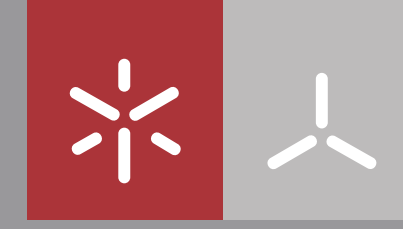


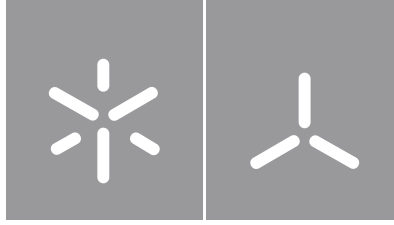


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Morphology of Traditional Villages in the Iranian Central Plateau: Analytical Study for a Heritage Understanding

Universidade do Minho
Escola de Arquitetura, Arte e Design





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**Morphology of Traditional Villages in the
Iranian Central Plateau: Analytical Study
for a Heritage Understanding**

Doctoral Thesis
Architecture
Architectural Culture

This work was carried out under supervision of
Professor Jorge Manuel Simão Alves Correia, PhD

April 2023

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration.

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Morfologia de Aldeias Tradicionais no Planalto Central Iraniano: Estudo Analítico para a Compreensão do seu Património

Resumo

As aldeias encontram-se entre as primeiras formas de organização humana. A sua configuração tem sido moldada sob a influência de vários fatores, de modo a servir os seus habitantes. Assim, o presente estudo procura investigar o meio em que se construíram as aldeias tradicionais iranianas localizadas no planalto central e compreender o valor do seu legado. Através de uma análise detalhada, este trabalho tem como objetivo destacar as características únicas destes lugares, a sua importância histórica e cultural, e contribuir para a preservação e promoção dos seus patrimónios.

Num primeiro momento foi levada a cabo a revisão da literatura, que enfatiza os aspetos chave da morfologia urbana, a história das formas de urbanização, e os fatores que influenciaram o seu desenvolvimento no Irão. Apesar do papel crucial desempenhado pelas aldeias na formação das cidades históricas no Irão, a literatura existente tem-se dedicado sobretudo aos centros de maior dimensão e conhecimento, ignorando as comunidades mais pequenas. Os diferentes fatores que contribuíram para a sua morfologia não têm também sido adequadamente considerados.

Utilizando uma variedade de métodos e parâmetros para selecionar os estudos de caso, as aldeias escolhidas foram classificadas em três categorias principais: montanha, deserto, e fortificação, cada uma com características singulares. Em seguida, foi realizada uma análise minuciosa de três aldeias - Abyaneh, Qehi, Ghourtan - com base nos principais elementos da morfologia urbana, juntamente com uma abordagem qualitativa que considerou fatores ambientais e não ambientais. Essa análise envolveu ainda levantamentos, trabalho de campo e entrevistas. Para um maior entendimento, foram produzidos desenhos em diferentes escalas e resoluções para cada estudo de caso.

Os resultados desta pesquisa não só estabelecem um caminho para estudos futuros, mas também introduzem de forma clara uma metodologia de análise dos fatores influentes. Esta abordagem oferece um modo mais eficaz de investigar estas aldeias, permitindo uma compreensão dos principais fatores que influenciaram o seu desenvolvimento. Este conhecimento é, portanto, essencial para a compreensão do património histórico destas aldeias e relevante para o planeamento e esforços de conservação destinados ao seu desenvolvimento sustentável. Em última análise, este trabalho tem como objetivo poder impactar na perceção estratégica deste património, atribuindo-lhe um papel instrumental no bem-estar das comunidades locais.

Palavras-chave: Arquitetura, Irão, Morfologia Urbana, Património

Morphology of Traditional Villages in the Iranian Central Plateau: Analytical Study for a Heritage Understanding

Abstract

Villages are among the first human settlements. Their traditional form has been shaped under the influence of various factors to meet the needs of the residents. The purpose of this research is to investigate the built environment of traditional villages located in the Iranian central plateau with the main objective of gaining a thorough understanding of their heritage value. Through a detailed analysis, this study aims to uncover the unique features, cultural and historical significance of the villages, and contribute to the preservation and promotion of cultural heritage.

To begin with, a comprehensive review of the literature is conducted, emphasizing the key elements of urban morphology, the history of urban form, and the factors that have influenced settlements in Iran. Despite the crucial role played by villages in shaping historical cities in Iran, the existing body of research has primarily focused on larger and well-known cities, disregarding smaller communities and villages. Furthermore, the various factors that shaped these villages have not been adequately considered thus far.

Using a range of methods and parameters for selecting case studies, the chosen villages have been classified into three main categories: mountain, desert, and fortress, each with unique built features. A detailed examination was then conducted to three villages - Abyaneh, Qehi, Ghourtan - based on the main elements of urban morphology schools together with a qualitative approach that considers environmental and non-environmental factors. This analysis further involved surveys, fieldwork and interviews. To facilitate the analysis, different drawings were produced for each case study, varying in scales and resolutions.

The findings of this research not only establish a comprehensive framework for future studies but also transparently introduce a methodology to analyse influential factors. This approach offers an enhanced and more effective means of researching these villages, thus facilitating a clear understanding of the primary factors that have influenced their development. This knowledge is essential for understanding the historical heritage of these villages and beneficial to consider in planning and conservation efforts aimed at their sustainable development. Ultimately, this work aims to impact the strategic perception of heritage, positioning it as an instrumental role for the overall well-being of local communities.

Keywords: Architecture, Heritage, Iran, Urban morphology, Village

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Chapter one.

1 Introduction



Figure 1 : Case studies, by author

This chapter presents the meticulous considerations of the dissertation, organized into four sections. The first section frames and explains the introduction and motivation behind the research. The second and the third sections present the problem and outlines the main objectives. The fourth section describes the project structure and an overview of the thesis.

1.1 Framework and Motivation

This study adopts a multi-disciplinary approach, incorporating theoretical, historical, and analytical research, to follow the morphological studies. The aim of the study is to analyse the formation and

development of selected villages in Iran and to describe the morphological framework that helps us understand their current situation at various levels of resolution.

Morphology typically involves the field-specific analysis of form or structure (Ye, 2015). Urban morphology investigates the urban form, including the physical parts of urban structures such as streets, plots, and block patterns (Cowan, 2005), as well as functional and social processes (Ye, 2015; Lozano, 1990; Smailes, 1953). Meanwhile, urban morphology is not just a description of forms, but also an explanation of the processes of morphogenesis and the inherent relationships between several spatial components (Moudon, 1997; Samuels and Gebauer, 1981; Larkham, 1998). Understanding urban morphology is a prerequisite for an awareness of urban aesthetics and the layers of meaning attached to townscapes. Through such appreciation, its study adds to the quality of life. Practically, the study of urban morphology performs a vital educational function (Barke, 2018).

Urban morphology is not just about cities. Small communities such as villages play an important role in urban morphology research. Sometimes, villages become cities over time. In many cases, especially in Iran, villages have played an essential role in the formation of cities through their expansion. They serve as a critical human settlement, and studying historic villages is part of each country's heritage.

The formation of both cities and villages is best comprehended through the examination of their construction processes, which encompass a multitude of political and economic factors. The interdisciplinary practice of urban design plays a crucial role in shaping these settlements and the numerous variables that influence their form and structure (Madaripur, 1996). Therefore, understanding the various reasons and factors that contribute to the morphology of settlements is of paramount importance.

In Iran's long history, the relationship between cities and villages has been one of complementarity rather than rivalry. It was common for villages in the region to capitulate without a fight upon the capture of their respective cities by conquerors (Habibi, 1990). The distinction between cities and villages in the field of urban morphology is often challenging, especially in the examination of historical cases, as the growth of many ancient settlements can be traced to their origins as small villages that gradually expanded due to population growth, the amalgamation of adjacent villages, or political transformation. In metropolitan areas such as Isfahan and Tehran, some districts retain the attributes of their former rural identities, evidenced by their preservation of original village names, despite the demolition of older structures and the widening of roads. The continued influence of their rural origins on the urban form of these areas is discernible, particularly when compared to other areas within the cities.



Figure 2 : The Location of the Historic Village of Sichan on the Contemporary Map of Isfahan City and Its Impact on the City's Form. Satellite photo by google.

To gain a deeper understanding of these settlements, it is crucial to examine and interpret various effective layers (Pakzad, 2018). The form of each city or village is a response to an extensive range of demands and events in society, including cultural heritage, war, religion, politics, and most significantly, physical environmental conditions. This interdisciplinary aspect results in a more insightful examination of the origins of urban morphology. These studies take into account architectural, geographical, and sociological considerations (Cömert, 2013). An effective method for categorizing influential factors in village morphology is to distinguish them into environmental and non-environmental categories.

The location and morphology of traditional Iranian settlements have been influenced by environmental factors such as topography, climate, and water availability. For instance, they have usually been located at the foothills of mountain chains or in intermountain basins; Or those located in the deserts of Iran most often obtained their water using Qanats (subterranean aqueducts). The physical morphology of the traditional Iranian city reflected a struggle with extreme climatic conditions: water shortage, high evaporation, intense solar radiation, high temperatures, torrential downpours, and dust and sandstorms (Blake, 1993).

On the other hand, non-environmental factors are based on social, cultural, religious, and other elements of society. These factors appear to influence architecture and urban form, often operating at a deeper level, perhaps beyond the noticeable forms of buildings and spaces. Therefore, further investigation is needed to better understand their impact. The influence of culture and religion is particularly noteworthy, as each period in history has been marked by unique cultural and religious beliefs that have impacted the way people live and build their communities. Despite the importance of these non-environmental factors, they have not been adequately studied in previous research in this field, and there is still much to be learned and explored in this area.

Therefore, analysis of different factors (environmental or non-environmental) helps understand the form and presents an opportunity for a wide range of design or planning strategies; that is why urban morphology has been chosen for this study. It is a system containing many disciplines. It falls within the interest of different professions, such as architecture, geography, philosophy, archeology, anthropology, history, and ethnography (Cömert, 2013). therefore, it is a wide-ranging approach to study these factors in Iran.

Urban morphology is used for this research, even though historical maps and drawings in many Iranian towns and villages are almost non-existent. The choice of this approach was based on two main reasons; Aside from not having enough documents or low-quality documents and maps, the urban landscape preserves thousands of years of that growth; it needs a study of the existing physical and spatial organization, which could compensate for information shortages. Additionally, modernization jeopardizes such an important physical legacy for urban development plans (Esfanjary, 2017) ; It is essential to document and research these heritages before we lose them. The importance of urban morphology is grounded in what is present in the visually built environment. This may be derided as simply descriptive, but accurate and precise description is the root of any scientific study. Thus, developing a detailed methodology for recognizing and understanding the elements that make up a town's morphological character is crucial.

There are numerous types of urban morphology research; in a typical classification that ISUF¹ confirms, they are divided into three primary schools: English, Italian, and French. Each school has different and familiar characteristics to others, but in general, they are similar in some principles. In this thesis, an attempt was made to follow the principles of these schools and not fall into just one of them.

Moudon (1997) believes that morphological analysis is based on three principles:

1. Urban form is defined by three main physical elements: buildings and their related open spaces, plots or lots, and streets.
2. urban form can be understood at different levels of resolution. Commonly, four are recognized, corresponding to the building/lot, the street/block, the city, and the region.
3. urban form can only be understood historically since the elements of which it is comprised undergo continuous transformation and replacement. It is important to know where is the primary core of the city or village and how it was developed.

Thus, the three fundamental components of urban morphological research are form, resolution, and time/history. These components are integral to all studies in this field, regardless of the focus on a specific era, such as medieval, baroque, or contemporary cities, and regardless of the disciplines of the researchers, whether geographers or architects. Thus, in order to conduct a comprehensive study of urban morphology in the selected villages, it is essential to focus on the interrelated elements of history, form, and resolution.

This study focuses on three types of villages located in the provinces of Isfahan and Yazd in central Iran, including two main types and one less common type. Isfahan and Yazd are large provinces with a rich history. The first type of village is located on the edge of the Desert in a micro-climate region surrounded by mountains. The second type is situated in the middle of the Desert and lacks access to a river. The third type is a fortified village located in the Desert. The first two types can be considered representative of the main types of villages in the central region of the country.

This region of Iran has been chosen for this study is noteworthy due to its diverse and rich heritage, encompassing signs of different religions such as Islam and Zoroastrian. Yazd and Isfahan have a long history and has been a significant city since ancient times, with main historic roads passing through it. This region encompasses both desert and mountainous areas, offering a unique opportunity to examine a broad range of factors. These unique attributes make these two provinces a valuable choice for this research. Unfortunately, these heritage sites face numerous threats due to a lack of attention and preservation efforts, resulting in the destruction of many historical fabrics. This study aims to document and preserve what remains, ultimately benefiting both the heritage sites and the residents of the region. The results of this research may be useful for similar cases in other regions and contribute to future studies in this field.

1.2 Research Problem

Heritage is viewed as part of a society's cultural tradition; Built heritage is often recognized simply as one form of cultural heritage (Nuryanti, 1996; Worthing, 2008). Heritage sites and buildings play an important role in society's culture, as we learn more about them, we can conserve them more effectively.

To gain a comprehensive understanding of the evolution and transformation of spatial morphology to fit the needs of the people and how they use the spaces, it is crucial to study the heritage. To effectively compare the development and progression of current villages and cities, it is important to have a clear understanding of their history. A consistent method of analysis using a uniform set of terms should also

Research Problem

be established (Kropf, 2009). Over the past few years, numerous studies on urban morphology and urban geography have been carried out (Noghsan-Mohammadi, 2001). However, there is still a significant gap in the studies conducted in Iran, particularly with regards to small communities such as villages. As Abaee(2022) claims” The study of urban form in Iran has not produced a substantial body of knowledge”. The majority of the research in Iran has been focused on larger cities, leaving the exploration of village forms and morphologies understudied. This leaves a noticeable void in our understanding of the formation and development of villages in Iran, especially given that these communities serve as crucial indicators of the cultural and social landscape of a region.

Moreover, previous research in Iran has largely focused on environmental factors, such as climate, as determinants of village forms. However, non-environmental factors such as beliefs, culture, and religion also play a significant role in shaping the morphology of these communities. To this end, it is imperative that these factors be given equal consideration when studying village forms.

The aim of this study is to address this gap in the literature by analyzing the formation and development of selected villages in Iran through the lens of urban morphology theories. The study will provide a comprehensive understanding of the villages morphologies that have evolved and changed over time to meet the needs of the inhabitants and the way that people use the spaces. Additionally, the study will describe the morphologic framework that will aid in comprehending the current situation of these villages. By doing so, this study hopes to make a valuable contribution to the field of urban morphology and geography, as well as contribute to the preservation of these heritages.

Most of Iran's area is considered a desert (Khosroshahi, 2010), mainly concentrated in the country's center. The physical morphology of traditional Iranian cities reflects the challenges posed by the harsh climate, including a lack of water, high evaporation, intense solar radiation, high temperatures, heavy rainfall, and dust and sandstorms (Blake, 1993).

The morphology of Iranian villages has been under-researched, putting these heritage sites at risk of being forgotten and destroyed due to a lack of attention and the construction of new buildings. The provinces of Isfahan and Yazd are the most well-known and significant regions in this area. While Yazd is entirely located in the desert, Isfahan has greater diversity thanks to the Zayandehrood River and Zagros Mountains located in the west. This diversity results in the formation of microclimates and varying forms and types of villages in the region, making it a more suitable choice for study.

Research Problem

Furthermore, from a historical standpoint, this district has a rich heritage from various reign periods and religions such as Tepe Sialk², which had their effect on the existed today's culture and so architecture and forms. In addition to historical values, Isfahan was an important place from a political point of view and, for many years, was the capital of the country. These factors caused this district to become more prosperous, so different ethnicities with various religions lived there, which ultimately affected the form of villages and cities. In other words, this district has a long history and religious background, which affected the current form of settlements (non-environmental factors).

Through studying previous works of literature, interviews, and fieldworks, it was found that the villages of this area are divided into two main different types; however, another specific type was also identified, which has been studied in this thesis. Mountainous and desert villages are the two main types of settlements, with fortified villages being a less common type. These cases were chosen after reviewing literary works, interviews, and visits to the numerous villages in the provinces of Isfahan and Yazd.

Due to the similarity between the villages and to narrow the scope of the study, for each type of village form, one case has been selected (Abyaneh, Qehi, and Ghourtan). These villages are precious for urban morphology studies due to their history and current conditions. These three types are built in the Desert. However, one type is in areas with higher altitudes, usually the edge of the desert, and due to the existence of some mountains, which caused a microclimate in their environment the form is different. The other one is in the desert environment, far from mountains or rivers and the last one, which is not very popular but exists, is fortified village; these are made in the middle of deserts inside forts that cause different forms and conditions.

In other words, studying environmental and non-environmental factors in these three villages with considering mutual elements of three primary morphology schools (form, history, and resolution) can tighten the current gaps in the field of urban morphology in Iran.

Based on the preceding discussion, a review of existing research in Iranian village morphology reveals that there is a gap in research on the urban morphology of Iranian villages. There are also some ambiguities in the study of these villages in Isfahan and Yazd provinces with attention to the morphology schools. As a result, the purpose of this research is to determine how these various types of villages were formed while taking into account the major urban morphology elements (history, form, resolution); and

² Tepe Sialk is a large ancient archeological site (a *tepe*, "hill, tell") in a suburb of the city of Kashan, Isfahan Province, in central Iran, close to Fin Garden. The culture that inhabited this area is linked to the Zayandeh River Culture. A joint study between Iran's Cultural Heritage Organization, the Louvre, and the Institut Francais de Recherche en Iran also verifies the oldest settlements in Sialk to date to around 6000–5500 BC (Fazeli, 2010).

to recognize the primary influential factors. In conclusion, this thesis offers updated insights into the small communities that are at risk of being forgotten, and sheds light on the impact of various factors on each type of village. The research identifies the challenges these communities face and provides recommendations on protective measures and essential actions that can be taken for each case study to preserve these valuable cultural heritages.

1.3 Research Objectives

"Urban morphology" is a progressive method of analyzing villages and cities in order to learn about heritage and investigate village forms. Moudon (1997) believes that urban morphology is the study of the city as a human habitat. Urban morphology is the systematic study of the form, shape, plan, structure, and functions of the built fabric of towns and cities, the roots, and how this fabric has changed, developed, and evolved over time (Moudon,1997; MadaniPour, 1996). This research tries to,

1. Explore the primary influential factors on the development of different types of forms in villages of Iran throughout history.
2. Explore and classify what are the environmental and non-environmental factors affecting villages form.
3. To examine how the environmental and non-environmental factors have affected the village morphology in the center of Iran.
4. To provide recommendations for each case study in order to enhance the protection of the country's cultural heritage and assess the current state of these heritages.

1.4 Project Structure

The research structure and work plan follow the seven-stage project development model. The seven stages of this model are:

1. State-of-the-art analysis and definition of detailed project objectives; Analysis of different factors and primary morphology schools' characteristics.
2. Search for case studies through interviews, library research, and field works.
3. Choosing the best possible case studies to narrow down, and establish the proper framework and method for analysis.

4. Site survey and fieldwork, measuring, interviews, taking photos, etc.
5. Prepare and analyse the data and case studies considering the literature review and urban morphology schools. Drawing different maps to present the characteristics of each village.
6. Compare the results and analyse each village's main factors and to provide updated knowledge for each type of village.
7. Highlight the threats that these villages face, as well as recommendations for each case study on how to deal with threats and necessary protections to save these heritages.

1.4.1 Overview of Thesis Structure

Chapter 1: Provides a research background, explains the problem statement, outlines the project structure and the aim and objectives. The final section of this chapter succinctly outlines the structure of the thesis.

Chapter 2: Presents a part of the study's theoretical background in terms of urban morphology and different main schools, and reviews previous research efforts that may have common points with this study about the formation of cities and villages in Iran. The aim is to identify the key factors and relevant information necessary for understanding Iranian cities and villages, as well as their architectural characteristics and specific spaces.

Chapter 3 describes the research methodology, including the case selection method and the chosen case studies, as well as the methods used in this dissertation.

Chapter 4, 5, and 6: Describe and analysis of the urban morphology in three different chosen villages, exploring different factors in various resolutions and layers to present each village through field works using different tools and methods.

Chapter 7: Provides answers to the research objectives and problem statement by analyzing the data gathered in the previous chapters. It compares the case studies, evaluates the factors affecting their forms, and generalizes the data to characterize each type of village form in the region. This chapter also highlights the threats to these heritage sites and offers solutions and recommendations for their protection; Also evaluates the government's plans. The thesis concludes with its contributions and suggestions for future studies.

Figure 3 illustrates the research map for this study, which can serve as a brief guide to the general methodology and organization of current research.

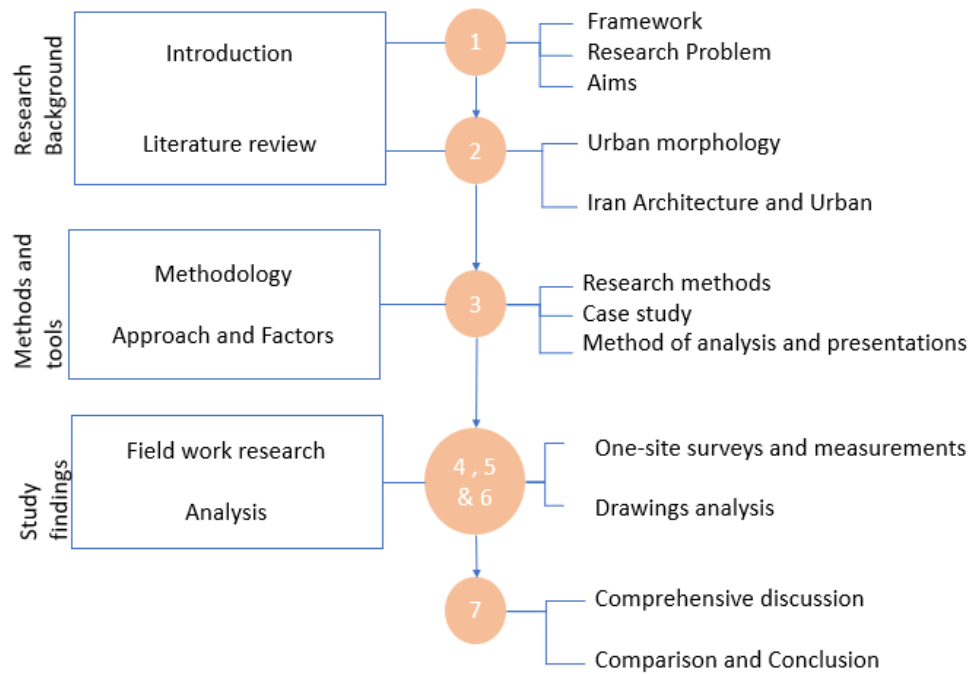


Figure 3 : Research map, by author

Chapter two.

2 Literature review

2.1 Introduction

This chapter provides a theoretical background and state of the art in two part that represent a brief knowledge base for the research efforts. It starts with the urban morphology section. This includes definitions, followed by the urban morphology schools and their comparing and common elements and methods that used for this research. The second section of this chapter aims to broaden our understanding of Iran's cities and villages, as well as their architecture and morphology, in both environmental and non-environmental contexts and determining effective factors that shaped them. Furthermore, the necessary information for a better understanding of this research is presented, such as explanations of specific terms and buildings.

2.2 Section One, Urban Morphology

This section of the research endeavors to examine previous studies in the realm of urban morphology within the academic domain. Essential concepts within the field are defined and the English, Italian, and French schools of thought, as well as their prominent figures, are critically analysed. A comparative analysis of these schools is conducted to identify the principal similarities among them.

The study of these schools is aimed at obtaining a comprehensive understanding of how research in this field has been conducted within diverse international contexts. This knowledge is deemed crucial in facilitating a deeper understanding of the key factors in this research, and in enhancing the ability to present and analyse the data collected on the form of villages in this region of Iran, in an academically rigorous manner.

2.2.1 Morphology

The word 'morphology' denotes the knowledge of form (Pont & Haupt ,2005). The study of physical form is mainly a study of not only living things but also works of art, as initially conceived by the German poet Von Goethe (1749-1832) (Kropf, 2009). For Goethe, Morphology meant a "science dealing with the very essences of forms." Morphology is typically the field-specific analysis of form or structure (Ye, 2015). His key inspiration and contribution were to connect the outward form of an organism or artistic creation to its internal structure and to define the internal parts. Goethe often viewed external and internal shape as a result of a creation and transformation phase. It is worth mentioning that comparative gross morphology in plants and animals is one form of evidence leading to evolutionary theories. More precisely, the resemblance or the homology of the inner structure, such as the skeletal structure of mammals, implied a common descent (Kropf, 2009). Human settlements are also been understood as a living system and organism with various forms.

2.2.2 Urban Morphology

The term "urban morphology" is defined from a morphological perspective as the examination of urban forms and the factors that contribute to their transformation and growth processes. This involves the identification of elements that shape and structure the urban fabric of a city, such as buildings, urban

plots, and urban spaces (e.g., streets and squares) (Oliveira, 2016; AL-Sudani, 2018), as part of the overall analysis of urban form.

The field of urban morphology mainly deals with urban development and emphasizes cities' physical form and character. In European background, it has produced a relative wealth of historical records and maps, some of them dating back to the 16th century. There are military maps and local records from the eighteenth century onwards (Esfanjary, 2017). In the 1980s and 1990s, researchers were interested throughout various disciplines and traditions in the physical form of urban areas; Important books on dominant morphological approaches were written (Oliveira V., 2019).

Thus, in simple terms, urban morphology is the study of urban form. While the self-proclaimed "urban morphologists" generally agree with their research, there is some debate on studying urban forms. An inevitable source of confusion occurs when scientists from a wide range of fields and linguistic and cultural backgrounds contribute to the urban morphological study. The multi-lingual glossary of the scientific vocabulary would undoubtedly mitigate some of the ambiguity resulting from divergent hypotheses and approaches in the field of urban morphology. In other words, a great deal of controversy and confusion is due to the diversity of this field (Gauthier and Gilliland , 2006).

Urban morphology is not only a description of forms, but it is also the explanation of processes of morphogenesis and the inherent relationships between several spatial components (Moudon, 1997 ; Samuels & Gebauer , 1981 ; Larkham, 1998). Thus, the investigation of urban morphology is the study of urban form, including the physical part of urban structure, such as streets, plots, block patterns (Cowan, 2005), and functional and social processes (Lozano, 1990 ; Smailes, 1953 ; Ye, 2015).

2.2.3 Interdisciplinary Scope of Urban Morphology

Although morphology may seem to be used in the sphere of human settlements, the use of urban morphology in non-specialist contexts is worth considering (Kropf, 2009). Urban morphology is the crossroad between numerous academic fields such as architecture, urban planning, history, and geography. Besides, each of these disciplines is influenced by various traditions, analytical apparatuses, research programs, research problems, and research objectives (Gauthier and Gilliland , 2006). At the end of the 19th century, the word morphology slowly applied to geography (Whitehand , 2007). Otto Schlüter (1872-1959), a German geographer, to a certain level, is considered to be the father of urban morphology because of his work on ground plans and urban landscapes. His research on tracing urban form changes during history is the main principle of long-term urban morphological study (Ye, 2015).

In 1996, morphologists from different disciplines, such as geography, architecture, sociology, history, and planning, established the International Seminar on Urban Form (ISUF) (Cömert, 2013), an organization that acknowledges the expansion of urban morphology as an emerging interdisciplinary field. ISUF aims to provide a platform for exchanging ideas, theories, and information through conferences and journals about projects among a wide range of readers (ISUF, 2017).

Architects are always finally interested in forms; An illustration of this interest in form can be observed in the works of Rob Krier. Krier's approach does not strive to introduce novel definitions of space but rather to revive its original significance (Krier, 1975), with a deliberate avoidance of value judgments and the imposition of aesthetic criteria. Consequently, he designates urban space as the "external space," encompassing all varieties of spaces between buildings in towns and other locales.. This is a purely physical space, which is geometrically bounded by a variety of elevations. His analysis of urban space is therefore confined to a morphology, enumerating the basic elements of urban space, street and square, and its basic forms, square, circle and triangle, with several possible variations and combinations; Geography, which had started by describing the phenomena on the earth's surface, narrowed down to the level of intra-urban studies in the field of urban geography. Architecture, on the other hand, which was initially concerned with the design and construction of single buildings, has expanded its scope to cover whole cities. Despite their differences in subject , these two lines of research into urban form have found common ground in the prescriptive fields of urban planning and urban design (MadaniPour, 1996). This coming together of researchers from different language areas and disciplines is based on the agreement that the city or town can be 'read' and analysed through the medium of its physical form (Moudon, 1997). For example, geographers and architects have been kept apart by their different approaches to understanding urban phenomena, which are reflected in their different areas of interest. Whereas urban architecture tends to see the city as a physical entity, urban geography, along with urban sociology, has shifted its focus more onto the people who live inside this fabric. In this way, urban-geography concentrates on the study of urban spatial structure rather than the study of the urban fabric, which is the domain of urban architecture. To bridge these disciplines, urban morphology combines elements from both, offering a systematic approach to gain insights from both fields. This process begins with the physical space of nature, as demonstrated by MadaniPour (1996). By focusing on the process of city-making, this approach aims to maximize the benefits from both disciplines.

As a result, Urban morphology, as a field of study, aims to understand the various aspects that shape and define the physical form of a city or town. This encompasses not just the study of buildings, urban plots, and spaces, but also a deep examination of the socio-cultural forces that contribute to the growth

and transformation of urban areas. It is widely accepted that the physical form of a city cannot be fully understood without also considering its socio-cultural context. As such, urban morphology encompasses not only a study of the physical structures that make up a city, but also a deeper analysis of the cultural and societal factors that play a role in shaping it. Some researchers believe that it is imperative to examine these aspects in tandem, as they are inherently linked and cannot be studied in isolation. As Oliveira (2018) highlights, urban morphology is also closely connected to fields such as art, which have a cultural and societal perspective.

2.2.4 A Review of Urban Morphology Schools

In order to present a comprehensive and up-to-date research on urban morphology, it is imperative to thoroughly examine the various schools of thought and the relevant information associated with them. These schools have received limited attention in Iranian studies, and therefore, a thorough investigation is necessary.

To ensure that the analysis adheres to standard academic methods, it is crucial to identify the central themes and important considerations of the main schools, as well as to integrate current insights and knowledge in the field. This approach will result in a transparent and systematic study, aligned with academic standards, which will contribute to the expansion of knowledge in the field and provide a clear framework for future research endeavors.

The ISUF meetings have shown an interest in urban morphology from several generations of scholars from various countries such as England, Italy, France, and many other countries. The area was dominated by German geographer M. R.G. Conzen (1907-2000) and the Italian architect, who taught in Venice and Rome, Saverio Muratori (1910-73). Within their respective fields of geography and architecture, both men's ideas were unique and contradictory; They started English and Italian schools.

The attributes of Conzen's and Muratori's theories attracted researchers who saw the value of understanding the city and study of form. Whitehand (1981) confirmed Conzen's research by bringing together some of his works and researching the development and importance of his ideas. Whitehand, an urban and historical geographer, moved the boundaries of urban geography into urban economics and studied the relationship between the city and its habitats and the dynamics of the building industry. In the late 1960s, a third school arose in France after Conzen and Muratori settled the field for two primary schools in urban morphology (Whitehand and Conzen, 1981 ; Moudon, 1997).

2.2.4.1 English School

This school can be deemed the most flourishing tradition of research in urban geographical morphology (Moudon, 1997). However, the roots of the English school can be traced back to Otto Schluter, a German-speaking geographer (Whitehand, 2007). But this school's origin is known to be British as the most prominent studies in the context of this school were conducted by Conzen in Britain (Moudon, 1997).

Otto Schluter is undoubtedly the father of urban morphology (Whitehand, 2007). Schluter presented the morphology of the cultural landscape, which in human geography plays a role similar to geomorphology in natural geography. Thus, making the urban landscape an essential topic for research, at least in industrialized countries (Mirmoghtadayi, 2006).

Conzen³ is originally from Germany but he developed his framework in Britain after moving there and seeing English cities (Moudon, 1997). His framework encompasses distinct features such as morphogenetic methodology, cartographic representation, and terminological precision (Whitehand, 2007). However, Larkham suggests that this school can be referred to as the German school. This may be because English morphologists were interested in describing and classifying more than conceptualizing processes (Larkham, 1998; Mahmeli-Abyaneh, 2012), or maybe because Conzen spread his ideas outside the German-speaking countries. Hence, this school, which can be considered the most yielding and popular tradition of urban morphology research, is sometimes referred to as the German school (Moudon, 1998; Pourmohamadi et al, 2011).

Conzen is a prominent figure in the field of town planning, and his philosophy focuses on the city plan, building fabric, and land utilization. The essential elements of Conzen's urban form can be summarized as follows: the street system, the building system (including plots and buildings), and the land-use pattern (Ye, 2015). In other words, Conzen's analysis of the urban plan reveals that the three-component systems of roads, sections, and buildings come together separately in various areas of the city. Each combination is unique to its specific site circumstances and contributes to a level of morphological homogeneity or cohesion within its region (Conzen, 1960).

Advocates of this school believe that the study of urban landscape sets the basis of the theory of the city-making process that explains the history of urban development and guides future planning, and

³ He studied geography, history, and philosophy at the University of Berlin, and later immigrated to Great Britain to study town and country planning at Victoria University after the rise of the Nazi Party in 1933. While working in Macclesfield, Cheshire in the field of regional and town planning, Conzen pursued postgraduate research in historical geography at Victoria University of Manchester (Oliveira, 2019). His education in Berlin exposed him to diverse perspectives from the arts, humanities, and natural sciences, enabling him to develop a deep understanding and insight (Larkham, 1998; Pourmohamadi et al., 2011).

introduces a new knowledge called townscape management (Moudon, 1998). MRG Conzen's view that the townscape is the "objectification" of the human spirit is a valuable starting point for considering the philosophical foundation of urban morphology. The urban environment represents the efforts and aspirations of residents in the past and present. This is reflected in its today's form: street layout, buildings, and the use of spaces. This physical form then encapsulates the genius loci or spirit of place. This may be received unconsciously for many inhabitants, but that does not make it any less significant as part of their identity and sense of belonging (Oliveira,2018).

Conzen's detailed morphological study of Alnwick is one of his most significant works, in which he explained his methods and analysis of town planning. By examining the physical structure of urban space, Conzen used a historical geographical perspective to decipher the accumulation of forms created by generations of builders, planners, and ordinary people (Xu, 2012). This research serves as an excellent example of morphology studies for small towns and villages, which are the primary focus of this thesis.

Alnwick, a small market town in England. A case like this cannot be expected to show all the phenomena that characterize the morphology of town plans. However, its modest size and simple structure make it more suitable for establishing some basic principles and promise to exhibit some morphological phenomena of general significance in addition to those peculiar to itself (Conzen, 1960). In recent years, the Conzenian school of thought has gained renewed attention and popularity within the fields of architecture and urban planning, particularly since 2001 (Xu, 2012). This has been attributed to the growing interest in understanding the complexities of town planning and the underlying factors that contribute to its morphology.

In this research Conzen attempted to explain the present structure of a town plan by examining its development. As he states, the theory of plan analysis developed there opens a wide field of research in two directions. In the first place it needs to be connected with a full investigation of the associated patterns of land use and building types in order to produce a complete interpretation of the townscape. Secondly, it should be extended to cover different functional types of towns, as well as towns of different culture areas (Conzen,1960).

In conclusion, the English School of Urban Geographical Morphology, rooted in the work of Otto Schluter, and popularized by German-born geographer MRG Conzen, has become one of the most flourishing traditions of research in the field. Conzen's contribution to town planning studies, his philosophy on the city plan and land-use pattern, and his detailed morphological study of Alnwick are widely recognized and continue to be a valuable source of inspiration for researchers and practitioners in the field of architecture

and urban planning. The urban environment reflects the human spirit, and the Conzenian approach to urban morphology provides a foundation for understanding the history of urban development and shaping future plans, making the study of the urban landscape a vital and exciting area of research.

2.2.4.2 Italian School

During the 1950s in Italy, studies of morphology were started by Saverio Muratori (1910-1973). Muratori taught at the University of Venice in the 1950s and then the University of Rome in 1964, he was deeply unhappy with the impact of modern architecture on existing settlements and cities. He and his main follower, Gianfranco Caniggia (1932–1987), were analysed the building and the city process in classical Italian cities. Their methodology was based on the categories of buildings and open spaces associated with them, from their initial state to their subsequent changes over time. Their works had a significant impact on the theoretical and practical features of Italian architecture as well as on the use of building typologies in North American architectural design indirectly.

According to Muratori, the roots of architecture should not be traced back to imaginative modernist designs. However, they should instead be sought in the more coherent and consistent tradition of urbanization from the old times to the 1930s. Muratori first proposed the morphology of existing cities in his architectural design ateliers but it did not take long for his lesson to become a defining issue for Italian architects. They considered morphological studies and analysis an essential pre-design step (Pourmohamadi et al., 2011). For his study, Muratori defined four classification scales: arredamento (interior decoration), edilizia (building), urbanistica (town plan), and territorio (region). There are also two sub-groups for each major group: seriali and organic. The "Serial" groups are aggregated by adjacency. "Organic" groups are the ones in which cohesion and association combine elements. Although the classification table and the level of specificity between followers of Muratori are varied, generally, they begin at the smaller scale of the architecture and move to a higher urban and regional level (Esfanjary,2017).

The Muratori mantle, which supervised his 1963 study of Como's city, was taken over by Gianfranco Caniggia (1933–87) in Italy. Caniggia continued the Muratorian tradition through his works. He called it the 'procedural typology,' as the basic origin of urban form is building types, which is because of the emphasis on building types as the elemental basis of urban form (Moudon,1997). Caniggia implemented the four-partite division in the same way as Muratori. However, its four scales included building, aggregate, urban organism, and territorial organism (Esfanjary,2017). Like Muratori, Caniggia not only

developed theory but also put it into practice, remaining actively involved in architecture and building throughout his life. He collaborated with colleagues and students in various cities in Italy and North Africa, and the Muratorian Legacy has been continued by practitioners such as Giancarlo Cataldi, Gian Luigi Maffei, Maria Grazia Corsini, Paolo Maretti, Giuseppe Strappa, and others in Florence, Rome, Genoa, and Siena (Moudon, 1997).

Many architects influenced by Muratori have regarded the historic city as a source of knowledge. The rejection of modernism by Muratori became the subject of further research by two well-known Italian architects: Aldo Rossi and Carlo Aymonino. They recognized the difference between a modern and a traditional city in at least two respects: first, how the single buildings connect with the city as a whole, and second, the process of design of the single buildings alone (Moudon, 1994). Aymonino and Rossi's work was clearly in line with the ideas of Muratori and Caniggia. However, the two students differed in their critique of modernism from their master's method of criticism.

Muratori and Caniggia believed that in order to restore the traditional relationship between buildings and cities in new urban areas, new building designs must be based on traditional city analysis. According to their approach, architectural design interventions should follow established structures, and the architect's role is that of a technician who organizes the human environment within the context of the growth and transformation process of the city (Poormohamadi et al., 2011). The Italian school of thought emerged in response to the standardization of modernism, with a focus on the types of buildings that form the basis of the entire city (Mahmali-Abyaneh, 2001).

In conclusion, the works of Saverio Muratori and Gianfranco Caniggia had a profound impact on the study of morphology in Italy during the 1950s. Their methodology of analyzing the building and city process, based on the classification of buildings and open spaces, remains relevant to this day and continues to influence architects in Italy and beyond. Muratori and Caniggia believed that the roots of architecture should be sought in the tradition of urbanization, not modernist designs. Their rejection of modernism and emphasis on the importance of analyzing traditional cities as a source of knowledge inspired architects such as Aldo Rossi and Carlo Aymonino but with different analysis techniques. The legacy of Muratori and Caniggia lives on through the work of their students and colleagues who continue to use their methodology and ideas in their practices.

2.2.4.3 French School

The third school emerged in France during the latter half of the 1960s, with its foundation attributed to architects Philippe Panerai and Jean Castex, in conjunction with sociologist Jean Charles Depaule. The establishment of the *d'architecture de Versailles* occurred contemporaneously with the dissolution of the *Beaux-Arts*. The French school's morphological framework, similar to that of the Italian school, was a response to the principles of modernism. The Versailles school displayed a dual focus, seeking to both establish a design theory and a theory of city building, with strong connections to the social sciences and a commitment to investigating issues of human interaction with their surroundings. This led to a rich intellectual discourse on urban life, incorporating critical ideas from sociologists such as Henry Lefebvre and architectural historians such as Françoise Boudon and André Chastel (Moudon, 1997; 1998). It can, therefore, be argued that the formation of the French school followed closely in the wake of the studies conducted by the Italian school.

Meanwhile, Rossi and Aymonino's views have influenced the French school more than any other Italian thinker, such as Caniggia (Cortes, 2006). The most important feature of the French school is the formative theories of city form which focuses on the interplay between geographical, social, historical, and cultural factors in shaping urban environments. They provide a multidimensional perspective on urban development, considering both physical and intangible aspects of cities. For example, in a study of different European cities, they examined the effects of the city gardens theory on London's shape and the effects of Haussmann urbanization on the form of Paris with the idea of the shining city of Le Corbusier (Panerai et al., 2004). Therefore, this school's scholars mainly engage in the changes that have happened under modernism (Mahmali-abyaneh, 2001).

In terms of architecture, the French School aligns with Muratori's philosophy. It is believed that modernism constituted a decisive break with the past and that the roots of architecture should be rediscovered in tradition. While in Italy, it involved architects and geographers, in France, sociologists, historians, geographers, and planners all worked with architects to gain a deeper perception of the city. Such an approach to morphology not only relates to design and geography but also includes views of the literary and social sciences. Therefore, the Versailles view falls between the English school and the Italian school and deals with both the design and city-making process. The broad-minded French ones of the 1960s strongly criticized the organizations and individuals responsible for restoring the ruins of the war in the country. Based on the theories of modern architects, the macro housing policy ruined the French urban landscape perhaps more than any other European city (Pourmohamadi et al, 2011).

Panerai and his colleagues criticize geographers' macroscopic approaches because they artificially divide the city into suburbs, downtowns, and urban margins, focusing solely on large-scale land use. Hence the more minor scales of the city where the made landscape is practically formed and felt are ignored (Moudon 1994). Public cherished theories and elite's theories are both important and studied by members of the Versailles school. They denounce the fact that specific architectures and elite classes tend to cut off their relationship with the city. This phenomenon arises in thoughts of the city of Versailles and studies of the emergence of the modern movement (Panerai et al., 2004).

Michelle Darin assumes that studies in France are very diverse and different, and many researchers are unaware of each other's work. In France, this domain is without particular order and priority, and no one is its owner (Darin, 1998). However, Versailles adopts a distinct approach to studying the city that is used in the evaluation of design theory. The new illustration of this approach will unavoidably review methodology and philosophy with a multi-disciplinary background. There is no such requirement in Italian and English schools. Creating a practical way also provides the basis for a systematic evaluation and design approach. Investigating the process of traditional city-making and the elite's city-making simultaneously also requires a critical examination of design theory concerning its practical achievements (Pourmohamadi et al, 2011). This school considers the combination of tradition and innovation essential to cities' design and preserving existing historical values.

Therefore, this school is deeply rooted in practical design and theoretical research in French-speaking countries. Typological and morphological research has been thoroughly tied to the growing debate on the city and its design. However, despite its involvement in the fields associated with urban crises and its multi-disciplinary foundations, the French School of Urban Planning, which separated from architecture in the years following World War II in France, made no meaningful progress (Moudon, 1994).

In conclusion, the French School of Urban Planning that emerged in the latter half of the 1960s, was a response to the principles of modernism. It had a strong connection to the social sciences and a commitment to investigating the issues of human interaction with their surroundings. The French school is rooted in practical design and theoretical research and considers the combination of tradition and innovation essential to the design of cities and preserving historical values. Despite its involvement in fields associated with urban crises, the French school made no significant progress in the years following World War II in France. It adopts a distinct approach to studying the city, considering the views of the literary and social sciences and providing the basis for a systematic evaluation and design approach.

2.2.4.4 An Overview and Comparison

The framework of the present study can now be expressed by understanding the urban morphology schools, their similarities, differences, and the methods they used for different researches.

Three urban morphology schools present a challenging scientific frame for speculating about the urban landscape's topic in a historical context. The Italian School provides a theoretical base for planning and design in the context of classical urban traditions. The English School uses a scientific approach to researching how a city (town plan) is created. The French School outlines a new approach that merges examination of the city with a critical look at design theory.

If we aim to compare the three main schools, the advantage of the British school lies in its emphasis on historical processes. Conversely, the formal method of city examination appears to be more precise within this particular school.. It may be claimed that the greatest weakness of this school is its descriptive and explanatory purposes. However, because of the opportunity to simultaneously study architecture, society, economics, and political fields, the French school can increase its efficiency. Thus, the French School can magnify the effectiveness of its studies. This approach's biggest weaknesses can be reflected in analyzing the current form and the historical trends that shape it. The French School's exceptional attention to the subject of critical design is not essential for achieving the effects of design theories on city-making (MahmeliAbyaneh, 2012).

Scholars of the Italian school have discussed the relationship of morphology with design theory. In contrast, the French have critically examined design theory's history and have taken a strong stance against the modernism movement. Regardless of whether Italian architects follow the tradition of the Muratori or not, they are common in having a controversial view and putting traditional and modern cities against each other.

The understanding of various schools of morphology is essential for conducting morphology analysis in a global context, including Iran. In order to effectively survey and analyse the central villages of Iran for this dissertation, it is necessary to examine past research and determine the best approach. While a significant amount of morphological research has been conducted on large cities, small cases such as Alnwick serve as a valuable example for researchers to understand how to approach such studies. These smaller cases can provide a clearer and more easily understandable demonstration of the methodology and principals involved in morphological analysis.

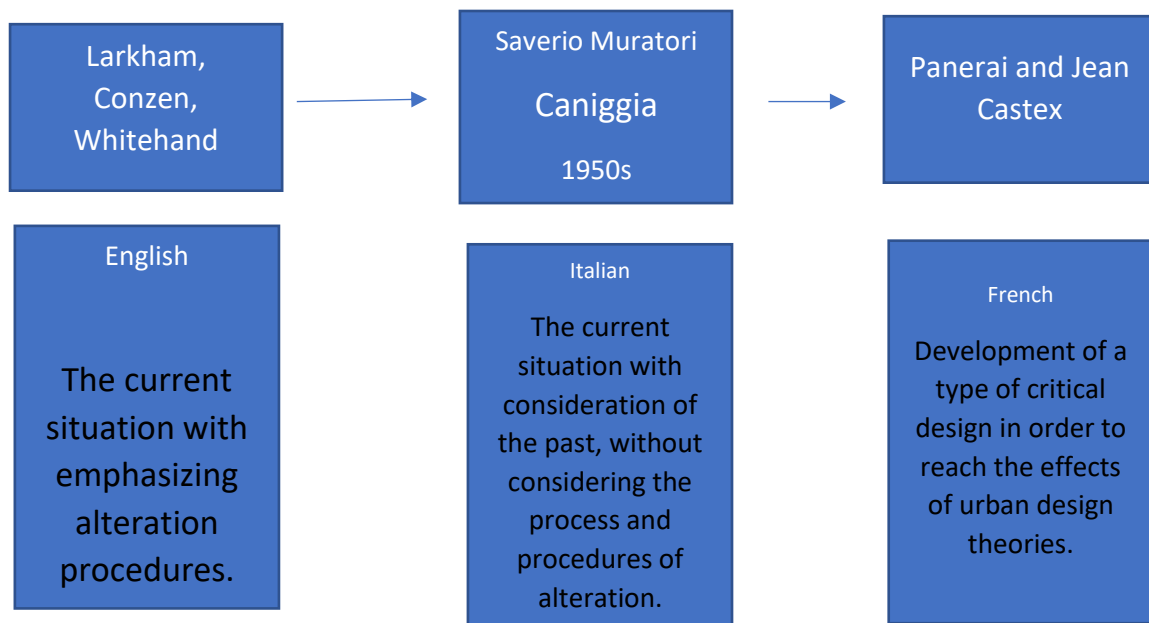


Figure 4 : Different main schools, according to Moudon, 1997, (Larkham & Jones, 1991)

The three schools offer extensive research, planning, and design program that addresses the relationships between space, time, residence, and culture. These schools claim that the urban landscape must be understood in three main respects: time, form, and resolution.

The urban landscape is constantly evolving and is subject to the influence of socio-cultural factors involved in its formation. As such, all morphological studies must take into consideration the factor of time. The interplay between constructed spaces and empty spaces creates form and shapes the artificial environment. However, usage and performance are subject to change in response to varying social conditions and periodic needs. It is important to note that the urban landscape is created at different scales, ranging from a single room to an entire city, with scales in between, such as blocks and neighborhoods (Moudon, 1994).

Broadly speaking, on a common ground of various researchers from different language areas and disciplines, Moudon (1977) notes that an agreement exists among researchers across various disciplines and language areas that a city or town can be understood and analysed through its physical form. Furthermore, there is wide agreement that morphological analysis is established on three fundamental principles (time, resolution, and form), as previously discussed. Whether geographers or architects, these principles are present in all studies and whether they concentrate on a medieval, baroque, or contemporary city (Moudon, 1997).

These schools and their common elements were chosen to study for this thesis about Iran to provide a comprehensive and updated study in this field and update the current literature in Iran in order to present and analyse the case studies in an academic form. By following the principles of urban morphology schools, the results will be more structured and tangible for researchers of this field. It will also make the analysis clearer for understanding, which ultimately helps in reaching to this research aims.

School	Similarities	Differences	Methods
Italian School	Theoretical base for planning and design in classical urban traditions	Controversial view of traditional and modern cities	Discusses relationship of morphology with design theory
English School	Focus on historical processes, scientific approach to town plan creation	Descriptive and explanatory purposes, less attention to design theory	Examines city in a scientific manner
French School	Examines city and design theory, attention to critical design	Weakness in analyzing historical trends that shape the city	Merges examination of city with critical look at design theory

Table 1: Urban Morphology Schools Comparison Table, by author

2.2.5 Issue and Challenges of Urban Morphology

Experts and practitioners familiar with studies of morphology and typology studies criticize it in a variety of ways. Some planners consider it to be too bland and soulless (Samuels, 1990). They are also dissatisfied with the fact that this research is almost entirely limited to city historic cores and historic small towns and cities. Geographers argue that urban morphology's non-quantitative basis undermines its applicability to forecasts (Carter, 1976). although nowadays there is more research about the new cities and now it's not just limited to the historical settlements.

Italian city-planners also believe that morphological analysis is only applicable to historical parts preservation. Its application in contemporary design and building is inadequate because the inspection of contemporary urban fabric requires a different approach to the city-making process. Critics of urban typology and morphology have called this a typological crisis. They accept that the relationship between the separate blocks of urban fabric from the dependent elements of the city as a whole has been transformed into separate and autonomous components.

Critics suggest that morphological research in contemporary cities is complex and not even enlightening. Maps, images, and other land use studies provide only descriptive data that does not help clarify cities' planning and design processes (poormohamadi et al,2011). It is important to note that while these criticisms exist, they may not apply to all morphological studies and should be taken in the context of the specific research being evaluated.

Few scholars have looked at the city in historical terms. According to Larkham, a desirable and appropriate approach could combine detailed morphological studies on the history, development, and form of physical texture with systematic assessments of the qualities associated with these forms and the discovery of user group expectations before the design solutions phase. Typo morphology would then be a helpful component of the urban design process (Larkham, 1998).

