional definition of space starts by incorporating elements that enclose an open space. However, in the case of Cappadocia's settlements, the space was initially enclosed, not empty. Humans intervened by carving and shaping it from inside out to create what is known as living space. The method of creating the living spaces differed, but at the end, both spaces served as living space. Hence, the settlements of Cappadocia might not have been entirely constructed by humans, but it was humans who utilized and adapted those natural formulations (e.g. Fairy chimneys) to create human settlements. For this reason, Cappadocia was not excluded from the list of the selected sites. Although, the settlements of Cappadocia have different characteristics I had to treat Cappadocia in a consistent manner with the other sites to ensure a fair and a constant study.

6.1 LIMITATIONS AND CHALLENGES

Actually, like any previous studies, this study faced some challenges and limitations. Limitation of adequate sites was the main issue, although Türkiye has twenty-one (21) world heritage sites only three (3) of have extent human settlements. Furthermore, the limitation regarding the generalization of our theory based on only three (3) sites was acknowledged, especially considering two (2) of them share similar features. The second challenge appeared when I had to treat Cappadocia's settlements as the two other sites, despite its unique natural settlements, where the cone-shaped dwellings were considered as building, which represents an unconventional approach. The third challenge is also related to Cappadocia, lately the natural rock settlements in the region of Cappadocia faced new changes, where the inhabitants of the rocky dwellings began constructing extensions using rock masonry for several reasons including converting them into hotels or restaurants, or simply to expand living space. At the beginning of this study there was uncertainty regarding whether to study the area after or before the incorporation of extensions. Consequently, the settlements with constructed extensions were excluded from the scope of this study, since the aim was studying the settlements under UNESCO protection. The final limitation is no less important than the previous, while searching for the architectural features and techniques used in the selected sites, I was limited to the previous studies, as I was unable to personally visit all the sites and take notes. Safranbolu precisely created a challenge in our study due to the lack of studies addressing the traditional architecture in the region.

7. CONCLUSION

This thesis examines the impact of settlements pattern, building envelope and structural elements on the selection process of world heritage sites. Where the criteria set by UNESCO while selecting three vernacular sites in Türkiye were evaluated and analysed from an architectural point of view through a comparative study.

Based on the findings of this study, settlement pattern of the vernacular settlements significantly fulfilled all the criteria that led to the selection of those sites as a UNESCO world heritage site. In contrast, the building envelope and structural elements which only met a few criteria, such as (ii) and (iv). However, the current study concentrated on fulfilling all the criteria that contributed in the selection of the sites as world heritage sites through settlement pattern, building envelope and structural elements separately. In order, to conclude that whether settlement pattern, building envelope and structural elements has a direct impact on the selection process or not.

Overall, we conclude that architectural features and construction techniques were never sufficient for inscription as a UNESCO World Heritage Site; rather, multiple aspects must simultaneously fulfil UNESCO's criteria. Since UNESCO's selection criteria addresses the cultural and natural backgrounds in both tangible and non-tangible heritages without taking in consideration their distinctions. Therefore, either the criteria should be updated or new criteria should be added in order to prevent the possibility of underrepresentation or exclusion of a site from the UNESCO World Heritage List.

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