Some believe that urban morphology is too much seeking a definitive refined theory, concepts, and themes such as land fragments and the like in medieval European cities and forgets contemporary urban development issues. In their view, there is no demand for other theories to emphasize the importance of certain concepts, such as the cycle of the land fragments change. These issues have been engaging urban morphologists for a period. Nevertheless, it is time to incorporate these concepts into the daily literature of the people who shape and monitor our cities (McGlynn & Samuels, 2000).

Conclusion

Another challenge in the field of morphologic studies is the semantic inconsistency of the words and technical terms. The multidisciplinary nature of this intellectual field may be one of the reasons for word misunderstanding. Each word has been entered from a separate specialty field. It has found a meaning other than the purpose of its origin, or has lost some sense, or some different meaning has added to its original meaning. Therefore, one of the problems in typology and morphology studies is promoting and distributing technical and specialized vocabulary concepts in various disciplines because, while it has a broader and more useful scope, it can lead to misunderstanding and loss of meaning in some cases (Larkham 1998; Pourmohamadi et al, 2011).

In conclusion, the field of urban morphology and typology studies has faced criticism from various experts and practitioners. While some believe it is too limited and lacks applicability in contemporary design, others see it as a useful component of the urban design process when combined with other studies. However, the field faces challenges such as semantic inconsistency of technical terms and a lack of clarity in its application to contemporary cities. Despite these criticisms, the importance of understanding the history and form of cities remains crucial for informed city planning and design.

2.3 Conclusion

By examining the common elements of the main schools, the study aims to provide a structured and tangible analysis of the case studies in Iran. The principles of the selected urban morphology schools will serve as the basis for the analysis, ensuring that the results are aligned with established methodologies and theories in the field. This structured approach will not only benefit academic researchers, but also help to clarify the findings for a broader audience, thereby achieving the research goals in a more meaningful and impactful manner.

For this research, a nuanced and interdisciplinary approach has been adopted, avoiding the limitations of adhering to a single school of thought. Instead, the focus has been on the three general principles and essential issues that are central to the study of urban morphology. These include the examination of the different layers of the selected villages at varying levels of detail, the analysis of land division, land use, and the historical expansion of the village, as well as the investigation of the forms, accesses and architectural details.

In this research, a careful examination of the morphological principles and methods established by the classic schools of urban morphology is deemed to be the most appropriate approach for understanding and uncovering the historical heritage embodied in the selected case studies in Iran. While there are

more modern methods and techniques for analyzing the morphological characteristics of urban settlements, this study believes that the classic schools and their fundamental elements provide a comprehensive and rigorous framework for exploring and comprehending the unique characteristics and evolution of the central villages in Iran. By adhering to these classical principles, this research aims to produce a more structured and comprehensive analysis of the selected case studies, contributing to the advancement of knowledge in the field of urban morphology.

2.4 Section 2: Urban Morphology study in Iran

2.4.1 Introduction

Villages usually undergo two distinct journeys of evolution and development: the natural or organic dynamic process, and a predefined planning system. In the first process, villages shape and develop by interacting with natural and human-made factors. Inhabitants shape their villages based on their experience and collective knowledge to meet their needs. On the other hand, authoritarian planning toward rural development has some fundamental differences from the natural pattern (Ameri & Ahmadi, 2003). Thus, to fully comprehend the heritage of these villages, it is necessary to have a comprehensive understanding of the diverse information that defines them. This study focuses specifically on historic villages that have primarily evolved through an organic process.

This section is divided into two parts. The first part explores the geographical conditions of Iran and provides a brief overview of Iran's rural and village formations, including its history and the resources available for research. It covers the history of urban development in Iran, including the formation of various urban forms across different historical periods.

The second part examines the key factors that have shaped the Urbanism and Architecture of Iran, including environmental influences such as climate and non-environmental factors such as religion. Given the broad scope of these factors and the limited resources available for research into traditional Iranian architecture and urban morphology, particularly in rural contexts, it was necessary to consult with Iranian traditional experts and architects.

2.4.2 Geographical Conditions of Iran

The present borders of Iran are the result of numerous colonial divisions. The borders of Iran have been changed many times over the centuries, different dynasties have ruled over this country and during their reign, many parts of the country were separated. Even though the country has been facing so many changes in different fields such as beliefs, traditions, art, culture and borders, one thing has been mutual between different eras; the land that we know as "Persia". This district covers various locations with many similarities in their rich history and culture and habits. Iran's (Persia) land is located between three important cultural districts: the Mesopotamian civilization in the West and the Chinese and Indian civilizations in the East. The land's boundaries are faced with deserted Stipa-filled fields and cold weathered Central Asian lands in the North, tropical warm regions of Africa, and the Indian Ocean in the South. Countries such as Iran, Afghanistan, parts of Pakistan, Turkmenistan, Tajikistan, Uzbekistan, some regions of Kazakhstan, Iraq, and Southern beaches of the Persian Gulf and the Gulf of Oman are located in this region (Pakzad, Ebrahimnia, Besharatizaadeh, Ayedi, & Kaveh, 2017).

The country is characterized by high mountainous areas near the borders and dry, infertile desert areas in the center. The Dasht-e Kavir and the Dasht-e Lut, are located in the central part of Iran's current boundaries. incomparable in drought and infertility, surround several drainage basins that act as a pit at the end of a seasonal inland river. Usually, Waters that originate from the surrounding tall mountains flow down areas and drain into the deserts.

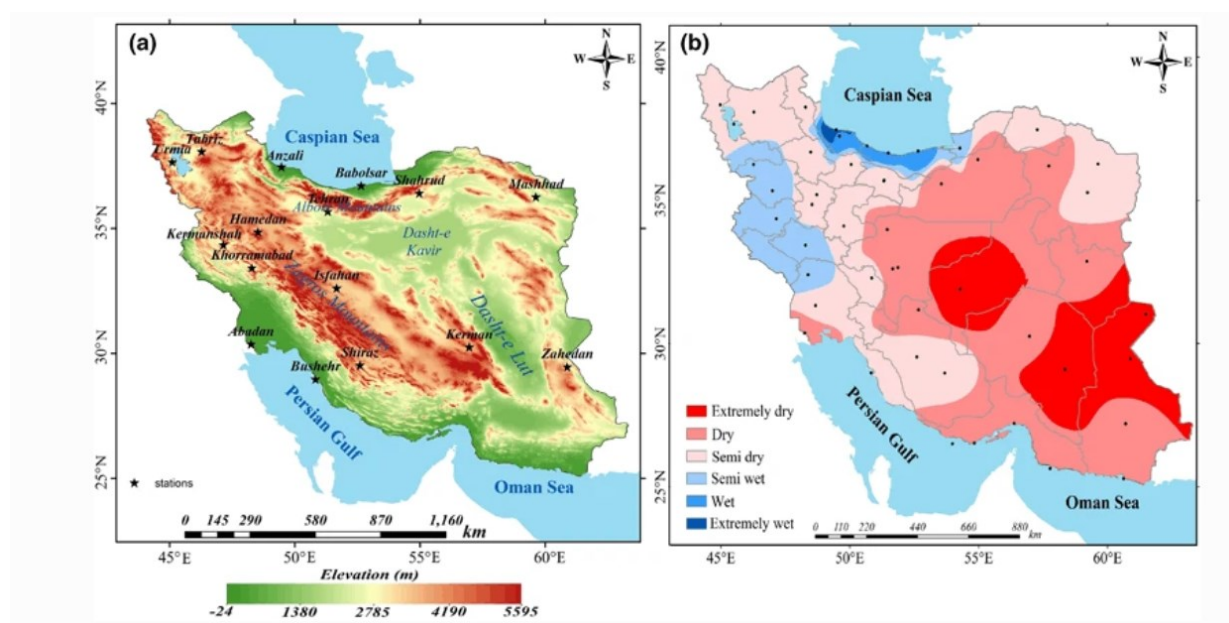


Figure 5: Climate map of Iran, by Alizadeh-Choobari, O.; Najafi, M.S. Extreme Weather Events in Iran under a Changing Climate. By: Clim. Dyn. 2018

2.4.3 The Appearance of Villages and Cities

The Natufians are regarded as one of the earliest societies to have embraced the practice of sedentism, thriving from 12,500 to 9500 BCE (Garland, 2020). Nonetheless, the archaeological evidence pertaining to this period is somewhat ambiguous. The shift towards sedentarism appears to have stagnated at the termination of the Würm ice age. Subsequently, the emergence of villages became a worldwide phenomenon, with the Near East witnessing the establishment of numerous villages around 7500 BCE, the Ando Mountains around 2500 BCE, and Central America around 1500 BCE. This convergence of the advent of villages and the Neolithic Revolution drew the attention of a cohort of anthropologists, leading them to postulate that the advent of agriculture enabled humans to abandon their nomadic lifestyle and adopt a sedentary existence, characterized by pursuits such as pottery, textiles, and other activities associated with rural living (Felenri & Abdi, 2000). Nowadays, despite the trend of high migration towards urban centers, a significant proportion of the world's population still resides in rural areas, accounting for 44% of the global population and 23% of Europe⁴.

Some geographers and sociologists who study villages believe that early villages were formed by small human populations who made their living by gathering, hunting, and probably by some kind of animal husbandry. It is also argued that the way people made a living suddenly changed around the 9th millennium BCE (Baybordi, 2016). Homo sapiens of this era, who obtained their food by hunting and gathering, did not pay much attention to the soil and its biological potential (Mahdavi, 2019). Such villages gradually grew through remarkable industrial development and a greater tendency toward stationary settlements. These villages assumed a relatively rural character. However, some archeologists have referred to them as cities (Pakzad et al, 2017).

Several experts contend that the origin of villages in Iran can be traced back to a millennia prior to the common era (Lambton, 2015). However, there is a dearth of reliable information regarding the inception of early villages in Iran, and no comprehensive studies have been conducted on this subject (Mahdavi, 2019). The earliest villages uncovered in Iran were small, scattered sites that were inhabited for thousands of years before the common era. Over time, the inhabitants of these villages learned to make pottery, domesticate animals, and forge metal tools from metals such as gold, silver, copper, iron, and lead. Prior to the arrival of the Aryans, these villages were inhabited by local tribes, such as the Tapur and Amardi in the region of present-day Mazandaran province and other tribes that lived throughout the

⁴ As of 2020 statistics (data.worldbank, 2022).

country. The origins of these tribes have not been thoroughly researched (Pakzad et al, 2017), making it difficult to establish with certainty the origins of these villages.

2.4.4 Earlier Resources and studies

To discover and understand Iranian urban space in ancient times, it is not enough to rely only on the idea of urban space introduced by Western theorists. The research should begin with the analysis of urban spaces in ancient Iran and, at the same time, be based on the understanding of people (Mirzakochak Khosnovis, 2006).

The sources on Iranian architecture can be classified into two main categories: first, existing buildings and places; second, the literature and historical texts. The number of extant buildings and sites, especially from the pre-Islamic period, is so small that we cannot obtain enough helpful information about the characteristics of urban planning and architecture in this period just by studying them. The information and documents in the texts are also so limited that they cannot be readily evaluated. Nevertheless, their review is crucial for further helpful information although it is less informative (Soltanzadeh, 1998). If we look for the oldest documents about the emergence of cities and Iranian architecture, we can probably find the oldest documents in Iranian poems and travelogues.

In conclusion, studying Iranian urban space in ancient times requires a multi-disciplinary approach combining the analysis of buildings, sites and examination of literary and historical texts. Despite limited sources, understanding early architecture and city origins through poems and travelogues provides valuable insights. A comprehensive approach is necessary to fully understand the history.

2.4.4.1 Travelogues

The travel literature of Arabs, Europeans and others who visited Iran since the Mongol period contains valuable information about Iranian villages. One of its most famous pioneers is Marco Polo, who lived from 1254 to 1324. Ibn Battuta (1304-1369), the owner of "Tahfah al-Nozza", "Ibn Khaldun" (1332-1406) and the owner of the famous "Introduction" written about the history of al-Ebar must also be mentioned. In the books and travel literature of Safavid tourists, useful content regarding village lore and rural architecture can still be found. Some of the popular tourists who wrote about these topics are Tavernie, Charden, Peter Delawaliye, Karzon, and Sykes (Zargar, 1997).

For example, Naser Khosrow, a writer, poet, philosopher, and tourist born in Iran in 1004 CE, was not an architect by the modern definition of the word. However, his itinerary places notable emphasis on

Section 2: Urban Morphology study in Iran

architecture and the form of cities. He traveled to Hijaz due after a dream he had. This journey lasted for seven years. In his journey, he recorded everything regarding some cities and villages' foundations and defensive systems. This collection includes information about architecture and urbanism in that era and the most complete gathered knowledge on fieldwork techniques. His method can be summarized as follows; Whenever he entered a new city or place, he exactly observed that place, questioned, measured, and wrote down about it. Therefore, we currently have information about cities like Diyarbakir, Jerusalem, Mecca, and Cairo thousand years ago (Hoseinyzade, Mehrjardi, & Zabihnia, 2012).

European tourist John Chardin from France traveled to Iran and the Middle East twice and wrote one of the most important historical sources about Iran, a ten-volume book covering various topics such as medicine, music, ethics, mathematics, philosophy, education, and geography. The book also includes paintings and sketches from cities across Iran, making it a valuable source for morphology studies.

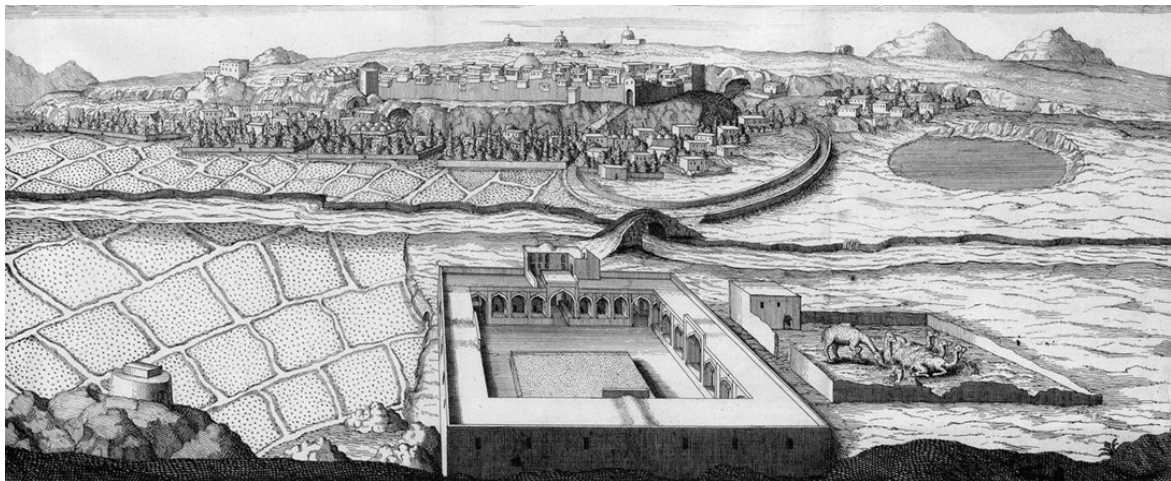


Figure 6 : Sketch of Izad Khast by Jean Chardin (1670s)



Figure 7 : Photo of Izad khast 2018 by author

Another notable figure is Maxime Siroux (October 25, 1907 – January 26, 1975), an architect hailing from France. He played a significant role as one of the earliest professors at Tehran University's Faculty of Fine Arts. Siroux's initial visit to Iran was as part of a delegation from the French Louvre Museum, assigned with the task of identifying and preserving historical monuments. During this period, he closely collaborated with Andre Godard, the head of Iran's antiquities department. Their collaboration resulted in the book "Artifacts of Iran." Recognizing Siroux's talent and expertise, the Minister of Education, upon Andre Godard's recommendation, hired him to design and oversee construction projects at Tehran University and the Museum of Ancient Art of Iran. Additionally, Siroux authored several books focusing on Iran's architecture and cities, his works were useful for the research as he visited some of the case studies. Siroux's works were valuable for this research as he visited some of the selected case studies. This firsthand experience allowed him to provide detailed insights and observations about the architecture and urban spaces in Iran.

2.4.4.2 Persian Literature

Persian literature serves as a historical source for investigating the formation of cities. The genre encompasses a diverse range of topics, including Persian epics and ancient stories, religious and philosophical works, romantic narratives, and ethical treatises. An examination of these works from the relevant historical period offers valuable insights into the realm of urbanism and architecture. For instance, Ferdowsi, widely regarded as one of the greatest Iranian poets (born c. 935 near Ṭūs, Iran, died c. 1020-26 in Ṭūs), is the author of the Shāh-nāmeḥ ("Book of Kings"), the Persian national epic. The Shāh-nāmeḥ comprises epic poems and narratives that depict the cultural landscape of Iran before and after the advent of Islam. According to Britannica (2016), Ferdowsi's composition of the Shāh-nāmeḥ took 25 years, although there are satirical references to the process taking 30 or 35 years (Britannica, 2016).

Šāh-nāma can be considered a national masterpiece due to its simplicity and rationality, and still, after one thousand years, the text is understandable and familiar to Iranian people. Moreover, it covers valuable information about the culture and history of Iran before Islam. Another important point in Šāh-nāma is that it provides knowledge about urbanism and architectural context as well as how some spaces were used in that era. The way of using porch, palace, garden, and other similar spaces is one of the critical points which could not be imagined from remaining places and buildings easily (Soltanzadeh,1998). So, the provided information in this book is of great value but mostly for an overall knowledge, not specific location or cities.

For case studies of this research, an attempt was made to utilize this category of sources. However, obtaining information about small villages from Persian literature proved to be challenging. Nonetheless, for the examination of selected case studies, travelogues were employed and proved valuable in uncovering historical information about the villages. Furthermore, considering poetry as a resource, we can glean insights into the various spaces and overall architecture of specific periods in history.

2.4.4.3 Contemporary Researches

According to Abaee (2022), The study of urban form in Iran has not become a systematic flow of research. The number of publications that rely on the classical repertoire of urban morphological knowledge is very low. Despite this, there have been several studies on cities in Iran. For instance, Russian officers created maps of Iranian cities between 1828 and 1859 to gather military information, resulting in a valuable collection of documents that provide insight into the development of Iranian cities. These maps are useful resources for researchers in various fields, including architecture, urban planning, city-building, sociology, history, geography, demography, anthropology, economics, and even agriculture (Mahyari et al., 2000).

In 1972 Khosrow Khosravi wrote: Studies on the village and rural areas in recent periods about 90 years ago, during the Qajar period was carried out by Etemad al-Saltaneh. He has monographed several northern villages of Iran in a book called *Matla-Al-Shams*. During the Second World War and after that, especially from 1942 to 1953, some studies on Iranian villagers' lives were carried out by some groups; however, this research was sociologically weak and focused only on its political aspects. Rural research has started at the University of Tehran, Institute of Social Studies and Research, in 1958 from the perspective of sociology or other social research, and from that year on, teaching rural sociology and research, especially rural monographs, started and following that department, rural research of the institute was founded (Khosravi, 1972). Among the works done in the field of monographs of villages, the collection of monographs published since 1954 by the Institute of Social Studies and Research of the University of Tehran can also be mentioned. Also, other books on rural studies were published by the same institution, but they did not have the title of the monograph (Zargar, 2003).

In recent years, the government has introduced a type of plan for villages known as "Hadi" (Means Guidance) plans. Hadi plans examine the existing rural structure of an area and set priorities for improving and organizing a region. They establish boundaries for the development and expansion of individual parcels of land and assign them a specific use. Such plans have been implemented in most of rural

areas of Iran. This study utilizes data and results from Hadi plans and relevant government research to analyse the selected case studies. Expert interviews were conducted to gain a more comprehensive understanding of the government's current solutions for rural communities and to evaluate the quality of these plans. The goal is to contribute to the discourse on rural development in Iran and identify potential areas for improvement.

2.4.5 Iranian Cities form in history

Defining the distinction between cities and villages is a complex task, particularly when taking into consideration the fluid nature of the definitions of these two terms in different regions and throughout history. To better understand Iran's villages, it is necessary to have knowledge about the form of old cities and villages in different historical periods. This is particularly true in the case of Iran, where there is a blurred boundary between cities and villages, making it challenging to differentiate between them. In terms of cities' formation and form, most cities have been villages that have expanded over time and became cities; except those that were designed and built with a specific purpose from the beginning.

Building upon the work of Habibi (2011), the forms and structures of cities throughout Iran can be divided into three principal categories: Pre-Islamic, Islamic, and Contemporary. The Pre-Islamic Urbanism period commences in the 9th century BCE and terminates in the 7th century CE with the Arab invasion of Iran. The Islamic Urbanism era begins with the establishment of the first self-governing domestic regimes and persists until 1876 CE and the establishment of the Qajar dynasty. The Contemporary Urbanism era encompasses the duration of the Qajar and Pahlavi dynasty and after Islamic revolution. To maintain a focus on the primary topic of the thesis, only the crucial phases of each era have been analysed in this study.

2.4.5.1 Cities before Islam

2.4.5.1.1 Emergence of Urbanism Concept in Mede era (7th to 9th century B. CE.)

The Aryans, who were settling in the Zagros Mountains and high plains, established The Mede government (Maad in Farsi). They are considered one of the first tribes who transferred their simple tribal rural society into a civilized society. Based on available evidence, it appears that the geographical region from which the Aryans originated was characterized by an exceptionally frigid climate. It used to be cold

for almost 10 months a year and with only two mild months (Soltanzadeh, 2017). In the Medes era, different types of social formations and relations started to take a different shape. People who resided in the rural areas were assigned by the governing laws to only work in the agriculture field, stripped away from having any special role in the government (Mahdavi, 2019).

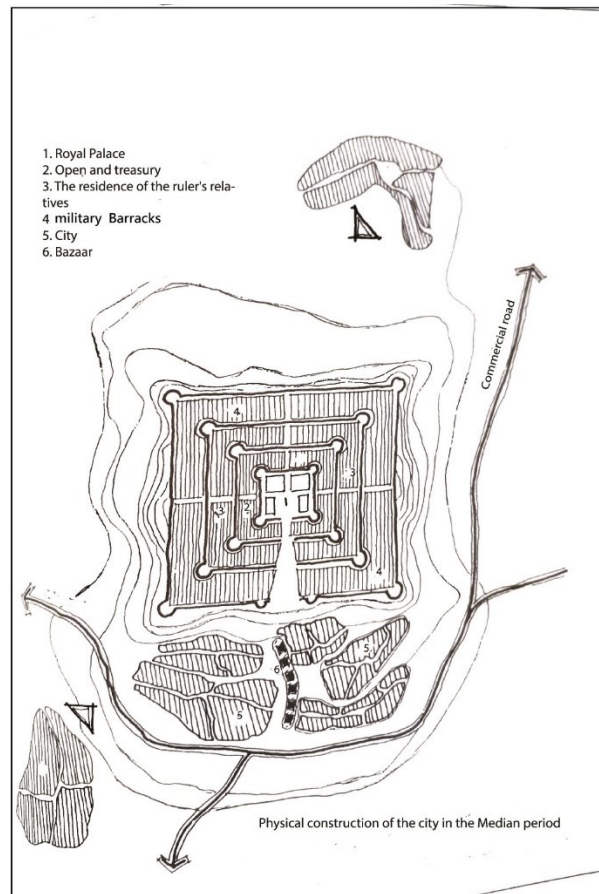


Figure 8 : Physical construction of city in Mede era, source: Habibi,2011, edited by author

2.4.5.1.2 Cities in Achaemenes (Hakhāmanesh) Era 559–330 BCE

In the Achaemenid period, agriculture was the main source of wealth and economic power. At that time, the majority of people were living in villages (Mahdavi, 2019). The wide scope of subsidiary lands of Achaemenes governments led to the establishment of the first powerful empire in near East.

Development of military roads and commercial roads is one of the first actions that Achaemenes did to link critical parts of subsidiary lands; The goal is to develop Shahi (Royal) road from Shoosh to cities alongside the Mediterranean Sea with 2400 Km length. In Tigris and Euphrates route was to provide a quick link between commercial-agricultural Mesopotamian cities, central Power-Town and other parts of the country.

The high number of Persian cities across Iran in that era reveals the urban community's empowerment during the Achaemenes government. This government planned and designed its own cities.

They built their residential cities from a map that has been sanctified by priests. All of the ancestral traditions had been taught to them, and they never trespass the map guidelines. The city was quadrangular with a length equal to a square (700*700 m). In its center, they kindled fire as the real guardian of the place, and beside it, they delved a pool proportional to the number of residents, so they built a cistern. After constructing the building, fireplace, and cistern, they started to construct the house and also gardens. Establishing such cities demonstrates a real Persian city; a concept that plunders and defenses still stands in the contemporary era through all of the challenges. Such a wide city is designed and developed based on social unity and also as complementary to rural areas not based on labor division or acting against rural areas (Habibi, 2011).

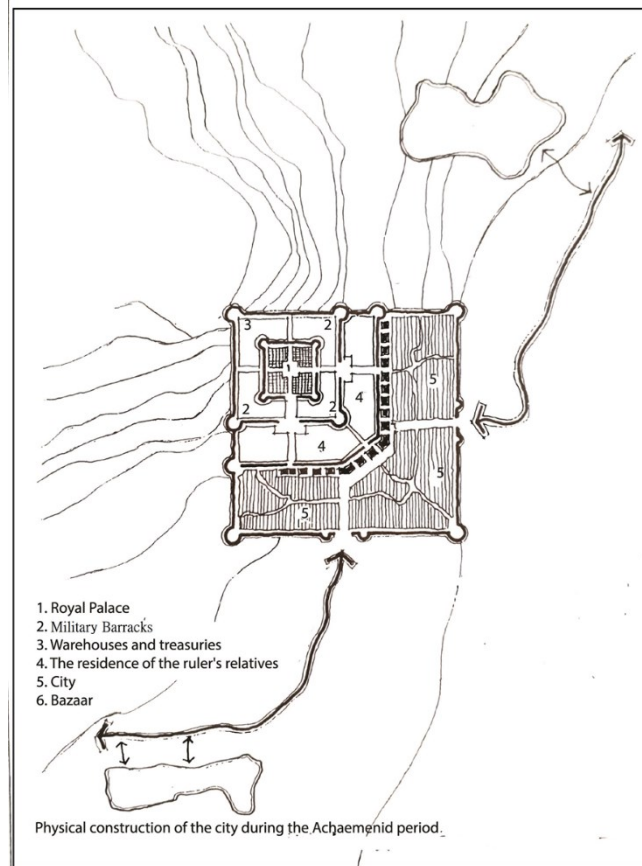


Figure 9 :Physical construction of city in Achaemenid era, source: Habibi, 2011, edited by author

2.4.5.1.3 Parthian City 247 BCE to 224 CE

Not much is known about the urbanization of the Parthians, but many cities are attributed to them. There were certainly new changes in Iranian cities' growth during the Parthian period (Mirzakochak Khosnovis, 2006). There have been many different theories about the urban structure of the Parthians. It is mentioned that the urban structure of Parthian cities has been a geometrical checkered type of pattern with main streets being in perpendicular order with one another and the local roads being aligned or in perpendicular order with them, and a circle which the important authorities' buildings were located in the middle of the city and the residential buildings surrounding by the borders (Pakzad et al, 2017).

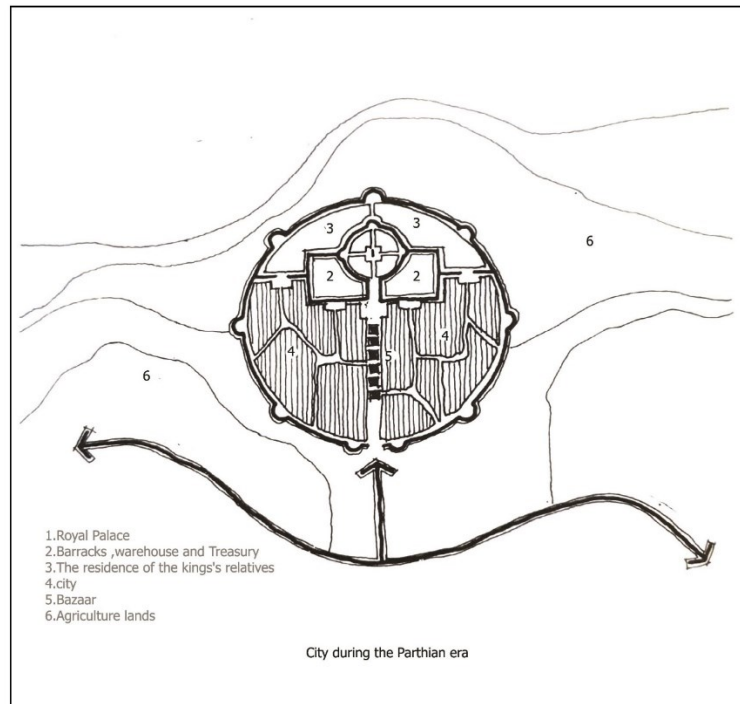


Figure 10 : Physical construction of city in Parthian era, source: Habibi,2011, edited by author

They built the city in a circle and traditionally drew a long wall around it. This way of building circular cities is of Parthian origin in eastern Iran before the Romans encountered it. The towers, congresses, and quiver gaps created around it all belong to the Parthian era that was built around the old rectangular city (Mirzakochak Khosnovis,2006).

2.4.5.1.4 Sassanid Government (3rd to 7th century)

Nearly six centuries of centralized Parthian government and its numerous conflicts with the Roman government caused new concepts and life meanings. They produced new ways of thinking about the world in the Parthian government. The emergence of Mithraism mixed with Hellenism and its combination with the Christian worldview originating from monotheism formed the central part of a return to the ancient religion in Iran. The widespread extension of the Parthian government, on the one hand, and the successive replacements of the Parthian kings due to internal differences in the dynasties of power led to the weakening of the Parthian government, and the Sassanid government started in the third century CE (habibi,2011).

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Like the Persian city in the Achaemenes state, Sassanid city is based on religious beliefs and is influenced by worldview. The city usually ends up with a fence that has forty gates to forty parts of the universe. This is reminiscent of the quadruplet directions and quadruplet elements. The city's physical appearance in the Sassanid government is more or less drawn by historians of the early Islamic period. The physical texture and spatial organization of this city were a pattern used in early post-Islamic cities. The Sassanid Iranian cities, especially those built during the latter period, are very similar to the Islamic cities.

This description of the physical form and spatial organization of the Sasanian city shows that in this case, the Sassanid government also referred to the ancient construction of the Achaemenes state and shaped its city (Habibi,2011). The Arab Muslim invasion of Persia and subsequent Islamization of Iran brought an end to the Sassanid government in 651.

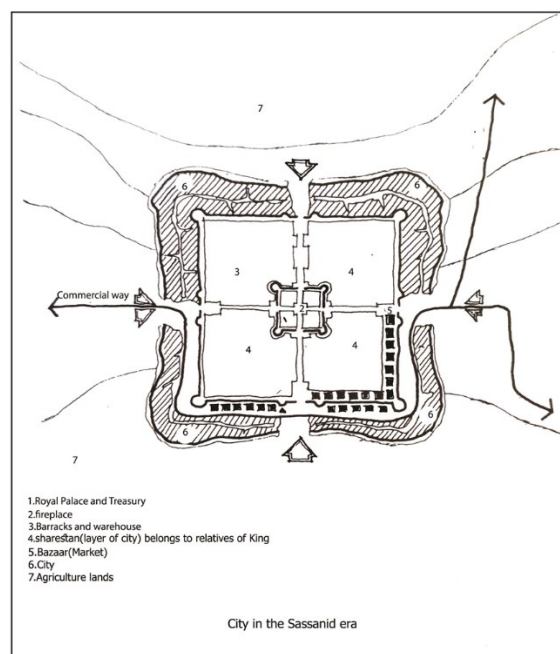


Figure 11 :Physical construction of city in Sasanian era, source: Habibi,2011, edited by author

The city of the Sassanid era was the main place for the establishment of the upper social classes. The king and his entourage lived in a citadel or palace built in the center of the city or at its highest point. The cities built during this period had mostly political-administrative functions (Behzadi, Jalilian, & Heydarzadeh, 2014).

2.4.5.2 Urbanization of the Islamic Era

The seventh century coincided with the conquest of Iran by the Muslims, who presented a new worldview. The spread of Islam throughout Eastern Rome and the Iranian Empire was accompanied by a clear urbanization process in the regions dominated by these two powers. The urban system and the interconnected network of cities played a crucial role in the political systems of the Sassanid and Roman governments. In Iran, the urban system was derived from the central state and its social hierarchy. During this time, mosques, bazaars, and neighborhoods became the key components of an Islamic city (Habibi, 1990). These elements continue to influence the historic cities and selected villages for this thesis in Iran.

2.4.5.2.1 Neighborhood

At the inception of the Islamic State's formation, social stratification based on ethnicity, tribe, and race was rejected. However, such divisions began to expand later, focusing on national and racial differences, in contrast to the social class differences of the Sasanian era. During this time, neighborhoods often conflicted with each other and had their own mosques, bazaars, schools, cisterns, aqueducts, and bathhouses (Habibi, 2001). Although, according to Pakzad (1991), even prior to Islam and continuing after its inception, thousands of tribes and clans constructed separate neighborhoods within the city based on familial conditions, shared interests, and kinship ties. As a result, the presence of a hierarchy of access spaces became a defining characteristic of these neighborhoods. The connection of houses was established through private deadlocks or semi-private alleys, influencing the formation of cities and villages.

2.4.5.2.2 Entries: Transforming the Concept

In the city of the Islamic era, the city's religious role has priority over the military-economic objectives of the governments located in that city. The Islamic city has other meanings: This city is not like the city of the Sassanid era (the city - power); It is not a place that represents the rule of the central government; It's not like the city in the Greek and Roman governments; the city of the Islamic era has no privileges over the region around it because the city obeys the Islamic worldview laws, and there are no exceptional privileges for the people. In these laws, only the community of believers, regardless of their place of residence, who believe in the Islamic worldview have special privileges over others. Citizens of the Islamic

era such as villages or tribes that believe in an Islamic worldview are only obedient to Islamic rules or Imams, caliphs, and their representatives (Habibi, 1990).

Although the features of urbanization and urban planning during the Sassanid period were transferred to the Islamic period, after some time, changes were made in this process that urbanization of the post-Islamic period had its own distinctive and special features (Mashhadizade-dehghani, 2007). We see a unity that is mainly achieved in the use of materials, colors, and shapes and has been developed in an organic system. The idea of centrality remains the same as in the Sassanid period, but the center is not considered as a single point in space, but moves over time and creates the line, which is the linear element of the bazaar. (Khaledian, Karimian, Pourahmad, & Mazaherian, 2016); Unlike the Sassanid era, based on archaeological studies and the study of historical texts, physical space was less designed than before (except in some newly established cities), but the general process of formation of residential neighborhoods was subject to economic, demographic and urban growth. The complete view of all the spaces and buildings of each neighborhood at the beginning of its formation, in some cases, caused them to buy and destroy local houses to create a public space such as a mosque (Soltanzadeh, 2011).

2.4.5.2.3 Khorasani Style 7th to 11th CE

Khorasani architectural and urban style was famous during the Samanid period in Khorasan. The architectural structure of the city during the Samanid period was completely different from the previous eras. The city became wider than its old counterpart. The city walls were removed, and a new urban planning style emerged. The two main lines of streets which were intersected in the central intersection were surrounded by the courtyards as well as the Jame Mosque, and there was a bazaar at the beginning of the main path. As the bazaar was expanding in the direction of the city gates, it created different neighborhoods, Agriculture, trade, and industry, and the three tribal, rural, and urban communities were intertwined. At this time the city included both the main city and nearby villages. One of the remarkable points is the organizational coherence of physical spaces, which is due to the order of water supply, access system, the neighborhood's center, and big and small squares (Habibi s. , 2011) . During this period, buildings had a more humane scale (Pirnia M. k., 2009), for example they are having less height and smaller entrances.

2.4.5.2.4 Razi Architectural Style 11th to 14th CE

Most evolutions in scientific and literary in Iran after emerging of Islam happened during the fourth century after *Islam*. Numerous freedoms in various areas, including religion, thought, and equality, had effects on the spatial-physical structure of the city (Habibi , 2011). Pirnia believes that Razi's architectural style has all the good features of the previous styles in the best way (Pirnia M. k., 2009). During this period, large cities such as Siraf, Rey, Isfahan, Neishabour, Toos, and Shiraz recorded their names in history. Trade unions and schools were two notable turning points that are influenced by free thinking and education.

The city's main body was located at the center of the square, surrounded by government buildings, markets, and mosques. However, the scientific and literary revival declined with the rise of the Seljuk Turks in Transoxiana and Khorasan in the fifth and sixth centuries. During this period, social freedoms were restricted, and the government took ownership of water and land. The government was present everywhere and production and trade became secure. Therefore, urbanization and town planning expanded. In this era, the spatial urban organization included the large main square around which palaces, offices, the grand mosque, and, sometimes, hospitals were built. The main opening of the bazaar enters into the main square and spreads its branches into the city. Neighborhoods were formed around the main bazaar. Schools and mosques were built along the pathways and main passages. Each neighborhood had its own mosque, school, bathhouse, small bazaars, cemetery and the like, and the whole city unit was located within strong fortifications (Habibi , 2011). In Razi architecture, the building was constructed from the foundation with high-quality materials, and also the methods of making arches and domes were greatly improved (Pirnia (Pirnia M. k., 2009).

2.4.5.2.5 Azeri Style 14th to 17th CE

During the Mongol invasion, the country's urban organization has been destroyed and urbanization became meaningless for nearly a century. Following their attacks, large cities such as Merv, Bukhara, Samarkand, Neishabour, and Rey were destroyed. Due to the strong connection between city and village, the destruction and collapse of the city led to the destruction of the villages; therefore, four-hundred-year of scientific and literary movement came to an end. The lack of an urban network can be considered as one of the most important features of Iranian urban planning in the Mongol era. The absence of government and the insecurities of the time caused the people to live where Mongol Khan (King or ruler) lives. That is why single cities such as Tabriz grew. There are few sources of information about the urban

structure in this period. In fact, the growth of single cities, the checkered plan, and the separation of neighborhoods from each other are other Azeri-style features (habibi,2011).

Mongol invasion had a massive impact on Iranian life and the form of cities and villages. this invasion caused a lack of urban planning in Iran for many years.

2.4.5.2.6 Isfahan style (Safavid) "17th to 19th CE

The style of Isfahan, with its emphasis on Islamic-Iranian culture, art, and thought, had a prosperous and influential period in architecture and arts during the Safavid era. these influences can still be seen in some traditional cities to this day (Ziari et al, 2014).

In the 17th century, the collapse of the central government and its absence for three centuries cause the downfall of the ideological constitution and the prevailing worldview resulting in the emergence of diverse religions and Islamic groups. Ultimately, the Safavid government by relying on mysticism concepts and interpretations of Sharia from the point of view of the Shia religion succeeded in gaining a very broad social stance in a wide area. The Safavid government, according to olden traditions, organized, commissioned, and created infrastructure facilities and equipment which also led to the expansion of urbanism and urbanization.

During this period, the concept of the city was reinvented. Despite being a combination of agricultural, industrial, and commercial activities, the city was also the court's seat and the government's presence. In this era, the skillful composition of art, architecture, and urban planning in ancient times led to a new style in these fields (Habibi , 2011). The architectural features of this period include the simplicity of designs and simple geometry in comparison to previous styles (Pirnia , 2009).

The physical characteristics of the cities of this period can be summarized as follows:

- Creating green space and gardens in cities. One of the important features of Safavid urban planning, especially in Isfahan, is the design of Charbagh that have a recreational function (Pirnia)
- Development and design of cities based on the master plan. In the Safavid period, the expansion of cities was done according to a certain plan.

- Create a large square in the city center. around which there were baths, mosques, schools, water, warehouses, bazaars, and other buildings.
- Construction and development of roads and intercity communication networks (Mahjour, 1999)

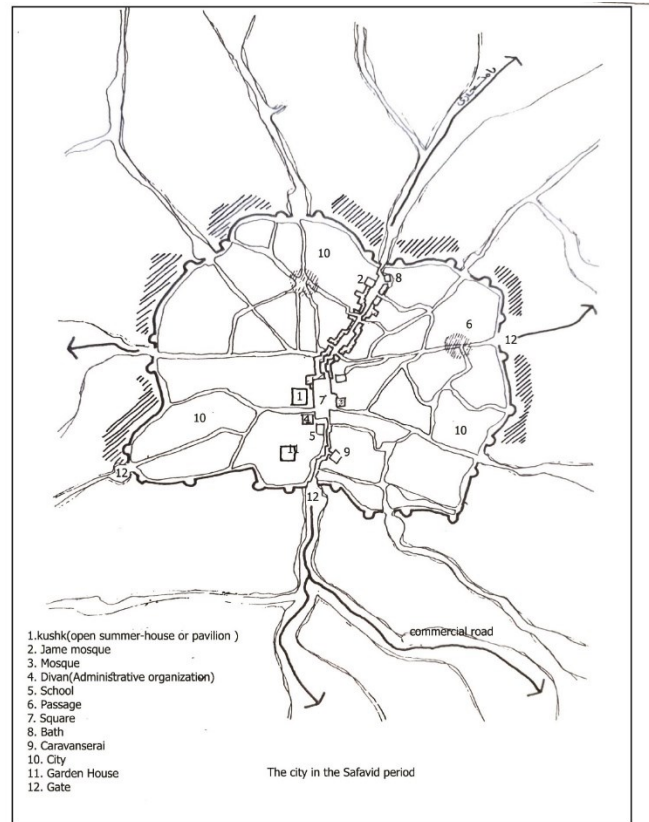


Figure 12 : Physical construction of city in Safavid era, by: Habibi,2011, edited by author

The Isfahan style has a strong impact on the selected villages in the study. It is characterized by elements such as bazaars, religious buildings, and Jame mosques that serve as major urban elements in cities such as Isfahan in Iran. The style had effected the selected case studies in this region more than others and thoroughly considered for analysis of the villages.

2.4.5.3 Urbanization and Urban Morphology in the Contemporary Era

The evolution of urbanization in the contemporary era begins with establishing the Qajar dynasty (1789-1925). Habibi believes that the Qajar era had been a period of invention and re-invention of a new city concept. The appearance of cities did not change much during the Qajar period The bazaar and the city center, in addition to their economic function, emerged as visible expressions of the social and economic structures within the city.

Access to bazaars is limited and the neighborhood centers become the access points instead - Neighborhoods are considered semi-independent places in cities. The urban organization in the Qajar era consists of the citadel (government, administrative, and monarchy sector), bazaar, the Grand Mosque, other mosques, and residential areas (Habibi, 2011).

The development of Hosseiniyeh and Tekyeh (religious places) is considered special urban elements of this era. The Qajar era is the beginning of the period in which Iran had been influenced by the West and the evolution in the urban and regional structure. This impact expands its scope in the Pahlavi era (Shieh, 2018).

The Qajar Dynasty had a weak practical administrative managing system, and the country was involved in many crises. During this period, the Industrial Revolution was progressing in the West. The people were dissatisfied with the situation in the country, and eventually, the Constitutional Revolution took place, which again did not lead to a flourishing situation.

The Pahlavi period, due to the concurrent important historical events in Iran and the world, had a great impact on the shaping of the cities. At the beginning of the Pahlavi period, Reza Shah took immediate actions to reconstruct Iran and its urban and national infrastructure. Thus, the way of life and the shape of cities underwent many alterations.

During his 27-year rule in Iran, among Reza Shah's achievements, we can mention the construction of a national railway and nationwide road construction throughout the country, which had a great influence on the connection between the different cities and villages. Also, modernizing the government system led to the emergence of new offices and buildings in the cities. For example, the establishment of the Document Registration Organization, the founding of the first bank, the creation of a nationwide army and barracks, and the establishment of universities, academies, and factories such as the Iranian Textile Industry led cities to move rapidly toward transformation.

These changes moved the form of cities, villages, and buildings towards modernization. During this period, wide streets were built in the cities, which damaged the old texture of the cities. This matter was not much important at that time, but at the same time, it should be noted that the historical monuments of Iran were reconstructed and repaired during this period. The architecture of the new buildings of this period, while being in a modern form, also reserved elements of Iranian architecture. Rezvani believes that the ultimate goal of these changes was only the elimination of seemingly old and rotten traditions and their replacement with patterns imported from the West without modification; patterns that were

considered modern, life-giving and strict. Therefore, the most important reason for paying attention to cities was that modernization was considered impossible without modifying their form. On the other hand, "expanding and integrating the urban market" are also the reasons why the ruling party considered the cities. Improving and expanding and widening roads, drastic physical changes in the city, etc., led to the integration and coordination of the market and facilitated the circulation of goods and capital in this market, whose most important function was to export the economic rural surplus and import foreign products (Saeedi-Rezvani, 1992).

Prior to the reign of Reza Shah, the distribution and construction of settlements were largely influenced by environmental and defense factors, as the natural surroundings held a greater influence over human habitation and considerations for defense were a prominent factor. Cities were established in regions with abundant agriculture or locations of crucial importance to the national security strategy of the country, or as the seat of a new bureaucracy system. However, with the advancements in technology and improvement in security and stability brought about by Reza Shah's rise to power, the significance of environmental and defense factors in the location and growth of cities was greatly reduced, and instead, political, economic, social, cultural, and technological factors emerged as the driving forces behind urban development. These factors, which had their origin during the Reza Shah era and continue to impact the country to this day, have caused a shift in the hierarchy of cities, as well as impacted the number of cities and villages and the process of urbanization in Iran. Consequently, Iran's urban geography has undergone a dramatic transformation in terms of the spatial arrangement of cities and a new outlook has arisen (Rahnamayi & Shahhoseini, 2009).

During the period of the second Pahlavi, Iran's rapid growth and development continued. In this period, the land reform plan initiated fundamental changes in the amount and manner of land ownership, especially agricultural land, to increase public productivity, and the lands taken out of the hands of the feudal lords or main landlords were divided among farmers (peasants), and the feudal system that had formed after the Mongol invasion and had undergone many changes was almost terminated. During this period, the oil price surge also triggered extensive changes and very high economic growth. Moreover, very large construction and urban development projects such as extensive urban plans, construction of stadiums, airports, etc. were carried out in Iran, which resulted in a set of factors. As a result of the aforementioned changes, the migration of villagers to cities increased.

During the Pahlavi era, Iranian architecture underwent significant changes due to increased security measures and the influence of new cultural and educational systems. As a result, it moved away from

introversion, marked by the reduction of high walls, an emphasis on building facades, and the creation of broad streets that invited public scrutiny of the exteriors. Important Architects of this period mainly studied in the West, primarily in Beaux and Bauhaus, and later played a major role in shaping modern architecture and cities during this time. Following the 1979 revolution and the subsequent Iran-Iraq war, this rapid progress came to a halt.

Masoudi (2011) posits that revolution and its widespread demographic and social impacts, including significant emigration and the unrestrained growth of cities resulting in new and unequal income levels, especially in the post-war years, made cities a breeding ground for the development of vacuous and ostentatious architectural patterns. Conversely, the implementation of identical urban and rural plans, regardless of the national background and the diverse structures and functions of cities and villages, led to the loss of cultural heritage in both the urban and rural areas and resulted in a valuable collection of buildings, such as desert, foothill, forest, coastal, and urban architecture, becoming disordered towns and villages.

The discussion regarding the contemporary changes in the forms of cities and architecture in Iran is relevant not only to cities, but also to the case studies and villages within the country. This includes a wide range of topics, from the construction and evolution of religious structures, to the unfortunate trend of low-quality development and mismanagement that has been observed in recent years. These issues span across different regions and affect both urban and rural areas, making them applicable to the entire country. The examination of these changes is crucial in understanding the current state of cities and architecture in Iran, and in finding ways to address and improve the situation.

2.5 Distinctive Structures in Classical Iranian Architecture

Iranian architecture is a behavioristic style, in which the form of space is heavily influenced by the function (Larijani & Salehi, 2015). To answer to the diverse demands of society different buildings and spaces have been shaped in Iran's cities and villages. Knowing these buildings and their function are important for understanding the urban morphology of selected case studies. The buildings and structures explained below are some of the most common spaces in the historic parts of cities and villages in Iran.

2.5.1 Sabaat

Sabaat (awning) is a roofed route. It is one of the elements of Iranian urban spaces that can be found in many passages in ancient Iranian cities and villages to this day. The Sabaat was constructed to answer the need of some climatical or statical issues and is one of the elements of Iranian urban spaces that

can be found in many passages (Azad & Soltanimohamadi, 2018; Pakzad et al, 2017). As Pirnia explains: "The Sabat is sort of a midway structure for passengers brief comforting stop which consisted of a roofed rout surrounded by rooms or platforms on both sides" (Pirnia&Memarian,2010). Similar to the formation of a bazaar. =



Figure 13: Different Sabaats in the 3 selected case studies, photo by author

Naeema (2004) describes the Sabaat in the book titled "Dezful, The City of Bricks" as a room over a passage that was built not only for architectural purposes but to face climate issues (Naeima, 1998). Soltanzadeh, in the book titled "Urban Spaces in Ancient Context", also describes the Sabat as a roofed room over a passage (Soltanzadeh & Roohbakhsh, 2012).

2.5.2 Hashti (Dalan-e-voroudi)

The Hashti (Vestibule) is a small, roofed space that connected the opening door facing the alleyway to the inner part of the house with one or two detours. Usually, the entrance used to be located at the back of the house. The Hashti, which had access to the outside space, was designed behind it; So, The Hashti's wall, which was facing the main entrance door, remained closed and untouched. This space limited the visible view from the alleyway to the inner part of the house and kept the privacy of the house unharmed.

Two small platforms used to be built on both sides of the alleyway's opening door, which provided a shelter against the brutal sunlight or a rainstorm for passengers. It also provided a space for neighbors to sit with the owner of the house for a talk (Pakzad, et al, 2017). The Hashti did not function as a dividing

space, but more as a waiting space that would glorify the passenger's journey from outside to the inner space of the house. The Hashti was also used as a means to redirect movements (Soltanzadeh, 2017).

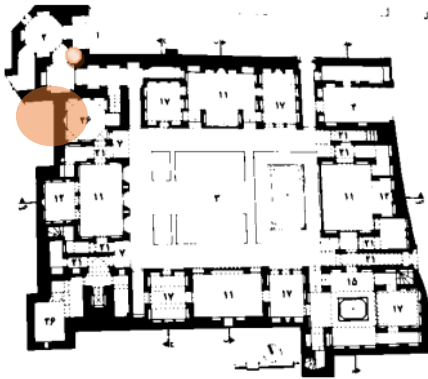


Figure 14 : Plan of a house with Hashti (circle) by Khalaghdooost & maroofi, 2020



Figure 15: Hashties in selected case studies by author

2.5.3 Domes and its Combinatory Types

Elements such as Domes and some types of Arches are structures leading back to the pre-Islamic times. In their origins, Dome is a curved-shaped structure that covers a square. Sometimes octagon-shaped, or in some rare cases, any shape that would fit in a circular or square boundary. Many types of Iranian domes were structured on four individual legs placed in four corners of a room; however, the lower space below the dome could have varied in shape or form. "Chartaqi" was a roofed structure that had a square-shaped plan with four piers in each corner and the structure that connected them with the help of four continuous arches on four sides of the square (Soltanzadeh,2017).

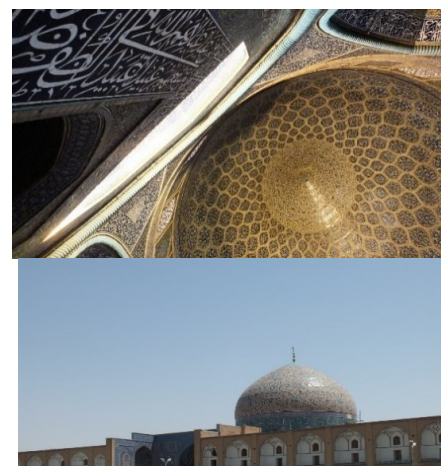


Figure 16: different domes in Isfahan mosques, Photos by author

2.5.4 Ab anbar and Yakhchāl

The ancient Iranians had developed two types of structures to store water and ice: "Ab Anbar" and "Yakhchals". "Ab Anbar" were cisterns, underground reservoirs used to store water for families or villages. They were particularly important in areas where water was scarce or not readily available, as they allowed communities to store and conserve water during the wetter seasons for use during dryer periods. But "Yakhchals" were a type of evaporative cooler used to store ice.



Figure 17: Ab anbar roofs with windcatcher, photo by author

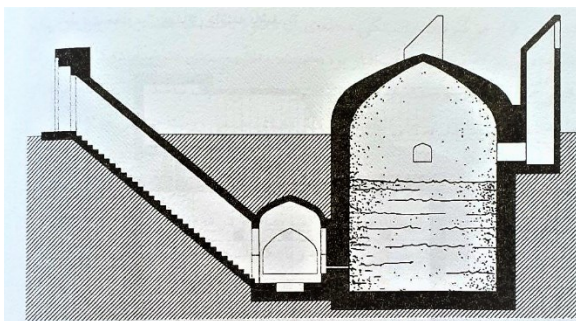


Figure 18: section of an Ab anbar source (Pirnia ,2009)

These structures have been in use for thousands of years, with the oldest remnants of cisterns dating back to the early days of Iran's first civilization (Ghobadian, 2014). Both "Ab Anbar" and "Yakhchāl" played a crucial role in the survival of ancient communities, providing them with access water (Pirnia ,2009; Zargar, 2014). But cisterns were more crucial structures in cities located in warm, dry climates. They were known for their bold and eye-catching designs, featuring tall windcatchers and impressive domes that were visible from miles away. Although there were similarities in the architecture of these buildings, slight variations could also be observed (Ameri & Ahmadi, 2017).

2.5.5 Public Baths(bathhouses)

In the past, baths were an integral part of Iran's large villages. Except in the tropical areas where bathing in rivers or streams was possible in most seasons of the year, in other villages and cities, this bathing was done in the public baths. for example, In Khuzestan, the heat is such that it is possible to use river water for bathing for about nine months of the year, so the villages are without baths (zargar, 2003).



Figure 19 : Vakil Bath, an old public bath, built around 1769, Shiraz, Iran by: Diego Delso, delso, photo License CC-BY-SA

After the rise of Islam, bathhouses bulked and distanced themselves from their previous luxurious identity. Bathhouses were usually built near important buildings such as mosques or the commanderies. The water used in these bathhouses was provided and gathered by the ditches and wells surrounding the building. They were also built lower than the water supply level so that the water flow would have happened easily. Bathhouses used to split the hours of the day to give service to men and women at different times; in some cases, some days of the week it only for men, and the rest of the days belonged to women. It can be said that the early concepts of the Iranian Bathhouses were inspired by the roman and byzantine prototypes (Pakzad et al, 2017). Nowadays, some of the historic baths have been destroyed and, in some cases, converted into museums or restaurants. Usually, the baths in the villages

aren't as big and beautiful as the ones in the cities but they have the same function and mostly similar architectural patterns.

2.5.6 Windcatcher (Badgir)

Wind catchers, also known as "Badgirs" in Iran, are a traditional architectural feature used in hot and dry climates. They are used to promote indoor comfort and ventilation through passive temperature control (Hosseini et al, 2016). The structure of a wind catcher is designed to capture the wind and direct it into indoor spaces, providing natural ventilation and cooling. The wind catcher works by harnessing the prevailing wind direction and channeling it into a building or indoor space.

In addition to houses, wind catchers were also incorporated into the design of water storages, as explained. This helped to reduce the possibility of water stagnation, by providing a constant flow of air and ensuring that the water remains fresh and clean.



Figure 20: A windcatcher in Iran, photo by author

Wind catchers are typically made of local materials, such as adobe, brick, or stone, and their design and construction have been carefully optimized over many generations to ensure maximum efficiency and comfort. In Iran, the use of wind catchers has a long history, and they remain an important part of the country's architectural heritage. Overall, wind catchers serve as a great example of how traditional architectural design can be used to promote sustainable living and to enhance comfort and quality of life in hot and dry climates.

2.5.7 Bazaar

A bazaar is a marketplace for exchange or sell of goods and services. According to Britannica Bazaar is a public market district of a Persian town (Britannica, 2016). The word "bazaar" itself can emphasize the Iranian originality of this urban element because this word has entered the other languages of the world from Persian (Shafaghi, 2005). From Persia, the term spread to Arabia (the Arabic word sūq is synonymous), Turkey, and North Africa. In India it came to be applied to a single shop; In current English

usage it is applied both to a single shop or concession selling miscellaneous articles and to a fair at which such miscellany is sold” (Britannica, 2016).

A bazaar is a symbol of Iranian cities and is widely recognized as a main commercial center. This structure features a linear network of spaces that often begins at administrative buildings or governmental squares and extends to the city gates (Abaee, 2022). Traditional bazaars have long been the hub of social interaction in Iranian cities and are melting pots of economic, religious, and political activities. With a rich history of cultural significance, bazaars include ancillary buildings such as schools, mosques, and baths, woven into the fabric of the market (Feizabadi & Kolahchian-Tabrizi, 2013). Throughout their history, bazaars have played vital roles in Iran's economy, acting as lively centers of trade and commerce. Despite the advent of modern shopping centers, bazaars remain integral parts of Iranian life and testaments to the country's rich cultural heritage.

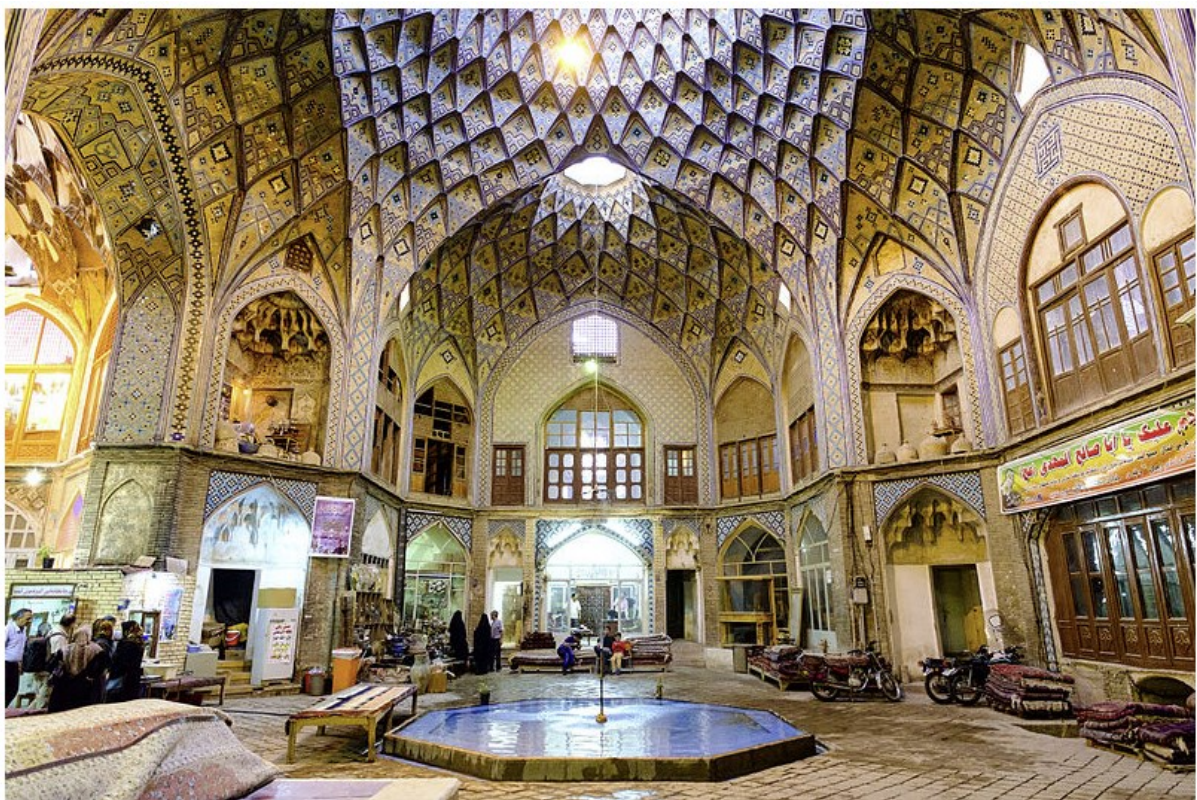


Figure 21: Kashan - Timche-ye Amin od-Dowleh, Bazaar of Kashan Photo by: Jérémie B. This file is licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

The Islamic government's creation of bazaars and squares in conquered territories gave them a significant role as defining elements of Islamic cities. Bazaars evolved over time, just like mosques,

starting with a simpler form and eventually becoming a symbol of local and regional government power. In the Sasanian era and in Islamic cities, bazaars were located in the center of the city and extended from the main squares towards the city walls, with the bazaar often surrounding the mosque and school (Habibi,1990). Despite the growth of modern commercial centers in Iranian cities, traditional bazaars continue to thrive and remain a significant part of the country's economy.

Bazaars are both a product of urbanization and a catalyst for its growth. In most Iranian cities, the bazaar is located in the center of the traditional, older part of the city. However, bazaars in villages are smaller and have less impact on the local morphology. These bazaars mainly serve the needs of the local population, while city bazaars served as a hub for trade and distribution throughout the country and beyond.

2.5.8 Religious Buildings

Religious buildings are a prominent feature of almost all villages in Iran and play a central role in local communities. In many villages, these places of worship are the largest and most prominent structures, often towering over other buildings and constructed with the most durable materials available. Mosques, Hosseiniyehs, and Imamzadehs (shrines) serve as physical expressions of villagers' religious beliefs and practices. These buildings not only provide a space for worship, but also serve as gathering places for the community and play a significant role in shaping the cultural and social fabric of the village. The importance of religious buildings in rural Iran is a evidence to the strong religious traditions and cultural heritage of the country.

Hakim (2008) outlines the key components that a city should have, including a Mesjid al-jami (Jame Mosque) recognized as the Friday Mosque where the Friday sermon is delivered, a governor and/or Kadi to fulfill their duties within the city's jurisdiction, and a Suq (Bazaar) catering to the needs of the residents and surrounding areas.

2.5.8.1 Mosque

An Islamic government is born within the city, and since such a movement was first formed in mosques, therefore the existence of the mosques in the city has become one of the main identifying elements of an Islamic city. The central mosque played a religious role and performed a strong political and social

outlook. due to its function, it had a great effect on the form of the cities and villages. Apart from that, they are many other mosques in each village or city.

The word mosque is from the Arabic word 'masjid', meaning 'to prostrate oneself'. A mosque is a building where Muslims bow before Allah to show their submission to His will (Colledge, 1999). Persia made a peculiar type in adding new elements there, the dome and Iwan. On the one hand, it erected a symbolic dome at the center of the worship hall, on the other hand, it set an Iwan on the center of each side of a courtyard, establishing the 'Four-Iwan type' mosque. An Iwan is an architectural component that was developed in Sasanian palaces, a half-exterior space used as an audience room, etc. It was adopted in mosque architecture, which made the courtyard far more articulated and formative space than in Arabic-type mosques (Kamiya, 2020).

In the construction of mosques, notwithstanding the geographical and spatial diversity, signs are usually put up to indicate the religious nature of the building. In areas where it is feasible to build a minaret, a dome, or both, these architectural elements are added to express the religious nature of the building.

The mosque serves as the central location for salat, or prayer, and as an expression of submission to God. The Qur'an explicitly states that the mosque is the place where Muslims worship and affirm their belief in the unity of God through prayer, stating, "And the places of worship are for Allah: so invoke not anyone along with Allah." (Qur'an 72:18). The Arabic word "masjid," which is mentioned in the Qur'an 28 times, translates to "mosque." Masjid derives from the word sujud, which means prostration, referring to the third position in Islamic ritual prayers where the worshipper's forehead touches the ground (Mortada, 2003).

In Arabic-Islamic cities, local Mosques are simple prayer facilities that are widely available. They are intended to provide a convenient location for daily prayers, excluding the Friday mid-day prayer and those of the two Eids or festivals, which are held at Jame Mosque. Local mosques typically include a water source for ablution and sufficient space for a small group of people to pray (Hakim, 2008). Thus, a mosque is a significant location for Islamic worship, and one of the main buildings in Islamic cities and villages.

2.5.8.2 Imamzadeh

The presence of Imamzadeh has been instrumental in transforming rural settlements. These tombs, which house the descendants of Islamic religious leaders, are among the most significant religious symbols that have caused the formation of many villages and influenced the physical texture and development of the village. Villagers, therefore, construct their Imamzadehs and religious places using the best and most long-lasting materials (Abaszadegan, 2017).

Attention should also be paid to the Islamic Revolution of 1979 in examining the existing Imamzadehs and other religious buildings and their effect on the villages.

According to official figures, at the beginning of the Islamic Revolution, the number of Iran's Imamzadehs was 1500 tombs, and it has extended to 10500 tombs by 2011. The number of Imamzadehs has increased sevenfold over the past 30 years; 300 Imamzadehs have been identified annually on average in Iran in recent years (DW, 2019) However, over 8000 of these Imamzadehs lack confirmed records and genealogy (Tabnak, 2012) In recent years, some false Imamzadehs have been destroyed (Asriran, 2010). but these buildings had a sensible effect on the form of villages in Iran.



Figure 22: inside yard of Abyaneh's Imamzadeh, photo by author

2.5.8.3 Hosseiniyeh

Hosseiniyeh is a multitude hall for the mourning of Muharram and other commemoration rituals of Shia that its name gets from Hossein ibn Ali, the grandson of Muhammad (Marafi, 2012). At the end of the Safavid period and the spread of Shiism, especially in the central cities of the country that had a long history of Shiism, the Hosseiniyeh became the place of mourning ceremonies in the month of Muharram (Zaka, 1971).

Hosseiniyehs are usually a simple indoor space for gathering that connects with the city streets and are the most important indoor space in the city. Most Hosseiniyeh have a simple architecture, but the architecture of each Hosseiniyeh is somewhat different depending on the type of use; For example, the

Tehrani Hosseiniyeh in Karbala, which welcomes pilgrims, has a large nave, many basements and several rooms for pilgrims to live in. Hosseinieh Ershad has large halls and reception halls for the purpose of cultural and social activities, depending on its specific function. Some Hosseiniyeh such as Amir Soltani Hosseiniyeh, also have libraries and clinics (Soltanzadeh , 1983).

2.6 Characteristics of Iranian Traditional Architecture

Iran is a diverse country in terms of climate, race, languages and so the architecture and forms of cities. Researching the causes and origins of this diversity requires extensive study. This type of architecture and urban form includes a variety of buildings and settlements, and Iran has a distinctive morphology in terms of geographical, climatic, and cultural diversity in each village. The following is an overview of the principles that are visible in the predominant architecture of Iran according to experts.

Pirnia (1922-1997) is one of the significant professors in Traditional Iranian architecture. He is known as the "father of traditional Iranian architecture" and had a large number of academic studies and research in this field. His investigations concluded some characteristics as key principles of Iranian architecture, Also, other researchers provided some principles in architecture and form of villages of Iran; by putting both of them together, we can reach the following characteristics:

2.6.1 Flexibility and Creativity

In many villages, buildings or houses do not resemble each other, although there are many similarities. Sometimes the houses differ in their position or size. Sometimes the slope and roughness of them differ. The architecture of the village is such that it easily adapts itself to these special conditions. Flexibility is not only in shapes and forms but also in how spaces are combined (Pirnia , 2009).

2.6.2 Introversion

Introversion is one of the most important characteristics of Iranian architecture.

One of the reasons for introversion in architecture can be religious. Islamic communities have a strong sense of secrecy and personal privacy, which can be seen in their traditional architecture as well as their interior and exterior design. The modesty and secrecy of Muslim houses, as well as the distinct distinction between indoor and outdoor spaces in Islamic cities, are fascinating features of Islamic cities. (Bagheri, 2014). As a result, Iranian religions and beliefs had a large influence on the process of creating different spaces and cities that were formed by these buildings. Introversion is also a good choice for dealing with harsh environments in desert areas.



Figure 23: Introversion in Iran's Architecture, there isn't any windows on the facade and house spaces are around a central yard in Qehi, photos by author.

2.6.3 Local Materials and simplicity

In villages, the basis of the villagers' thinking is to reduce the costs of building and avoid the use of non-native materials. they aim to increase the capability and durability of local construction materials to provide shelter for families (Zargar,2014). The building is expected to be constructed using materials that are abundant in the surrounding nature for any function. Examples include swamp straw, nearby forest wood, desert clay, and mountain stone. Family members are often involved in rural construction. Neighbors and relatives are sometimes asked to work together temporarily to build a house. However, if the task is complicated, they will enlist the assistance of a professional worker to complete a part of the building (Zargar, 1997 ; Pirnia & Memarian, 2010). Rural houses are built in such a way that they are

not difficult to maintain. Repairing or replacing Mudbrick walls (Khesht) that are adjacent to surface moisture and damaged by moisture, can be done easily by family members or indigenous people.

Although new developments of villages are very similar to urban maps which do not follow traditional rural life and style, the village house still is a simple rural home. There is this simplicity in the house's design and the composition of the spaces in the house. The overall shape of the rural house is as simple as the surrounding nature.

2.6.4 Human Suitability (Human Scale)

The size of space in rural homes is commensurate with the human dimensions; This is perhaps the most important principle that was not given much attention in the past architecture of Iran (before Islam) (Zargar, 1997). The flexibility of rural people is high; For this reason, the seemingly uncommon stairs of the city may also be seen in the village, or the height of the door may be short for the homeowner who will have to bend over each time he enters. House components such as stairs and porches are only formed by their minimum size to avoid functional complexity, big size, and false impression.

2.7 Factors Shaping Rural Form in Iran

Rural districts contain useful information about the village's formation process and natural development from the different aspects like geographical, climatic, economic, social, and cultural (Ameri & Ahmadi, 2017). All of these aspects have impacted the village's form.

In addition to the direct interference of the community's people, the villages' fabric has been affected by environmental factors. Human abilities sometimes decline the intensity of these factors' exposure but always maintain their effects on the village's form and space. Therefore, the villages' characteristics are formed under two general groups of factors related to the environment(nature) and humans (ahmadian, mohamadi-makrani, & mousavi, 2008). Most likely, the climate is the most influential factor in the form and architecture of villages in Iran, which directly impacts their construction material. However, there are many other factors that had effects on these forms, which is why we can see many differences in Iranian architecture during various political or religious eras (Abaszadegan, 2017).

In this section, the diverse factors are divided into two categories as follows: environmental and non-environmental. The factors influenced by the environment such as climate are in the first category, and cultural, religious, and the ones that are related to humans are explained in the second category. Although many factors influencing a certain outcome cannot be separated due to the interplay of environmental and non-environmental factors, such as technology and construction methods or water use methods. Despite this, in this research it was attempted to classify them in a more relevant category.

2.7.1 Environmental Factors

Every village is formed in a natural context, for evaluating the current situation and achieving stable development, it is necessary to identify the influential natural elements and clarify how to deal with them (Abaszadegan, 2017). In this research, nature includes land, air, and water. The factors that originate from these environments are considered natural or environmental factors. Climatic factors, form and topography of the land, surface water network pattern, humidity and rainfall status and its forms, surface water distribution condition, and groundwater access pattern are considered environmental and natural factors. These factors have an impact on the morphology of villages (Ameri & Ahmadi, 2017).

As Shieh stated regarding the nature and shape of the land: the issues of whether villages are built on a slope or on flat land, with clay and mud, their color, strength, divisions, and the orientation view of the buildings are important. Climate and nature were both involved in the creation of the physical shape of Iranian cities and villages. For instance, in the central part of Iran, Nain, Aqua, or the northern area of Isfahan, where the texture is a bit dry, and its south is mountainous, such as Golpayegan and Shahrekord and similar areas, wherever there is a path for an aqueduct, alleys, and passages are located in the same direction. Alternatively, in some other locations, such as Golpayegan city, the mountainous environment specifies the building materials' substance. Moreover, in desert areas, the soil and light brown color are effective (shieh, 2020).

In this section, the natural features of Iran generally and the desert regions, in particular, will be discussed. first, we will introduce Iran's natural features, especially the central plateau and the desert margin. It is based on geographical information in the basin from mountain slopes to the end zone of the desert in arid regions. Then, by introducing the other factors.

2.7.1.1 Geography of the Place/Topography

In the subject of geography, two issues of artificial geography and natural geography should be referred to (Abaszadegan, 2017). In the context of Iranian villages, the interplay between artificial and natural geography is evident. The villages in Iran have been shaped by both human-made structures and the natural landscape, creating a unique and diverse landscape across the country.

The location of a village relative to the city and its transportation links can have a significant impact on its economic and social aspects. For example, villages in close proximity to cities such as Isfahan, Mashhad, and Tehran have experienced growth and development due to easy access to markets, services, and employment opportunities. On the other hand, villages located far from these cities may struggle to attract investment and development due to limited access to markets and services.

The natural geography of Iran is also diverse and complex, ranging from deserts to mountains. In mountainous regions, the steepness of the slopes can greatly impact the availability of arable land and the way in which the land is used. Houses may be built on steep slopes that are not suitable for agriculture, while milder slopes may be for farming purposes.

Thus, both artificial and natural geography play important roles in shaping the character and appearance of villages in Iran. Understanding these factors can provide valuable insight into the development and sustainability of the communities in this region. In artificial geography, the village's position relative to the city, roads, etc. The proximity of the village to the city not only can transform the economic and social part of the village but can also affect its overall shape.



Figure 24 : Topography map of Iran, source: en-us.topographic-map.com

Mountains in tropical regions, such as the Alborz and Zagros slopes, are often used to shelter residential units against prolonged winter cold, and this method of village settlement is common on steep slopes. However, the risk factors for the villagers are graded based on the location and slope of their settlement. On flat plains, where there is a risk of flooding, villagers prefer to settle at high altitudes, even though their homes are exposed to cold winter winds. Under the heading of natural geography, many factors can be classified. In the field of physical architecture, most references are made to climate factors such as water, wind, rain, snow, cold, heat, humidity, sunlight, shape and material of the earth, vegetation, and more.

To understand the relationship between each of these factors and the form of the village, their components must be considered (Zargar, 2014). However, providing examples for all these factors may deviate from the main discussion and expand the work unnecessarily.

2.7.1.2 Climate divisions

Iran can be divided into different regions based on climatic conditions, as depicted in Figure 24. The country primarily experiences five main climates

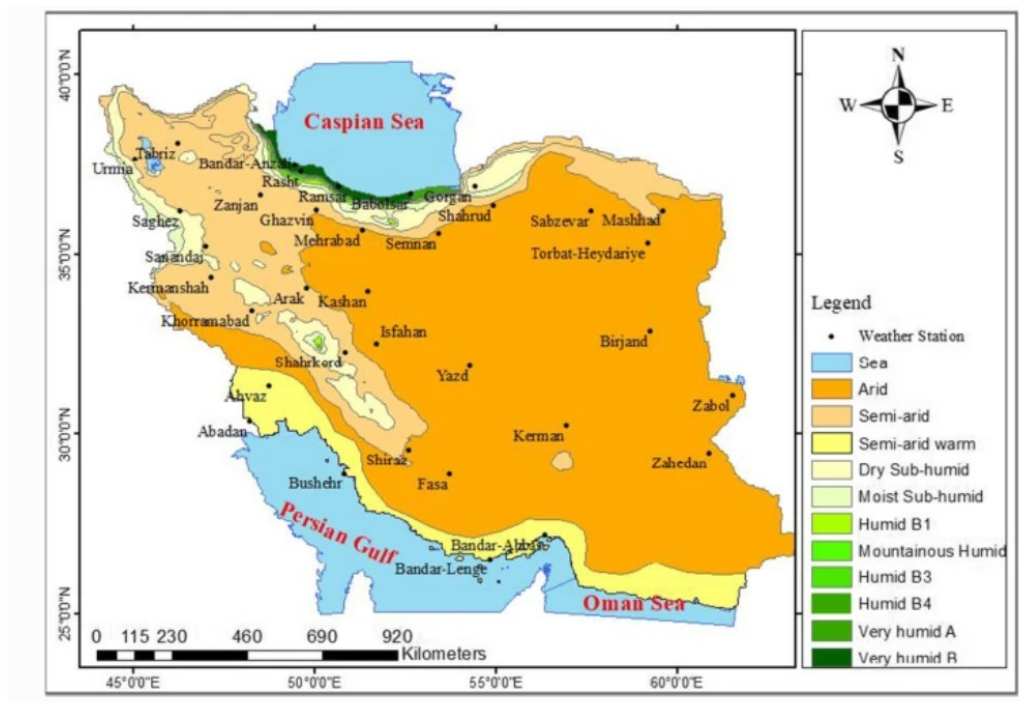


Figure 25 : Map of Climate zones of Iran, source: Abbasi et al ,2021

2.7.1.2.1 Caspian Shores

This area lies between the Alborz Mountain range and the Caspian Sea in the North of the country. The region is considered to be the wettest and most rainy part of the country, with an average rainfall rate of around 1500 mm. The biodiversity of the area is highly dispersed and mostly fed by rivers and rainwater.

2.7.1.2.2 South Coast of the Country

This section is located between the Zagros Mountains and the Persian Gulf. The region is characterized by climate variability, high temperatures, large rivers, and fertile lands. Most of the biological complexes in this area are fed by surface water from rivers.

2.7.1.2.3 Mountainous Areas in the Alborz and Zagros

These areas are temperate and cold. Special features of these areas are high altitude from sea level, low temperature, high rainfall, and rangeland for livestock.

2.7.1.2.4 Desert Areas Located in the Center of the Central Desert and Dasht-e Lut

Deficient rainfall (less than seventy millimeters per year), low vegetation, saline lands, and very low population density are characteristic of these areas.

2.7.1.2.5 Desert Margin Areas

This area includes the slopes of the Alborz and Zagros Mountains, which surround the desert areas. The climatic characteristics of these areas include low rainfall (between 100 and 200 mm/year), high temperatures on hot days with significant differences between night and day, and a variety of vegetation. As we move closer to the desert basin area from the slopes, rainfall and vegetation decrease. Most of the villages and complexes in the area rely on groundwater and aqueducts for their water needs. The temperature in different basins in these areas depends on factors such as sea level, wind direction, and

wind speed. However, high-temperature dusty winds and severe radiation can be considered as disturbing environmental factors in this area.

This thesis aims to introduce the form of settlement and rural districts in desert and desert margin areas.

2.7.1.3 Water and its Importance

The emergence and survival of human groups without the constant presence of water in the natural environment is improbable. In this regard, water is one of the basic and essential elements, and its biological role makes it inevitable for any human society to gain and consume it. Especially in the semi-arid and low-water land of Iran, water has a very vital role in village life (Ghobadian, 2014).

The water in the village generally has three major uses: 1) drinking; 2) hygienic uses; 3) agriculture, livestock, and other production cases.

Regarding the hygienic use, bathing, washing, dishes, and the like are generally considered, which sometimes give features to the village's form in terms of location of facilities and place of the activity. Agriculture is generally water-dependent. Livestock is also dependent on drinkable water. the use of water in service and production activities such as water mills is considered, but it is not widespread (Zargar, 2003 ; Ghobadian, 2014).

The types of water resources in Iran are varied. their most important forms are rivers, canals, springs, wells, rainwater, etc. Each of which can be effective in the physical appearance of the villages. Groundwater in Iran, especially in arid and low rainfall regions of desert margins, is a critical factor in establishing villages. Most of the desert villages use groundwater. Groundwater accessibility is affected by natural factors such as land layers, topography, rainfall, and water reserves at heights and depths above ground level(*ibid*,1995). Two common ground water sources in central of Iran are Qanats and Wells.

2.7.1.3.1 Wells

About the wells, from ancient times until recently, in most villages in different parts of Iran, it was common to use wells for drinking and sometimes for washing and sanitation or both (Zargar,2014).

In agriculture, well water has generally been consumed since the water pumps were invented. There are two ways to utilize wells in villages:

1- Every house has its own self-sufficient well.

2- Drinking water is delivered to each house using a piping mechanism while the pumping system pushes the well water into a metal or concrete source and then into the houses.

Therefore, it can be indicated that the prevalence of piping technology gives more flexibility to the texture of the village; since the necessity to trace a path with fixed traffic and direction in the village is obviated (Ameri & Ahmadi, 2017).

2.7.1.3.2 Qanats

Qanat or Underground aqueducts, can undoubtedly be considered the economic artery of consecutive centuries of ancient Iran. It is a canal network that covered all cities and villages. In addition to supplying agricultural water, it also provided drinking water to this land (Maleki & Khorsandi-aghayi, 2015).



Figure 26: aerial photos of qanats in Iran, Yazd, photo by: Gerster, Georg-1979

Changing the village's water supply from the river to the aqueduct can significantly impact its physical landscape. Below is some information about Qanats.

Many believe that Qanat is an Iranian invention. The Qanat is a water access technique. About three thousand years ago, the Iranian were able to flow water using the gravitational force and physical nature of the water in the land by recognizing groundwater resources and the force of gravity and the use of apparently simple technical knowledge, i.e., digging wells and atriums and reach it to the plain with a mild slope considered. In this regard, wind energy, fuel energy, and muscle energy (animal or human) are not used to transfer water. It is only the gravity of the earth and the property of water itself that helps. Underground aquifers and alluviums are discovered in the Qanats in the foothills. There, a well is dug to get to the water. The depth of this well, called "mother well," fluctuates from 15 meters to 100 meters in Iran. The symbol of the Qanat is specified near the considered village where Qanat water can be found. The excavation of the Qanat begins from the same Qanat and proceeds directly and with a gentle and calculated slope to reach the depth of the mother well. The length of these atriums ranges from one to two kilometers and reaches up to 30 kilometers. At certain intervals, the wells are dug to reach these atriums (Zargar,2014; Ameri & Ahmadi, 2017).

Qanats had a noticeable effect on the morphology of villages in Iran. Firstly, when the water source is Qanats or springs, the villages take on a compact and clustered form. Secondly, and perhaps most importantly, there is the issue of water source restriction. Consequently, when the population of such villages reaches its saturation point in terms of water use, the number of houses will also reach its limit and further development will cease.

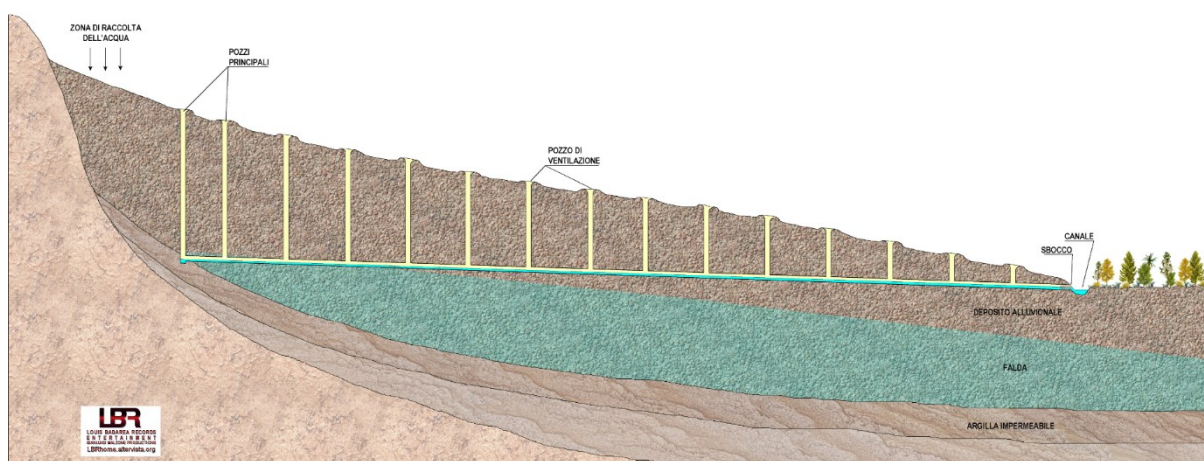


Figure 27: Section of Qanat, by : lbrhome.altervista.org/antichi-acquedotti-qanat-e-foggara ,accessed on 5/12/2022

Another point is that concerning the topography of the area and other factors, the Qanat is often either in the upper part of the village and very likely in the middle of a square of the village, or outside the village

and completely out of public access. The fabric of these villages is mainly dotted. The movement of water from the Qanat point to the inside of the village and within its fabric network is dependent on the shape and slope of the land. Therefore, access to streams that direct the water from the Qanat, or fountain is considered a kind of value. Irregular and non-geometric passages in many villages can be due to following the water flow. On the other hand, given the cleanliness of the water in Qanat and its gradual contamination, proximity to the Qanat will be considered a kind of value. Thus, the village form can have a hierarchy depending on the manifestation of the Qanat and its creeks.

The custom of the villages was to bring drinking water from a spring or Qanat. Families washed their clothes in the water flow, and then the remaining water was used for agriculture. Whether the village water source is the river or the Qanat, in the villages, the particular areas where water is determinant are devoted to activities that the work is in their responsibility from gender division; The place where women gather to wash clothes, and sometimes the dishes usually establish privacy.

It is important to note that springs are often abundant in the foothills of the fountain, but people use more spring water for drinking and cooking, and many times, villages use river water for irrigation (Zargar,2014; Ghobadian, 2014).

The refreshing and moist breeze from qanats, or underground aqueducts, was utilized to regulate the basement air temperature and provide relief on hot days in arid regions. Thus, the influence of qanats on village formation is evident in the following ways:

- The rural landscape with a single-point water source, such as springs or qanats, is densely populated in limited areas.
- The physical development of these areas is severely restricted by the limited water supply from qanats and springs.
- The structure of the villages is hierarchical, depending on the origin of the qanat and its distribution.

2.7.1.4 Basins and Annual Rainfall Rate in Iran

Basins are closed surfaces created by the morphology and topography of the earth. The slope inward of the basins directs the flow of surface and groundwater to the inside and center of the basin. The basins are separated by a range of mountains. Due to the diversity of natural features, basins are created on different surfaces and shapes. Dasht-e Kavir and the Dasht-e Lut create the largest basin in Iran. It is noteworthy that the altitude varies in the basins and there are different sections in terms of altitude,

geographical directions, and prevailing winds. These factors have caused different climatic conditions in different regions (Ghafarisade,1995).

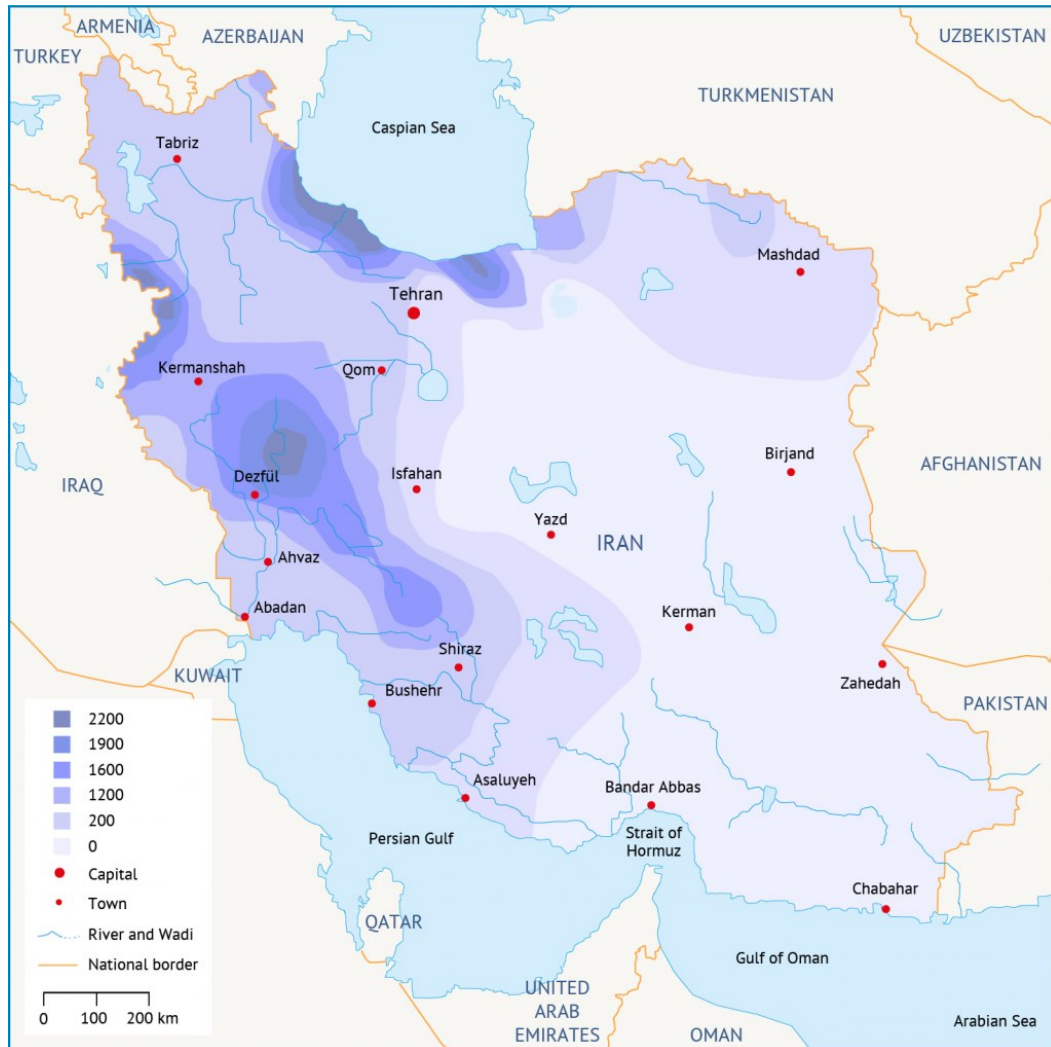


Figure 28: Map of Precipitation distribution (mm) in Iran. By @Fanack water

2.7.1.5 Wind

Winds and airflow are important and effective factors in different regions of Iran. Winds have had a significant impact on the location, shape, and architecture of the settlements (ghafarisade, 1995; Zargar,2014). Each village tolerates different winds depending on its geographical location. Each of the winds has its own name such as Badme, Bad Shahriar, etc. The villagers of each village are well aware of these names (Zargar,2014).

The variation of winds in terms of airflow's direction, velocity, humidity, and season have different effects on the forms of villages; in relation to the above conditions, different regions of Iran can be divided into two groups:

A) Areas affected by humid winds; Winds from the northwest that transport humid air from the Atlantic Ocean and the Mediterranean Sea to the East causing precipitation in the western regions of the Zagros Mountains in winter, the north and northwest winds that direct humid air from the Caspian Sea and the Black Sea to the Alborz Mountains and have a significant impact on rainfall in the Caspian shores.

B) Areas affected by dry winds from the North and northeast. These winds carry sand to the desert margins from the central plateau desert areas (Ghafarisade,1995; Kasmayi, 2012). Probably one of the reasons for the construction of castle villages in the desert is the winds. In this type of village, all the houses are concentrated within the tall four walls of a castle and are virtually immune to any attack, including sandstorms (Zargar,2014). Thus, winds are important factors in the architecture and urban design of desert cities.

Examples of the wind's impact on architectural and urban forms can be Creating compact forms in the village's physical architecture. Narrow and winding alleys and avoiding wide ways; planting trees within the village context and around the houses or in the direction of the wind and in the yard, and avoiding the windshields in the direction of winding, or minimizing the level of these awning windows.

Although specialized geographical maps have generally recorded the general winds of Iran, there are local winds in each region and area of Iran that have a direct impact on the inhabitants and are not recorded on these maps. Therefore, in the survey of the settlements in these areas, it is necessary to record all the characteristics of these types of winds. Each of these features may have physical effects on village architecture. Important factors and characteristics that can be questioned in relation to housing research include permanent or seasonal wind and wind direction.

2.7.1.6 Construction Technology and Materials

The advancement of construction and technological methods by human beings has been a critical aspect in enhancing the quality of life and mitigating challenging environmental factors. The evolution of technology has brought about significant alterations in the forms of buildings and villages over time. Technology, along with natural, cultural, and traditional factors, has played a pivotal role in shaping the

forms of villages. It can be specifically stated that the technology of a particular era has had a profound impact on the development of both urban and rural fabrics at various stages of their evolution.

Different building materials have unique thermal insulation, absorption, and heat transfer properties (Kasmayi, 2012), which leads to different solutions in terms of form. In Iran because other materials are scarce in desert areas, soil can be used to make building materials such as brick or masonry. However, in such areas, the preferred heat-resistant materials are clay and plaster of clay and straw. Because of the presence of straw particles, thatch has become an excellent material for heat resistance and transmission. Other materials can be seen in construction in various regions of Iran due to climate and material availability (Zargar, 2014). It is imperative to note that the crucial properties of building materials are contingent upon the climatic conditions of the building's surrounding environment.

As a result, the properties of construction materials exhibit variability across different climatic regions. In regions where only one dominant season prevails, and the temperature conditions during other seasons are moderate, the selection of materials should be based on the properties required to withstand the primary season. Conversely, in regions where two dominant seasons exist, such as extremely cold winters and scorching hot summers, the materials should be selected with careful consideration given to their resistance and thermal capacity to endure the complex conditions of both seasons. (Ameri & Ahmadi, 2017).

mudbrick buildings are among the oldest buildings. The remains of the oldest found examples of this type of building have been discovered in Dehloran valleys, belonging to 5800-6200 BCE. These buildings' materials are sundried square mudbricks molded by hand. In Iran, the main building materials have been mudbrick, except in certain areas like the southern Caspian Sea. Most residential and public buildings, including houses, mosques, schools, inns, and so on, have been made of mudbrick. Mudbrick buildings are the developed form of mud buildings since both types of buildings have the same materials. Nevertheless, the difference is that the mud mass is first molded for mudbrick buildings, and it is used in the building after being sundried.



Figure 29: largest adobe building(citadel) in the world-Bam, Iran, it was a large fortified with a citadel that was almost completely destroyed by an earthquake in 2003. By Georg Gerster,1977

One of the reasons for the use of clay or Mudbrick in mountainous areas or foothills, where certainly there are abundant materials such as stone, is the special behavior of clay and Mudbrick in terms of thermal behavior. The clay is well insulated to prevent heat and cold from the outside and works well by keeping the home residence in comfort. In contrast, the stone absorbs heat internally and rapidly, and it exchanges it with the outside cold environment (Zargar, 2014; Ameri & Ahmadi,2017).

Brick buildings have a history of several thousand years in Iran. Dating back to four thousand years BCE, the remains of brick kilns have been found in Shush and Sialk. Previously, although most buildings were built of mudbrick, for buildings that were more important and wanted to last longer; Like mosques, palaces, and bridges, bricks were used. In recent years, the number of brick buildings has considerably increased, particularly in the last fifty years (Ameri & Ahmadi, 2017).



Figure 30: Description: Tchogha Zanbil Bricks, founded c. 1250 BCE, Source: Geoff Steven © OUR PLACE the World Heritage Collection .URL: whc.unesco.org/en/documents/125552

Hakim's 2008 study also reveals the critical role that similarity of technology, particularly transportation, played in unifying the Arabic-Islamic city. During the fourth to sixth centuries CE, the camel was the primary means of transportation for carrying heavy loads over long distances in the Middle East. By the seventh century, during the time of the Prophet Mohammad, the use of camels for transportation had become firmly established. This fact, in combination with the dynamics of the building process, influenced the resulting street patterns. The size and capabilities of the camel directly impacted the design of streets, resulting in changes in level and rounding off building corners.

2.7.2 Non-environmental Factors

In addition to the tangible and visible natural factors, which can be easily comprehended through analysis, there exist other equally crucial non-environmental factors that greatly influence the current form of villages. These non-environmental factors are more subtle in nature and require a more nuanced and in-depth understanding to fully appreciate their impact.

These non-environmental factors can be broadly categorized into three categories: religion and culture, economy and ownership, and security. Each of these categories encompasses a complex set of beliefs, values, practices, and economic structures that influence the development and form of a village. To truly

comprehend the current form of villages, it is crucial to consider the impact of these non-environmental factors alongside the more easily analysed natural factors.

2.7.2.1 Religious and Culture

According to Hakim (2008), the Middle East has a rich tradition of town building and design language that has been in existence for over 3,000 years. The Arabs have adopted and modified this language to suit the values and social requirements of the Islamic community. During the mid-second century of Islam, around 750 CE, the Umayyad dynasty played a significant role in standardizing the names of physical elements and components, leading to uniformity within a geographical region extending from Spain in the west to Pakistan in the east. Hakim's study highlights that the Qur'an emphasizes the importance of privacy, the right to it, and respect for it. The Prophet is credited with numerous sayings on this matter, and Muslim teaching includes all mediums that may affect privacy.

In terms of housing, visual privacy of the family, especially the protection of female members from male strangers, is of utmost importance. Therefore, any context that allows for visual overlooking is deemed harmful and is considered an offense in Muslim law, which must be avoided. Muslim Kadis view the source of any offense as correctable and/or removable.

Thus, one of the important factors that affected the form of villages in Iran is religion and culture. Under this general title, we deal with the role and influence of factors that, contrary to geographical features, are often hidden. This includes a set of beliefs, values, customs, traditions, and various religious ceremonies.

Some believe that the overall shape of a settlement is directly related to this factor. They say that its even affected houses architecture because the house is considered not only for a set of practices of material life but also because there are many religious practices(zargar,2014). On the one hand, religion has been one of the most significant factors in social solidarity and, on the other hand, one of the prominent causes of divide and hostility in Iranian cities. It is interesting to know that ethnicity and family relations were the most important factors in religious solidarity (Pakzad et al , 2017).

In short, throughout history, various ethnic groups retained their own religion and traditions under different reigns. due to the expansion of the empire and a large number of ethnicities and religions, the central government couldn't impose a unified religion and culture, even if it wished to, like during the Sassanid era when Zoroastrianism was declared the official government religion; the central government

was not able to convert all ethnicities to Zoroastrianism; and besides that, religions like Christianity (with different sects) in the West, Hinduism, and Buddhism in the East, Mithraism, Manichaeism, and the followers of Mazdak continued to exist and even thrive. Many Jews who were dispersed after the conquest of Babylon by Cyrus, immigrated to Persia, and spread all over Iran and remain Iranian citizens to this day.

After the arrival of Islam in Iran, various interpretations of religion and faith led to the four main branches of Sunnites and various sects of Shiites. By the eleventh century, almost four hundred years after the arrival of Islam, Muslims were still a minority, and it should be noted that it was after Iranians' political separation from the Abbasid Caliphate that Muslims gained dominance over Zoroastrianism. Motahari writes: "By three hundred years after the Hegira, the people of Tabaristan and the Northern Alborz had not been acquainted with the new religion and they constantly rebelled against the Caliphates. The majority of the citizens of Kerman state remained Zoroastrian during the Umayyads reign." (Motahari, 1996). The gradual progress of Islam in Iran and its dominance over Zoroastrianism occurred especially in the era of Iranian local governments.

Moreover, In Iranian villages and cities, the followers of main Sunni faiths and other Shiite sects had political and social activities. Basically, each sect lived in a separate neighborhood and had established its own market, mosque, Tekyeh (place of public mourning), and Hosseiniyeh (assembly hall for commemoration ceremonies). The existence of various sects with religious differences was usually a context for economic, social, and political conflict between neighborhoods. These religious conflicts often involved acute clashes and scuffles leading to the ruin of neighborhoods and the massacre of people. For instance, during the Caliphate of ten Islamic sects in Ray, the two ethnic groups of Jews and Zoroastrians lived in separate neighborhoods (Pakzad et al , 2017).

One of the religious and cultural factors that affected morphology of settlements in Iran is Mahramiat. The concept of Mahramiat is a term that finds usage within the Islamic religious context, referring to the concept of family privacy. The term "Mahram" can be translated as "Relatives" and Mahramiat encompasses the idea of privacy that restricts access to certain individuals or groups, be it an individual, family, or group. Mahramiat represents a cultural and religious factor that exerts an observable impact on the physical landscape of villages. It has been noted to have a range of effects on the network of passages, the expansion of the village fabric, and the patterns and forms of residential architecture (Abaszadegan, 2017). Further research is required to fully comprehend the impact of Mahramiat on the architecture and urban forms in Iran.

According to Hakim's (2008) discussion, the orientation of the Qibla⁵ wall is a crucial factor in the hierarchy of building decisions. In Isfahan, Iran, the Masjid-i-Shah Mosque serves as a classic example of how the Qibla wall's orientation can impact the urban plan and its form. Despite being turned away from the formal axis of the Maydan-i-Shah, an elongated, rectangular open space, the mosque created an architectural challenge that was skillfully resolved, especially in the design of the main entrance.

Interestingly, even though the Qibla direction should be accurately implemented whenever possible, it has been observed that once a direction has been established by a major religious structure, its influence far outweighs the realities of geometrical exactness. This phenomenon can be attributed to the high regard that society accords its major religious facilities.

2.7.2.2 Economy and Ownership

Most villages in Iran were similar to small communities, somewhat isolated and economically self-reliant. To come across their needs, the villagers both farmed crops and produced all kinds of required artifacts such as carpets, kilims, fabrics, farming tools, and so on. On the one hand, due to the dispersion of villages, it was not possible to continuously exchange goods; and on the other hand, due to water shortages, there was not much crop surplus that could be swapped for other goods. This led to the unavoidable self-sufficiency of the Iranian villagers (Pakzad et al, 2017). The economic prosperity and wealth of a region are significant factors that influence the lifestyle of its residents, which in turn affects the form and design of their built environments, including their buildings and cities.

2.7.2.3 Security

Abraham Maslow believes, that the need for security after the need for food and water has the highest priority (Maslow, 2013). Perhaps the most important political aspect of the village is security. At least in the traditional view of Iranian villages, this issue was important. The scattering of villages in the plains and mountains has made them vulnerable to possible attacks, and therefore since the preservation work should be done as self-sufficient, inevitably some architectural and construction measures are designed for this purpose (Zargar, 2014).

The early inhabitants of Iran turned to flat plains and built primitive settlements after leaving the heights and caves. The first houses had a very simple architecture using the foliage of trees and flowers that

⁵ Qiblah, also spelled qibla or kiblah, the direction of the sacred shrine of the Kaaba in Mecca, Saudi Arabia, toward which Muslims turn five times each day when performing the salat (daily ritual prayer) (Britannica, 2020).

could provide relative security and well-being to humans. Through time and with the increase of construction knowledge and technology as well as confrontation with the surrounding nature, permanent residency in diverse places becomes more common and people start farming and animal husbandry in the vicinity of their homes. The scope and spreading of rural settlements in the vast land of Iran as well as the threat of attacks and possible damage have affected Iranian architecture and urban planning. Security and defense systems and foreign invasion repulsion skills have altered the rural and urban architecture texture of Iran (Ameri & Ahmadi, 2003).

Zargar (2014) categorizes the effects of this factor into three groups:

A) From a location perspective, relocating the village to a secure place, such as on a rock shelter or the edge of a precipice.

B) Fortifying the village perimeter: As previously discussed, one of the key reasons for the development of fortified villages in Iran was security.

C) Within the village: Implementing various measures to enhance security, such as constructing tall walls with limited openings at low altitudes, creating indoor passages that are impassable for riders, incorporating winding and indirect passages, providing secret access between homes through basement connections, and providing hiding places to store food within the buildings. These are some examples of the possible solutions. In some cases, underground cities were also built.

According to Ameri (2013) forts have been used in two main different types.

The first type includes fortified villages; That is, people always live inside the fort and their gardens and agricultural lands are located outside the fort. A model of this can be seen abundantly in busy traffic routes more likely to be vulnerable to bandit attacks.

The second type consists of villages that have separate fort in a proper place, close to residential houses and farming lands, and take refuge there only when they feel threatened by the enemies and spend some time in them.

Forts are usually enclosed by high mud walls. Four cylindrical towers higher than the walls are built in the four corners in which the guards of the castle reside at night to inform the people of the enemy's invasion when there was a fear of attack by foreign tribes. These forts usually connect to the outer space by a large gate which is the room that housed the castle gatekeeper. The gates were closed at night (Ameri & Ahmadi, 2003). Most fortified villages are located in lowland and flat areas that is more difficult to

protect the villages, while in mountainous areas it is possible to use natural elements and topography to locate the village in a location that is less dangerous for possible attacks.

2.8 Conclusion

In this chapter, we aimed to provide a comprehensive overview of the background, previous studies, and influential factors affecting the diverse urban forms in Iran, with a particular focus on the morphological information of both rural and urban settlements. Our examination revealed that Iranian scholars have demonstrated a limited inclination towards qualitative or descriptive-analytical methods in their research, and that there has been a persistent focus on large cities, particularly those that have served as historical capitals, resulting in a relative paucity of research on the topic, particularly with regards to villages.

To address this, we conducted a thorough review of the current literature and existing knowledge on the influential factors affecting urban form, categorizing them into two groups: environmental and non-environmental factors, such as political, religious, and cultural factors. We also conducted an overview of the available resources for research purposes, as well as highlighting the significance of public buildings and specific architectural elements.

Given these findings, the conclusion of this study highlights the need for further research in the area, as the impact of non-environmental factors, such as religious and cultural factors, has yet to be fully understood. To this end, we plan to explore these ambiguities through expert interviews and site surveys, and to examine the hypotheses and factors identified in the case studies, with the ultimate goal of clarifying their impact and potentially identifying other factors that may shape the forms of these settlements.

This chapter serves as a foundation for our ongoing research, and it is our hope that the insights we have gained through our examination of the existing literature and knowledge will inform and guide our efforts to further our understanding of urban form in Iran.

Chapter three.

3 Research Methodology

3.1 Introduction

In this chapter, we establish research methods for constructing a research structure by creating an analytical framework. The foundation for this framework is drawn from the previous chapters. We begin by discussing case study selection techniques, limitations, and important selection criteria. Then, we describe the methods for reviewing and analyzing each village, as well as the methods for collecting data. Finally, we discuss the tools and techniques used to analyse and review the villages.

The analytical framework consists of two mixed parts. The first section explains the urban form in each village on a large scale. This is achieved by demonstrating both the theoretical foundations and knowledge about various factors that impact the general form of each village through morphological analyses. The

The study Area

data collection techniques used include library materials, interviews, and site surveys. Our goal is to develop a consistent framework for all case studies, allowing us to compare them in the end.

The next step is to present and analyse the data using drawings and maps with different resolutions and layers. This part of the chapter will investigate various factors, including the historical development of each village.

3.2 The study Area

According to Iran's Law on Definitions and Rules of Country Divisions (approved on 1982), a village is considered the primary unit of country divisions. This is based on its environmental homogeneity, which includes natural, social, cultural, and economic conditions. The village must have a registered or customary independent domain and territory, and it must have a minimum of 20 households or one hundred people, whether they are concentrated or dispersed. The majority of its permanent residents must be directly or indirectly engaged in agricultural, animal husbandry, horticultural activities, rural industries, fishing, or a combination of these activities (Majlis, 2021). The law does not specify a maximum population limit for a village.

As per this definition, Iran has more than 45,000 villages (SNN, 2021), as depicted in Figure 29. The number of cities and villages decrease as one moves towards the deserts of the country. For this study, the main types of villages located in the center of Iran, specifically those in the Isfahan and Yazd provinces, as shown in Figure 31, will be the focus.



Figure 31 : Villages and cities in Iran, acquired from coactm.ir

The region showcases a blend of diverse religions such as Islam and Zoroastrianism. Isfahan and Yazd are ancient and significant cities in this area, and the country's main historic routes traverse through these cities and provinces. Despite being mostly arid, the region's geography is enriched by the Zagros Mountains and the Zayandehrood River, creating distinct microclimates that have made it an attractive

Case Study Selection

location for various types of villages in the center of Iran and beyond. As a result, this region offers immense potential for research. However, the cultural heritage sites in the area are endangered due to neglect, leading to the destruction of several historic structures. It is crucial to preserve and document whatever remains of these sites. Unfortunately, accessing the survey plans and information was challenging due to government policies. Besides, the ongoing pandemic exacerbated the travel restrictions between villages and cities, hindering access to buildings for the research.



Figure 32 : The location of Isfahan and Yazd provinces in the center of Iran, Source: Google, edited by author

3.3 Case Study Selection

The sample is part of the cases or people under study (Ahmadian & Mohamadi, 2008). The selection of case studies was carried out through a pre-determined methodology, so that inferences about the whole area can be drawn from this part. The process of sample selection, data extraction, and specific inferences related to it will be discussed in this section.

According to available sources (sahebnews, 2020; yazdrasa, 2020). There are an estimated 3300 villages in Isfahan and 2900 in Yazd, with 1500 villages in Isfahan and 1800 in Yazd being deserted. The large number of villages and the multitude of factors impacting them necessitated the implementation of several grouping and sorting methods in order to select the most representative case samples. These methods include:

1. Categorizing villages into abandoned and inhabited
2. Dividing into sparsely and densely populated villages
3. Grouping based on the preservation or destruction of historical fabric and the current state of the historical fabric
4. Classifying based on village location in different topographical areas
5. Classifying based on religion, with a number of villages still following the Zoroastrian religion

6. Grouping based on water supply source
7. Classifying in terms of heritage threats, prioritizing research based on the level of maintenance and the presence of natural or human-caused destruction
8. Classifying based on economic status
9. Grouping based on cultural and linguistic factors, such as ethnicity or language spoken
10. Categorizing based on their level of development, such as contemporary or traditional styles and vernacular
11. Grouping based on access to resources, such as proximity to transportation or healthcare facilities
12. Categorizing based on environmental factors, such as air quality or access to green spaces
13. Grouping based on demographic factors, such as age or gender distribution
14. Sorting villages based on whether they were historically fortified or not

After a comprehensive investigation and consultation with experts in the related field in Iran, this thesis undertook an examination of the form of different villages across different levels through the process of grouping. The selection of a particular grouping was based on a comprehensive consideration of research limitations such as geographical distance and pandemic-related constraints, as well as an extensive evaluation of diverse sources including government reports and base maps.

The goal of these groupings and classifications was to ensure the selection of case samples that accurately reflect the diversity of villages in the region and provide a comprehensive representation of the area under investigation.

Through library studies, visits and interviews with experts, 43 villages⁶ have been preliminarily studied. That are shown in the figure 33, The purpose of this preliminary study was to obtain a general understanding of the villages in the region and to get informed about the main effective factors. This study was the first step in finding the most effective method for categorizing the villages.

⁶ The names are in appendix A

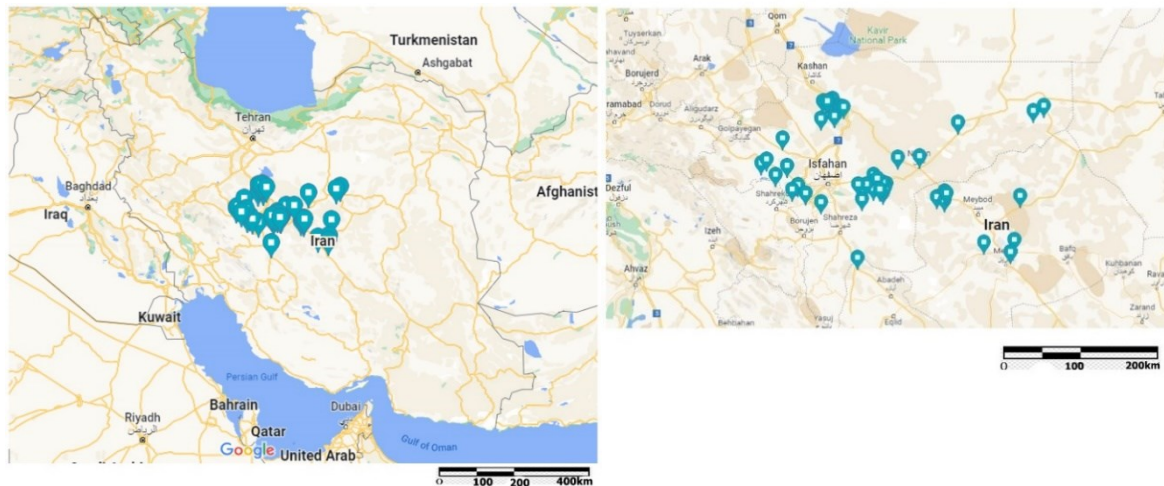


Figure 33 : The 43 preliminary villages that has been chosen, base map by Google

Considering various grouping methods for the preliminary studied villages, an approach was selected based on a mixture of topography (figure 34), general layout of the village with regard to fortifications (figure 35), and the current state of their historical parts (figure 36). This decision was made with the understanding that villages in the area are commonly situated in either flat plains or mountainous regions, and that certain unique features may exist within fortified-like structures in the flat plains, while some villages have almost completely lost their historical form. By utilizing this method, a broad range of villages in the region can be examined, allowing for the analysis of various factors and ultimately leading to generalizations about a larger environment.

The study aimed to understand the morphological characteristics of villages in the region, and the findings revealed that these villages exhibit two predominant forms, differentiated based on their location in either mountainous or desert areas. Additionally, a number of desert villages have been constructed within forts, which contributes to their distinct appearance.

As a result, finally, the villages were categorically divided into three types: desert, mountain, and fortified villages. Each category was assigned a representative village for further examination and analysis. This classification facilitates a deeper understanding of the form and structure of each village type, as well as the factors that contribute to their unique characteristics. Consequently, all villages in the study area can be classified into one of these three categories.

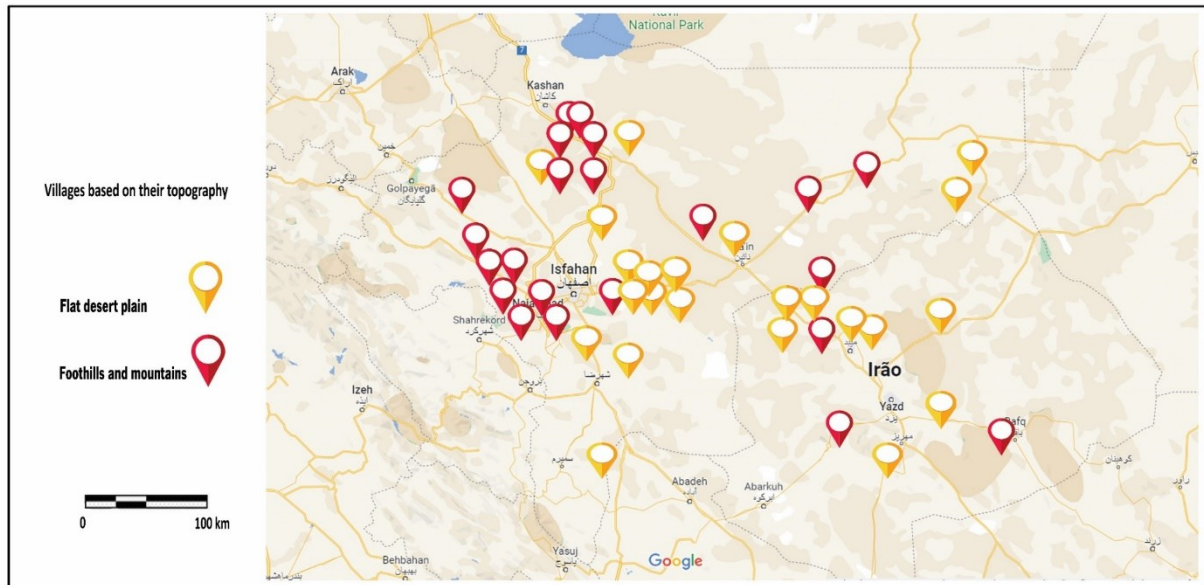


Figure 34 : Grouping of preliminary studied villages based on their topography location; by author

A significant number of villages have undergone major changes, such as complete demolition or unplanned construction, and were not considered as potential case studies (figure 35). As a result, those villages that remained relatively unchanged were included in this research.

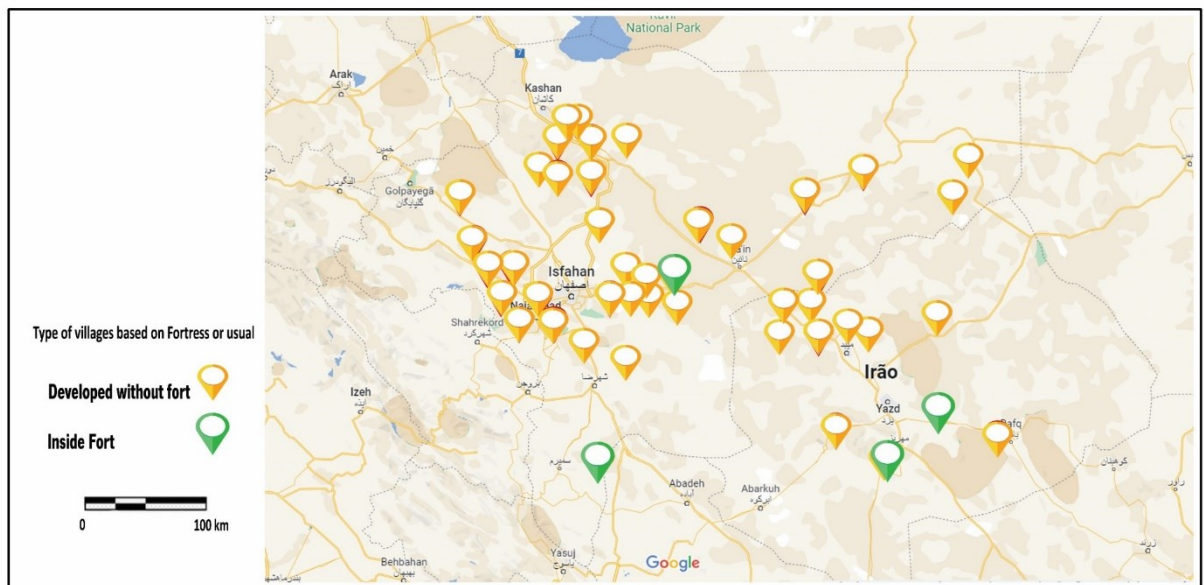


Figure 35 Preliminary studied villages based on their development inside fortified or without fort

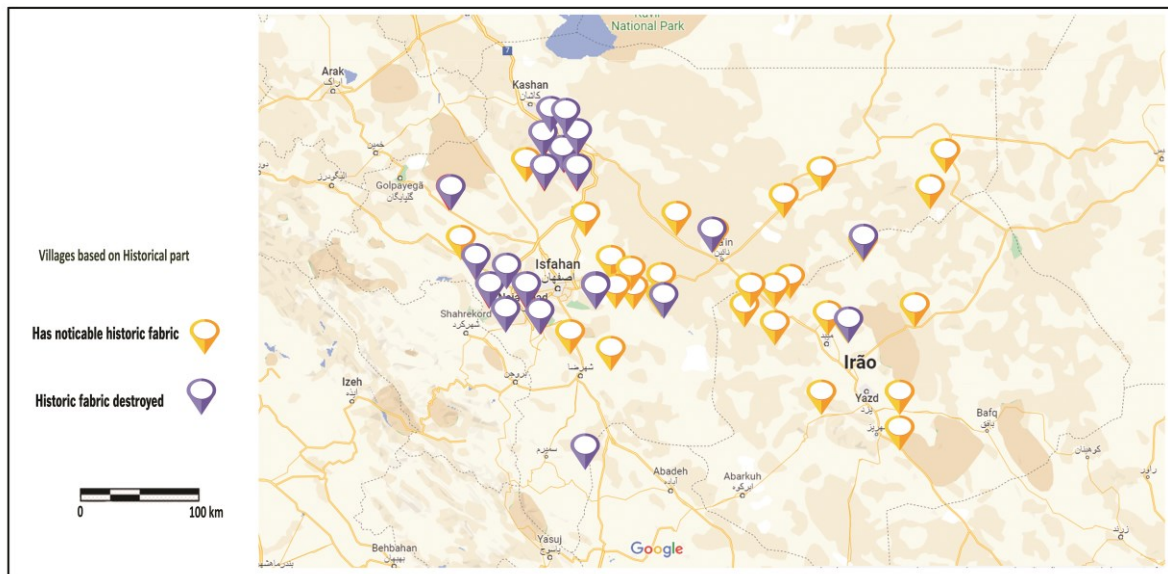


Figure 36: Grouping of the preliminary studied villages based on the quality of their historical part; by author

In the second stage of the study, a more in-depth evaluation was conducted on 15 villages⁷, selected from the original group of 43. This was due to the size of the region and the limitations of the research, which included both field and library inquiries and the quality of historic fabric in addition to restrictions of movements during pandemic. These 15 villages were chosen based on the findings from the preliminary study and were subjected to a more detailed analysis. The villages are shown in the figure number 37. This second stage provided a more comprehensive understanding of the villages and helped to identify more factors and clearer understandings of different styles. In figure 38 these villages are shown in their specific style.

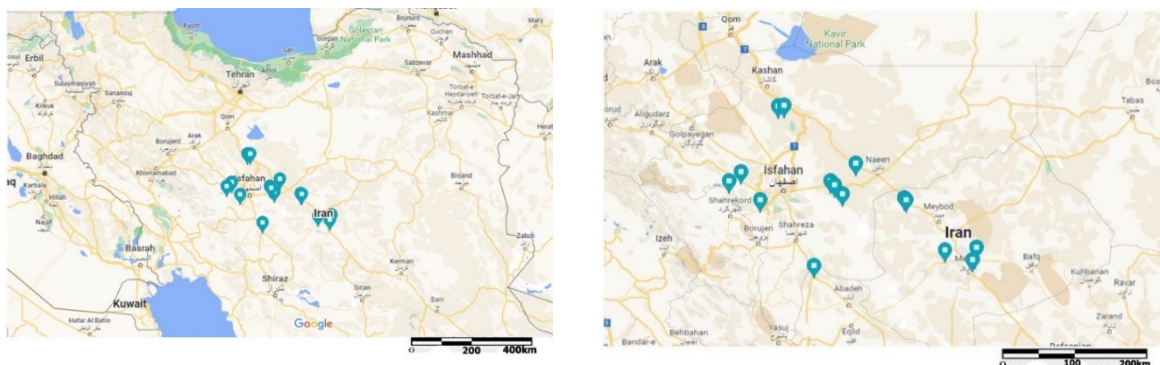


Figure 37 : The 15 villages that were explored more, base maps by Google, modified by author

⁷ The 15 villages names are mentioned in appendix A

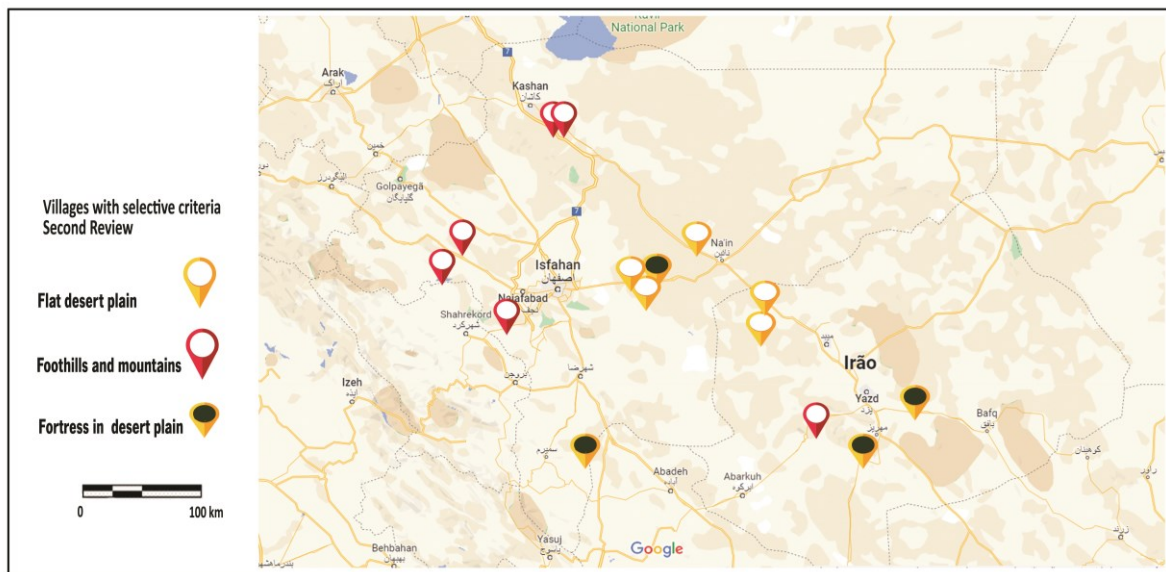


Figure 38: Villages in second layer of review based on the selected method of categorization

The goal of this study was to select sample villages that would accurately represent the major categories of the region, while also being representative of similar cases. In order to achieve this, the following factors were taken into consideration when selecting the sample villages:

1. The villages should have a long history of residency, preserving the traditional and local architecture of the area, with the original form being preserved.
2. The sample villages should be selected from central Iran and encompass a wide range of influencing factors and climatic conditions.
3. Access to basic maps of the village and ease of accessibility for multiple visits were also crucial considerations.

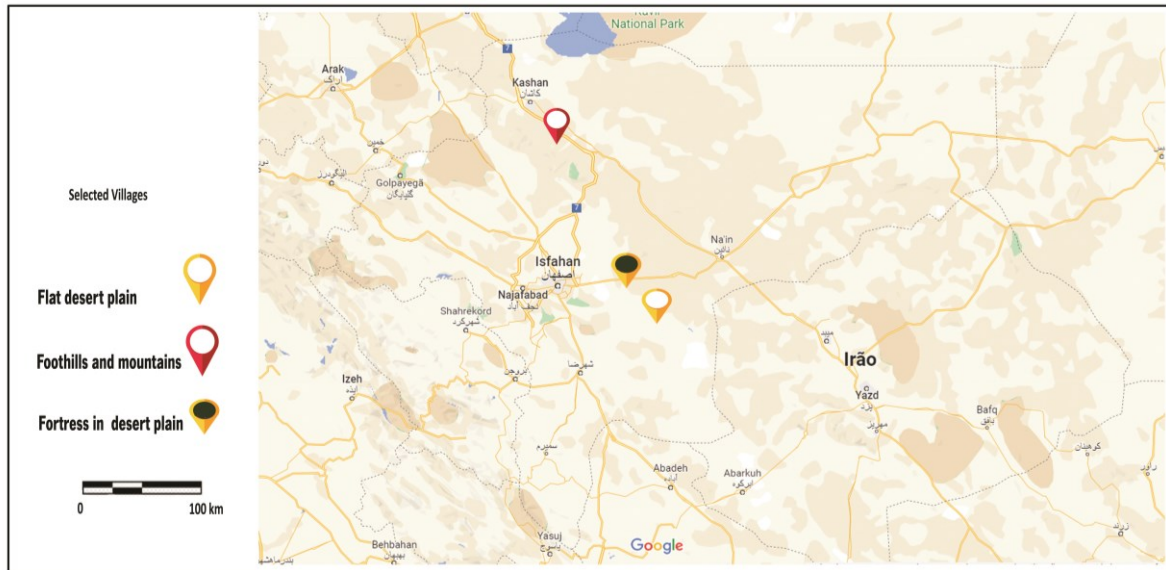


Figure 39: The selected case study locations, base map by Google

As a result, after conducting additional field visits and interviews, three villages (as depicted in figure 39) were selected for further study. The selection of the three sample villages was based on the aim of accurately representing the major categories of the region and being generalizable to similar cases. After considering the factors mentioned above, it was determined that the villages of Abyaneh, Ghourtan, and Qehi would best serve this purpose.

Abyaneh is a mountainous village located on the edge of the desert, and its selection represents a typical example of villages in mountainous regions. This village showcases the traditional architecture and form of these mountainous communities and serves as a representative of their cultural heritage.

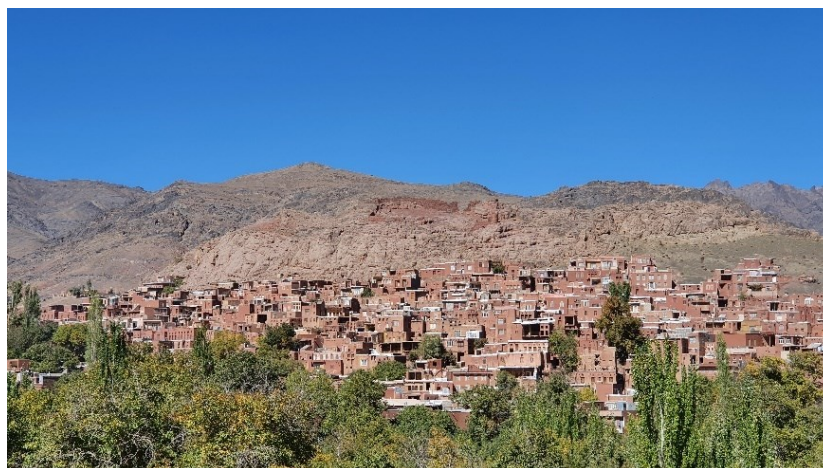


Figure 40 : Village of Abyaneh, photo by author

Case Study Selection

Qehi, on the other hand, represents the desert villages that have developed on the flat surface of the plain. These villages have their own unique architectural style and form, and their selection as a sample provides insight into the characteristics of this type of village.



Figure 41: Village of Ghourtan inside the fort, photo by author



Figure 42 : Village of Qehi, photo by author

Finally, Ghourtan represents fortified villages located in the desert, within walls. These villages have a unique form, characterized by their fortifications, which serve as a means of protection from potential threats. The selection of Ghourtan provides a representative example of fortified villages in the desert region and sheds light on the unique features and characteristics of this type of village.

For reference, photos of the villages that were visited but not selected as case studies are available in the figures referred to as 43 to 60. These photos can also provide an idea of the changes that have taken place in the region.



Figure: 43 Village of Barz, by author



Figure 44: Village of Yarand, by author



Figure 45: Village of Kahand, by author



Figure 46: Village of Hanjan, by author



Figure 47 :Village of Harize, by author



Figure 48 :Village of Mirjafar, by author



Figure 49 :Village of Eslamie, by author



Figure 50: Village of Sarv, by author

Case Study Selection



Figure 51 :Village of Fahraj, by author



Figure 52: Naeen, by author



Figure 53 :Village of Fahraj, by author



Figure 54 :Village of Khashooyie , by author



Figure 55 :Historic part of Eslamie village, by author



Figure 56 :IZADKHAH village, by author



Figure 57 :Varposht village, by author



Figure 58 :Fahraj Village, by author



Figure 59 :Village of Saryazd, by author



Figure 60 :Village of Izadkhist, by author

3.4 Framework for Examining Selected Villages

The examination of the morphology of the selected villages necessitates a well-defined research framework to take into account the basic components of urban morphology. This study endeavors to evaluate the effect of various factors on each village form at various scales using a qualitative methodology, with a focus on clarity and transparency.

Figure 61 displays the two-part analytical framework of this study. Part 1 showcases the extension of the Urban Form method using theoretical foundations and methods with morphological analysis. Part 2 examines case studies to arrive at a general conclusion for each village form type in Iran's region.

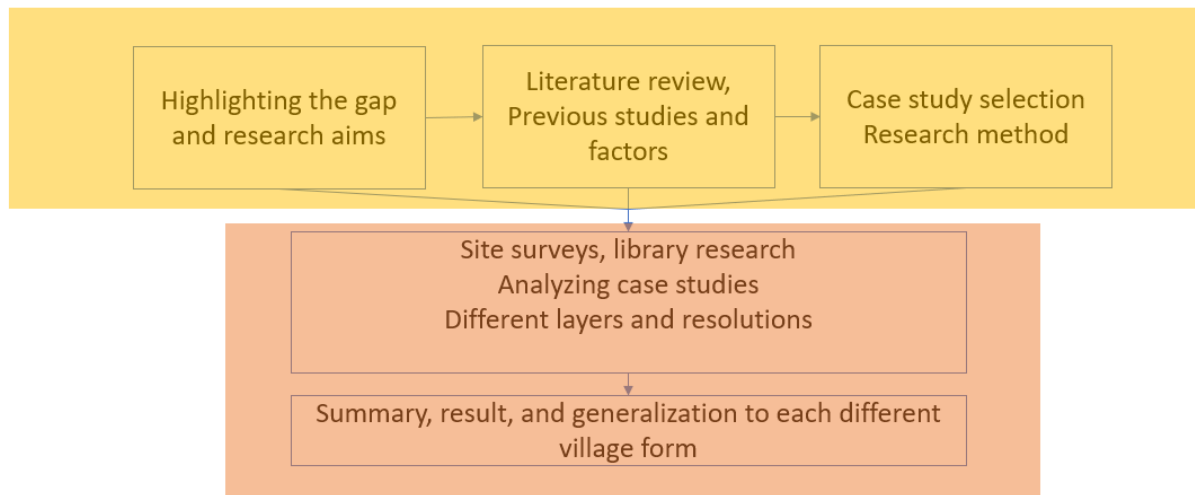


Figure 61: Analytical framework of the thesis

To trace the impact of different factors on the spatial organization, form, and composition of the village at various times and resolutions, the analysis is performed in a hierarchical manner, starting from a macro scale to a micro scale (different resolutions):

1. The first scale pertains to the settlement and location of the village, where the effects of geography and climate on village form are analysed.
2. The second scale focuses on the spatial arrangement of the village, including the disposition of buildings, gardens, fields, roads, bridges, and other elements.
3. The third scale examines the fabric of the village, encompassing aspects such as routes, density, parcel division, neighborhoods, location of social and urban spaces.
4. The fourth scale analyses building units, examining the general shape and design of houses and buildings, the number and types of spaces, how spaces are combined, and the reasons for the form and shape under the influence of various factors.
5. The fifth scale evaluates smaller components such as doors, windows, and architectural details, assessing the impact of external factors on them and the reasons for their shape and form.

The hierarchical structure of analysis at different scales and resolutions is presented in figure 62.

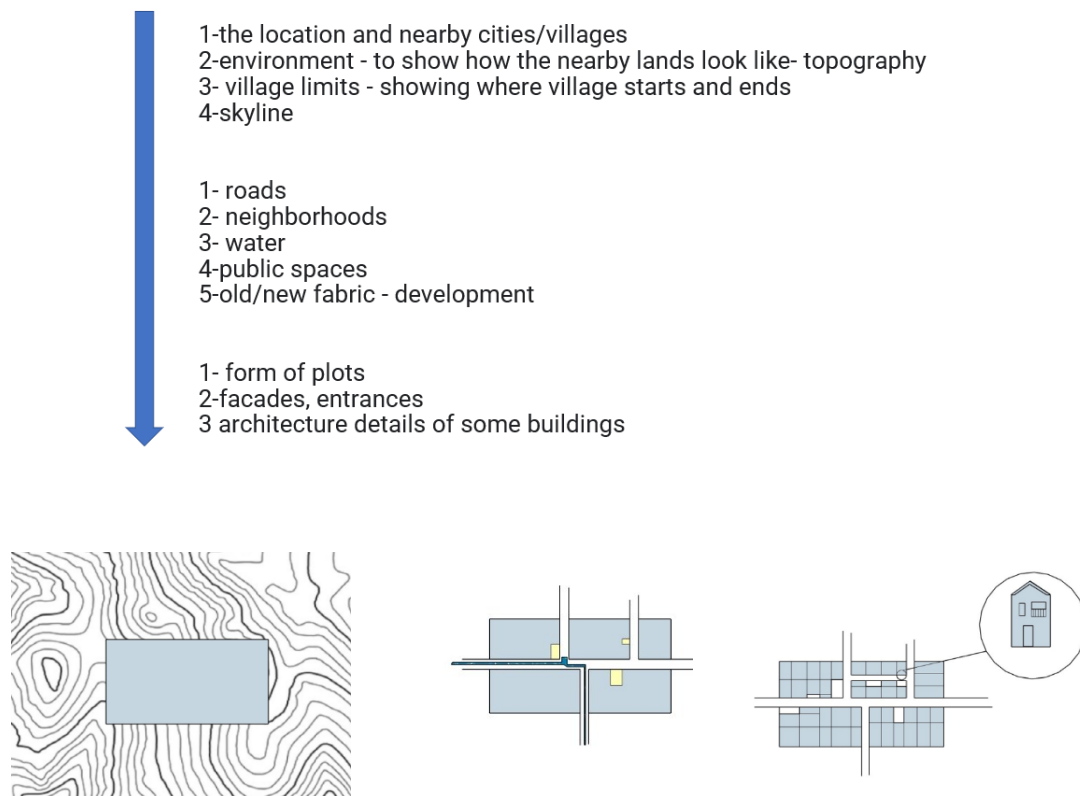


Figure 62: The hierarchical structure of analysis at different scales,by author

The present study investigates the role of urban morphology in comprehending the characteristics and evolution of urban spaces, specifically in the context of rural villages. The study area is characterized by its diversity in terms of the shapes, forms, and sizes of urban spaces, making it a unique subject of investigation. To thoroughly examine the subject matter, the historical background of the villages was also studied to gain insights into the context and surrounding environment of the case studies.

A comprehensive research approach was employed, which included a review of all previous literature and the use of old sources and travelogues to gain a deeper understanding of the formation and evolution of the villages. However, the case studies being in rural areas, there is a scarcity of image and information sources, such as old aerial photographs. To overcome this limitation, the researchers utilized a combination of library resources, including books, articles, dissertations, previous research, and government reports, as well as field studies and expert interviews. The field studies comprised of physical surveys of the villages and interviews with well-known experts in the field to obtain accurate information.

The findings of the study reveal the general features of the architecture and urban form of each village, and provide a brief explanation of their respective histories. The study highlights the importance of considering urban morphology in understanding the evolution of urban spaces and provides valuable insights into the history and formation of rural villages.

3.5 Implications

This research project takes a comprehensive approach to the study of traditional small villages in Iran, situated in a region with a rich historical legacy. The study is guided by the principles of urban morphology schools, rather than being constrained by the framework of a particular school. Drawing upon the relevant literature, the research employs a framework that emphasizes the three fundamental factors of urban morphology schools: form, resolution, and history. These factors will serve as the foundation for the analysis method that will be applied to each village in the subsequent chapters.

Given the unique cultural and historical context of Iran, it is essential to utilize qualitative classic methods for the analysis of the traditional villages. This approach will enable us to consider the distinct elements of Iranian urban and architectural design, which are integral to the character and identity of the villages under study. Through the use of this approach, we can gain a deeper understanding of the cultural and historical significance of these villages and their role in shaping the built environment of the region over time.

The three factors of urban morphology - form, resolution, and history - provide a framework for analyzing the villages in a systematic and comprehensive manner. Form refers to the physical characteristics of the villages, including their layout, building materials, and architectural style. Resolution refers to the degree of detail in the analysis of the villages, while history considers the evolution of the built environment over time.

The analysis of each village took into consideration various aspects and scales, including background information such as its history, religion, climate and nature, as well as information about water sources, roads and access, and important buildings. A closer and more in-depth view was also taken of the morphology of the village, taking into account the impact of these factors on its form. This involved collecting and analyzing additional data about the morphology of the selected case studies, which were presented in different maps and layers. The subsequent chapters of the thesis follow this framework, focusing on the analysis of form, history, and different resolution and layers.

Implications

By utilizing this analytical framework, we can gain valuable insights into the development of traditional Iranian villages and the cultural and historical forces that have shaped their evolution. Ultimately, this research aims to contribute to a greater understanding of the role of traditional villages in the built environment of Iran, and to inform future efforts to preserve and promote these unique heritage sites.

Chapter four.

4 Case Study One, Abyaneh



Figure 63: Abyaneh from distance, source: author

4.1 Background

4.1.1 Introduction

The picturesque village of Abyaneh is situated in the mountainous region of Isfahan, surrounded by a barren desert landscape. It is renowned for its harmonious combination of architecture and nature, with its iconic red-painted houses being its most striking feature. The surrounding foothills act as a natural barrier, safeguarding the valley and its structures from the harsh environmental conditions of the desert. The presence of springs and a creek that run through the valley provide a source of water, resulting in

Background

the development of lush groves and fertile farmlands. This results in a relatively temperate climate with cold winters and warm summers, which contrasts significantly with the low-lying desert regions.

Abyaneh is one of the oldest and most valuable human habitats on the edge of the Iranian desert. Its historic architecture, culture, and customs are a rich heritage from Iran's history. Despite a high rate of migration (Ahmadi-Lari, 2013), life goes on in this village. Abyaneh is located 40km northwest of Natanz, 20km west of Natanz-Kashan highway, and 80km southwest of Kashan. The distance from Isfahan is about 170km.



Figure 64: Location of Abyaneh in Iran, source: Google map

The name "Abyaneh" is believed to have originated from the word "Viona" or "Voneh" which has been altered to "Abyaneh" in Persian writings and spoken language. However, it has retained its original form in the local dialect of the people (Saqafi, 2007). It is believed that the name "Abyaneh" means "Bidstan" and "Bidzar" which means a place full of willow trees. This is because the village was located inside a green valley covered with willow trees.

The value of Abyaneh is due to its history, culture, architecture and beautiful nature. The village dates back to before Islam. The language of its people is close to Pahlavi Persian. Their clothes, customs, culture, and architecture are rich and unique. The nature is pristine and beautiful. Due to its proximity to the civilizations of Sialk and Kashan, the antiquity of human settlement and presence in this village can be attributed to before the common era. However, there is no evidence of the Abyaneh people's architecture or settlement prior to the Sassanid era. The only remained structures from that era is a fire

temple and a castle. The Grand Mosque in Abyaneh is the city's oldest standing functioning, having been built in 1098 C.E (Jamshidi, 2007).

4.1.2 Climate

Abyaneh has a pleasant climate and an advantageous location. In summer, the weather is relatively mild, and the temperature does not exceed 32 ° C, but in winter it may reach -15 ° C (Ganji, 2014). According to the statistics recorded in Abyaneh meteorological station, the average minimum temperature in the coldest month of the year in January is -10 ° C, the average maximum temperature in the warmest month of the year is 35 ° C and the average annual temperature is about 15 ° C; Annual rainfall in Abyaneh is 216 mm.

The red clay color and stepped houses are two prominent features of Abyaneh. If we look at the village from a distance, lush gardens, reddish stepped buildings, high hills, and high mountains will be exposed. The mountainous nature has also added to Abyaneh's visual richness.

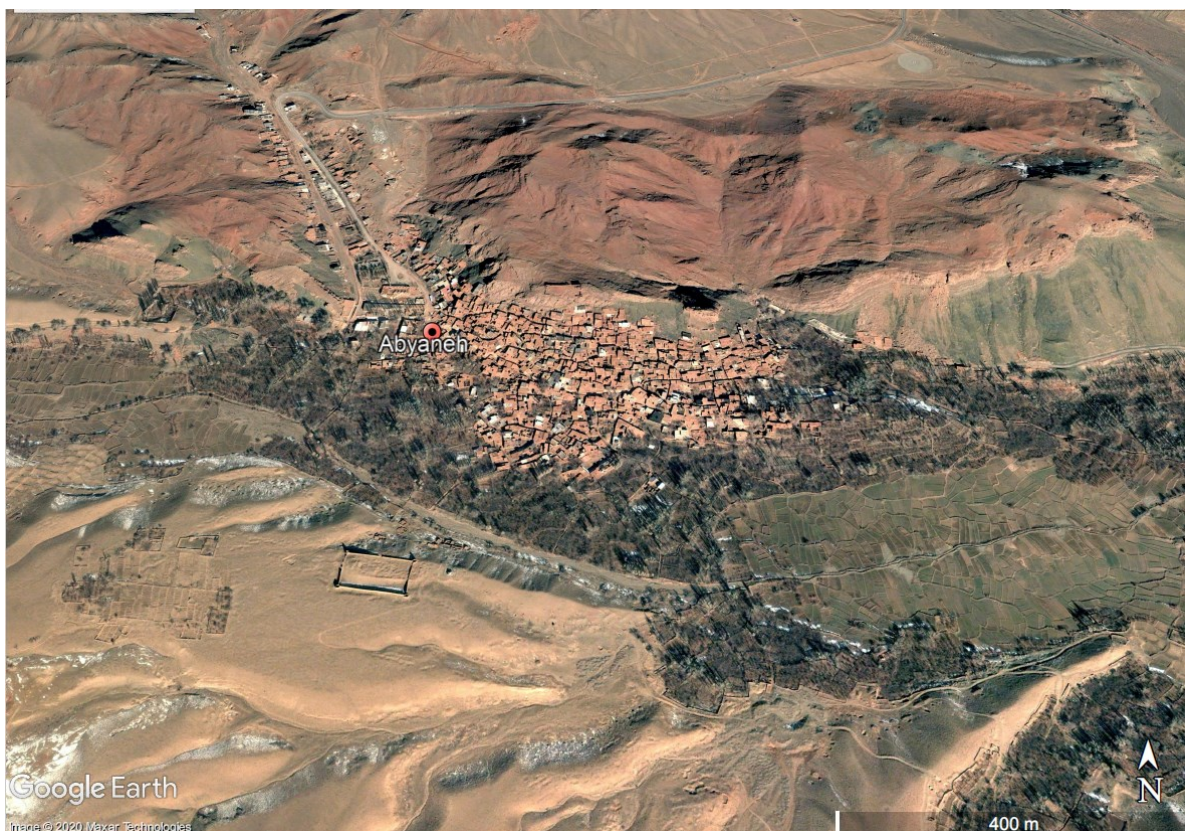


Figure 65 : Abyaneh, satellite view 2020, Google earth

Background

Water is obtained primarily through aqueducts and springs that flow from the heart of the surrounding mountains and become surface water. The main source of water is the Doabi spring, which is located about 6 kilometers west of the village (Jamshidi, 2007). Aside from the main water supply, the village has several aqueducts. The dry river has no water most of the year, but it does have water during the rainy season. When farms do not use spring water in the winter, it is directed to the dry river.



Figure 67: Dry River, by author



Figure 66 : Movement of water in Abyaneh, by author

4.1.3 Socio-Cultural Studies

4.1.3.1 Population and Demographic Changes

The population of Abyaneh has declined over time. The largest population recorded in Abyaneh was in 1967, with 2181 people registered for the village. Based on the number of vacant houses, it is estimated that there were about 2000 inhabitants at the time of full settlement (Memarian, 1993). Since the late 1960s, the population of Abyaneh has decreased sharply due to changes in the country's political, economic and social situation, such as land reform and migration of rural people to cities for work and education (Jamshidi, 2007). According to the most recent general population and housing census data from 2017, the village's population was 301 people (center, 2017). Aside from general reasons for this decrease, the village lacks sufficient land for new constructions and a shortage of fertile agricultural land also played a role.

It's worth noting that the population of Abyaneh fluctuates due to seasonal and migratory factors, such as traditional and religious ceremonies. However, there is still a good population living in Abyaneh village, and life goes on. According to some reports, the population of the village increases significantly on special days such as New Year's holidays and large religious ceremonies, sometimes reaching 5000 people (Saqafi, 2007) due to tourists.

4.1.3.2 Economy

The main economy of the village is based on agriculture and horticulture, which are primarily done using traditional methods. The ownership of agricultural lands and gardens is mainly in the hands of smallholders, and these lands and gardens can be seen prominently in the far view of the village. In addition to agriculture and horticulture, animal husbandry is also a significant economic activity in Abyaneh (Abaszadegan, 2017). The village also receives a significant amount of revenue from tourism, both domestic and foreign, which has been on the rise in recent years⁸. This has helped in preserving the traditional culture and architecture of the village.

4.1.3.3 Religion and Culture

Abyaneh is a village that boasts deep-rooted customs and cultures. Due to its mountainous nature and remote location, the village has been isolated for centuries, preserving traditional customs such as the ancient language and dialect, as well as the traditional clothing worn by its residents (figure 68), including loose-fitting trousers for men and long shirts for women made from colorful floral fabrics. The dialect of the villagers is also a contributing factor to the historicity of the village (Saqafi, 2007). Abyaneh's unique cultural characteristics and uniformity of traditions have helped maintain its cultural heritage and distinctiveness.



Figure 68: One of the most important remnants of Abyaneh's historical identity is the type of clothing, photo by author

⁸ In a research in 2014, unique architecture and urban form of the village and customs and clothes were introduced as powerful positive points for the tourism of Abyaneh (Naderi Mahdei K, 2014).

The Abyaneh people follow Islam as their religion. Religious ceremonies, traditions, and rituals are influenced by people's religious beliefs. Muharram, Ramadan, Eid al-Fitr, and other Islamic holidays hold a special place in the hearts of the villagers. Among all of these events, Ashura holds a special place in Abyaneh and serves as a consolidator and unifier in people relations⁹.



Figure 69: Yard of Imamzadeh, photo by author

4.2 Morphology and Architecture

4.2.1 Environment

Abyaneh area generally goes beyond the village's body. This area starts from the beginning of the Tardar aqueduct in the northeast of the village and extends to Gohiyeh valley. the village area is starting from the village cemetery and extending to the lower gate, everything is almost attached together, which occupied an area around 24 hectares, however they are castles and agriculture lands outside of this area¹⁰.



Figure 70: Topographic location of Abyaneh. source: opentopomap.org

⁹According to Yarshater(1983) The evidence of old mosques shows that Islam had penetrated the Barz-rūd valley early enough, and Siroux's claim (Anciennes voies et monuments routiers de la région d'Ispahan, Mémoires de l'Institut français d'Archéologie Orientale du Caire 82, Cairo, 1971, pp. 20, 23, 221, 223) that the valley had remained Zoroastrian until the time of Shah Esmā'īl (1502-24) can not be maintained; nor can his assertion that many Zoroastrians fled Abyāna as a result of Shah Esmā'īl's intolerance be substantiated (Yarshater, 1983).

¹⁰They are some other Scattered buildings outside of this area and far from village, such as castles and a temple that are mostly ruined.

As shown in the figures number 70 to 72, Abyaneh is located in a valley and the presence of water and surrounding mountains has created a milder microclimate than the mountains and deserts around the village. The village faces south sunlight which has higher quality and intensity of sunlight in different seasons. The area and form of this valley had effect on morphology of the village.

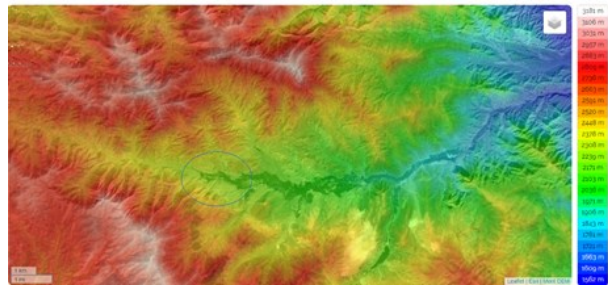


Figure 71: The altitude of the village source: topographic-map.com

The presence of Abyaneh in a mountainous area has given special features to the architecture and fabric of the village. Its form has beautiful harmony with its surroundings. The appearance of the village is a uniform fabric on the sloping surface and the red clay houses with flat roofs. Additionally, there are porches from which the gardens facing the valley and the mountains can be viewed. The houses are almost sun-facing and are compactly built side by side to escape the harsh winter cold, and some passages are covered.

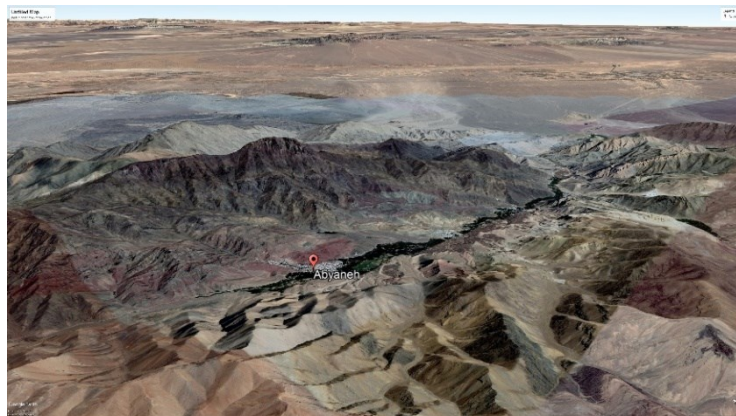


Figure 72 : satellite image of Abyaneh, In the middle of the valley and near the desert, Source: Google earth

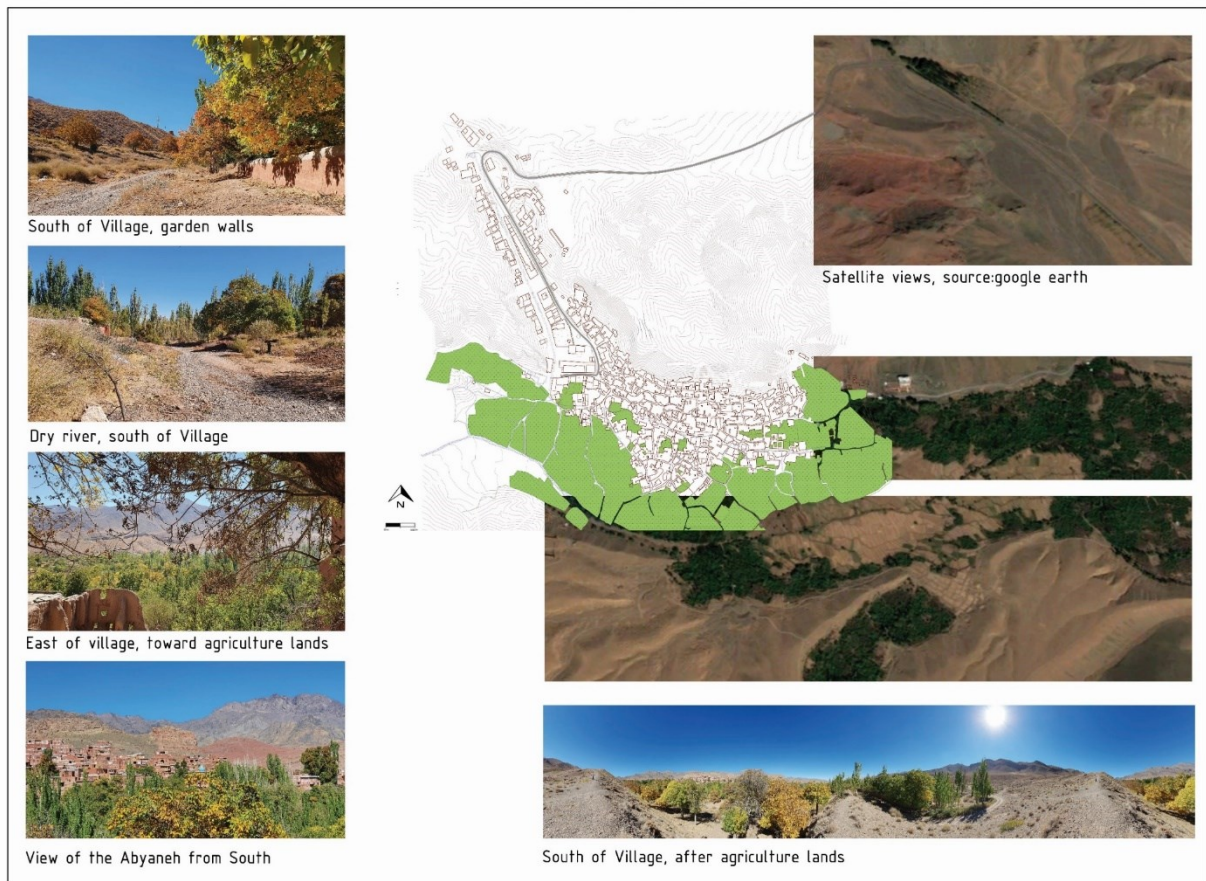


Figure73: Abyaneh and its harmonic form with the sounding environment, map was drawn based on published map by Miras organization, photos by author¹¹

The village has a dense, continuous, and linear form with narrow and steep alleys. It is situated on a steep mountain slope facing the sun and provides a beautiful mountainous view along with gardens in the valley. This positioning allows the villagers to benefit from the most possible sunlight, helping to keep the spaces warmer during cold seasons. The high density and the attachment of the houses to each other also helps to conserve energy and reduce waste.

The placement of the village on the slope can be attributed to a number of considerations. Firstly, its elevated position provides a degree of security and protection, given its vantage point over the surrounding plains and agricultural lands.

Secondly, the positioning of the village conserves limited fertile land for agriculture, which is found in the river bed and at the base of the mountain.

¹¹ The Maps (with small size photos) in larger sizes are available in appendix B of the thesis.

Thirdly, the orientation of the houses towards the sun, particularly towards the south, allows for the optimal utilization of sunlight, providing warmth during the colder seasons. Additionally, the close proximity of the homes to one another helps to retain heat, reducing the need for additional energy sources.

Fourthly, the slope of the mountain helps to mitigate the risk of flooding during rainy seasons, as the water is easily able to flow towards the agriculture lands and river. Finally, the solid bed of the mountain provides a more stable foundation for construction, in contrast to the looser soil found in plains.

4.2.2 Distance and Entrance View

The journey to reach the village of Abyaneh involves traversing the central deserts of Iran, characterized by their dry, flat terrain, and lack of vegetation. However, as the journey progresses and the altitude changes, the climate becomes slightly mountainous, and the presence of trees becomes apparent. As you near Abyaneh village, you will observe a shift in the weather and an increase in green trees. There are other villages along this route that have unfortunately lost their traditional architecture and form.



Figure 74 :Nearby villages to Abyaneh, Photos by author



Figure 75 :Road towards Abyaneh, from exit of the highway to the village, photos by author, map from google

The Figure number 75 shows Gradual change in the climate and environment from Desert to Valley and mountains and access roads towards Abyaneh.

As you continue down the road leading to the entrance of the village, a multi-story hotel building and the scattered residential units appear that have various shapes, colors, and materials present a stark contrast to the traditional architecture of the region. Despite being constructed using local materials like red clay, these new buildings have incorporated elements that are unfamiliar to the Iranian building tradition, such as Roman-style columns and triangular tops.



Figure 76 :Buildings in new parts of the village, by author

This approach to architecture has been widely criticized by the architectural community in Iran as it is seen as an imitation of modern building styles found in larger cities (Figure 77). The buildings lack an Iranian identity and the added architectural elements appear artificially and weakly attached to the façades. Furthermore, these new buildings stand in stark contrast to the traditional buildings in the village, creating a jarring visual landscape that deviates from the village's historical architectural heritage. The newly constructed buildings in the village do not align with traditional building patterns, further contributing to this distinct shift in the visual landscape of the village.

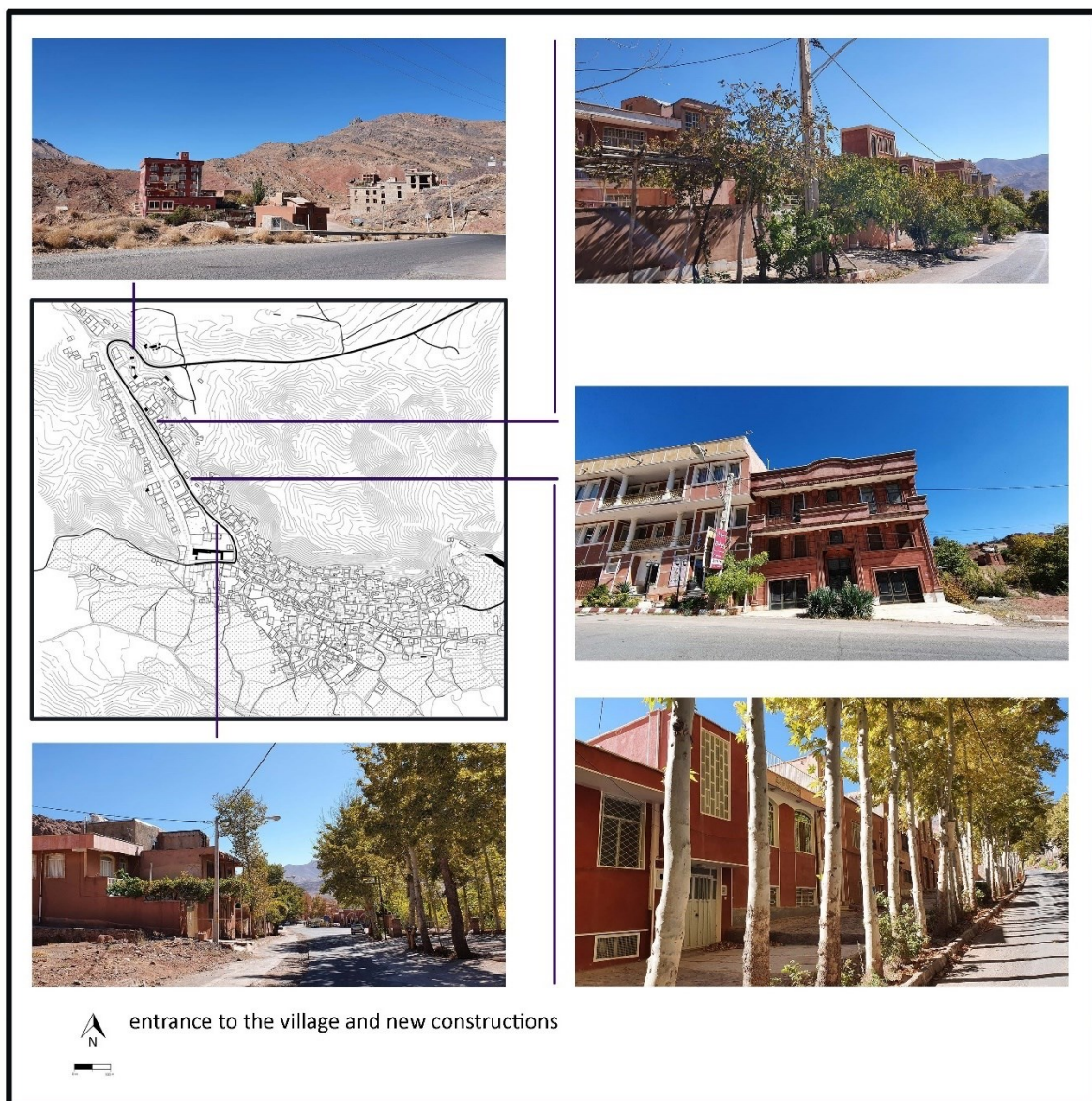


Figure 77 :Towards historical part of the village and new constructions, by author

4.2.3 Inside the village

4.2.3.1 General Form

Apart from the new part of the village, as depicted by Jamshidi (2007), Abyaneh possesses a unique architectural style marked by the presence of cubic structures stacked atop rocky cliffs. The cubic structures display a rotational arrangement, creating a cohesive visual composition. The square openings in the form of windows, doors, and porches serve to provide visual permeability, and together, the cubic structures form a variety of volumes that are interrelated. In regions with a flatter terrain, the density of these volumetric elements decreases and eventually blends into agricultural lands and orchards.



Figure 78 : Photos of Abyaneh, by author

It is worth noting that this architectural style is not only aesthetically pleasing but also practical, as it allows for the efficient use of limited available space and provides ample natural light and ventilation. The cubic structures are in sync with the rugged landscape, creating a harmonious relationship between the built environment and the natural surroundings. This unique architecture serves as a testament to the ingenuity and resourcefulness of the people of Abyaneh, who have adapted to the challenges posed by their environment.

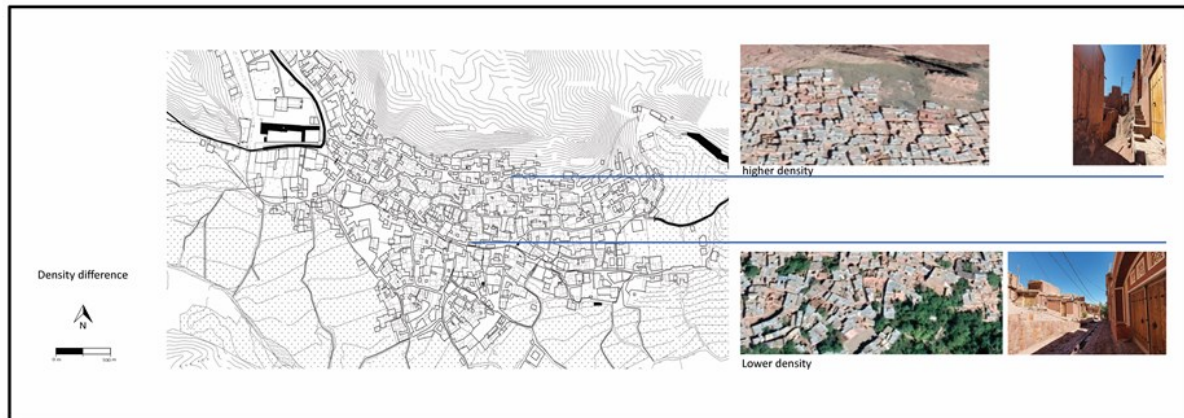


Figure 79: different density of construction in Abyaneh, base map by miras, satellite photos by Google, photos by author

As illustrated in Figure 79, there is a noticeable variation in the construction density and distribution of green spaces across the upper levels of the village. Moving southward, the decrease in slope results in a decrease in construction density, with an increase in parcel sizes and a higher presence of green spaces and urban spaces. This disparity between the north and south of the village is a result of the limited availability of suitable land.

In the central part of the village, along the west-east axis, topographic changes are relatively minimal, providing more opportunities for construction. This has led to the concentration of social, religious, and cultural uses, which require larger lands and buildings, along with the houses of village headmen and chiefs. The ease of movement in this central area has facilitated the development of this key hub for the village's social, religious, and cultural activities.

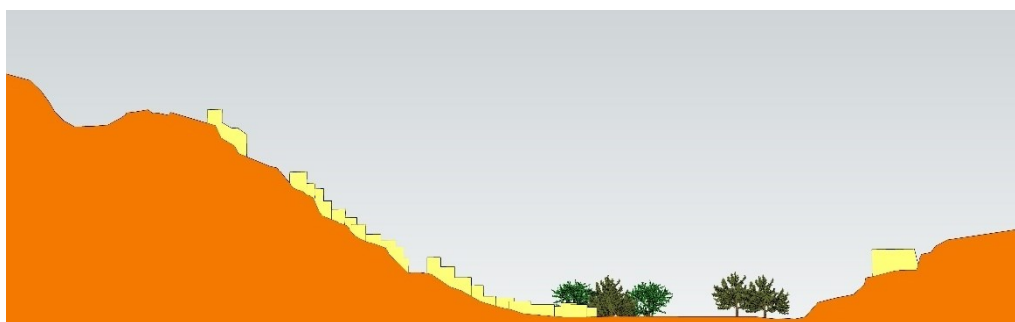


Figure 80: An approximate section of Abyaneh village – by author

In the lower part of the main axis, the roads enter the valley with a lower slope from the village and join the gardens. Here, due to the open space, larger and more open units have been designed and built, so that the total fabric from north to south is stepped and is observed linearly in the west-east axis with uniform volumes. The part of the village that has been developed in the last few decades, with an urban

linear layout along the entrance road of Darvazeh Bala (Upper Gate) to the foot of the mountain and on both sides of the road and the flood path, is considered as part of the new fabric (Saqafi, 2007). This section has no physical proximity to the historical part of Abyaneh, the parcel sizes have no relation to the natural terrain and slope of the land, and the ground was leveled wherever necessary. This fabric does not face the agricultural land and south, so it cannot benefit from the natural energy of the sun as much as the historic fabric. The parcels in the new part are more similar to each other, almost the same size and the lines are straight. The buildings are mainly built facing west-east, while in the historic part they face more north-south. Although south-facing is the best direction in this region, they probably wanted to face the main road.

4.2.3.2 Neighborhoods and Development

There is a high level of social solidarity among the people of the localities. And also, in terms of local ties, after the family, there are neighbors. Each person has a special belonging to his neighborhood (Jamshidi, 2007). Thus, the people of Abyaneh have a special bias towards their neighborhood. This sense of belonging is evident in the organization of ceremonies such as the mourning ceremony of the month of Muharram. The people of each neighborhood make a lot of effort to organize the mourning ceremony of Muharram month and other events related to their neighborhood. They want to organize this event in the best way. As people say, many of their relatives who left the village years ago come back to participate in the ceremonies. In this case, in the history of this village, there has always been fierce competition between the people of the neighborhoods.

In the past, each neighborhood had its own bathhouse, mosque, and even a barber shop. The village starts in the shape of an alley from the northern, next to the hotel; entrance appears as a result of the natural shape of the valley and topography. This area consists of five neighborhoods (figure 81); Herdeh (Yellow color in the picture), Pol, Yasmoun, Ziaratgah and Panjali, which respectively, Herdeh, Pol and Yasmoun have more antiquity and historical value. These neighborhoods occupy about 16 hectares of Abyaneh area (Abaszadegan, 2017). Panjali neighborhood has no historical background like those, and most of the new buildings in the village are located there.

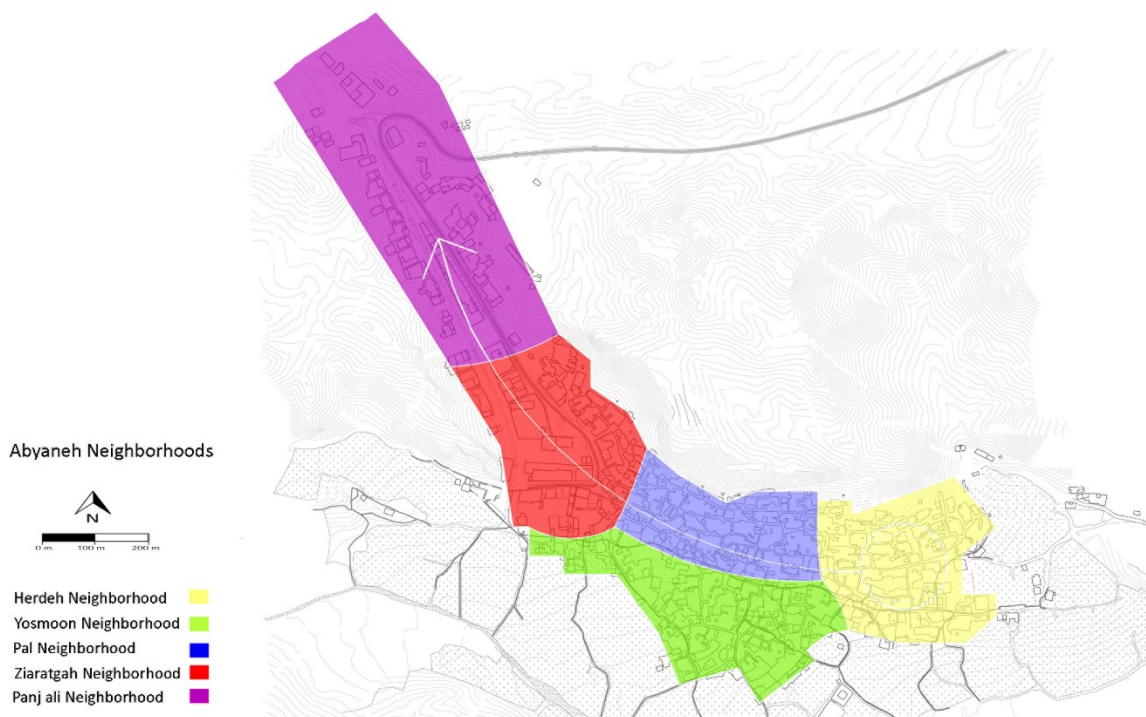


Figure 81 :Abyaneh neighborhoods and development plan, Source map by Miras, drawing and edit by author

Conducted studies by the Abyaneh Cultural Heritage organization and available evidence show that original location of Abyaneh was on the east side of the current location of the village; Ancient excavations have also confirmed the history of life in this area(Ahmadi-Lari, 2013).The growth of the village is in line with the natural slope of the land, the use of local materials, the flow of water, the view of nature, etc. have all led to the integration of architecture with nature in Abyaneh (Pourjafar, Sazandeh, & Hosseini, 2008) . As mentioned, Hardeh neighborhood (east of village) is the oldest neighborhood of Abyaneh and forms the primary core of this village. The accuracy of this statement is also confirmed by archeological findings and the antiquity of the buildings left in that neighborhood (Jamshidi, 2007).

Thus, the growth and expansion of the village has been from east to west. Regarding the border of the neighborhoods, it is worth mentioning that in the religious ceremony of Ashura, the path of the mourning groups is in line with the borders of the neighborhoods and the groups do not enter the other neighborhoods¹².

¹²The ceremony is explained under subtitle of religious factors

4.2.3.3 Blocks and Access

In the figure number 82 the adjacent buildings parcels have formed a block and the spaces between them, which are access roads, have been identified. As can be seen from the image, in the historical fabric of the village, almost all the buildings are attached to another building and have formed various blocks. This high density helps to keep the houses warm in cold climates and consumes less energy. Roads are often narrow and have an organic form mainly due to lack of flat land and need of lands for construction. The main route of the village with more width and more empty spaces is clear in the map.

At higher altitudes and above the middle of the village, the slope of the village is sharper. The blocks are smaller and the open spaces are shrinking. This is probably due to land restrictions that caused smaller houses. It appears that the upper side had less value economically mainly smaller house with less architectural details, also most of the big houses are in the middle or in the south side, the reasons are the high slope that made it difficult to build bigger houses in addition to being far from water sources in the center and finally the difficulties with access to the upper parts.

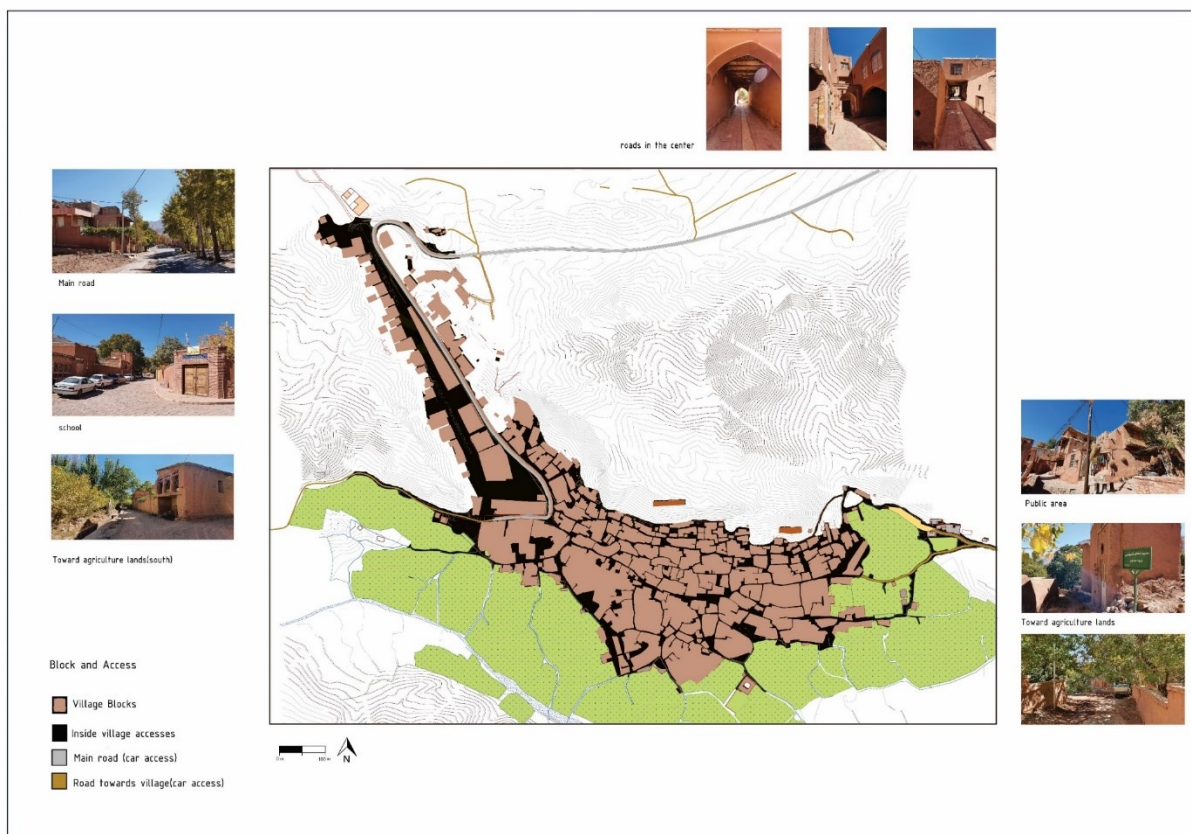


Figure 82: Blocks and access in Abyaneh, photos by author

4.2.3.4 Religion Factor

Religion, as a non-environmental factor, has exerted a range of impacts on the village of Abyaneh. One notable effect is in regards to privacy. Observation reveals that the architectural design of the village buildings features an increasing number of openings at elevated levels, effectively preventing any view into the interiors of the houses and ensuring the residents' privacy is maintained.

Although the houses are extroverted, they have very little view of each other and most of the balconies face the plains and garden lands. Therefore, the privacy (Mahramiat) of the houses has been preserved. The building of the houses is also designed in such a way that the inside is safe from the view of strangers and they cannot see inside of them. The organization of the interior space of the house is also designed to divide it into interior and exterior areas. The activities of strangers are controlled within the limits of the house. After opening the entrance of the house, there is a space like a hall, which is the connection between several other spaces and the location of the stairs to reach the first floor. The greeting area for foreign guests is usually on the ground floor, and its stairs are located in the hallway. A stranger can go to the guest space without entering the residential part of the house (Miras, 2013).



Figure 83 :Palm and the place for holding it, photo by author

In addition to all the ancient and deep-rooted customs, the ritual of palm-turning in the Moharram ceremony is very important in Abyaneh. This ceremony attracts many visitors every year, there are two palms, one belongs to the people of Hardeh, which is kept in Hosseiniyehof that neighborhood, and the other belongs to the residents of Yasmoun and Pol neighborhoods, which is kept in their Hosseiniyeh. Hence, the palm of each neighborhood belongs to certain tribes. The palm is a symbol of Imam Hussein's coffin that is carried in this religious ceremony in the city, at the time of Tasua and Ashura ceremonies, as mentioned before, when the palm is turned in the neighborhoods, its movement path is clear at the neighborhoods' border. The movement of palms in the alleys of the neighborhoods also indicates the border of the neighborhood and the sub-neighborhoods. It is said that sometimes it happens that mourning groups with palms went beyond

the designated area. At this time, there could be a verbal conflict that could be resolved through the mediation of the trustees and the elders (Jamshidi, 2007).

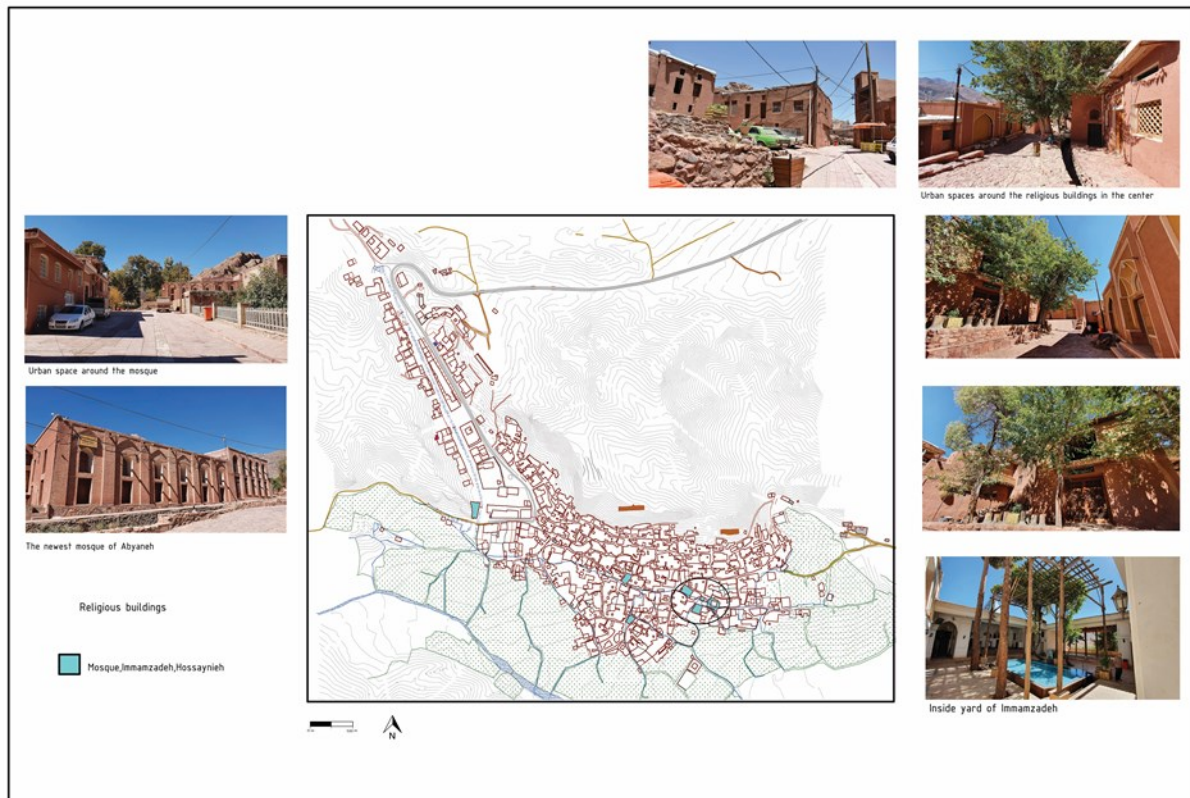


Figure 84: Religious buildings of Abyaneh, base map by Miras, modified by author

As depicted in the Figure 84, religious buildings in the village of Abyaneh are predominantly located in the older neighborhoods along the main road and are concentrated in the central area of the village. One of the most significant religious structures is the Imamzadeh Yahya building, which stands out for its central courtyard and large terrace with a breathtaking view.

There are several reasons for the scarcity of religious buildings in the newer parts of the village. Firstly, the population has declined, and with it, religious beliefs have diminished among younger generations. This has led to a reduction in the demand for religious structures. Secondly, urban spaces have been developed in front of these religious buildings to provide a gathering place for religious events, such as the ceremony of Ashura and Palm tree movement. The presence of these urban spaces helps to foster a sense of community and religious solidarity.

Another factor contributing to the limited presence of religious buildings in the new parts of the village is the challenging topography. Many of the upper regions of the village are located on steep slopes, making it difficult to construct large structures. As a result, religious buildings are more likely to be found in the central and lower areas of the village, where the terrain is relatively flat and building is more feasible.

4.2.3.5 Water Use System

Do Abi Spring, which always has water throughout the year and supplies the majority of the village's water along with another smaller spring. The water of this spring and the water canals inside the village have added to the visual beauty of the village and have increased the quality of space in urban spaces. This is one of the important natural elements influencing the shape of the village.

If we examine the directions of the slope according to the existing topographic complications, we will find areas that have an even slope; The rains in these areas are finally directed to the river by the only major canal of the village. This traditional canal has a west-east direction and its water supply is made from those two springs, which is permanent (Saqafi,2007).



Figure 85: Water streams in the main route of Abyaneh

The water stream enters the village from the west and leaves in the eastern part of the Herdeh neighborhood. Thus, this axis passes from the west to the east through the village. Next to the water route, the main passage of the village (Rashteh) has been formed. In the north of this passage, due to the difference in level, there is no direct access to water (Ahmadi-Lari, 2013), but in the southern part water channels have been separated from this passage in several places, forming water streams to the

south of the village. The movement of water in this village creates amazing and beautiful scenes while also contributing to the improvement of urban space quality.

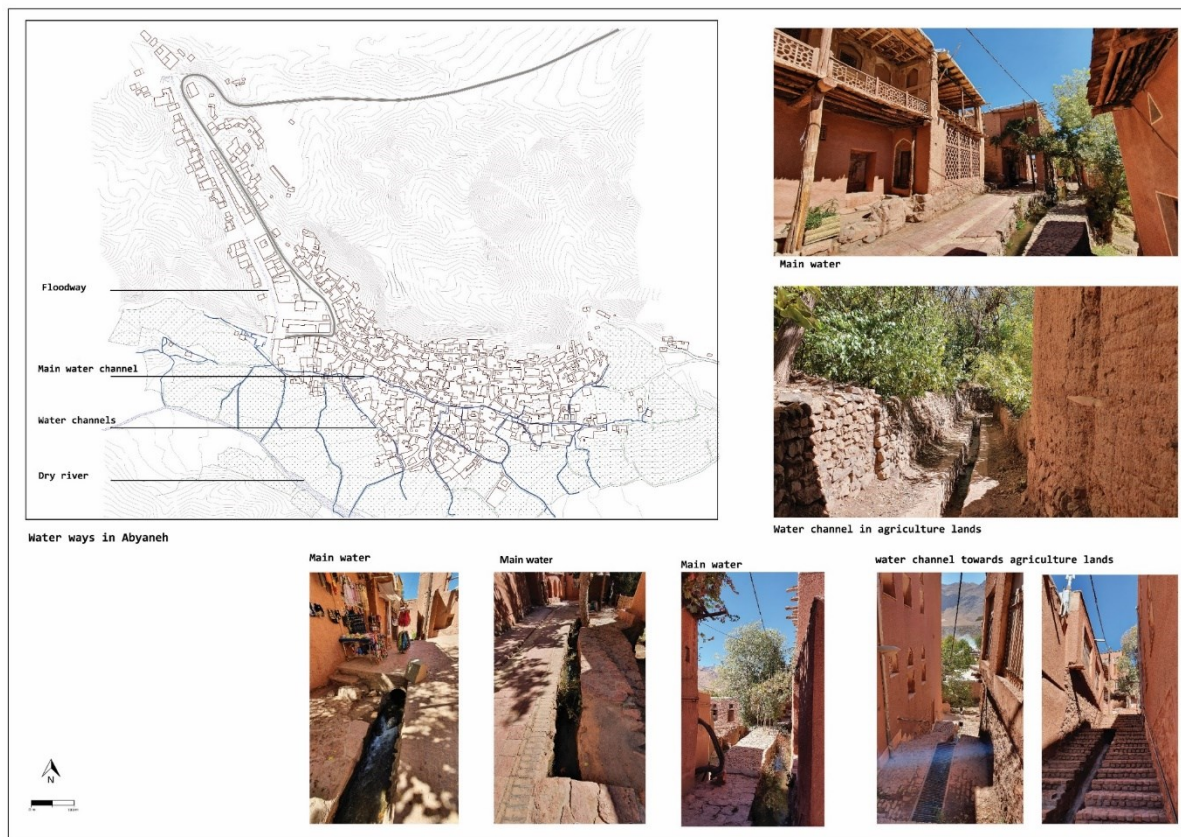


Figure 86: Water in Abyaneh, by author

The map in figure number 86 depicts various water flows. The slope of the surface water demonstrates that the flood trap parallel to the village's entrance street directs the majority of the surface water towards the south gardens and the river. The main streams of water that flow in the direction of the village's main route enter from the west and exit from the east. The water from inside the canals that is divided in various locations flows to garden and agricultural lands via a land slope and finally arrives in the dry river. The dry river has no water most of the year, and when it floods due to heavy rainfall, it becomes a torrent and flows there. In addition, when the water from Do Abi spring is not used by the fields during the winter, it is directed to the dry river.

4.2.3.6 Typology of Passages

There is a main route axis that connects the Darvazeh Bala (Upper Gate) in the west of the village to the Darvazeh Paein (Lower Gate) in the east of the village in Abyaneh. This passage, called Rasteh (Rasteh

means straight path) in the local language, acts as the backbone of the village's form in the center. The main religious sites of the village, such as the Grand Mosque, Hosseiniyehs (Palm Sites), Yahya and Isa Imamzadehs, the village's main (covered) water reservoir, and the fire temple, are located along this route, and the southern and northern parts are connected to this axis through the northern lanes. The presence of gates made the entrances more obvious.

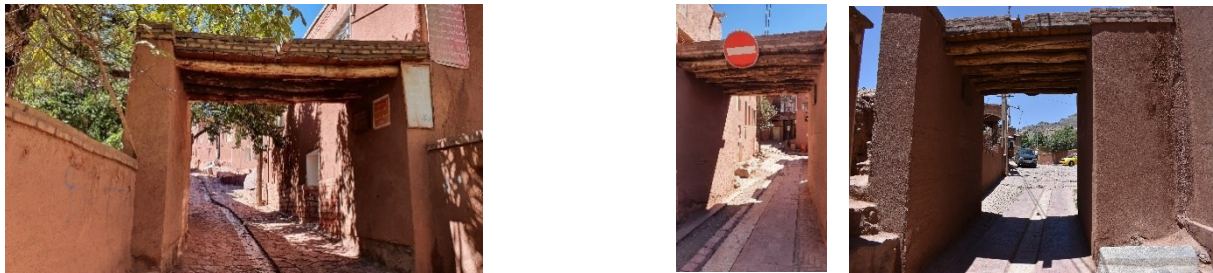


Figure 87 : Two main gates of the village

The passages in Abyaneh exhibit unique traits and can be classified into four categories, as shown in figure 88. The purpose of these categorizations is to enhance comprehension of the various passage types found in the village of Abyaneh and their significance in connecting its inhabitants and structures.

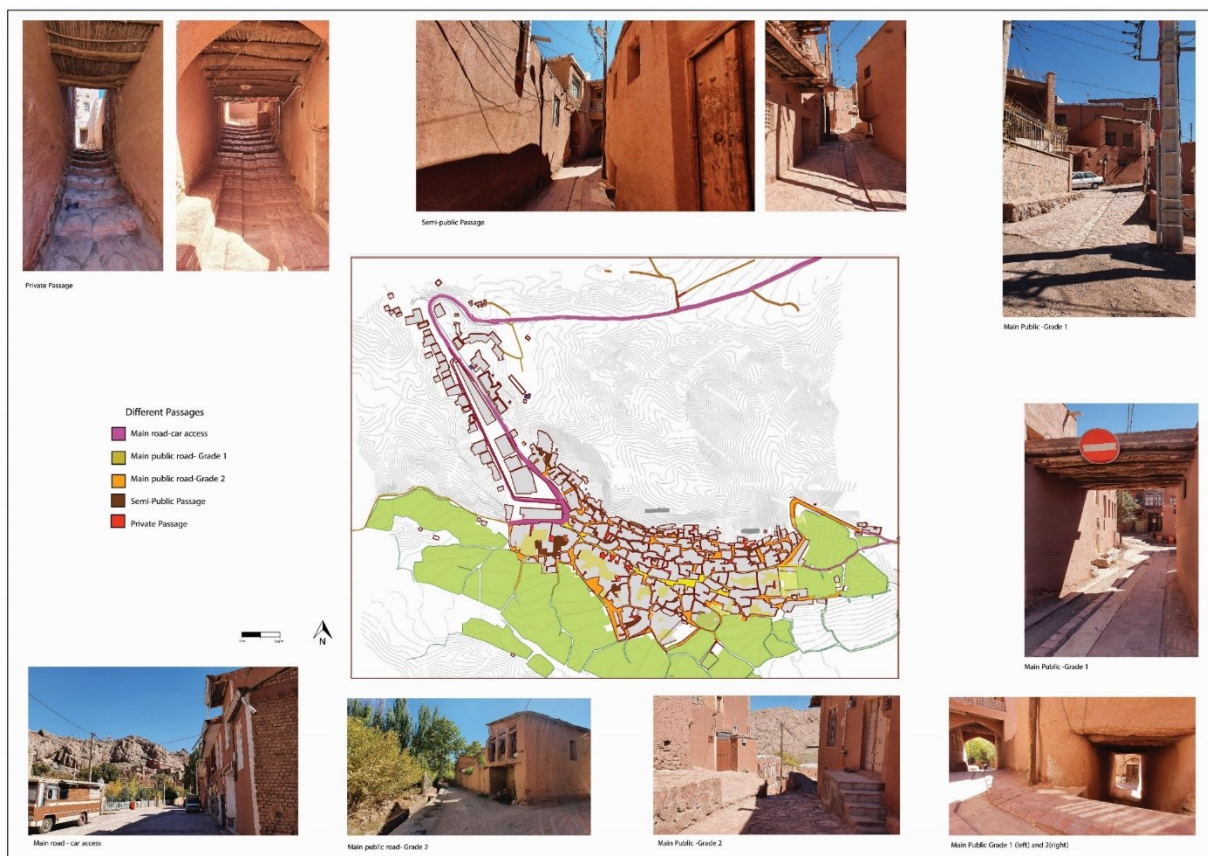


Figure 88 : Different types of passages in Abyaneh, by author

The categories are:

A) Main passages with car access: These passages are located along the border of the village and are easily accessible by car. They have wide widths and long lengths, and provide easy access to the village.



Figure 89 :Passage type A in Abyaneh with car access, by author

B) Public passages grade 1: These passages serve as main roads and provide connectivity throughout the village. They have wide widths, long lengths, and direct access to important public buildings such as mosques and water storages. Some of them may be accessible by car, while others may have stairs.



Figure 90: Public passage Grade 1 in Abyaneh, by author

C) Public passages grade 2: These passages connect different residential units and act as neighborhood passages. They connect to the public spaces and grade 1 passages. They may have limited width or have stairs and do not have direct access to public buildings.

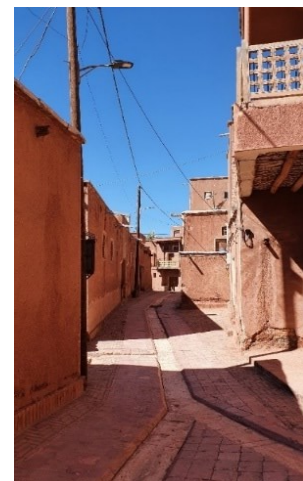


Figure 91: Public passage grade 2 in Abyaneh, by author

D) Semipublic passages: These passages are similar to public grade 2 passages but have a more private sense. They are not inviting to strangers and have more narrow widths or small stairs. they usually have an entrance or sabaats. They connect a small number of houses together, but they are not considered private passages



Figure 92 : Semipublic passages in Abyaneh, by author

E) Private passages: These passages are completely private and only accessible to residents. They lead to a residential unit and may have warehouses or other private buildings. They are not inviting to strangers and do not provide access to public spaces.



Figure 93: Private passages in Abyaneh, by author

Classification	Description	Length and Width	Access
Main Passages with Car Access	Located along the village border, easily accessible by car	Wide and long	Car Accessible
Public Passages Grade 1	Serve as main roads, connect important public buildings	Wide and long, some with stairs	Direct access to public buildings
Public Passages Grade 2	Connect residential units, connect to public spaces and grade 1 passages	Limited width, stairs	Connects to public spaces
Semipublic Passages	Similar to grade 2 passages but more private	Narrow width, stairs, entrance/sabaats	Connects a few houses but not considered private
Private Passages	Only accessible to residents, lead to residential unit	Narrow width, stairs, short length	Not inviting to strangers, no access to public spaces

Table 2 : Classification of Passages in Abyaneh, by author

The village of Abyaneh is renowned for its untouched architecture. However, many of these houses are not easily accessible by car due to the steep slope of the village, making it difficult to drive. As a result, many parts of the village are only accessible by foot. In some places, cars have reduced the visual quality of the village and damaged old buildings. Fortunately, the village of Abyaneh has been protected by the government, preventing excessive destruction to create car access.

Figure 94 displays that the principal car access points to the village are situated along its perimeter, excluding the mountainous northern area. The primary point of entry is from the west of the village, which offers a straightforward road and is readily accessible by car until the historical section and entrance gate of the village are reached. There is also an entry on the east side. Consequently, only the buildings

located in the new neighborhood have convenient access to the car path and can park their vehicles on the street with ease.

Cars also have access to the southern part of the village, which is a dirt road and a path to gardens and agricultural lands. Cars have limited access on the old and main road in the middle of the village, as well as a few eastern and northern roads that are marked on the map. It is not possible to pass cars on other routes due to their small width or the slope of the land not allowing for the use of a car. Overall, the village of Abyaneh is best explored on foot to fully appreciate its traditional architecture and natural beauty.

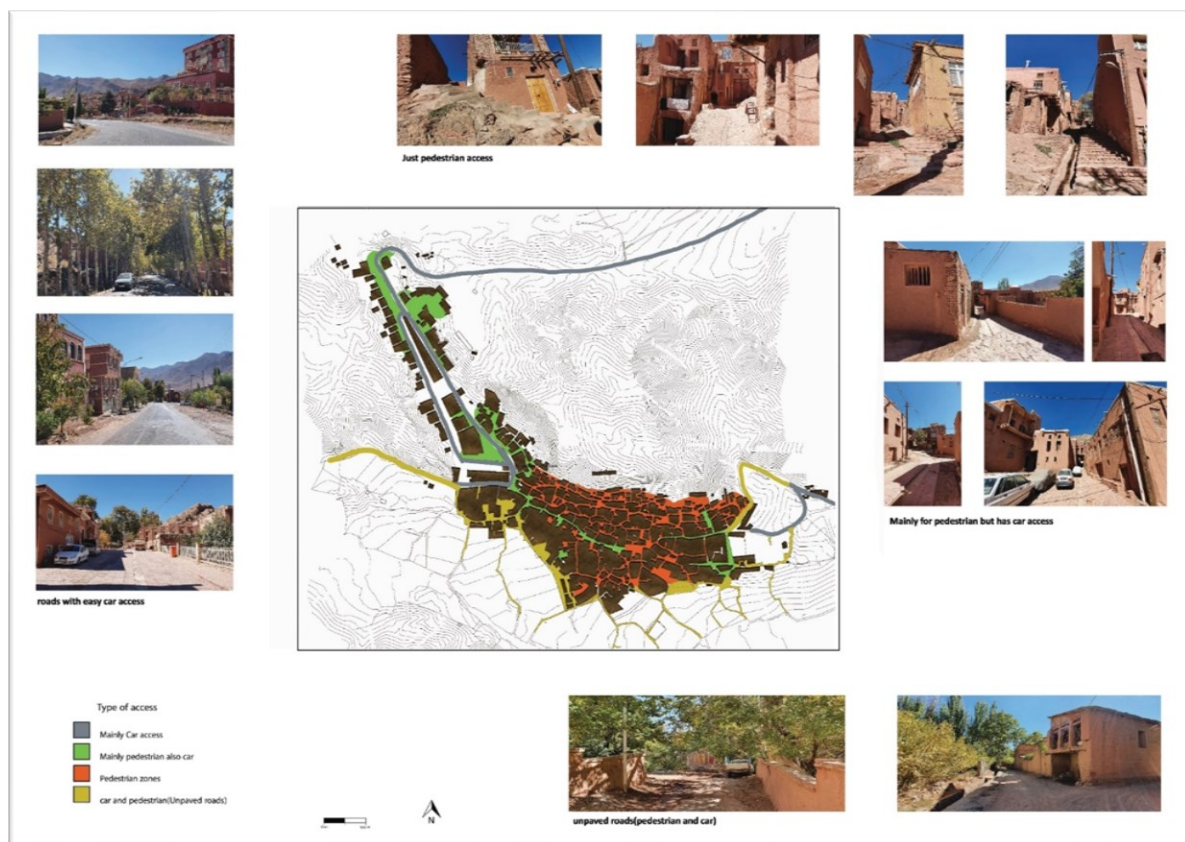


Figure 94: Accessibility in Abyaneh: Cars and Pedestrians, by author

The presence of a large number of sabaats in various forms is one of the characteristics of Abyaneh. In this village, unlike in desert areas where Sabaats is commonly used to create shade, it has been mostly due to a lack of land for constructions. This increased the area of the buildings and maximized the use of the land. However, the Sabaats continued to contribute to the villagers' way of life in terms of climate. For example, in snowy winters or rainy weather, they make it easier to cross the village.



Figure 95: location of Sabaats in Abyaneh by author,base map by Miras organization

The distribution of Sabaats, as depicted in Figure 95, highlights a noticeable concentration in the central and upper regions of the village. This clustering suggests that a scarcity of land is a contributing factor to the prevalence of Sabaats in this particular settlement. It is likely that the residents in these areas face limitations in expanding their living spaces horizontally, and as a result, they have resorted to building upwards. The high concentration of Sabaats in the central and upper regions of the village is a reflection of the common practice of utilizing vertical space as a solution to the land scarcity issue.

4.2.3.7 Architecture

The soil of the Abyaneh region is red, and its resistance to wind and rain has made it a suitable choice for building facades. As a result, the buildings in the village are the same color as their surroundings.

As discussed, the distinctive feature of the buildings of this village which differentiates it from the villages located in the desert and central regions of Iran is the extrovertedness of the buildings. The old residential units are two to four-story buildings. The reason for the multiple floors is the relatively high slope of the

land, the lack of buildable land and climatic characteristics. These factors have caused almost all architectural units of the village, whether residential or public, to have no yards or open spaces, including the Jame Mosque. For these reasons, residential units have a special perspective. The first feature is the high height of the building walls. This feature is especially visible in the case of buildings that are built higher above the passages. The high height of the walls of residential units has created a distinct view.

Most of the buildings in Abyaneh have flat roofs. The abundance of high-quality wood, which can withstand tensile pressure stress (Ahmadi-Lari, 2013), has made it possible to build flat roofs and porches in the village.



Figure 96 :Residential buildings in Abyaneh, by author

Another visual quality is the presence of more openings on the upper floors. The main reason is that the allocation of the ground floor is for the winter residence or livestock and the upper floors are for the summer residence. Additionally, safety against cold winter winds and lower heat exchange make the ground floor suitable for winters.



Figure 97 :Architecture details of the houses in Abyaneh, by author

The reasons that make the upper floors suitable for summer living are the possibility of creating large and numerous porches and openings without being seen inside (for Mahramiat and Privacy), and a good view of the gardens. Thus, the large number of openings in the first floors compared to the ground floors is one of the visual features of the village passages.



Figure 98 :Architecture details in Abyaneh, by author

The materials used in the outer shell of the units is red clay with a plaster mold around the openings and corners of the walls. The shape of the openings of the upper floors, which are in the form of long and vertical openings and smaller square openings on top of them, also has a climatic-environmental logic. When it is necessary to keep long openings closed, the upper openings perform the ventilation function by removing hot air from under the ceiling. The existence of these frames has both cultural and economic reasons. The financial ability of the unit owners has made it possible to make these features. The homogeneity of these materials has created an integrated visual alignment throughout the village (Abaszadegan, 2017).

Net bricks on the outside of the ground floor windows are other architectural features of this village, and it is said that these nets allow light to pass through but prevent the cold and strong winds from passing through (Jamshidi, 2007). Besides, they use these net bricks to protect the building from theft



Figure 99 :Net bricks on the façade of the buildings in Abyaneh, by author

and also maintain security and privacy which is related to the religious believes too (Mahramiat).

The entrance to the house is often done through a corridor or porch-like space. This space connects several rooms and is the location of stairs to access the upper floors. The rooms are generally located on the south side of the building facing the sun. In the architecture of many Abyaneh houses, the ground floor has no residential use and was used to keep livestock, thus, it was possible to create a space with a smaller area.

Due to the lack of access to light, the rooms on the northern front are usually used as storage for horticultural and agricultural products. Rooms are often multi-functional and function differently in different seasons. The living room is the main living space of Abyaneh people. This room was used for cooking, baking, resting, sleeping, eating and even entertaining guests. Moving the living room in different seasons is normal and the people of Abyaneh usually spend winters on the ground floor and summers on the upper floors.

MassoudZadegan's house (figure 100) is located next to the main passage of the village and in Pol neighborhood. The house is built on two floors and part of the second floor on the main passage is covered with a Saabat. This house is built on sloping land and has two levels. The house has neighbors on three sides and the Saabat wall is shared with the southern neighbor. The entrance to the house is located on the ground floor in the main passage. The entrance porch and warehouse are also in this floor. A series of stairs connect the ground floor to the first floor. On the first floor, a space connects the four rows of rooms. The guest place (where guests are entertained) is located on Sabat and has a porch facing the alley. Furnaces and toilets are also in this floor. Small spaces have also been built on the roof.

Morphology and Architecture



Masoudzadegan house

Figure 100 : Masoudzadegan house in Abyaneh, photos by author, plans source: Beheshti,2005

The village of Abyaneh is home to many significant architectural structures. Some of the most notable buildings can be found on the main road and in the center of the village, and often have a religious function. These buildings are specified on the village map in figure number 101, and are considered to be of architectural and cultural value.

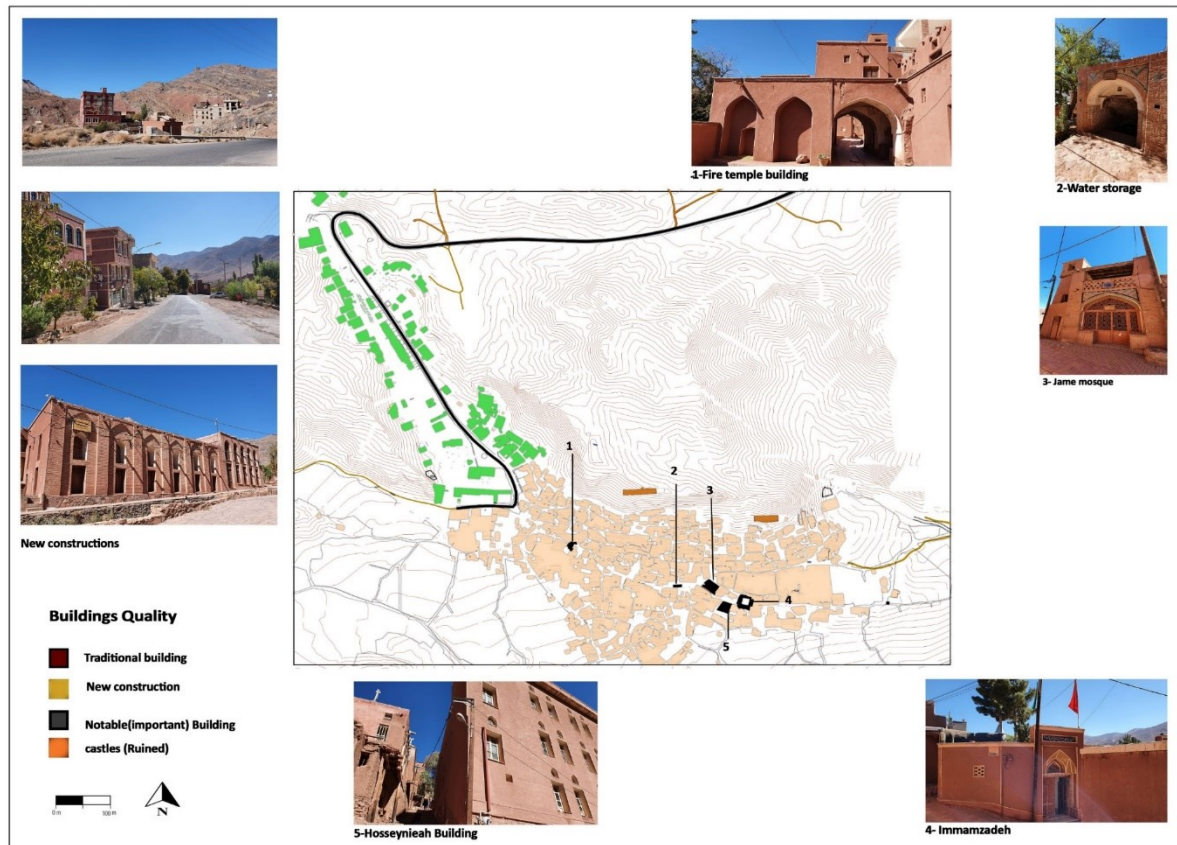


Figure 101 :Building quality in Abyaneh, by author

As shown in the above map, the old neighborhoods in Abyaneh, located between the village's two main entrance roads, are characterized by traditional architecture; Many of the buildings in these areas have been preserved in their original forms, with only a few undergoing renovations. However, more recent constructions have a different aesthetic.; In new neighborhood they are typically painted red to conform to local regulations, but it is clear that they are not part of the historical district. The village's significant and notable buildings, including its main religious structures, can be found along the main road and in the center of the village towards the south, where the slope is less steep. Specifically, buildings 3, 4, and 5 (Jame Mosque, Imamzadeh and Hosseinieah) are the primary religious buildings and are located in close proximity to one another.

Despite its small population, Abyaneh has a few mosques, three of which are historic. The Grand Mosque, which was built 300 meters away from the fire temple, is Abyaneh's oldest mosque. Despite numerous renovations (Ahmadi-Lari, 2013), it has retained its original shape.



Figure 102: A mosque in Abyaneh, by author



Figure 103 : Abyaneh Grand Mosque, by author

The oldest historical monument in Abyaneh is a fire temple, which, like other buildings in the village, is built on a slope. A small hall remains from the lower floor of this temple, but the floor that was dedicated to religious ceremonies is now known as the fire temple, and the main street of Abyaneh runs through it. The Abyaneh fire temple is an example of a Zoroastrian temple built in a mountainous area (ibid, 2013). Maxime Siroux, believes, the temple, built on a sharp slope and clearly visible from village houses, consisted of three levels and was built in two stages. The lower level, the oldest, of which some parts still survive, dates probably from the 5th century, and the upper levels probably from the 7th. A village lane now passes through the intermediate level, which contained the fire altar and service chambers and was topped by a domed *čahār-ṭāq*¹³. The skeleton of the *čahār-ṭāq* with a broken dome is still standing (Yarshater, 1983).

¹³ *Čahār-ṭāq*, literally “four arches,” is a modern term for an equilateral architectural unit consisting of four arches or short barrel vaults between four corner piers, with a dome on squinches over the central square; this square and the lateral bays under the arches or barrel vaults together constitute a room of cruciform ground plan. It has been in continuous use in both religious and secular contexts over a period of more than 1,500 years (O’Kane, 2021)



Figure 104 :Remains of fire temple in Abyaneh, photo by author

Apart from religious structures, they are also water reservoirs (Ab anbars), none of which are currently operational. They are located in the center of the village and provide easy access to all villagers. They are also three defensive forts that were used in times of danger. The forts of Pol and Hardeh are located on the northern cliffs, while Yosemite is located in the south of Abyaneh in the foothills of the opposite mountains. Each of these castles appears to belong to one of the village's three old neighborhoods (Ahmadi-Lari, 2013). However, according to locals, the one in the south, far from the villages, was used to keep sick people during contagious outbreaks.



Figure 105: Ab anbar (water reservoir) in Abyaneh, by author

4.3 Conclusion

Abyaneh village is renowned for its unique architectural characteristics, particularly its stair-shaped form and distinctive red thatch. The morphological conditions of the region, including its steep slope, have greatly influenced the design of the village's buildings. These structures are built to face south, with extroverted designs and no yards, a result of the rural nature and climatic factors of the area.

Conclusion

The compact and dense fabric in the north of the village, contrasting with the more scattered fabric in the south, is another notable characteristic of Abyaneh. A variety of factors have contributed to these solutions, such as limits in the proper lands, use of energy and security. Unlike desert buildings that often feature domed roofs, the roofs in this area are flat, a result of both the climate and the availability of materials for flat roof construction.



Figure 106 :View towards Abyaneh from agriculture lands, by author

The village's security is further reinforced by its general form and limited access, as well as the presence of surrounding castles. Many solutions in this village have some overlaps between them. For example, the use of brick protection on windows serves both security and religious/cultural purposes, as well as controlling sunlight.

Overall, it can be concluded that the climate and surrounding environment have played the most significant role in shaping the village, while governmental support has helped preserve its original form. However, there are challenges facing the village today, such as inadequate maintenance and a lack of comprehensive rules for new construction. Some personal renovations of houses do not respect the original form, and the use of red color on building facades has had mixed results.

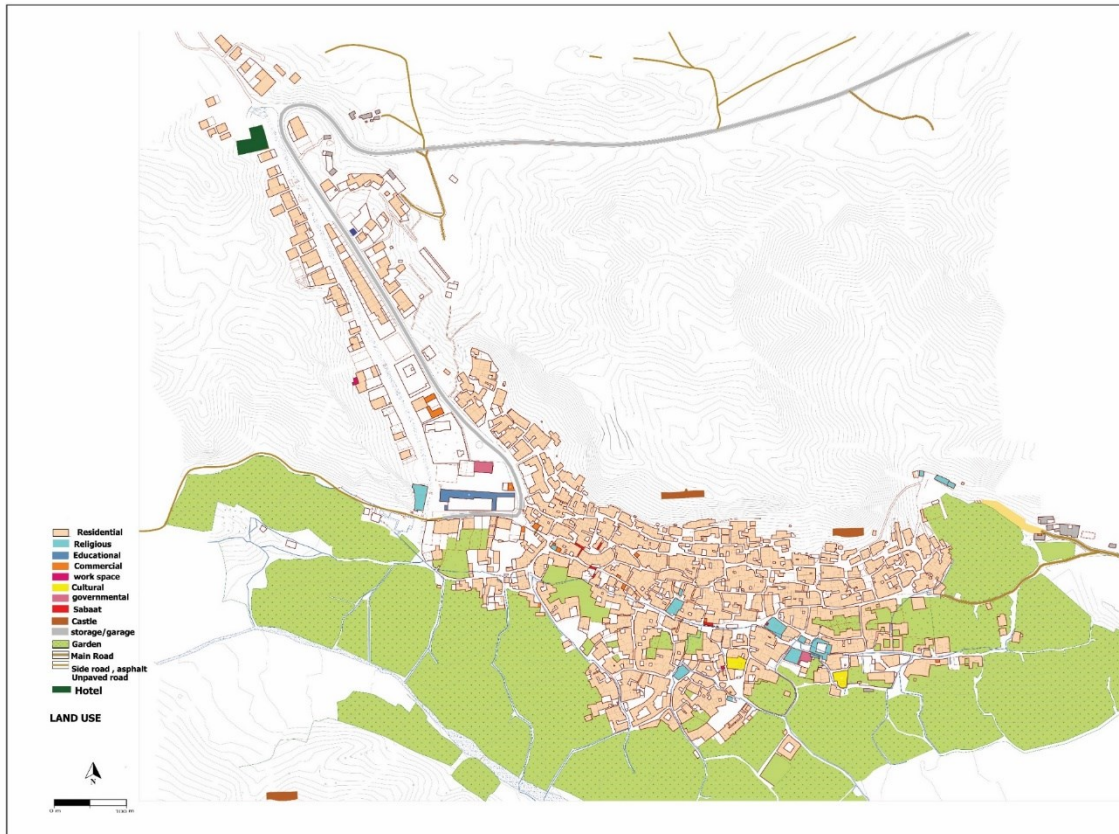


Figure 107 :Land use map in Abyaneh, edit by author based on Map of Miras organization.

As we it shown in figure 107, the distribution of non-residential uses in Abyaneh village is primarily concentrated in the southern half of the village or along main access routes. This is due to the combination of public access and land restrictions, particularly in the north part of the village where the slope is steep. Additionally, new public buildings are located in the newer parts of the village with access to car roads. Gardens, which are an important aspect of the village, are mostly found below the main road where they can benefit from more available water sources. Furthermore, there are a few buildings with central yards in the south part of the village, and the parcel size is generally larger in this area.

In conclusion, by seeing this from a low resolution, the natural topography of the land and location of the village in the valley created the general form of Abyaneh. However, in bigger resolution and closer examination, it is clear that movements of water, religion, materials, and climate have played a more significant role in shaping the village over time. The solutions found by generations of inhabitants in Abyaneh can be applied to similar villages forms in mountainous parts of Iran. However, there is a need for clearer and more comprehensive rules for new construction to ensure that the traditional form and aesthetic of the village is preserved.

Characteristics/ Factors	Explanation
Unique architectural features	Stair-shaped form, distinctive red thatch
Morphological conditions	Steep slope, facing south, extroverted designs, no yards
Compact and dense fabric in the north	Scattered fabric in the south
Roofs	Flat instead of domed, due to climate and material availability
Security	Limited access, surrounding castles, brick protection on windows
Climate and environment	Significant role in shaping the village
Governmental support	Helped preserve original form
Challenges	Inadequate maintenance, lack of comprehensive rules for new construction, personal renovations not respecting original form, mixed results with red color on building facades
Non-residential uses	Concentrated in southern half of village or along main access routes
Public buildings	Located in newer parts with access to car roads
Gardens	Below the main road where water sources are more available
Central yards	Few in the south part of the village, larger parcel size in this area
Topography	Natural topography of the land and location in the valley created the general form
Other factors	Movement of water, religion, materials, and climate also played a role in shaping the village
Recommendations	Need for clearer and more comprehensive rules for new construction to preserve traditional form and aesthetic

Table 3: Summary of characteristics and factors about Abyaneh by author

Chapter five.

5 Case study two, Qehi



Figure 108: Qehi village, by author

5.1 Background

5.1.1 Introduction

Qehi is a historic village located in Isfahan province, Iran. Its historical center has been registered as a national heritage. It serves as a representative example of the thousands of villages in the central deserts of Iran that do not have access to groundwater and are located on flat land. This type is the dominant type of villages form in deserts of Iran. Despite being located in the desert, with no access to rivers or mountains, Qehi was once a prosperous and important village.

The village is located 7 km from the desert city of Harand and 80 km from Isfahan city. Its name, "Kehi," was changed over time from the pre-Islam era to "Qehi", "Kehi" meaning a low-altitude place or due to the presence of many aqueducts it is called "Kehi", that comes from "Keh" which is an abbreviation of "Kehriz" which means aqueduct in Persian language. In detailed map of Iran, by Abajour printing house of Istanbul in year 1912 is mentioned with the letter "K" (Mohammadnejad, 2006). The village was visited and mentioned in the book "Ancient roads of Isfahan and their related buildings" by Maxime Siroux, who wrote that There are legendary houses here that used to be the center of camel breeding in all of Central Iran (Siroux, 1979) . However, Qehi is now a deserted village and its valuable, historic houses are in a state of ruin, with only small parts of the village slightly protected. Most of life now flows in a new fabric that bears no resemblance to the historic part.

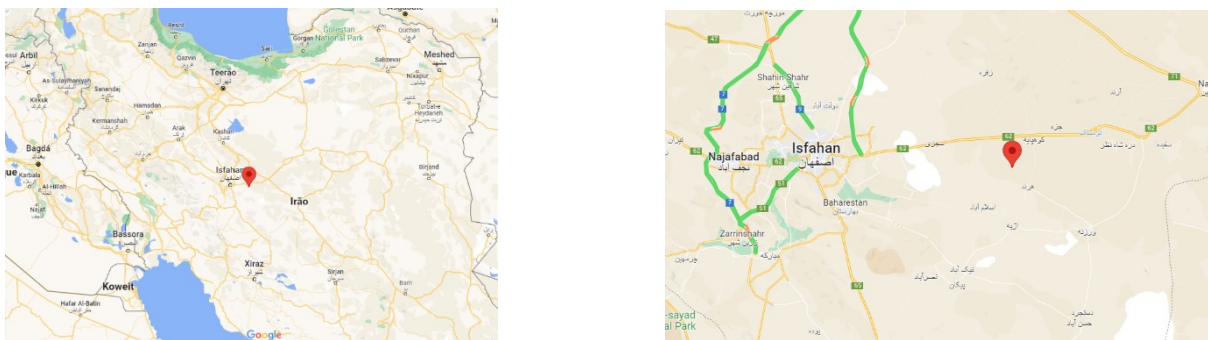


Figure 109 : Location of Qehi in Iran and close to Isfahan, Source: Google maps

There is no doubt that the village is historical, but unfortunately not enough research has been done in this regard but the village dates back to before Islam (Hadi's revised plan, 2012). Some of the Qehi buildings date back to the centuries before Islam. The origin of the Jame Mosque, which was built by Sassanid is a proof of this claim. In addition to this, the surviving works of the Zoroastrian crypts, the ruins of which existed as a pile of soil until fifty years ago, strongly confirm this theory, but to document the issue, it needs more research by archaeologists (Mohammad Nejad Kobaria, 2006). Despite its historical significance, there has not been enough research done on the village, but it is known to date back to before Islam.

5.1.2 Climate

The climate of Qehi, like all desert and semi-desert areas, is hot and dry. Despite the extremely hot days in summer, the nights are cool and pleasant. Most of the rain falls in autumn and winter when the

weather is very cold. Despite being in a desert, Qehi has had a favorable situation in terms of vegetation and pastures in the past with the help of underground waters. 29 plant species have been identified in this area, some of them are Ashnoon, Gaz, Shoor, Taqaleh, Sandal, and others. During the last 10-year period, the nearest meteorological station is in Varzane city. The average temperature is 18.8 degrees. Also, the maximum average maximum temperature in the region in July is equal to 40%, and the minimum average minimum temperature in the mentioned statistical period is in December and is equal to -11.8. The reason for the low average air temperature is the cold desert nights, and it shows the high temperature difference in this area (Hadi's revised plan, 2012).

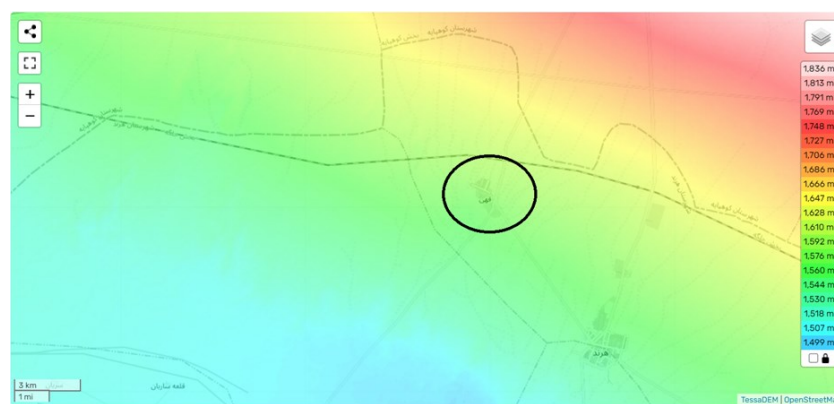


Figure 110 :Qehi topographic map, source: en-us.topographic-map.com



Figure 111 :Qehi in middle of the village and far from mountains, source: Google earth

Like other villages located in the desert, the climate has had a great impact on the architecture and urban planning of Qehi. The village has desert architecture and the houses are introverted. In the access routes of the old fabric, Sabaats and roofed paths can be seen, also the importance of aqueducts and reservoirs in the formation of the village is clear. Aqueducts are vital arteries of the village and its fields. The people of Qehi consider the existence of some aqueducts to the distant years and even before Islam. Also, there were many mills in the village in the past, rainfed agriculture was also popular in old times.

5.1.3 Socio-cultural studies

5.1.3.1 Population Size and Demographic Changes

In the late Qajar period, Qehi had a population of 3,000 people and in previous periods had a larger population that was primarily engaged in camel farming and agriculture. The village had significant agriculture due to the presence of several aqueducts. With more than 3,000 camels, the village played an active role in trade and freight (Mohammad-Nejad Kobaria, 2006). However, with the growth of technology and the emergence of cars, the role of camels as the main factor in the movement of goods ended. Additionally, according to reports, a disease caused the death of camels, and the camel owners of the village moved to Tehran over time (Karimi-Ghahi, 2019), resulting in the loss of popularity for Qehi over time.

According to Dehkhoda dictionary, the number of inhabitants of the village is 256 (Dehkhoda, 1994), which shows that between 1931 and 1941, Qehi village had the lowest population rate. However, the village population had increased to 852 people according to the 1956 census, and it has continued to grow since the first Pahlavi period. This increase in population can be attributed to several factors. One possible reason is the construction of the national railway, which passes close to Qehi, providing employment opportunities for some of the villagers. Additionally, the land reforms implemented by the second Pahlavi Shah, which involved transferring ownership of agricultural land from feudal landlords to peasants and the general population, may have also contributed to this increase. The construction of the national railway and the land reforms were both significant developments that likely played a role in the population growth of Qehi village.

Despite the development of village welfare and health facilities and the establishment of water, gas, and electricity, the population of Qehi village did not continue to increase over time. As of 2016, the population of the village is estimated to be around 850 people (Karimi-Ghahi, 2019). This stagnation in population growth can be attributed to several factors, including mismanagement and general problems in the country, as well as a shortage of water for agriculture in recent decades. These issues likely hindered the village's ability to sustain population growth, despite the improvements in infrastructure and services. This highlights the importance of addressing these issues in order to promote sustainable development and population growth in Qehi and other similar villages.

5.1.3.2 Economy

Raising camels and caravans has been a long-standing occupation in the village of Qehi. According to some of the village elders, the number of camels was estimated to be around three thousand. This activity played an important role in the economic, cultural, and commercial prosperity of the villagers as the main goods of Isfahan merchants were delivered to Qehi to be transported to other parts of the country (Mohammad-Nejad, 2005).

In addition to camel breeding, agriculture, animal husbandry, kilim weaving, and pottery have also been the economic sectors of Qehi. Rainfed agriculture was flourishing in the village, and crops such as wheat, barley, beets, turnips, carrots, hemp, alfalfa and millet were cultivated in the agricultural lands. However, nowadays, agricultural activities in the region, in terms of geographical location and natural conditions, are not as prosperous as it used to be, due to the drying and depletion of aqueduct water. Most of the residents are employed in the service sector, such as government organizations, especially in the

transportation sector (workers in railway company) (Karimi-Ghahi, 2019). This shift in economic activities highlights the impact of changes in natural conditions and technology on the economic development of the village. Furthermore, it is a clear indication of the need for finding alternative ways for providing water and promoting sustainable agricultural practices in the region.

5.1.3.3 Religion and Culture

The people of Qehi adhere to Islam and the Shiite religion, specifically following the twelve Imams. There are many mosques and Hosseiniyehs in the small village, which indicates the villagers have strong religious beliefs. The ceremony of the first decade of Muharram in Qehi has special features and still retains its old and traditional ways.

The language spoken by the people of the village is Farsi, and they have a unique dialect known as Velayati. This dialect includes many words from the ancient "Farsi Dari" which is an old dialect (Hadi's revised plan, 2012). From conversations with locals, it is noticeable that their accent is close to the Yazdi accent. This is likely due to Qehi's location between Isfahan and Yazd. This demonstrates the influence of the region on the culture and language of the village. Overall, the religious and linguistic characteristics of Qehi reflect the unique identity and heritage of the village and its residents.

5.2 Morphology and Architecture

5.2.1 Environment

The environment in the region where Qehi is located is primarily characterized by desert landscapes. The Zayandehrood River, which is the only significant water source in the area, is not located close enough to Qehi to have a direct impact on the morphology of the village. However, this river is important as it irrigates the southern areas of the region and joins Gavkhouni wetland in Varzaneh city. Unfortunately, the river has been facing water scarcity in recent years. Despite the lack of natural resources, Qehi village has more than 20 aqueducts that were used in the past for irrigation, which is unique compared to other villages in the region. This highlights the ingenuity of the villagers in making use of limited resources for their livelihoods.

In this environment, the best sources of water are underground waters, which are converted into surface waters by numerous aqueducts. The presence of mountains 16 kilometers north of Harand and Qehi village (at a height of 2000 meters above sea level), as well as the Zayandehrood river 30 kilometers

south and the Gavkhouni swamp 55 kilometers southeast, led to winds that were a little more humid and had a milder climate than the rest of the desert. However, with the drying up of the wetland and the river, this area has become a complete desert.

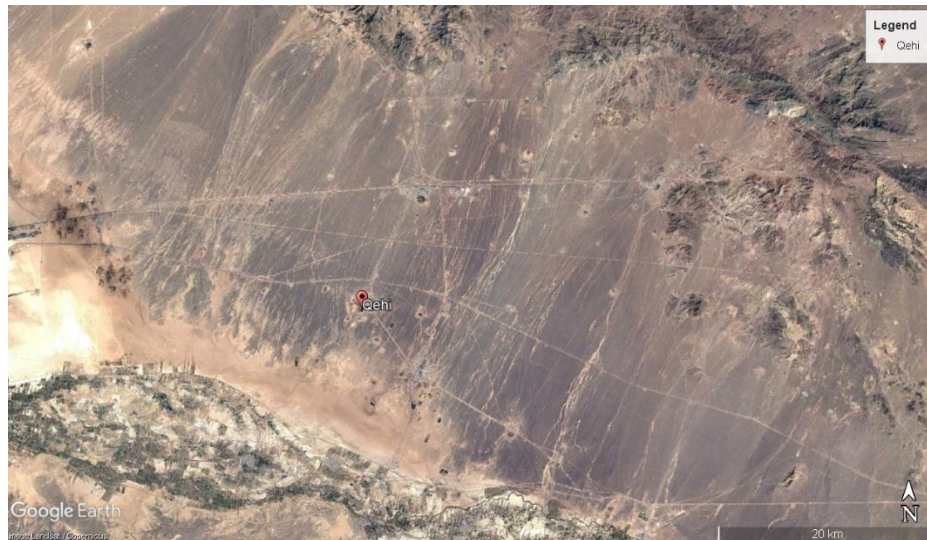


Figure 112 : Satellite view of Qehi, source: google earth

This highlights the importance of understanding the environmental conditions and their impact on the development and survival of human settlements, as well as the need for finding alternative resources for water and promoting sustainable practices for agriculture and other economic activities. It also emphasizes the need for preserving and protecting the remaining water resources and wetlands in the region.

The geographical location and surrounding environment of Qehi village have played a significant role in shaping the settlement. The dry and desert region of east and northeast of Isfahan, where the village is located, has unfavorable environmental conditions, resulting in rural settlements that are separated and scattered due to severe water shortages and are often sparsely populated. These conditions, coupled with low rainfall, low relative humidity and high evaporation, as well as low-quality soils for crop cultivation, make the area not favorable for agriculture.

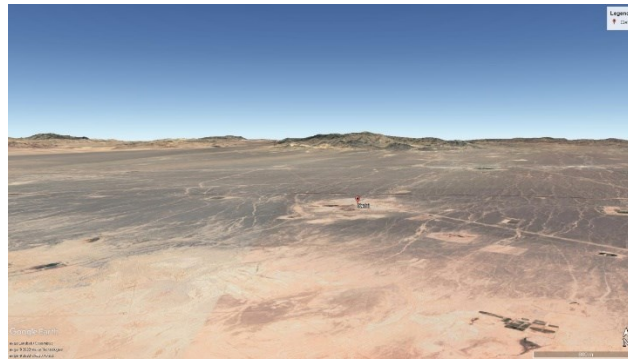


Figure 113 : satellite view of Qehi and its surrounding, source: Google earth

In terms of topography, Qehi does not have significant variations in altitude and the slope of the land in this village is not steep. The general slope of the land in the village is directed towards the north, and the waterways within the village generally follow this slope. The uniform topography of the land in the village has prevented any significant issues with surface water drainage.



Figure 114 : Roads towards Qehi, photos by author¹⁴

¹⁴ Maps are available in bigger size in Appendix C of the thesis.

As shown in the figure 114, on the way to Qehi, there are no natural obstacles. Only empty desert and roads. Even the mountains are not visible to the naked eye. This is a typical scene in the villages of this area. The flat land has allowed the village to develop gradually in all directions without any natural elements to impede its growth or shape, except for the presence of agricultural lands in the south and access roads to the village which are man-made. This highlights the impact of human intervention on the development of the village and the importance of understanding the topography and its role in shaping the settlement.

5.2.2 Distance and Entrance View

The flat topography of Qehi village, located in a desert plain, makes it difficult to discern from a distance. The architectural characteristics of the village's buildings, constructed primarily out of clay, blend in with the surrounding desert landscape. The lack of notable trees or vegetation in the area also adds to this difficulty in visibility. The newer construction in the village, utilizing different building materials, stands out in contrast to the traditional architecture.

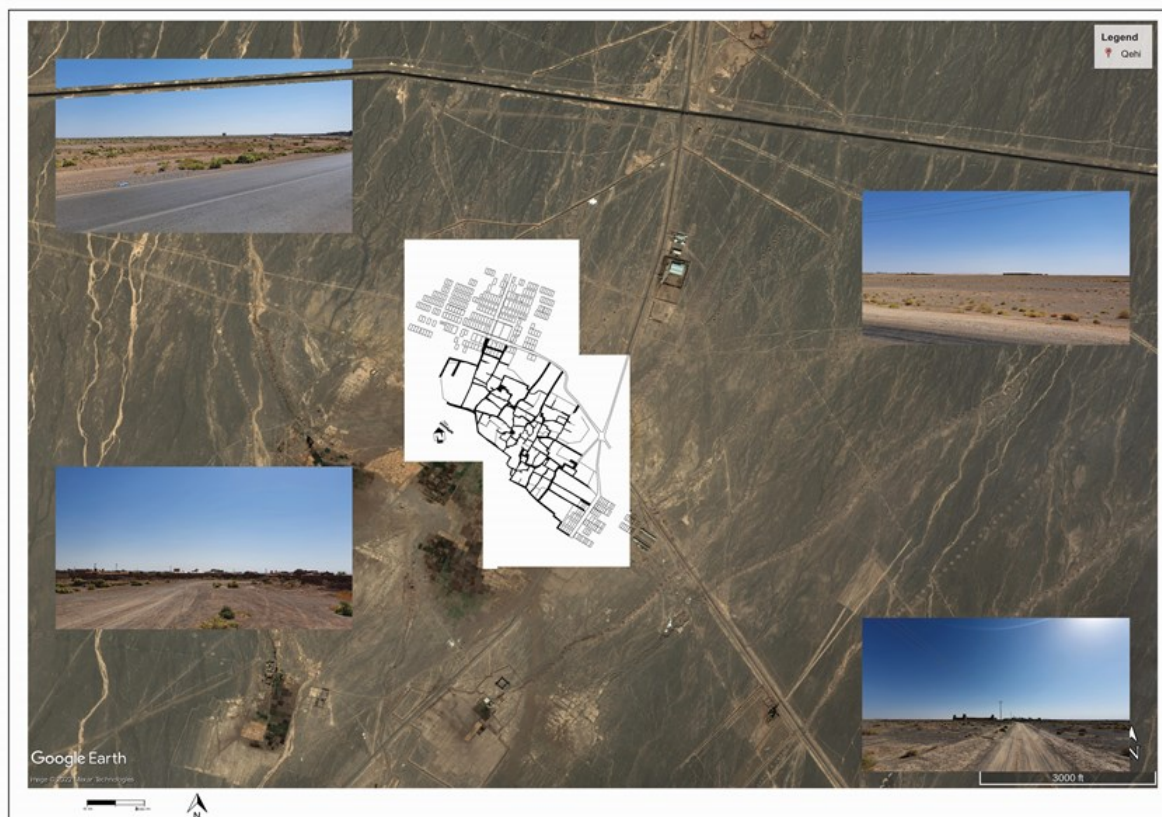


Figure 115 : Nearby environment of Qehi,base map from Hadi plan, modified by author,photos by author

Given that the village is divided into three sections and the entrance road leads into the village center, road signs and maps are the primary means of determining one's arrival. Along the main road, a small, old building can be observed, which is one of the village's mosques. Unfortunately, many parts of the village appear to have been destroyed. From a distance, several clay domes and towers are visible. Upon entering the village, one will notice plots of land that are enclosed by brick or cement walls, as well as historic building entrance gates that are now in a state of disrepair.

This highlights the impact of urbanization and development on the preservation of the village's architectural heritage and the importance of considering sustainable development in the village. It also emphasizes the need for preserving the traditional architecture and promoting sustainable development in the village, specifically in relation to the environment and the use of materials and architectural styles that can affect the visibility of the settlement.

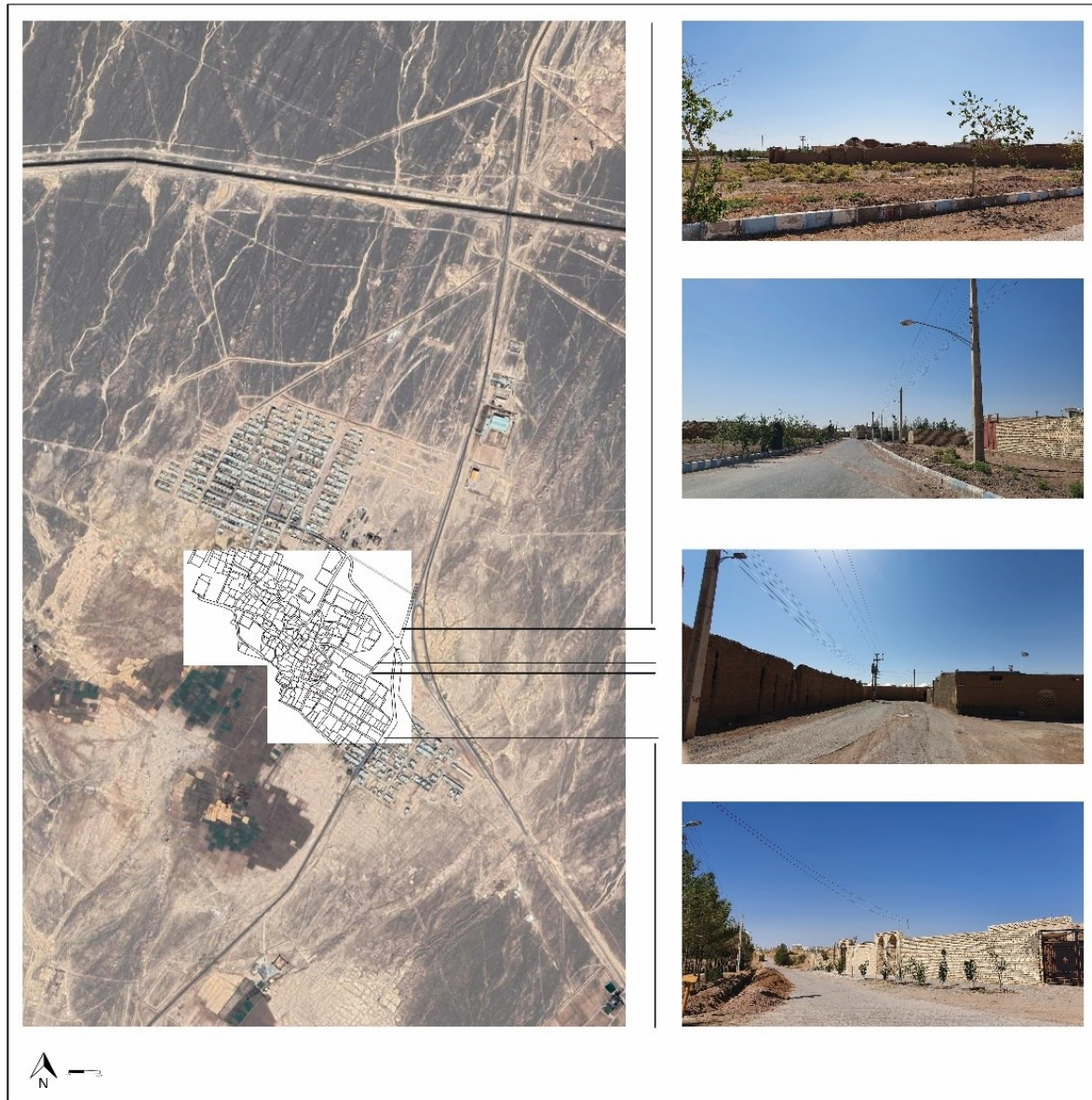


Figure 116 :Main entrance to the Qehi, by author

Figure 116 highlights the problematic state of the village entrance and the adjacent areas. The photos depicted reveal that the entrance to the village lacks clear definition, as well as proper road maintenance. Moreover, there is a notable absence of any signage indicating the significance of the village as a historic site of value. These conditions detract from the overall aesthetic of the village and potentially hinder visitors from appreciating its rich history.

5.2.3 Inside the village

5.2.3.1 General Form

Qehi has a rich architectural heritage, with many historical buildings dating back to the Qajar era and earlier. As previously mentioned, the terrain of this village is predominantly flat, with buildings situated at a consistent elevation. The facades of these structures bear no notable ornamentation, and are constructed primarily from clay sourced from the local soil. As a result, the village exudes a sense of uniformity and cohesion. However, the presence of new constructions also illustrates the ongoing development of the village. The coexistence of old and new



Figure 117 : Historical fabric of Qehi, by author

buildings highlights the changes the village has undergone over time. Unfortunately, many of these historical buildings have been demolished or abandoned, emphasizing the importance of preserving the village's cultural heritage through documentation and preservation efforts.



Figure 118: Current situation of some buildings in historical part of Qehi, by author

The access routes are characterized by their winding and organic nature, with the complexity of the roads increasing as one approaches the village center. The presence of camels in Qehi has influenced the width of the roads, with them being wider compared to other desert villages. Additionally, many of the sabaats

in the village are built at high levels, which is likely a result of the importance of camels in the village's economy and culture. The presence of single valuable buildings such as camel sheds, water reservoirs, castles, religious buildings, and houses may be what makes the village's fabric important and valuable.



Figure 119 :Access roads in Qehi, by author

New buildings have been constructed on both sides of the village. The majority of the population now resides in these new buildings, while many of the old buildings have been demolished or abandoned. The architectural significance of these demolished buildings can be inferred by their ruins; however, their preservation is critical to maintain the cultural heritage of the region. In order to preserve this heritage, it is crucial to document and gather information about the current state of the village.



Figure 120 :Satellite photo of Qehi, source: Google Earth

5.2.3.2 Neighborhoods and Development

The village consisted of two main neighborhoods called the upper neighborhood (Bala) and the lower neighborhood (Paieen)¹⁵. Each neighborhood has several mosques and Hosseiniyehs. Muharram mourning ceremonies are hold in these Hosseiniyehs (Karimi-Ghahi, 2019). The main mosque in the village serves as the dividing line between the upper and lower neighborhoods. The west and northwest

¹⁵The classification of Bala and Paieen is very common in Iranian villages and some cities

sides of the Grand Mosque belong to the upper neighborhood, while the east and southeast sides belong to the lower neighborhood (figure 121).

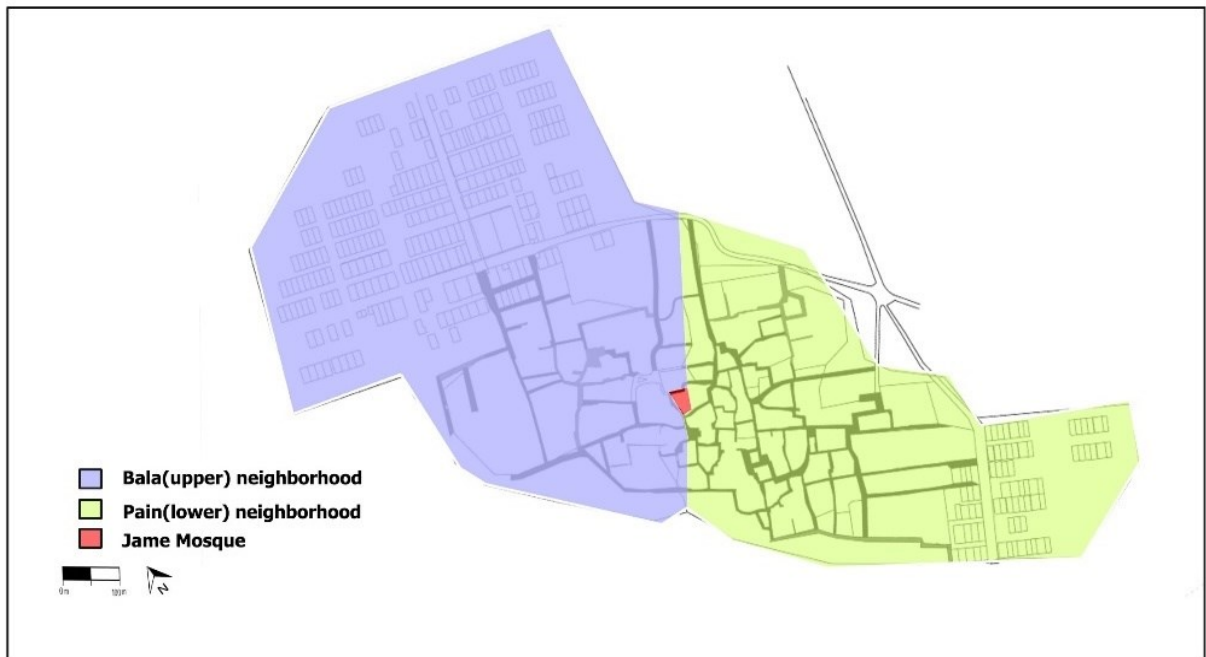


Figure 121 :Main neighborhoods of Qehi, by author, base map by Hadi report.

According to scholars, there are sub-neighborhoods within the two main neighborhoods, as depicted in Figure 122. However, currently, according to site visits, the division is referred to between residents is simply as the upper and lower neighborhood.

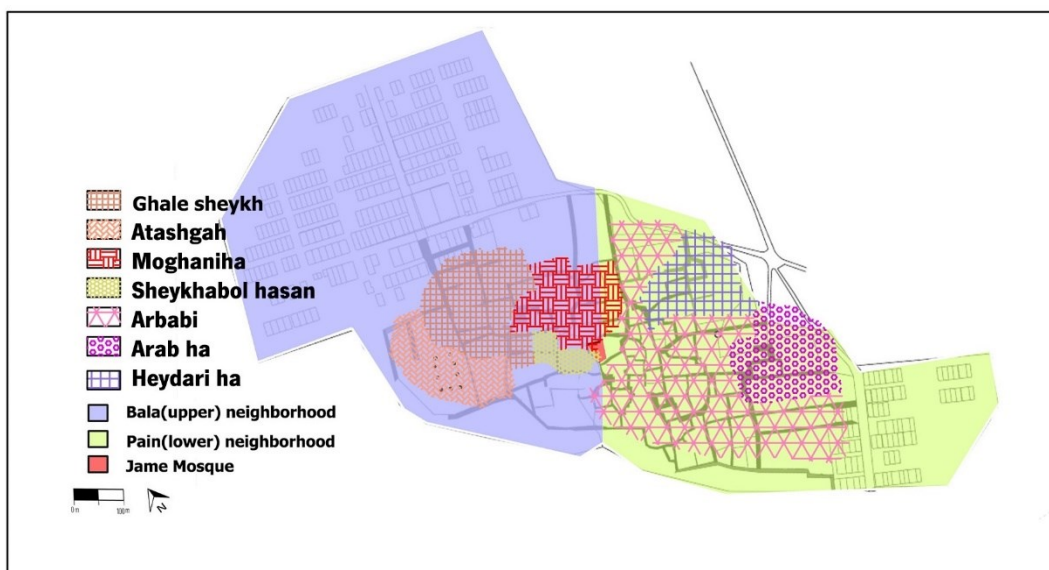


Figure 122 :The approximate location of sub-neighborhoods in Qehi- source: based on Hadi plan of Qehi, by author

The upper neighborhood is comprised of four sub-neighborhoods, namely Atashgah, Moghaniha, Sheikh Abolhasan, and Ghale sheykh. The Ghale sheykh neighborhood, identified as the original and oldest core of the village according to research conducted by the government as part of the Hadi plan, is located within this area.

The lower neighborhood, situated in the southern region of the village, includes sub-neighborhoods such as the Arab lords and Haj Heydari neighborhood. The majority of public facilities are now located in this region.

Studies have indicated that the majority of the village's historical monuments are concentrated in the central and southern parts of the village, particularly in neighborhoods with rich historical context, such as the place of the singers, Sheikh Ateshgah Castle, and Sheikh Abul Hosni. Prejudices between the two neighborhoods in the village have a long-standing history and have led to a reciprocal desire for access to the amenities of the other neighborhood. For instance, when a mosque was built in one neighborhood, a similar mosque was promptly constructed in the other neighborhood. This pattern was also observed with other public facilities such as Hammam, Hosseiniyeh, Ab Anbar, and others. The terms "upper warehouse", "upper Hosseiniyeh", and "lower Hosseiniyeh" are commonly used in the village to refer to these separate amenities.

The evidence that has been gathered to study the history of the village suggests a complex and layered process of settlement by different populations at different times. The naming of certain neighborhoods and the results of historical document analysis provide insight into the presence of various groups of immigrants who either settled in the village or on its outskirts. The quotes from historical records indicate that while some of these groups were welcomed by the residents (Mohammad-Nejad, 2005), others faced rejection and chose to settle in the area around of the village.

The lack of a singular direction for the growth and development of the village is a reflection of this complex settlement history. Rather than following a single path, the village evolved and grew from different directions at different historical intervals, eventually leading to the interconnectivity of the various regions.

As mentioned, there has been limited research on this village, however, Mohammadnejad's research (2005) sheds further light on the important role that water played in the settlement and development of the area. Based on his research, it is probable that the initial settlement of the village revolved around the four release points of the aqueducts. This underscores the significant impact that water had on the village's development throughout history. The four aqueduct release points are as follows:

-The Atashgah aqueduct, located at the western end of the village near the castle of the same name, which is believed to have been constructed in later periods.

-The Joulabad aqueduct situated in the northeast of the village.

-The Kohna and Esfidab aqueducts, both of which pass through the village.



Figure 123 : one of the Qanat's stream in Qehi, by author

The Atashgah and Joolabad aqueducts have been in ruins for many years, but the other two still stand. Furthermore, the names of these aqueducts provide further evidence of their ancient origins, as they are derived from Pahlavi Persian words (Mohammad-Nejad, 2006). According to the government's research, specifically Hadi's revised plan from 2012, the primary core of Qehi is situated in the Qala-e-Sheikh neighborhood. Considering all the research studies, the intersection of the Qanat and Qale Sheikh neighborhood is the most probable location for the central and primary core of the village, as illustrated in the figure below.

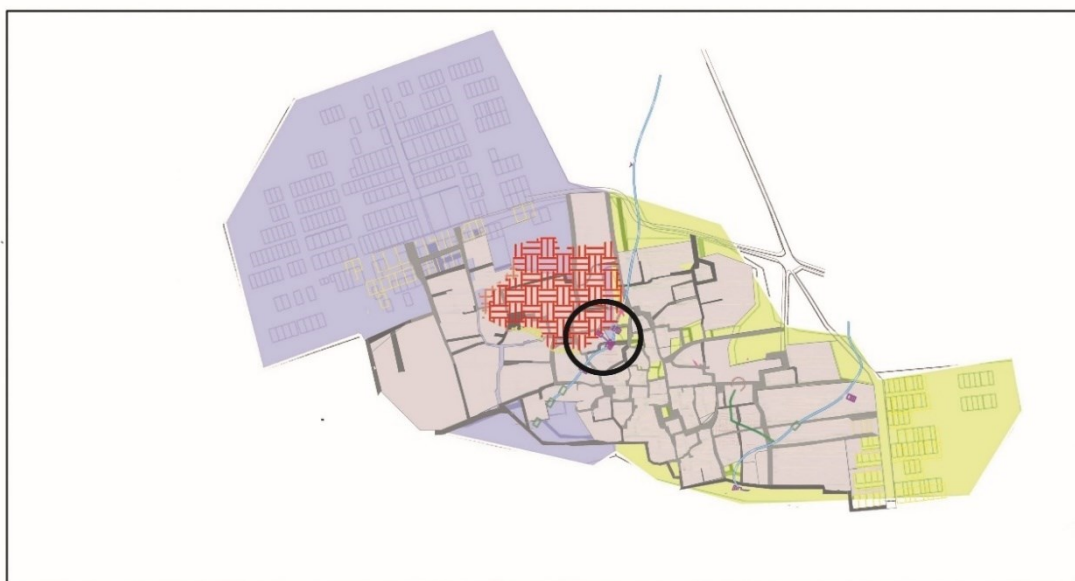


Figure 124 : Possible primary core of the Qehi, by author

As the population of the village increased, the development and expansion of the village began in the western area and subsequently spread to the east and northwest. Because the lands in these two areas of the village have poor suitability for agricultural activities, but they possess a strong potential for the development and expansion of residential and service-oriented facilities in this part of the village.

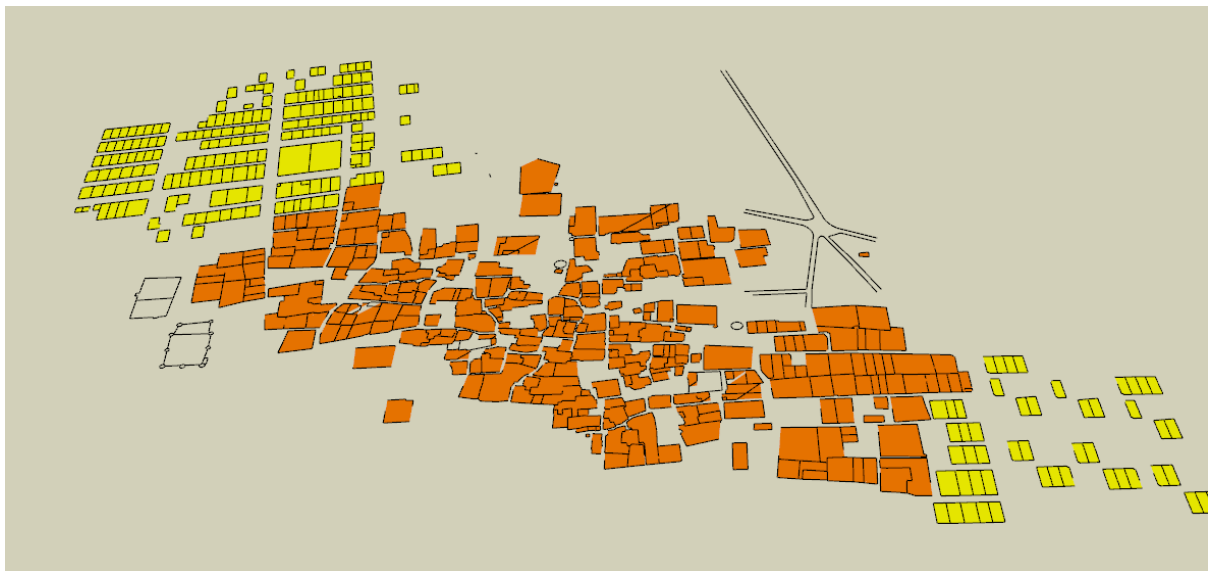


Figure 125: Village of Qehi, New(yellow) and historical part, by author

The recent expansion of the village has been focused mainly in the northwest and southeast regions, as evidenced by the use of new building materials in these constructions. The absence of restrictions or impediments to growth has been a critical element in promoting physical development in these areas. The availability of unoccupied and barren lands has also contributed to the expansion of the village in these regions.

However, the physical development of the village is hindered in certain regions due to certain constraints. For example, the presence of agricultural lands in the southwest of the village acts as a barrier to further development in this area. The presence of a cemetery in the north and northeast regions also presents a challenge to physical expansion, as these areas are reserved for cultural and religious purposes.

Therefore, while the absence of limiting factors and the presence of unused lands have facilitated the recent expansion of the village, the presence of certain constraints, such as agricultural lands and a cemetery, have acted as barriers to further physical development.

5.2.3.3 Blocks and Access

In Qehi, adjacent building parcels have formed blocks, with the spaces between them designated as access roads. As shown in the figure 124, a majority of the buildings in the village's historical fabric are interconnected, forming various blocks. This high density of buildings serves several purposes, such as promoting warmth in cold nights while reducing energy consumption and reducing sunlight exposure during hot summer days. The roads in the village are typically wide, with an organic shape. This may be due to the historical use of camels as a mode of transportation. The size of the blocks varies significantly, with the map indicating that the center of the village has a higher density and smaller blocks. This could be attributed to the more valuable land found in the center of the village, compared to the less valuable land found in the outer regions, leading to larger blocks. Because the land is flat and there are no topographic limitations, the newly developed areas of the village are organized with straight roads and regular blocks.



Figure 126: Blocks and access in historical part of Qehi, base map by Hadi plan, modified by author

5.2.3.4 Religion Factor

Religion plays an important role in the village of Qehi, as evidenced by the Ashura ceremony, which is honored and celebrated by the villagers. The ceremony is characterized by a variety of programs, division of work among different families, and the use of tents and black robes (Mohammad-Nejad , 2005). The mourning ceremony of the month of Muharram also includes turning (moving) of palm tree during this time. The Muharram mourning ceremony was initiated by the Qalahai family at Hosseiniye Bala (upper) of Qehi during the Safavid period. Over time, the ceremony has evolved and a similar ritual is also performed at Paieen (lower) Hosseiniyeh (Beygi,2019).

The village has six Hosseiniyehs, two of which are old and have been renovated (upper and lower Hosseiniyehs). Additionally, there are 12 mosques in the village, including the Jame Mosque, the Haj Sheikh Abdul Abdul Qarahi Mosque, and the Imam Hassan Mosque (figure 127). There is also a mosque that was located near the Atashgah Castle, but it has been destroyed.



Figure 127 :Religious buildings in Qehi, by author

The impact of religion and culture on the morphology of the village is evident in its introverted architecture. The traditional Iranian view of home and family has resulted in a design that emphasizes privacy and seclusion, with almost no openings on the exterior of the houses except for the entrance.

This has given the village a simple and minimalistic form, with a focus on creating intimate private spaces for families. The use of hierarchy in urban space systems and architecture has also reinforced the concept of Mahramiat in the spatial structure, separating public spaces from private spaces and controlling accessibility. These non-environmental factors play a crucial role in shaping the physical landscape of the village, highlighting the importance of considering them in any comprehensive analysis of historic settlements. These factors have caused that the only prominent buildings of this village are public buildings, especially mosques and their domes.



Figure 128: Introvert architecture and mosque tomb in Qehi, By author



Figure 129 : Introvert architecture in Qehi, by author

5.2.3.5 Water Use System

Aqueducts play a crucial role in providing water for the village and its agricultural fields in the desert. According to the villagers, some of the aqueducts in the area have a long history, predating the arrival of Islam. This is supported by their names, such as "Kohani" and "Klopeh", which are ancient Persian names. The number of aqueducts in the village of Qehi was approximately 21, however, due to a lack of maintenance, only some are currently in operation. Two of the aqueducts, Kohni and Esfidab, pass through the village buildings. It is important to note that the maintenance and preservation of these traditional water systems play an important role in the sustainability of the village and its surrounding agricultural land.



Figure 130: Water in Qehi village, by author

The primary source of water for the old aqueduct system is a mother well located about 8 km north of the village. Along the way to the village, 54 additional wells have been dug. This aqueduct passes through the upper neighborhood and has 7 water distribution points within the village. It ultimately reaches the southwestern part of the village, next to Imamzadeh Abdul Wahed, where it supplies water to the older farms. Another aqueduct, Esfidab, also begins 8 km away from the village and reaches it by digging 55 wells (Mohammadnejad, 2007). This aqueduct passes through the lower neighborhood and has 4 water distribution points, as well as providing water to 10 houses (directly). The aqueduct ends in the southwestern part of the village, where it enters the Esfidab farm. Unfortunately, most of the points and

water canals are being destroyed. As we mentioned they are two Ab anbar (water storages) that were crucial for water system of this village. Figure 130 illustrates the network of water channels, water storage facilities, and water distribution system in the village.

5.2.3.6 Typology of Passages

The roads in the village of Qehi vary in typology depending on the age and history of the village neighborhoods. The village is divided into two distinct parts: the historic and the new. The narrow and winding alleys in the middle of the village are a sign of its old and historic fabric, which is mostly related to the Qajar period and before the constitutional movement. New fabric has also been shaped in recent decades in the northern and southern parts by the Housing and People Foundation. New roads are formed by taking into account the communication factor of vehicles and riders, and with more length and width, with more order. Figure 131 provides a visual representation of the road covers' quality, encompassing both dirt and asphalt surfaces.



Figure 131 :Road cover quality in Qehi, by author

The following are the classification of the road network in Qehi village, based on factors such as importance and the dimensions of length and width which are illustrated in figure number 137.

1. The inter-village road: The road connecting the villages, which runs from the east side of the village and connects Qehi village to two nearby cities, Harand and Koh Payeh, serves this purpose. This road is actually divided into two axes, one of which runs through the lower neighborhood and the other through the Upper southeast. These roads are wide and asphalt-paved.



Figure 132: Inter- Village Road, Qehi, by author

2. Primary Main Road: Village's main first-class route that connects the village to other inter-village routes. These roads have an average width of 15 meters and are mostly asphalt. According to the road network map, the majority of the first-class main roads are distributed around village and are less asphalted on the west side.



Figure 133 : Primary main road in Qehi, by author

3. Secondary Main Road : located in both the north and south of the village, these roads connect residential areas to primary main roads.



Figure 134 :Secondary main roads in Qehi, by author

4. Secondary Road: These passages have varying widths in the old and historical parts of the village with more narrow and winding dimensions, but have equal and appropriate widths in newly constructed areas. Meanwhile they connect Secondary Main Road to Primary Secondary Road and provide access to local passages.



Figure 135 :Secondary Road, Qehi, by author

5. Local Access Road: As the lowest tier in the road hierarchy system, these roads have limited widths, sometimes leading to dead-ends, and average a width of 3 meters in the historical center of the village. Comprising over half of all roads in the village, the local access network primarily serves the primary core of the community and has a semi-private feel to many of its roads. Sometimes access with car is not very comfortable in this types of roads.



Figure 136 :Local access roads, Qehi, by author

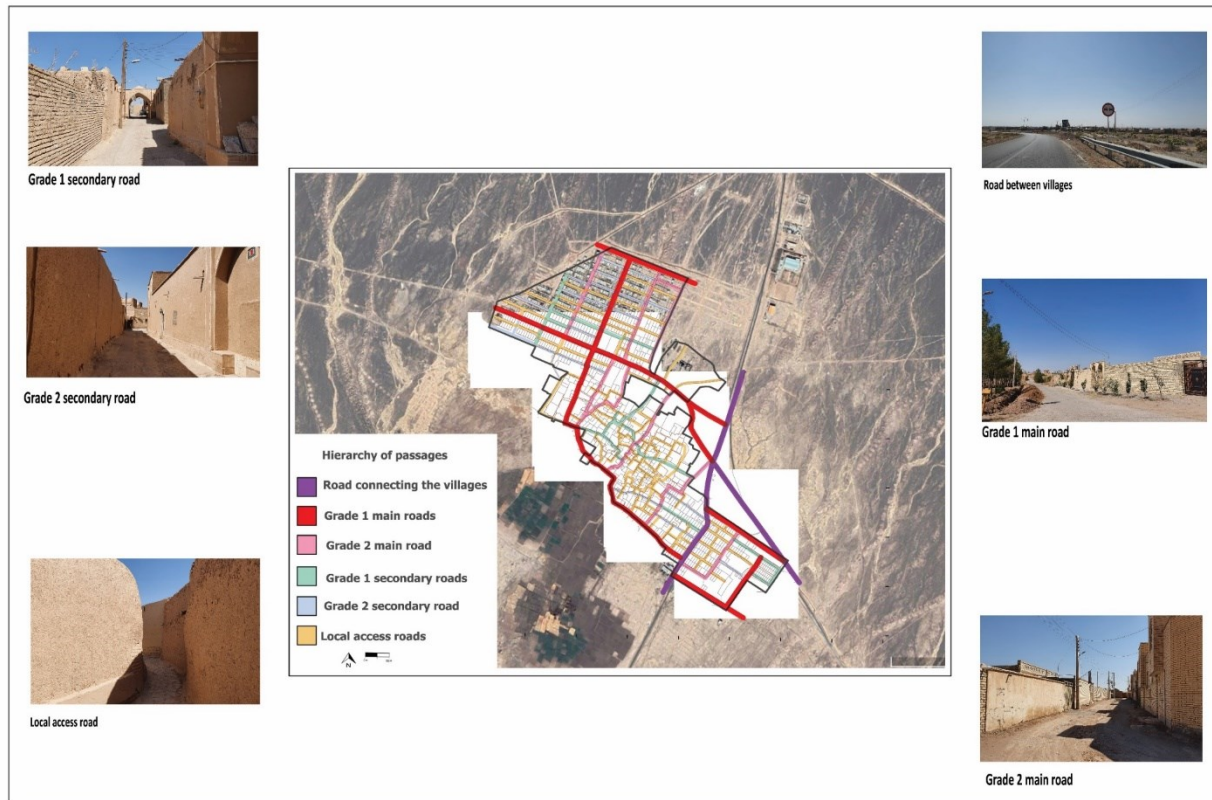


Figure 137 : Hierarchy of passages in Qehi, by author

Classification	Description	Dimensions	Car Access
Inter-Village Road	Connects Qehi village to nearby cities Harand and Koh Payeh	Wide and Asphalt-paved	Yes
Primary Main Road	Village's main first-class route connecting to other inter-village routes	Average width of 15 meters, mostly Asphalt	Yes
Secondary Main Road	Connects residential areas to primary main roads	Different	Yes
Secondary Road	Varying widths in old and historical parts, equal widths in new areas, connects Secondary Main Road to Primary Secondary Road	Different	Yes
Local Access Road	Lowest tier in road hierarchy system, narrow and sometimes dead-end, primarily serves primary core of the community	Average width of 3 meters, semi-private feel	Yes, but suboptimal

Table 4 : Classification of passages in Qehi, by author

In general, The village roads network can be characterized by the following:

-The road network has a slope that runs from north to south and west to east, this means that the roads are inclined in these directions which can affect the drainage system of the village.

-The newer parts of the village have a more regular road urban network. This is because the roads in these areas are laid out in a more orderly and planned fashion, with the roads being straighter and having a more consistent width. This can make it easier for drivers and pedestrians to navigate.

-More than half of the roads in the village are made of asphalt; However, some of the asphalted roads are damaged and require repairs. This could be due to factors such as heavy usage, natural wear and tear, or poor construction. These repairs are necessary to ensure that the roads remain safe and usable for the community.

5.2.3.7 Architecture

The Qehi architectural style is characterized by its introverted design and uniformity of building structures, which plays a significant role in creating a visually cohesive and unified village appearance. This uniformity is achieved through the homogeneous nature of the building facades, which are simple, monochromatic, and lack windows. This minimalist design aesthetic presents challenges for outsiders attempting to differentiate between large and small buildings based on external appearance, as the only means of distinction are the entrances and public buildings.

This similarity to minimalist architecture has a number of implications for the residents of the village. On one hand, it may provide a sense of uniformity and harmony within the community, as all buildings are designed in a similar fashion. On the other hand, it may also create a uniform and monotonous landscape that lacks visual interest or stimulation for some people.



Figure 138 :Village of Qehi, historic fabric and roofs. by author

This lack of windows on outside walls is a result of both the harsh climatic conditions of the region and religious and cultural factors. Buildings in the region are constructed in a way that minimizes heat loss and maximizes thermal efficiency through the use of mud clay, which has high thermal resistance properties, and a compact design that creates shade on the exterior surfaces. The buildings are dense and compact to ensure that the most shade falls on the outer surface.



Figure 139: similar walls of the buildings without windows, by author

Furthermore, the scarcity of wood and low rainfall in the region necessitates the use of alternative roofing materials, such as domes and arches made of bricks and clay. This design element not only serves a

functional purpose, but also contributes to the minimalist aesthetic of Qehi architecture and urban spaces with monochromatic walls and similar materials.

The central courtyard with trees and water pond is another element in the architecture of village buildings of this type. Additionally, other elements of village buildings include towers and attics.



Figure 140 :Harmonious architecture inside historical part of village, by author



Figure 141 : An approximate section of a neighborhood in Qehi by author

The village boasts a rich architectural heritage, consisting of both the magnificent mansions of the Arbabi (lord) and the houses of other residents. Designed by Yazdi and Shirazi architects, these houses stand out for their grandeur and outstanding design. Notable among them are the houses of Abolghasem Khan, Abu Turab Khan (Haj Darab), Haj Akhund, Alireza Qarahi, Haj Aminaullah Qarahi, Haj Hassan Qarahi, and others, which are listed as cultural heritage of the country. As previously stated, numerous buildings have been destroyed, but their remarkable architecture can still be appreciated through the remaining ruins. In addition, several valuable homes are in decent condition, although they are not open to the public for visitation, particularly during the ongoing pandemic. It is worth noting that these structures are privately owned and are largely vacant, with no owner residing in the village.



Figure 142: Interior decoration in the ruined buildings in Qehi, by author

The role of the lord in the village was not only to govern, but also to defend the people. This is reflected in the architecture of the lordly buildings, which resemble forts with high walls and, in some cases, towers. The construction of guard towers next to the lord's houses served the practical purpose of protecting the villagers from potential threats. These towers often housed guards to ensure the security of the village. Currently, there are three towers in residential houses, seven towers in the Atashgah castle, and approximately 30 towers in the farm castle. These towers were constructed over multiple floors and feature a round staircase that leads to the top of the house. The use of these architectural elements serves not only a functional purpose, but also adds an aesthetic appeal to the village.



Figure 143 : The village of Qehi with view towards water storage. tower and new constructions in the back

Additionally, the architecture of these buildings reflects the cultural and historical context of the village, where protection and defense part of their life. It also reveals the social hierarchy of the village, where the lord played a central role in protecting and defending the villagers and effected the appearance of village.



Figure 144 :An arbabi house in Qehi, by author

All houses are made of clay and mud. The exterior of houses is sometimes decorated with beautiful brick or brick entrances. The houses had a large courtyard, and around the courtyard were large five-door and three-door rooms. The height of the rooms was more than three meters. The roofs of houses were usually

made of domes so that when it rained, soil and mud would not fall on the roof. Some houses had wind catcher. The doors of the rooms were wooden and some with glasses.



Figure 145 : Central Yard in a house, Qehi, by author

Most houses in the village are single-story, with a small number of two-story houses built around a century ago. Some village houses feature one or more rooms on the roof or upstairs, commonly referred to as attics. These attics greatly impact the form of the village's skyline. Additionally, the rooftop space in front of these attics is often utilized as a place for sleeping during hot summer nights.



Figure 146 : Attic of a house in Qehi, by author

Another defining feature of the village houses is the large and beautiful entrances (Karimi-Ghahi, 2019). These entrances are typically designed in the form of a hemisphere with a specific function, or a rocking arch constructed with multiple bricks, or a curved arch.



Figure 147 :The entrances are toward a Hashti to provide privacy, by author

As motioned, buildings that do not often attract attention from the exterior. Despite the presence of impressive structures behind the walls, the simple walls are often all that can be seen from the outside.

Figure 148 illustrates the architectural quality of buildings in the Qehi village, as documented through field studies and reports from the cultural heritage organization and Hadi's plan. A significant number of buildings possess historical significance, but their physical condition is not good, with some having undergone renovations and others being completely destroyed. It is evident from the information presented that a substantial proportion of the buildings hold historical value.

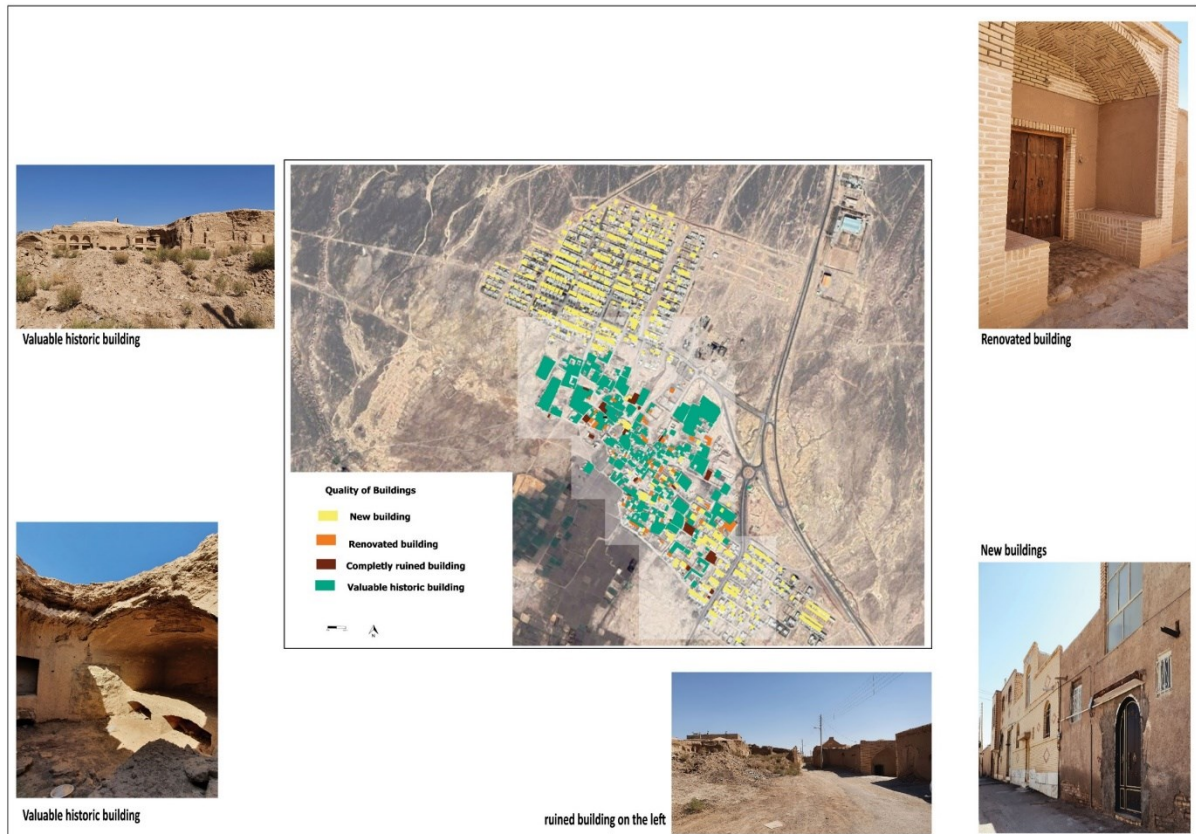


Figure 148 : Quality of buildings, base plan from Hadi plan, photos and edit by author

Among the public buildings, there are a few that stand out as particularly noteworthy, which are explained here.

The Jame Mosque among the village's mosques is particularly beautiful and significant. According to "Maxime Siroux," it is believed to have originated as an early Sassanid four-arch structure that was possibly a Zoroastrian temple. These four arches were later converted into a simple mosque by attaching an altar on the south side, and in the second and third centuries after the advent of Islam, a courtyard was added to it, similar to Arab mosques. While this theory is plausible, further research by archaeologists is needed to confirm it (Mohammad-Nejad, 2005). The mosque is constructed using clay, brick, and tile.



Figure 149 : Jame Mosque of Qehi, by author

Another notable building in Qehi is the Shotorkhan(place of camels) of Mullah Abbas ,this camel house was built during the Qajar period by a person named Haj Mullah Abbas and bears his name. Despite its current state of ruin, it is apparent that it was once a large and important structure. It is located on the northeastern side of the village, and at present, only the entrance door remains.



Figure 150 : Camel house, Qehi, by author

Qehi village also has two Water reservoirs, one located in the western part of the village known as Kadkhoda reservoir or Paein neighborhood reservoir, which was built during the reign of Nasreddin Shah Qajar. The other reservoir, known as Haj Mokhtar reservoir, is older and dates back to the time of Fath Ali Shah Qajar. It is referred to as the reservoir in the upper neighborhood. This reservoir is built in a circular shape with a diameter of 14 meters and features four windbreaks on both sides of the dome, with a height of 7 meters (Mohammad-Nejad, 2005 ; Hadi's revised plan, 2012).



Figure 151 : (right) Paieen(lower) neighborhood's water reservoir, by author

Figure 152: (left) Bala(upper) neighborhood's water reservoir, by author

Baazarche (small bazaars) are another notable structure in this village, these commercial areas, which existed in the past, were similar in nature to traditional large Bazaars in big cities, but on a smaller scale. They also served as saabats, which were communal gathering spaces under shadow in hot days. Inside these saabats, there were shops situated around the perimeter which are now abandoned and closed. Some of these markets have undergone renovation in recent years, but many still remain in a state of disrepair. These commercial areas were an important aspect of the village's economy and played a vital role in the daily life of the community. They served as a hub for trade and commerce, bringing together local merchants and buyers. Despite the changes that have occurred over time, these markets continue to be a significant part of the village's history and cultural identity but not function like before.



Figure 153: Bazaarche's in Qehi, by author

Conclusion

In this village also, there is a significant presence of Hosseiniyeh, which have undergone recent construction or renovation. These Hosseiniyeh exhibit a range of designs and configurations, tailored to meet the unique requirements of the local community and the resources available for their construction.

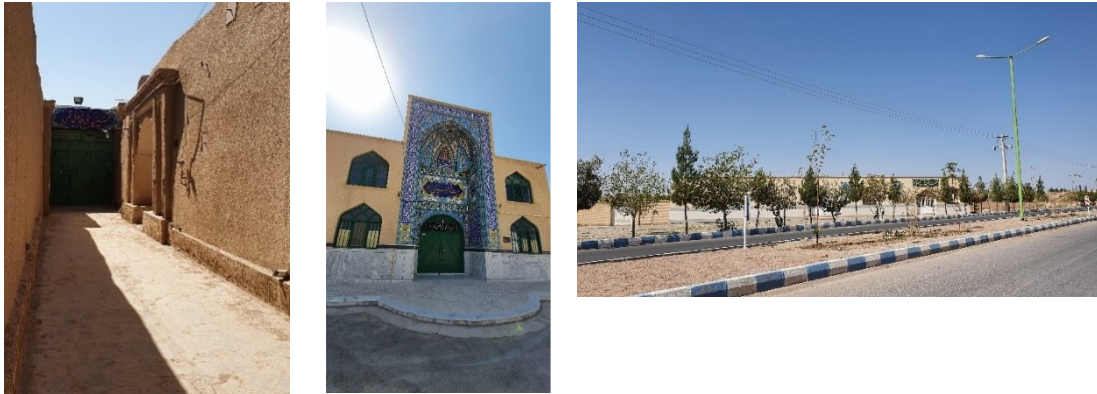


Figure 154 : Different Hosseiniyehs in Qehi, by author

5.3 Conclusion

The village of Qehi, located in the desert region of Iran, is an important example of traditional desert architecture and urbanism. Many of its buildings are registered in Iran's cultural heritage, attesting to its historical and cultural significance. The village, like many others in the region, embodies the intricate and complex form of traditional desert architecture, characterized by its winding roads, nested structures, and defensive towers, among other features. The defensive towers played a crucial role in ensuring the security and protection of its inhabitants, while the castle located at a distance served as an additional measure of security during times of conflict.

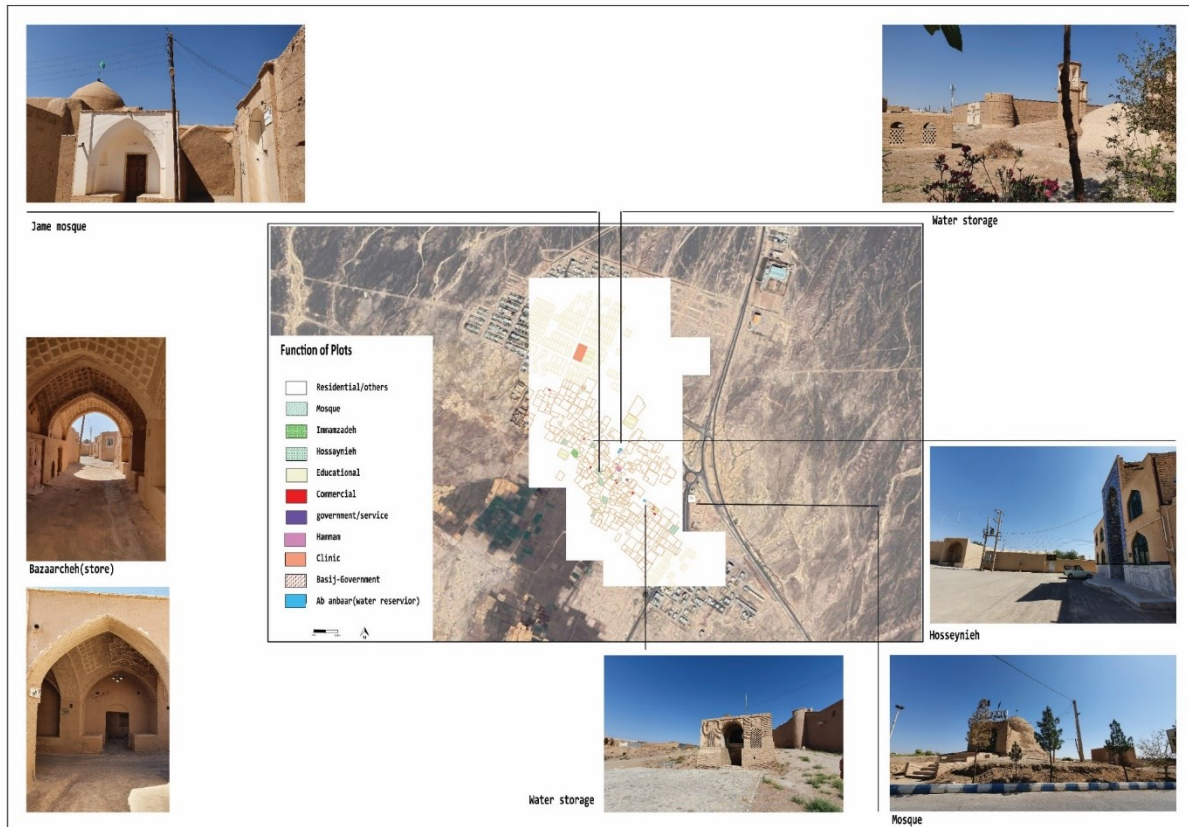


Figure 155 :land uses in Qehi, base map from Hadi plan, modified by author, photos by author

In the illustration depicted in Figure 155, the distribution of public spaces in the village is evident. It is observed that these spaces are approximately divided between the upper and lower quarters of the village, with the central area of the village attracting the majority of attention. The design of these public spaces suggests that they were intentionally constructed to facilitate ease of communication and access between one another. This design consideration may be attributed to the harsh desert climate, which necessitates the provision of easily accessible shady areas for the inhabitants. The small bazaars, which were once covered structures and are now largely disused, functioned as hubs within the village, providing shaded areas for commercial activities and facilitating movement between the various uses within the village. The placement of public spaces does not appear to have been influenced by topographical factors, unlike in the case of Abyaneh village, where the slope of the land had a significant impact on the arrangement of public spaces.

The morphology of Qehi village is a complex and dynamic result of various factors, both environmental and cultural. The village's visual appeal is not just limited to its individual buildings, but rather the harmonious and diverse collection of sizes and forms that make up the village as a whole. The domes of

Conclusion

mosques, cisterns, and thatched waves on the curved roofs, towers, high walls, and massive gates are all visible at first glance. But a closer examination reveals other architectural features such as bazaars, the appearance of the aqueduct channel, and windbreaks, particularly those around the water reservoirs.

These features are the result of both environmental factors such as the harsh desert climate, as well as cultural factors such as religious beliefs and privacy concerns. For example, the construction of windbreaks and domed roofs is a direct response to the harsh desert climate which is characterized by strong winds and sandstorms, and also it helps in regulating the temperature inside the building. While the use of introverted architecture and elements like vestibules at building entrances is not only driven by concerns for privacy and Mahramiat but also provides protection from the harsh climate. Additionally, the village has unique landmarks thanks to the way water is used. Furthermore, the presence of religious spaces such as mosques is a reflection of the village's strong religious beliefs. These religious spaces not only serve as a place of worship but also as a social gathering space for the community.

The village's past reputation as a center for camel breeding has also had a significant impact on its shape and the construction of its buildings. This industry led to the construction specific buildings and wider paths in compare to the other villages in similar style of Qehi.

Unfortunately, the village is currently facing a loss of its historical and architectural treasures due to neglect and destruction. Urgent action is required to preserve the remaining buildings, many of which are unique landmarks and important cultural heritage sites. The village's historical center is in danger of fading away, as many residents prefer to live in newer parts of the village. This also leads to problems like poor road conditions and crumbling buildings. Even the buildings that are listed as cultural heritage sites are in poor condition and the ownership of Lordi houses, which are owned by many heirs, makes it more difficult to protect.

In summary, the morphology of Qehi village is a result of a combination of environmental and cultural factors. The village's compact form and architectural elements are a direct response to the harsh desert climate and the cultural beliefs and values of the community. The intersection of environmental and cultural factors can be seen in the use of introverted architecture simple walls. However, the village is facing significant challenges in preserving its historical and architectural treasures, and urgent action is needed to protect these important cultural heritage sites. It is necessary that government implement laws for new construction and immediately acts to preserve the remaining heritages and document them for future plans and restorations.

Characteristics/Factors	Explanations
Traditional desert architecture and urbanism	The village of Qehi is an important example of traditional desert architecture and urbanism, characterized by its winding roads, nested structures, and defensive towers.
Defensive towers	These played a crucial role in ensuring the security and protection of the villagers.
Castle at a distance	Served as additional measure of security during times of conflict.
Distribution of public spaces	Approximately divided between the upper and lower quarters of the village, with the central area attracting the majority of attention.
Design of public spaces	Constructed to facilitate ease of communication and access between one another, likely due to the harsh desert climate.
Small bazaars	Formerly covered structures that functioned as hubs within the village and provided shaded areas for commercial activities.
Morphology of village	Complex and dynamic result of various environmental and cultural factors, including harsh desert climate, religious beliefs, privacy concerns, and past reputation as a center for camel breeding.
Domes, cisterns, thatched waves on roofs, towers, walls, and gates	Architectural features visible at first glance that respond to environmental and cultural factors.
Use of introverted architecture and elements like vestibules	Driven by concerns for privacy and Mahramiat, as well as protection from harsh climate.
Presence of religious spaces	Reflection of the village's strong religious beliefs, serving as places of worship and social gathering spaces for the community.
Challenges	Facing a loss of its historical and architectural treasures due to neglect and destruction, with the historical center in danger of fading away. Urgent action is needed to preserve the remaining buildings and protect these important cultural heritage sites.
Security	Form of passages, introvert Architecture, towers in some houses
Climate and environment	Materials, introvert form, domes, material color
Topography	Almost no effect

Table 5 :Characteristics and factors in Qehi, by author

Chapter six.

6 Case study three, Ghourtan



Figure 156 : Inside Ghourtan fortified village, by author

6.1 Background

6.1.1 Introduction

Ghourtan is a village located in the desert but, on the banks of the Zayandehrood River. The village is unique in that it includes a large, historical, abandoned fort within its boundaries. It appears that the original village of Ghourtan was situated within the fort, and was fortified, but is now almost abandoned. People now live primarily outside of the fort. This village is rarely mentioned in historical sources (Ganji, 2014). In 941 CE, Ibn Huql al-Baghdadi, an Arab geographer and tourist, mentions Ghourtan briefly in the Isfahan section of his book. Therefore, the village is much older and dates to 1067 years ago

(Heydarian, 2011; Hajrasouliha, 2018). From the time the fort was built until recently, there was residence there (Kiani-Abari, 2015).

The focus of this research is on the old village that was inside the fort, which is now abandoned. The historical section of the village was built inside the enclosed walls of the fort, giving it a different architectural style than other villages in the region. This type of fortified village can be found throughout the central desert of Iran, likely due to the lack of natural topography for defense. The research aims to investigate the morphology of the village inside the fort, known as Ghourtan Fort, and to generalize the findings for other fortified villages in the area.

The fact that the people have moved out of the castle has contributed to the preservation of the old buildings within it, as they have been largely protected from intentional destruction. The research will review and investigate the history, morphology and cultural heritage of Ghourtan village and its castle.



Figure 157 : Village of Ghourtan, by author

This village is located around 100 km to the east of Isfahan, is thought to have originally been named "Gourtan" before evolving into its current name. The name "Ghourtan" is derived from two parts, "Gor" and "Tan". "Gor" refers to the name of ancient cities in Iran and translates to "pit", while "Tan" is a suffix denoting a place. Together, the name can be interpreted as a low-lying and hollow area, which aligns with the topography and geography of the region (Mohebi, 2004).

The eastern regions of Isfahan, including Ghourtan and the area along the Zayandehrood river to the Gavkhouni wetland, are steeped in history. The average height of Ghourtan Castle, measured from sea level, is 1480 meters (Ganji, 2014).

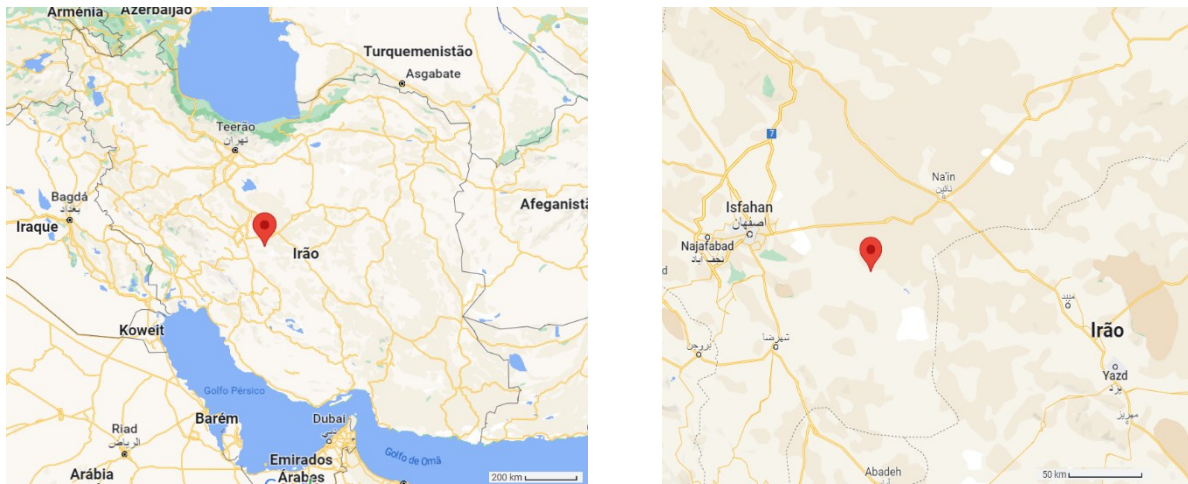


Figure 158: Location of Ghourtan in Iran, source: Google map

The fort, built with a rectangular plan, boasts dimensions of approximately 250 by 185 meters and an area of around 46,000 square meters. The buildings within the fort are interconnected in such a way that residents could utilize the passages for easy access to and from the building. The structures are primarily constructed from adobe and mud, and feature simple decorations of mud and brick facades. The layout of the village is densely packed with narrow roads running through it.



Figure 159 : Satellite view of Ghourtan, Source: Google earth

Due to its location near the Zayandehrood River, the village relied heavily on the river as its primary source of water. The river provided a reliable source of water. Additionally, the village had access to wells, which were strategically located to provide easy access to ground water. These wells were likely used as a backup source of water during times when the river's water levels were low. Overall, the proximity to the river and the availability of wells were crucial factors for the survival and prosperity of the village throughout its history.



Figure 160 :Inside Ghourtan fort, by author

6.1.2 Climate

Ghourtan is situated in a desert region, but is near the Zayandehrood River, which is known to dry up frequently. As there is limited meteorological data available specifically for Ghourtan, the information of the nearest town, Varzaneh (located 10 km away from Ghourtan), has been used for analysis. The average annual temperature in this area is around 19°C. The lowest average temperature can be found in January, at 4.4°C, while the highest average temperature is in July, reaching 41.5°C. The average maximum temperature is around 25°C and the average minimum temperature is around 9°C. The temperature difference between the hottest and coldest months of the year is 28.8°C (Saatian, 2013).

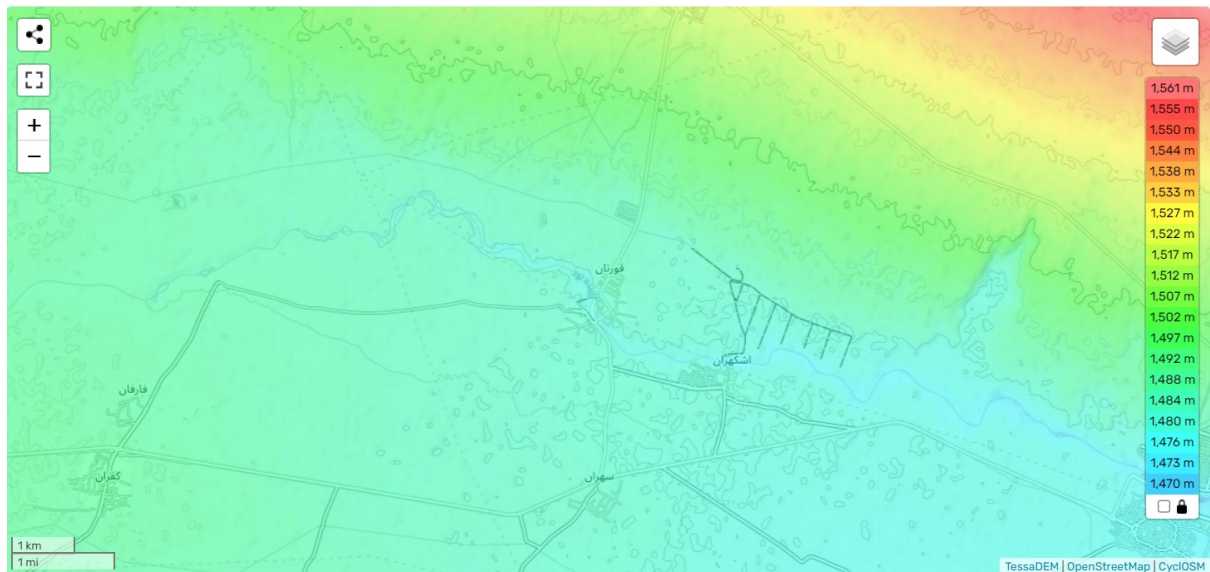


Figure 161 :Topography location of Qehi

Ghourtan, while located in close proximity to the village of Qehi, boasts a distinct environment due to its proximity to the Zayandehrood River. The presence of the river not only impacts the temperature and precipitation levels, but also influences the overall ecosystem and biodiversity of the area.



Figure 162: Satellite perspective view of Ghourtan, Source: Google earth

6.1.3 Socio-Cultural Studies

6.1.3.1 Population size and demographic changes

The 1997 census indicated that Ghourtan had a population of 2150 people, but by 2007, this had decreased to 1500. According to the most recent census in 2016, the population was reported to be 1283 (Statistical Center of Iran, 2020). However, the castle is now almost abandoned, with only three families living in it until a few years ago (Kiani-Abari, 2015).

According to Mohebi (2004), the fort has undergone significant demographic changes over the years, as evidenced by reports and historical records. Prior to 1957, the castle was fully inhabited, all the villagers lived inside the citadel. This was due to reasons such as government pressure, the need for solidarity to defend against theft and foreigners, non-personal ownership of land, and lack of financial ability to build houses outside the citadel. Leaving the castle began after the implementation of land reform regulations and increased sense of security, population growth, and the possibility of exploiting and building land. Over time, people began to construct new houses in the northern and northeastern margins of the citadel.

After the implementation of land reform regulations in 1963, there was an increase in the sense of security and opportunities for land development, which led to a gradual migration of residents from the fort to the northern and northeastern of the village. However, the years before and after the revolution, around 1979, saw a significant increase in emigration, leading to a decline in population and the fort becoming largely deserted. As a result, many of the less damaged and ruined houses within the citadel were repurposed for livestock and storage of agricultural products. In summary, a variety of factors such as government influence, financial constraints, land ownership issues, and community requirements all contributed to the changes in population and the eventual abandonment of the Ghourtan fort.

6.1.3.2 Economy

The Ghourtan village, like many other rural communities in the region, is primarily dependent on agriculture and animal husbandry for their livelihoods. Agriculture is the primary source of income for the villagers, and it plays a crucial role in sustaining the local economy. However, due to the village's location downstream of a river, it is particularly vulnerable to water scarcity, which is a major challenge for agricultural production. This can make it difficult for the villagers to produce enough crops to meet their needs.

Handicrafts such as carpet weaving, rug making and cotton spinning are also an important source of income in Ghourtan. These traditional crafts have been passed down through generations and are an

integral part of the village's culture. However, the market for hand-woven carpets has been unstable in recent years, which has affected the livelihoods of many villagers who rely on this income (Saatian, 2013). Animal husbandry is another traditional source of income for the people of Ghourtan, but it has not been as significant as the other sources. Despite this, the traditionality of animal husbandry in the region is still an important aspect of their livelihoods. Thus, the water scarcity issue and the unstable market for handicrafts are major challenges that the villagers have to face to sustain their livelihoods.

6.1.3.3 Religion and Culture

The people of Ghourtan possess a rich cultural heritage that is deeply rooted in their religious beliefs. They speak Persian with a unique local dialect, and are predominantly followers of the Shia branch of Islam. Religion plays a significant role in the daily lives of the people of Ghourtan, as they take great interest in religious customs and ceremonies. The village boasts several religious buildings, such as mosques and shrines, that are held in high esteem by the community.

The Roydasht region, of which Ghourtan is a part, is known for its distinct dialects. All the villages in the region, including Ghourtan, have a special dialect that is included in the provincial dialect. The dialect is heavily influenced by Pahlavi and Avestan languages, with many words borrowed from these ancient languages. Some of the neighboring villages known for this dialect include Ashkran, Baqrabad, Bazm, Belan, Jandan, Sohran, Sharifabad, Tahmoursat, Farfan, Kubrit, Kufran, Varzaneh, and Hashimabad (Pourriahi, 1998 ; Mohebi, 2004).

6.2 Morphology and Architecture

6.2.1 Environment

The village of Ghourtan, which is located in the larger region surrounding Isfahan, is shaped by a complex interplay of environmental factors at both large and small scales. At the large scale, the desert climate prevalent in the area, characterized by dry weather and low levels of precipitation, becomes increasingly desert-like as one moves from west to east. However, the presence of the Zayandehrood River serves to moderate the local climate. Furthermore, the topography of the region includes a mix of mountainous areas in the west and low-lying plains in the east.

At the smaller scale, this village is situated within this larger environmental context and is shaped by the specific conditions of the local area. The almost flat land, limited space within the village, and the harsh

desert conditions have all played a role in shaping the built environment. As a result, the architecture of Ghourtan is characterized by its use of locally-sourced materials such as clay, mud, and brick, which are well-suited to the area's environmental conditions. The village architecture also reflects the characteristics of the environment in terms of its adaptation to limited space and the climatic conditions.

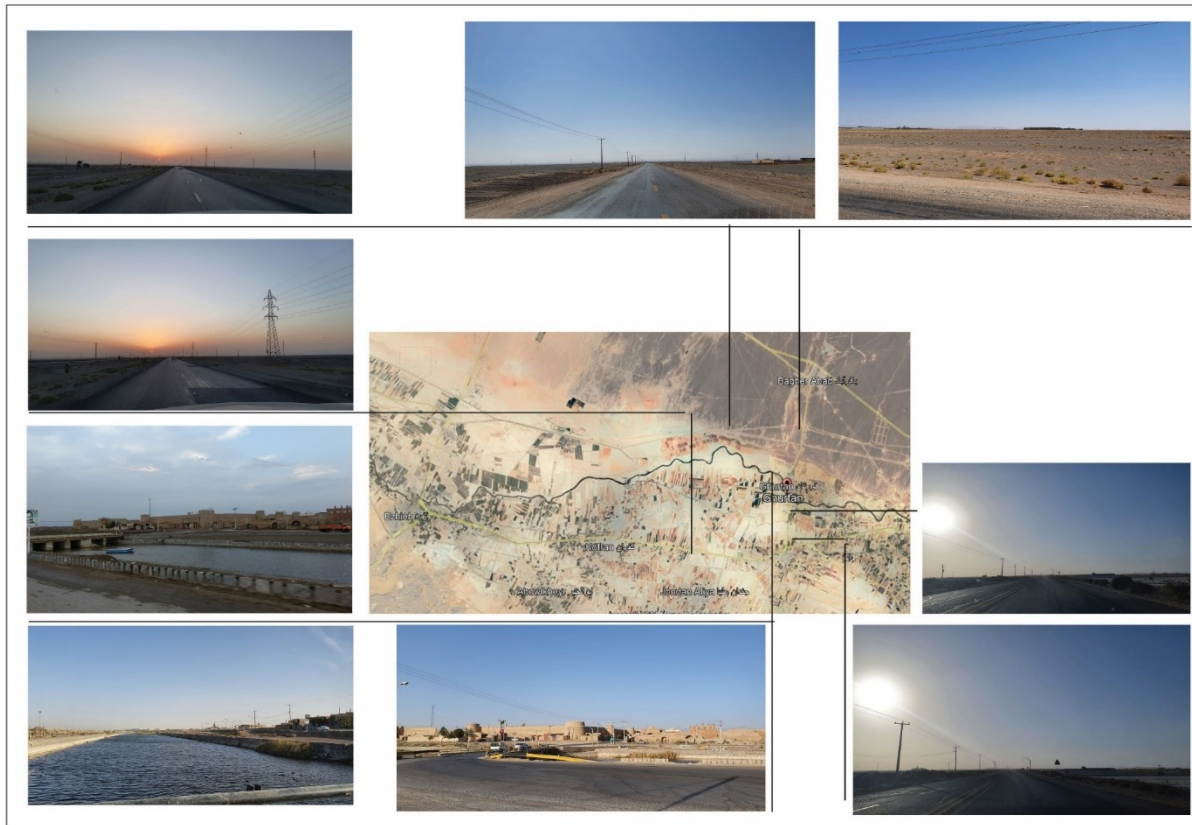


Figure 163 :The road towards Ghourtan, by author

The image depicted in number 163 illustrates a primarily arid landscape, lacking any significant vegetative growth such as gardens. The availability of water appears to be scarce and inconsistent, primarily utilized for agricultural purposes. The condition of the access roads is deemed acceptable. The presence of other villages and small towns can be inferred, located at relatively close distances, primarily in the direction of the river.

6.2.2 Distance and Entrance View

Going closer from the environment and region, The Ghourtan fort, situated in the southeast of the present-day Ghourtan village, effectively serves as a physical separation between the village and the nearby river. The fort exhibits a rectangular architectural design, with its four corners aligned with cardinal directions. The Zayandehrood river flows through the area in a northwest to southeast direction, and the fort is

located on the northern bank of the river, resulting in the southwestern and northwestern sides of the fort being in close proximity to the river. Due to this proximity, the western and southern walls of the fort have been susceptible to flooding in the past, leading to the deterioration of certain sections of the walls.

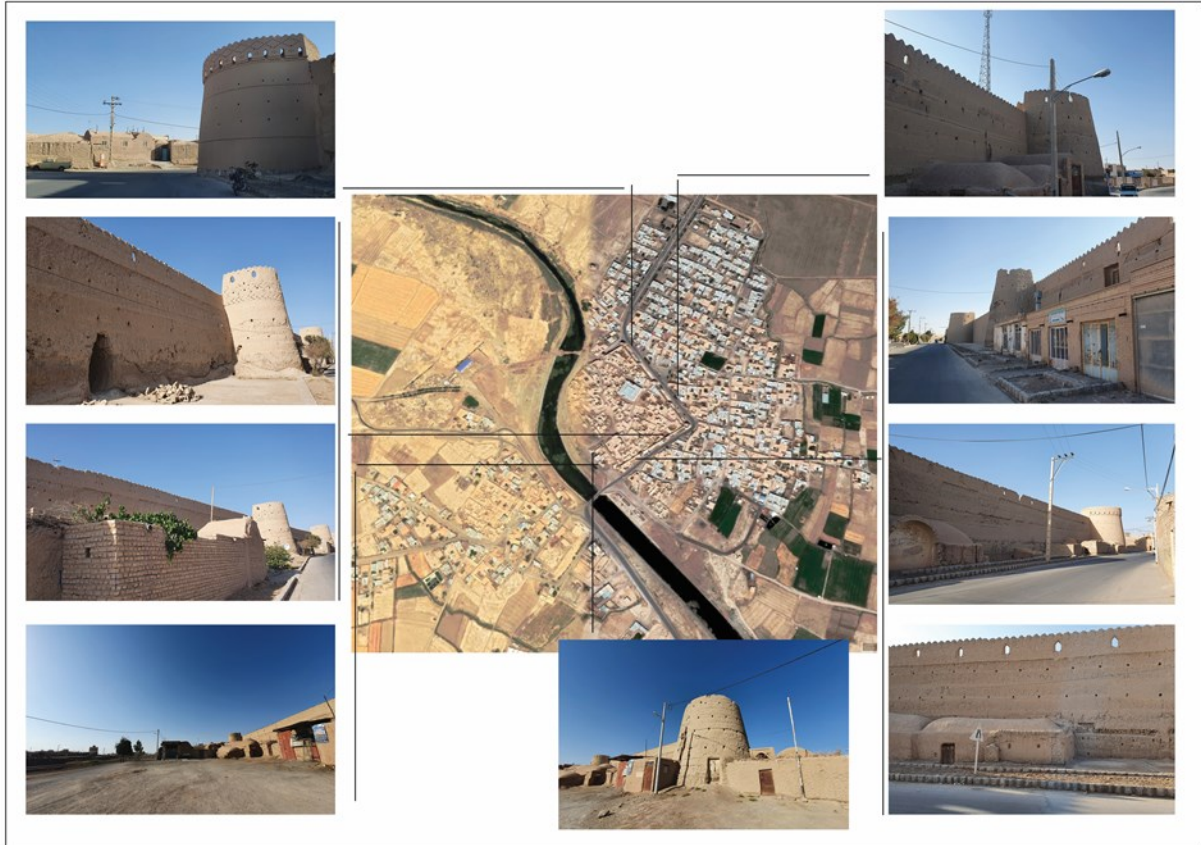


Figure 164 :Outside of the Fort, by author

Upon examination of the fort from a distance, one can observe the presence of a large mud and clay wall, surrounded by towers. The fort presents a mysterious exterior. Additionally, modifications in the form of annexes to the fort's walls have been made by local inhabitants, which lack historical significance, these annexes are mainly commercial shops that decreased the visual quality of the fort.



Figure 165: New entrances in the walls of the fort, By author

The fort had three entrances in the past, but now the third entrance has been ruined. Small new gates are seen on the walls and walls of some towers of the fort's wall. The exact time and reason for their construction are not known. It seems that these gates were built, when needed, by the inhabitants of the village at different times. Perhaps many of them were caused by people who used their property for animal husbandry and wanted easier access to it, the presence of these holes has resulted in damage to the walls and reduced their resistance, particularly in the event of an earthquake.

The castle has high ramparts more than ten meters high (Ganji, 2014), which caused a complete cutoff of visual connection with the surrounding environment. Visual contact with the surrounding environment is made possible from within the towers, passages on the ramparts, and on the roofs of some constructions. The adobe facade of the wall in most parts is not in good condition and needs to be repaired and renovated.

6.2.3 Inside the village

6.2.3.1 General form



Figure 166 : Inside Qehi fortress, by author

In the next layer and going deeper, the fortified village of Ghourtan displays a compact and organic fabric in its architectural and urban layout. Three main factors that have influenced this formation are security concerns, adaptation to the local climate, and limitations of space. The buildings in Ghourtan are densely packed, closely situated and organized in an organic manner. From the remaining structures, it can be deduced that only

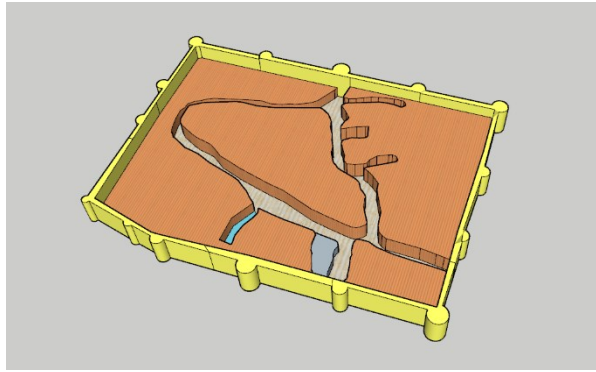


Figure 167 : A 3D conceptual design of Ghourtan by author

a small percentage of the castle buildings were constructed on two floors. Access to the second floor is typically achieved through the use of simple external stairs. The architectural design, access points, and layout of the buildings in this complex reflect the traditional architectural style of hot and dry regions, with some modifications made to accommodate the limitations of the land. From what remained and observations of Ganji in 2014 we can see that the interiors of most of the buildings in this castle are relatively simple, with only a limited number of buildings displaying decorative elements. Among the normal houses, there are also some larger, more luxurious houses that were likely occupied by more affluent residents.



Figure 168: Inside Ghourtan fort, by author

The use of materials such as clay, stone, sand, gypsum, and lime, with clay being the primary material, reflects the adaptation of traditional building techniques to the local climatic conditions. The presence of private ownership of buildings and donation of religious places by the villagers (as reported by Pedaram & Haghani, 2018) highlights the community's strong religious beliefs. However, the villagers' actions of replacing large sections of the fort with new constructions, such as the Hosseiniyeh and the sanitary facility, have resulted in both structural and aesthetic degradation of the heritage site. This illustrates the weakness of heritage preservation organizations in effectively preserving and protecting the cultural heritage of Ghourtan.



Figure 169 :Inside Ghourtan fort, by author

6.2.3.2 Neighborhoods and Development

Ghourtan was divided into four neighborhoods when it was inhabited (figure 170). The Rahmani tribe lived on the northeast side, the Sadat lived on the southeast side, another tribe known as Masah lived on the southwest side, and the remaining families lived in the middle and northwest of the castle (Mohebi, 2004). As mentioned, the entire fort is completely separated from the surrounding area by a strong and robust border however a historic mosque and some public buildings were built outside such as water reservoir.

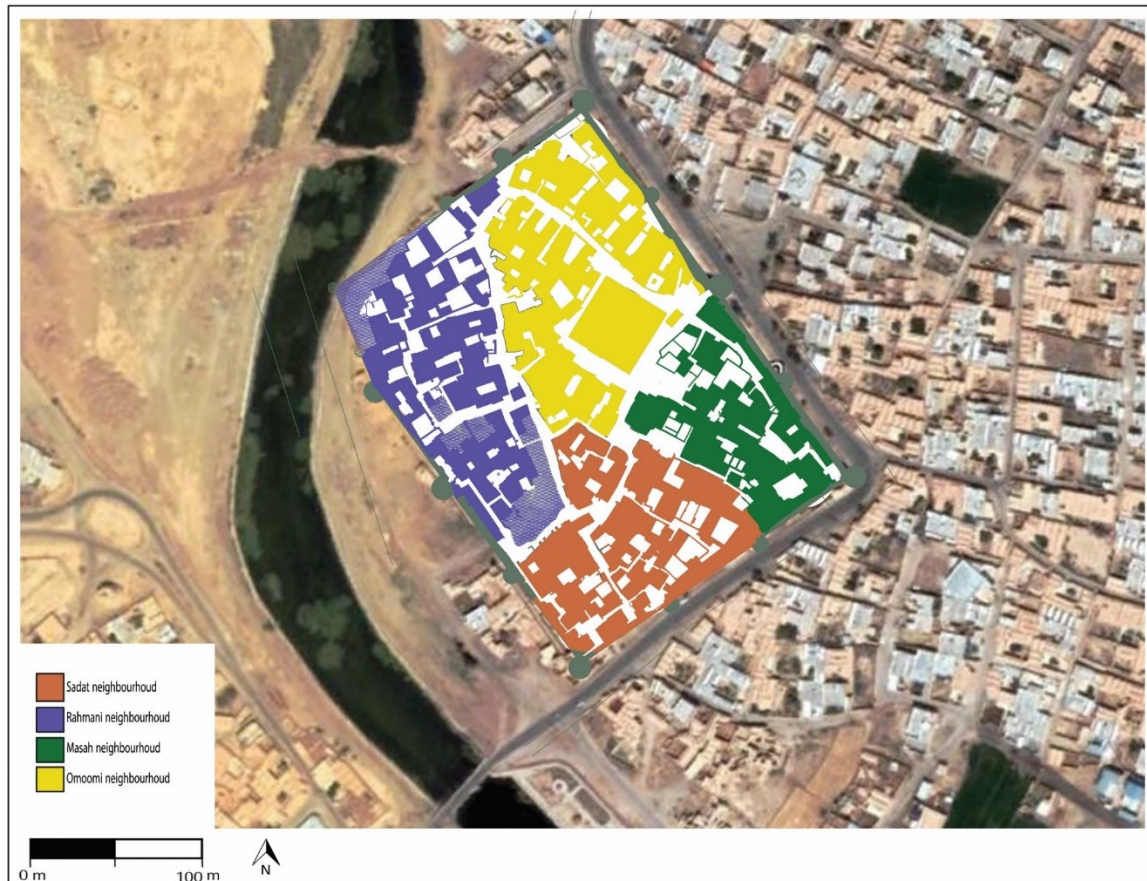


Figure 170 : Different neighborhoods in Ghourtan, base map from Miras, modified by author

The fort that we know today has a history that can be traced back to a small castle called Nawab Castle (as it shown in figure 171). According to research and studies, the original core of the fort was made up of four towers and short walls located on the southwest side of the existing fort. The compact design and architecture of this section suggests that it is older compared to the rest of the fort. As the fort developed over time, new areas were added to it. The evidence shows that after the original castle was built and security was provided, buildings and gardens with fences were constructed outside the castle. However, as the population grew, the residents decided to build a wider fence around the fort. This can be seen in the construction of a new tower on top of the old tower on the west front and on some houses on the east front. Furthermore, data suggests that there were originally three gardens within the fort, but as the

need for land to expand the fort's buildings grew, these gardens were destroyed and houses were built in their place (Hajrasouliha, 2018; Heydarian, 2011).

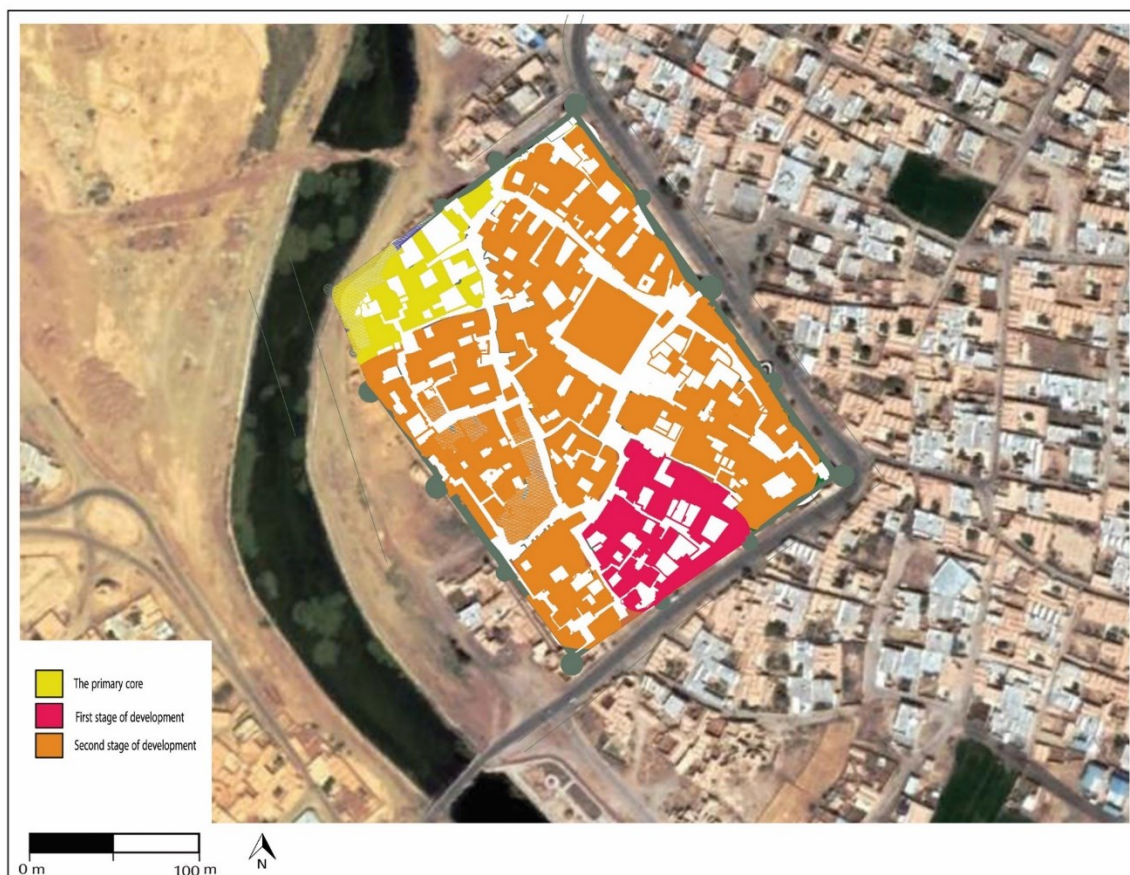


Figure 171: village development over time, modified by author

6.2.3.3 Blocks and Access

A comprehensive examination of the village's block layers as depicted in figure number 172, reveals that the castle is characterized by a high degree of compactness, with only a limited number of building blocks that are situated in close proximity to one another. This is likely a result of the limited space available within the fort and the resulting need for efficient use of land. The Hosseiniyeh building, despite its recent renovation, appears to have been a part of the central block, as inferred from its location and accessibility via roads. This suggests that the building may have had an important function within the castle's central area.

Additionally, it is worth noting that the arrangement of the building blocks within the castle appears to be organic in nature, lacking any discernible pattern or order. This may indicate that the village developed over time without a specific plan or design. Another noteworthy aspect is the placement of religious

buildings and other public buildings on the outskirts of the blocks, which could be interpreted as a strategy to facilitate access for the entire population. The only regular lines in the fort are the outer walls (except for the new Hosseiniyeh building).

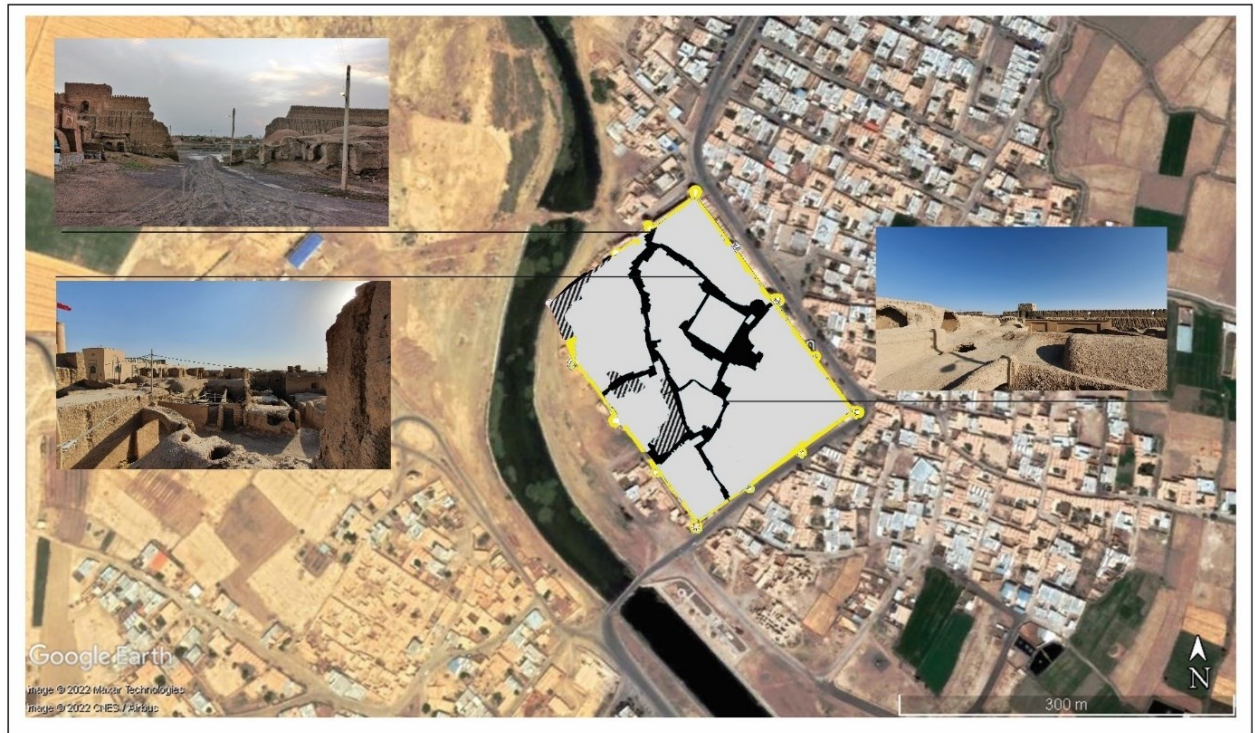


Figure 172: Blocks in Ghourtan, by author¹⁶

6.2.3.4 Religion

This village, as depicted in the image and map (figure 173), exhibits a high concentration of religious spaces spread across a relatively expansive area. This serves as evidence of the strong religious beliefs and practices of the village's inhabitants, as well as a possible indication of a larger population in the past. The village is home to four distinct mosques and a prominent Hosseiniyeh, which was built to replace the village's older and historically significant Hosseiniyeh. One of the mosques has undergone substantial renovations. However, it is worth noting that the architecture of the newly constructed Hosseiniyeh does not align with the architectural style of the fort, and the surrounding context of the original Hosseiniyeh was unfortunately destroyed in the process. Additionally, the village features a dedicated space for the preservation of the palm fronds used in the Ashura ceremony, which are currently

¹⁶ The maps (with small size photos) are available in a bigger size in Appendix D

kept in the Hosseiniyeh. The village's Jame Mosque, which is currently in a state of disrepair, is situated outside of the fort, raising questions about its purpose and location, and further research is required to gain a deeper understanding of this aspect of the village. All of the religious buildings are situated on the main roads of the village, and the religious route is composed of processions moving from the Hosseiniyeh to the various mosques. The architecture of the mosques varies from one another, with the Bala mosque featuring a single minaret on the exterior.

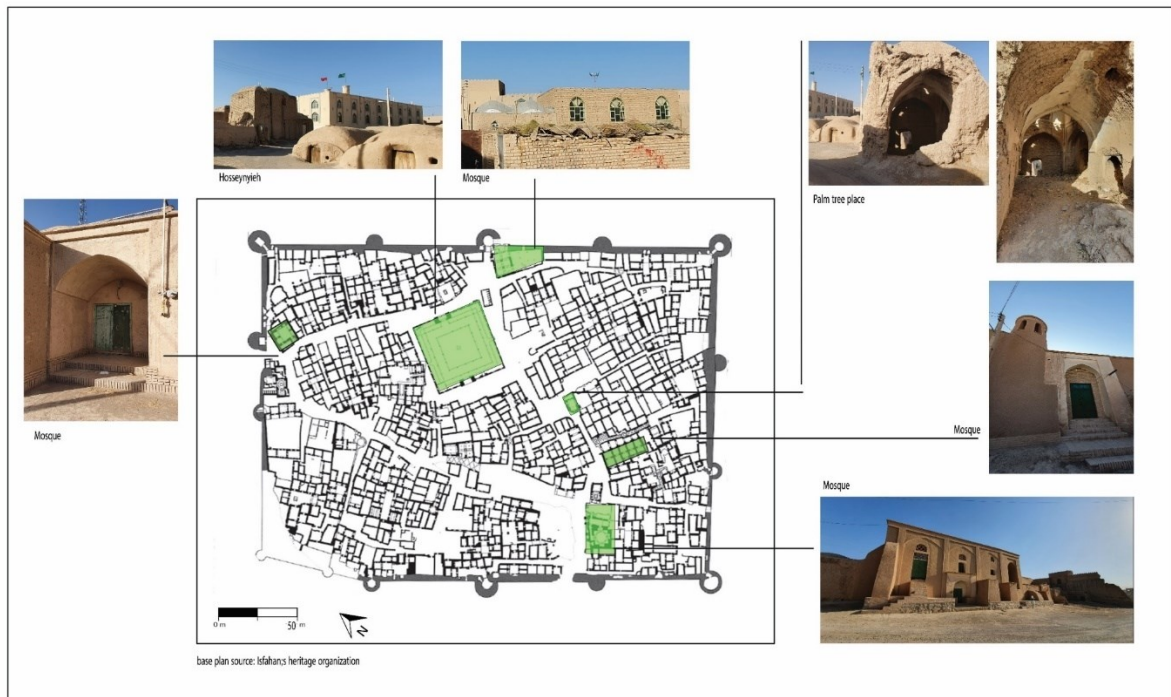


Figure 173: Religious buildings in Ghourtan, by author based on the map by Miras organization

6.2.3.5 Water Use system

The residents of Ghourtan obtained their drinking water through a combination of surface and underground sources. One primary source was a stream that flowed into the city near the main gate and flowed through the main passages before being consumed by the residents. It then flowed into the Zayandehrood river from under the southern wall. This stream was one of the sub-branches of Ghourtan's main water canal (Madi). Additionally, many houses in Ghourtan had wells, which were relatively shallow due to the high water table in the area. These wells were typically no more than three or eight meters deep. The residents likely obtained their drinking water primarily from the aforementioned stream, while the water from the wells was primarily used for livestock, poultry, and other purposes (Mohebi, 2004).

However, as the water sources weakened in this region ,we can guess that it became increasingly difficult to maintain a steady supply of water for both drinking and other purposes, such as for livestock and poultry. This highlights the importance of proper management and maintenance of water resources.

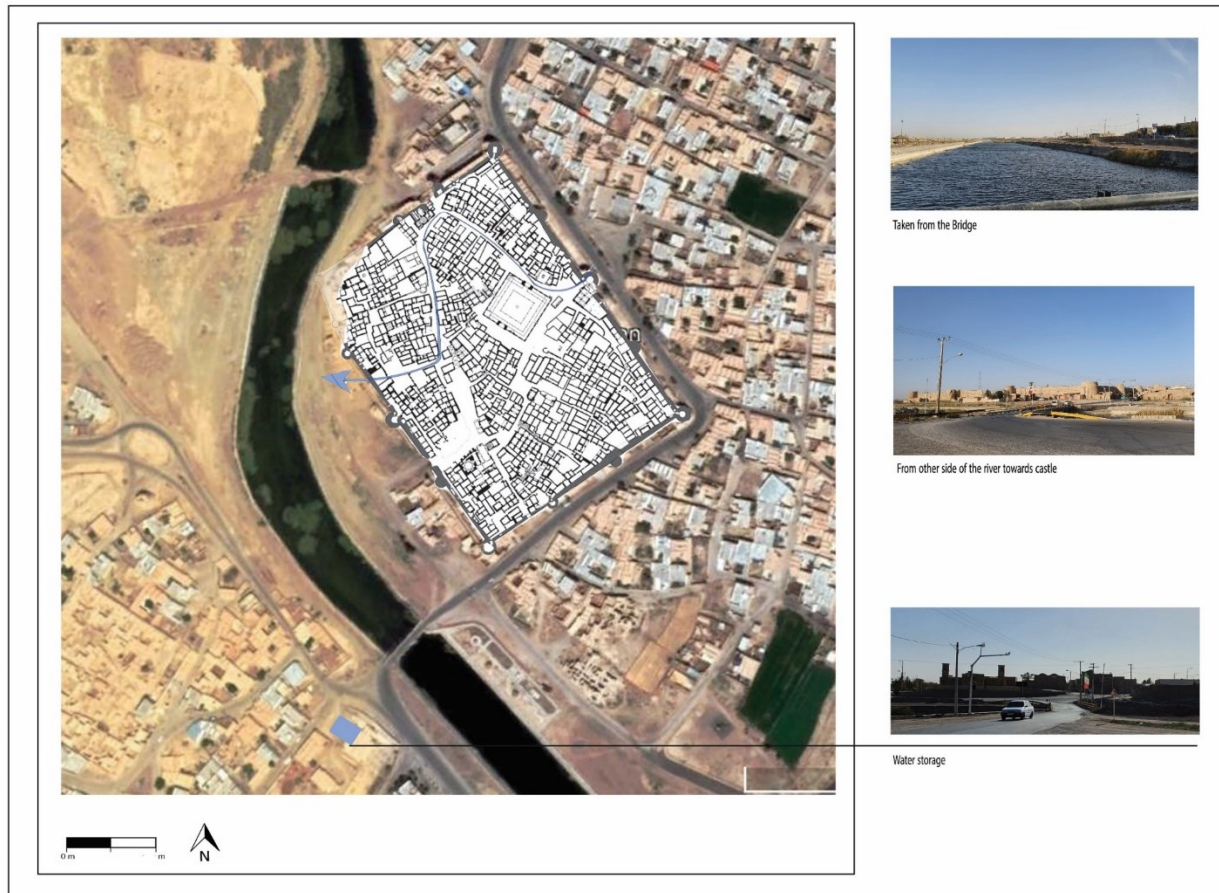


Figure 174 : Water in Ghourtan, modified by author

The figure 174 shows the flow of water in the fort. Additionally, there is an Ab anbar (water storage) located outside of the fort.

6.2.3.6 Typology of the Passages

The fortified Ghourtan boasts a densely structured layout, encircled by fifteen imposing round towers and

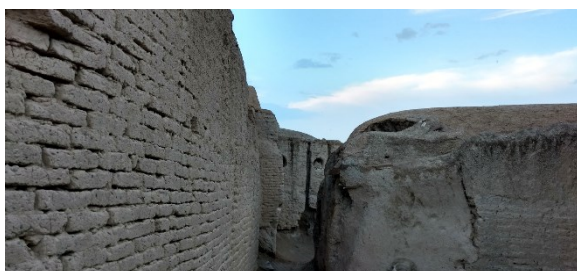


Figure 175: A passage in Ghourtan, by author

strong ramparts. This compact design is divided into several key neighborhoods or blocks by a network of main passages that typically lead to the entrances or towers. The central passages are primarily located within the center, while the peripheral passages are

situated along the sides. The buildings within the fort are positioned closely together, one behind the other, in the spaces between the passages. These passages are organic in nature and are designed to meet specific functional needs, with many of them leading to the towers.

The fort had two symmetrical entrances located in the center of the north and south walls, facing the Zayandehrood river bank and desert. The design of the towers surrounding these two entrances differs from the other towers within the fort. The two gates, known as the Desert Gate and the River Gate (Hajrasouliha, 2018; Heydarian, 2011), provide access to various public places within the village such as the bazaar, mill, bathhouse, Paen Mosque (Shabestan Mosque).

The passage connecting the two entrances was likely the main passage of the fort. Along this passage, one can find several important buildings such as the Mosque, Hosseiniyeh, Palm tree place (Nakhldan) and, mill.

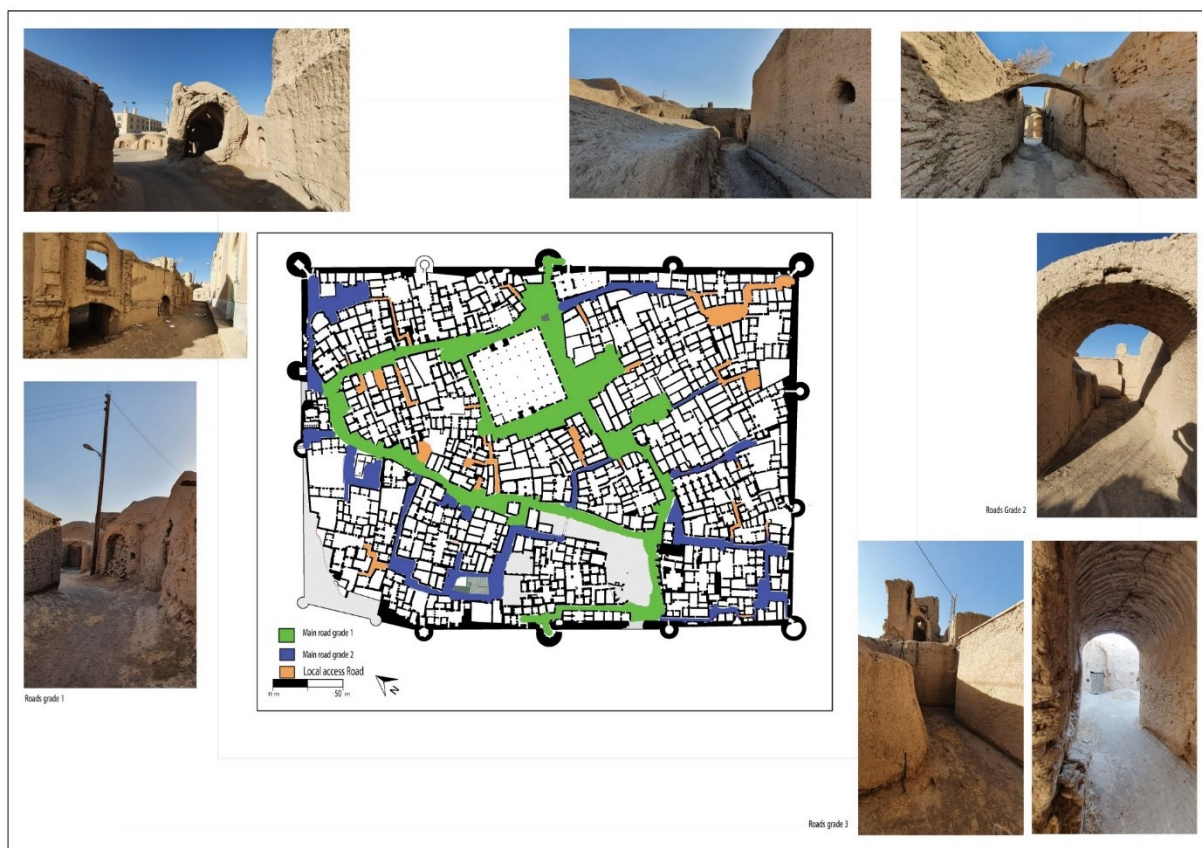


Figure 176: Roads in Ghourtan, by author

The village roads are classified into three distinct categories, each serving a specific purpose and characterized by different features. Which are shown in figure 176. Regrettably, the extensive damage to the structures makes it challenging to accurately identify all of the local access roads.

1. The first-grade main road is the primary access route from the fort entrances to the central area. These roads are typically open, and provide access to important public buildings such as mosques, mills, and hammams. The width of these type ranges from 3.5 to 4.5 meters, allowing for easy movement of people and goods.



Figure 177: First grade main road, Ghourtan, by author

2. The second-grade main roads are secondary access routes that are mostly situated between blocks. They provide access to the first-grade main road and are primarily located in residential areas. These roads have narrower widths, ranging from 2 to 3 meters, and are designed to serve the needs of the local community.



Figure 178 : Second grade main road, Ghourtan, by author

3. The local access roads, are used for house access and have extremely narrow widths. They have the feel of semi-private roads, and some have Sabaats. These streets are typically short, connecting

residents to their homes and serving as the primary means of accessing individual houses. Some of these passages are dead ends, providing privacy and security for the residents



Figure 179: Local access roads, Ghourtan, by author

Overall, the village roads are designed to serve the needs of the community, providing efficient access to important public buildings and facilitating the movement of people and goods. The different types of roads are strategically placed and designed to meet the specific needs of the residents.

Category	Purpose	Characteristics	Width	Access
First-grade main road	Primary access route	Open, access to public buildings	3.5-4.5 meters	Fort entrances to central area
Second-grade main road	Secondary access route	Located between blocks, serves local community	2-3 meters	Access to first-grade main road
Local street	House access	Narrow, semi-private feel, short	Extremely narrow	Individual homes

Table 6: Classification of passages in Ghourtan, by author

6.2.3.7 Architecture

As we found out, the architecture of this village was formed in a very dense and nested way over time due to being inside the walls of the fort. The majority of the dwellings structures within the village possess a central courtyard design and a simplistic layout, with the exception of a select few belonging to the affluent residents. These structures are primarily one-story, with a limited number featuring additional rooms or second-floor chambers suitable for use during the summer months. The architectural style and size of the houses serve as a clear indication of the wealth and status of the proprietor.



Figure 180: Ghourtan fabric from top, by author

However, an exception to this architectural trend can be observed in the form of a recently constructed building located at the center of the fort. This new construction lacks adherence to traditional design principles and is therefore incompatible with the historical fabric of the citadel. Additionally, according to reports (Pedram & Haghani, 2018) residents have destroyed portions of the historic bazaar, houses, and alleys under the pretext of conducting Muharram mourning ceremonies outside of the Hosseiniyeh.



Figure 181: Inside the fort, by author

In the architectural design of the village, the spaces within the buildings are structured in a unique and intricate manner. In addition to the courtyards, the buildings consist of square structures, which are positioned adjacent to one another, showcasing a remarkable diversity in their sizes. The structure of these buildings is primarily composed of load-bearing walls or columns, and arches or domes, which serve as structural support. It is noteworthy that the dimensions of these spaces are not uniform, but instead are proportionate to one another. This creates a harmonious balance in the design, rather than a monotonous uniformity. This feature highlights the architectural ingenuity of the designers and the skilled craftsmanship employed in the construction of the village's buildings.



Figure 182 :Inside the fort and Hosseiniyeh buildings, by author

As depicted in the architectural plan of the fort in figure 183, the spaces within the structure are interconnected and primarily serve as residential areas. A limited number of the buildings possess a second story. The location of public places is variable and not concentrated in a particular point. Only they are all built on the main road.

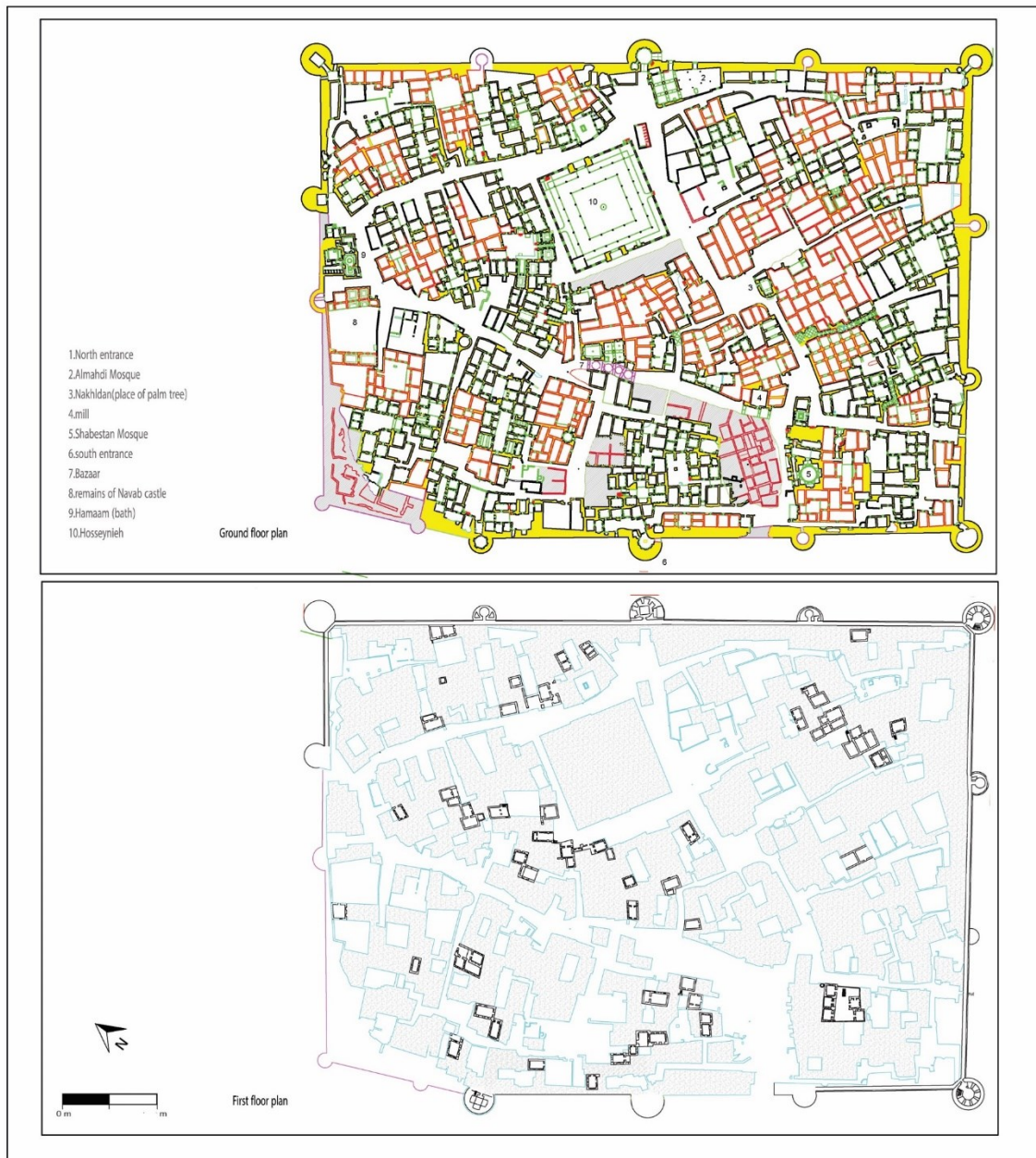


Figure 183 :Plans of the fort and land uses, by based on Heritage organization map, modified by author



Figure 184 : Sections and views from inside the fort, based on Miras report by Heydarian, edit and modified by author

The internal views of the fort further demonstrate the protective function of its walls. These walls served as a formidable barrier, enclosing and fortifying the entire village. They not only provided physical security but also psychological security to the residents, giving them a sense of safety and protection against potential invaders.



Figure 185: Central yard (left) and destroyed parts(right). by author

Additionally, it is worth noting that the high percentage of the roofs within the fort have been destroyed over time. This may have been a result of natural causes such as weathering and decay, or possibly due to historical conflicts and battles that may have taken place within the fort. Nevertheless, the walls, roads and other architectural elements of the fort, despite their deterioration, still reflect the strategic design and function of the fort as a fortified village.

Despite the fact that a significant portion of the village and notable structures have been left in a state of ruin, there are still a number of noteworthy buildings that remain standing and some ruins that shows they were important structures before which are shown in figure below.

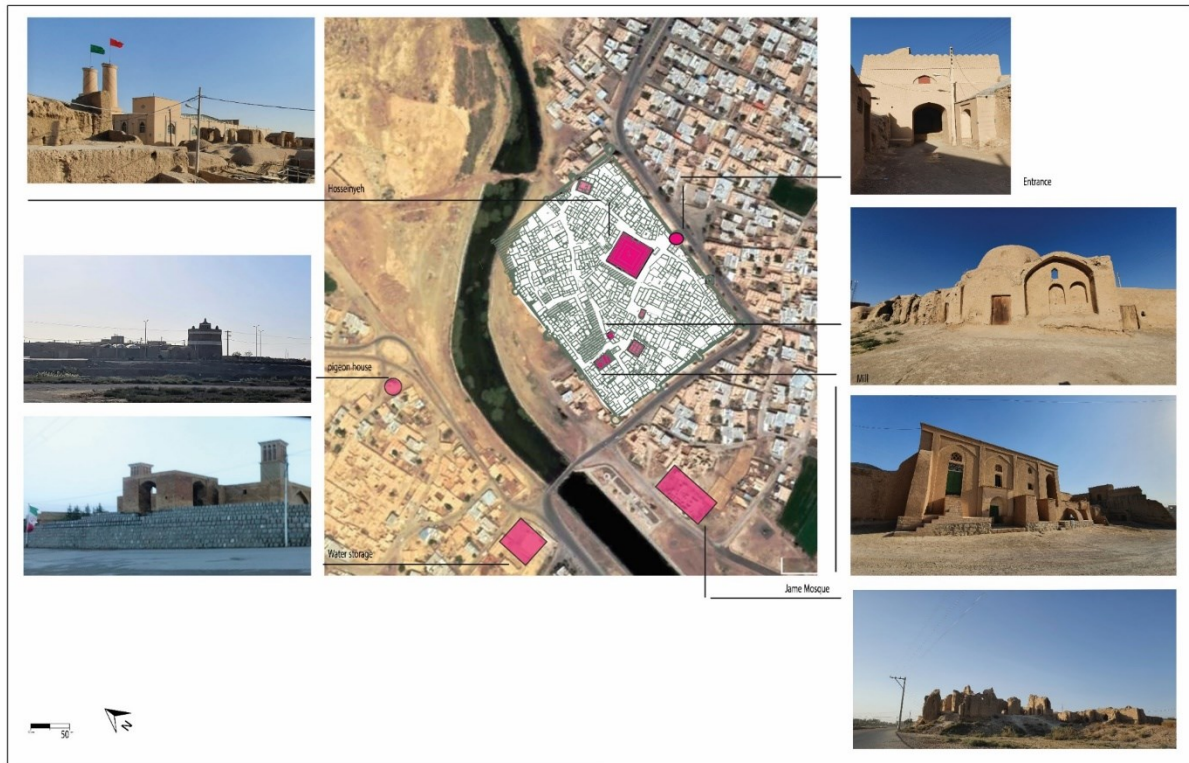


Figure 186: Notable buildings in Ghourtan, by author

Jame(Grand) Mosque, Situated on the southeastern side of the village, the remains of this building can be observed outside the fort and along the banks of the Zayandehrood River. According to historical records, it dates back to the Ilkhanid Period (8th century) (Kiani-Abari, 2013). The mosque boasts two floors and its size serves as an indication of the sizable population that existed in the village during that time period.



Figure 187: Remains of Jame Mosque, outside the fort, by author

Shabistan Mosque Also known as Ahleh Mosque or Payin Mosque, is considered to be the most significant and grand mosque within the fort. It is a type of mosque that is covered and does not have an open courtyard (Mohebi, 2004). This mosque is situated in the southwest region of the fort and is located beneath the upper mosque. It is considered to be one of the most well-preserved and noteworthy places within the fortified, making it an interesting point of interest for visitors.



Figure 188 :Shabistan Mosque, by author

As we already discussed about a new structure in the fort which is a Hosseiniyeh. In 1998, the local residents destroyed the old Hosseiniyeh and constructed a new, 10-meter-tall building in its place (Pedram & Haghani, 2018). However, the current Hosseiniyeh, a building that has been criticized for its lack of suitable architecture for the historical aspect of village, is probably the largest structure in the fort. The Hosseiniyeh's location on the main roads makes it a prime example of a religious building that also functions as an urban space; This is a common feature in cities across Iran that religious buildings create urban spaces. The new structure is highly visible from the outside, particularly when approaching the village.



Figure 189: New Hosseiniyeh in historical fabric of Ghourtan, by author

Another noteworthy building in the fort is the Palm Tree Place, also known as the Nakhldan Building. It is an interesting structure located within the fort and has historical significance as it was once used to store wooden palm trees used in the Hosseini Ashura ceremony. However, currently, the palm trees are not kept there. This beautiful building is situated between the Shabistan Mosque and Hosseiniyeh on the eastern side of the city. In the past, the sides of the building were open, but in recent decades, a brick wall has been built, blocking one side of it.

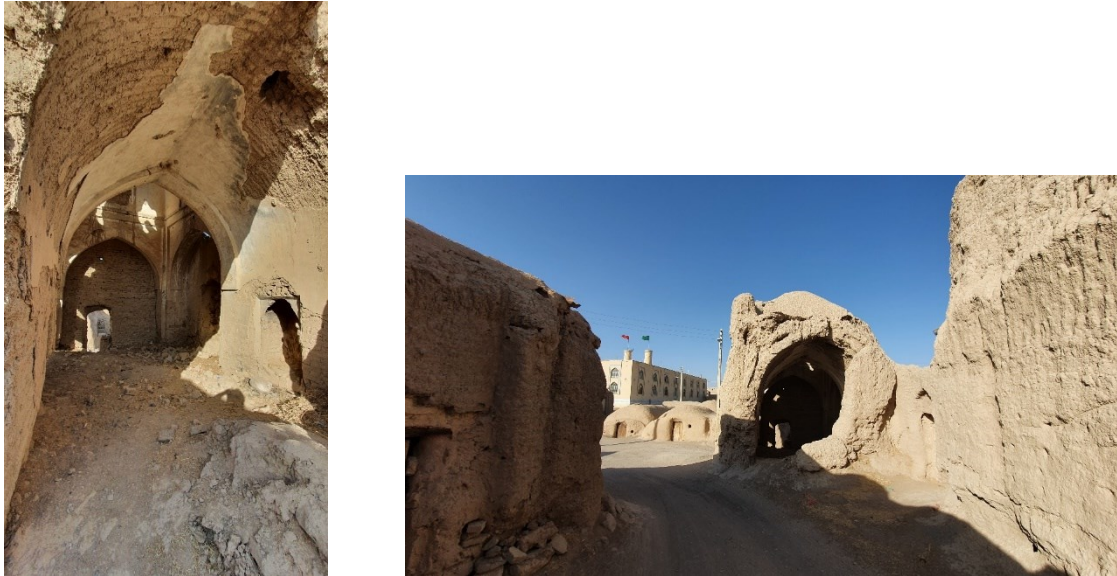


Figure 190 :Palm tree place in Ghourtan. by author

There is also a mill inside the fort. This mill was constructed using clay. These types of mills in this area were powered by the use of four-legged animals such as camels, horses, mules, and cows. The technical term for this type of mill is "tahuneh" (Hajrasouliha, 2018), although it is commonly referred to as a "cow mill." These mills were rotated by the strength of the animals harnessed to it, which would turn the gears and grind the grains. The use of animal-powered mills was a common method of grain production in the past before the invention of more modern machinery.



Figure 191 :The mill building, by author

Located opposite the Grand Mosque, the Water Reservoir (Ab anbar) is a notable structure outside the fort. The Shah Abbasi Reservoir is particularly noteworthy as it was situated on one of the oldest roads connecting Yazd to Isfahan. However, at the end of the Safavid period, the road lost popularity and usefulness when Mahmud Afghan invaded Isfahan through it. The Isfahan Cultural Heritage and Handicrafts Organization has since restored the reservoir. The reason for its location outside the fort remains unclear.



Figure 192 :water reservoir, outside the fort

The village was home to several Pigeon Houses or Towers, one of which has been restored and currently provides a habitat for pigeons. The Ghourtan Pigeon Tower is located on a farm known as Bahram Cemetery. In ancient times, the area was a large cemetery where tombs facing east and south were discovered. However, it was also used as a cemetery in the Islamic era (Kiani-Abari, 2015). All of these towers are located outside the fort.



Figure 193 : A pigeon towers, in front of the fort, by author

6.3 Conclusion

The village of Ghourtan is characterized by a unique form of morphology that distinguishes it from other settlements in the region. The configuration of the village is influenced by the presence of a fort, which impacts the local climate. While the use of similar materials and central yards is observed in other settlements, the primary factor driving the village's shape appears to be security.

This village was selected as a representative example of settlements built within a fort. The village is composed of a dense collection of buildings that have been shaped by a combination of environmental and non-environmental factors. This form of the village can be analysed as a unified entity.

From a macro perspective, a general examination of the village reveals that the current form is the result of a complex interplay between various environmental and non-environmental factors. Nevertheless, the aspect of security is paramount and has had the greatest impact on the shape and form of the village. Other factors such as lighting, climate, culture, and economy play a secondary role, akin to Maslow's hierarchy of needs, where basic human needs are ranked and prioritized. In this case, security and safety are of paramount importance, and must be met before other needs can be addressed.

A more detailed examination of the village at a smaller scale will reveal the impact of other factors such as climate and culture on the morphology. The fort's walls, for instance, were probably also useful for creating a suitable climatic environment by stopping strong winds. However, further research is required to verify this hypothesis.

Apart from the fort itself, the intricate and labyrinthine layout of the roads within the fort may have been deliberately designed for security purposes, providing an added layer of protection for the residents in times of danger. The winding and complex nature of the roads would have hindered the enemy's ability to navigate and reach the residents, making it more challenging for them to launch an attack on the village.

Throughout the history of the village, factors such as the economy, future expansion plans, changes in land ownership, and general government policies have had a significant impact on its form. Similar examples can be found among other fortified villages in the area that have also been abandoned.

Factor /Characteristics	Explanation and impact
Security	Greatest impact, primary driving force behind the village's shape
Climate	Secondary impact, materials, domes and roofs
Culture	Secondary impact/ religious buildings, destruction of historic part for expansion/introvert designs
Economy	Secondary impact, differences in size of the houses
Fort's walls	May have been useful for creating a suitable climatic environment, further research needed to confirm
Intricate and labyrinthine layout of roads within the fort	Deliberately designed for security purposes, providing an added layer of protection
History of the village	Significant impact on its form due to factors such as the economy, future expansion plans, changes in land ownership, and
Government	No preservation action or plan, change of land ownerships, increase of security effected the development of village outside the walls

Table 7 :Factors and characteristics in Ghourtan, by author

Chapter seven.

7 Summary and Conclusion

7.1 Case Studies: Key Findings Overview

This part of the chapter provides a detailed description of the summary of morphological characteristics of the case studies. It begins with a low-resolution overview and then gradually transitions to a higher-resolution analysis of the impact of various factors on the three different categories of chosen villages, including climate, material, water, economy, security, and religion. The ultimate aim is to generalize these characteristics for each type of village to a wider number of similar villages within the category.

The subsequent section of the chapter compares and examines the evolution of village form, the current state of these villages, and the challenges they face. This analysis categorizes the case studies based on similarities and differences to generalize the characteristics of each case study.

In the following section of the chapter, the research problem, objectives, and achieved outcomes are reviewed and analyzed. The thesis's contributions are highlighted, along with suggestions provided for the preservation of valuable heritage, identification of weaknesses in the current state of protection and development for these villages, and evaluation of government plans.



Figure 194 : Three case studies, By author

7.1.1 Case study 1: Abyaneh

When observing the village of Abyaneh from a distance, one can observe a settlement that is built in a stepped form at the base of a mountain, appearing as an integral part of the mountain due to the utilization of similar colors and materials. This type of architectural arrangement is typical of villages situated on the slopes of mountains.

Upon approaching Abyaneh village, new developments are immediately noticeable which lack the traditional architectural characteristics of the village. However, the use of reddish paint and masonry resembling the surrounding soil is a nod to the local aesthetic. Venturing further into the older neighborhoods, the true architectural and urban value of the village is revealed. The dwellings are arranged in a cube-like form, oriented in various directions and at different elevations along the mountainside. From any point within the village, stunning views of different parts of the village and its structures can be observed. Unlike many other villages in the deserts of Iran, the houses are outward-

facing and lack a central courtyard. In the neighborhood of Imamzadeh, a magnificent balcony offers panoramic views of the surrounding plain. The journey through the village continues to its lower elevations and culminates in the gardens.

7.1.2 Case study 2: Qehi

Unfortunately, when viewing the village of Qehi from a distance, little to no evidence of historical architecture can be seen, with the only structures present being those of low architectural value and not representative of the local style. However, upon traversing the newer parts of the village, one can encounter the historic and harmonious portions of the settlement. This phenomenon is prevalent in many cities and villages located in the central regions of Iran, where flat surfaces have led to the development of the cities over time, resulting in the concealment of their historic centers.

The approach to Qehi resembles that of a small town situated in the heart of a desert plain, which offers limited visually appealing prospects. Upon traversing through the newer constructions, which predominantly consist of single-story buildings, one reaches the more established and historic neighborhoods. The discovery of these older parts of the village is somewhat challenging. The village is constructed on a flat plain, resulting in a lack of visual interest from the surrounding natural environment. The alleys boast simple walls made of thatch, and the buildings are introverted in design, giving the village an understated appearance characterized by simple walls with doors being the only prominent architectural features. The simplicity of the village design evokes the minimalist aesthetic. The mosque in the village also follows this simple architectural style, with basic walls and a dome. The paths in the village are designed to allow the use of shadows.

7.1.3 Case study 3: Ghourtan

In the case of Ghourtan, the high ramparts of the fort can be seen, much like in many other fortified villages or cities that are situated along a river and surrounded by a city that has developed haphazardly around the fort structure. The fort building itself has undergone arbitrary additions over time.

Access to Ghourtan has undergone a transformation over time, initially being restricted to the fortified gates, but now there are alternative means of entry such as wholes and collapse points. The topographical features of Ghourtan bear resemblance to those of Qehi and it is situated in a desert region. However, what sets Ghourtan apart is its location at the terminus of the Zayandehrood river route. Upon approach

to the village, the formidable fort walls can be observed from a distance. The modern settlement stands in stark contrast to the fort, having been developed and expanded with little regard for its surroundings. The interior of the fort presents a scene of an abandoned, ruined village encased within high walls. In the center of the fort, a mosque featuring distinctive architectural elements has been erected. Given the evidence of the close proximity and high density of the residences within the fort, it is evident that the space was highly utilized and the individual structures were of modest size.

7.2 Effective Factors and Results

7.2.1 Climate

The three groups of villages studied in this research - mountainous, desert, and fortified - are all located in central Iran and in a desert region. However, slight variations in climate have resulted in distinct differences in their physical form, from the overall morphology of the village to the architecture of individual houses.

Abyaneh, is located on the edge of the desert but in a semi-mountainous area, which has resulted in a morphology that is more similar to villages found in mountainous regions, as opposed to those found in deserts. The geography and climate of this semi-mountainous area have influenced the architectural style of the houses in Abyaneh, which are built on the south-facing slopes of the land to maximize sunlight exposure. The houses are not introverted, and the exterior walls are made of reddish soil, which is a common building material in the area. Additionally, the architecture of the houses is designed to control the cold of winter and the roof are flat with wooden beams.

Qehi is a representative of thousands of villages in similar desert conditions as it. The hot and dry climate, as well as the flat terrain without any natural boundaries, has led to a developed village structure without land restrictions. In the historical part of the village, paths were built to take advantage of the shade provided by walls and houses were constructed with introverted designs, thick walls, and central courtyards to moderate the dry climate. The building material used is soil from the same area and is light-colored to absorb less sunlight, and many roofs are dome-shaped to reduce sun exposure during the day.

Ghourtan, on the other hand, is situated in a desert plain but within fortified walls and near a river. The walled fortified moderated the conditions inside the village in winter and controlled sunlight in summer due to the winding and narrow roads. This has led to a high density within the village, as the limited land area inside the walls is fully utilized. The dense fabric and ramparts of the fort also protected the village

from outside threats. Thus, climate is one of the main factors that has affected the form and architecture of the villages studied in this research. The semi-mountainous area of Abyaneh has led to a morphology that is similar to mountainous villages in east of Iran, while the desert conditions of Qehi and Ghourtan have resulted in a developed village form without land restrictions for Qehi while for Ghourtan a high density within the fortified walls. Understanding these factors and their effects is crucial for the restoration and preservation of these valuable heritages, as well as for the development of protection and preservation plans for these villages and similar cases.

Village	Location	Climate	Physical Form Development	Architectural Style
Abyaneh	base of a mountain in desert	Semi-mountainous	Morphology similar to mountainous villages, Built in a stepped form at the	Houses built on south-facing slopes, not introverted, reddish soil exterior walls, designed to control winter cold, flat roof with wooden beams
Ghourtan	Desert plain in central Iran within fortified walls near a river	Desert	Walled fortified with high density	Winding and narrow roads to moderate conditions and control sunlight, dense fabric and ramparts to protect from threats
Qehi	Desert region in central Iran	Desert	Flat terrain without natural boundaries	Introverted designs, thick walls, central courtyards to moderate dry climate, light-colored soil building material, dome-shaped roofs to reduce sun exposure

Table 8 : Climate on selected case studies, by author

In conclusion, the table number 8 summarizes the characteristics of the three categories of villages in central Iran, highlighting the key climate factors that have affected their physical form and architecture. Understanding these factors is important for preserving and protecting these valuable cultural heritages.

7.2.2 Building Material

In the rural regions of mountainous areas, traditional structures are primarily constructed using stone and mud as the main building materials. In the central plains and desert peripheral lands, houses are constructed utilizing clay and mudbrick, with walls that are significantly thick in order to prevent the transfer of heat from the exterior environment to the interior of the dwelling (Ameri & Ahmadi, 2017). These structures in deserts are often designed with dome-shaped roofs to ensure that the entire surface area of the roof does not receive direct sunlight. While in mountainous areas roofs are usually flat which is besides climate reason is due to access to woods materials. Additionally, some houses in these regions feature windcatchers, which serve as natural air conditioning systems.

It is interesting to note that the use of locally sourced materials and the implementation of design elements that respond to the local climate and environmental conditions, such as thick walls and dome roofs, reflect a deep understanding of the natural environment and a commitment to sustainable building practices in these regions. This highlights the importance of preserving traditional building techniques and incorporating them into contemporary construction methods in order to create sustainable and resilient communities.

Region	Building Material	Roof Type	Climate Related Feature
Mountainous Areas	Stone and mud, Wood	Flat	Access to wood materials
Central Plains and Desert Marginal Lands	Clay and mudbrick	Dome	Main material is soil

Table 9 : Materials in different types, by author

7.2.3 Water

The availability and management of water resources is crucial for the development and sustainability of any village. In the case of Qehi and Abyaneh, groundwater sources such as springs and Qanats (aqueducts) have been the primary means of supplying water to the villagers. In contrast, the main source of water in Ghourtan is the river, as the village was built along the Zayandehrood river.

The presence of springs as a source of water in mountainous villages like Abyaneh is a common occurrence, and the flow of water within the village is different from that of desert villages like Qehi, where Qanats are the main source of water and designed by human. Additionally, the presence of seasonal

rivers in the low-lying areas of mountainous villages can lead to floods, which must be managed and controlled. In fortified villages the water is controlled by inhabitants such as in Ghourtan, the villagers use the river water by directing it into the fort and also by using wells within the fort.

The flow of water in the village has had a significant impact on the development and expansion of the villages, particularly in mountainous and desert villages, which have developed more freely. In contrast, in fortified villages, the water flow is more controlled by the people, rather than by the environment and topography. This is because fortified villages are designed to have limits on development and the water flow is managed through channels, qanats and other means of control.

Furthermore, in desert villages, the water flow is controlled through qanats and channels, while in mountainous villages, the villagers have less control over the water and the form of the village is likely shaped by the presence of springs, rivers, and streams of water on the slopes. This is because the villagers and their construction in mountainous villages adapt to the natural flow of water and develop the village accordingly, whereas in desert villages, the villagers have to actively manage and control the water resources available to them but they have more control over the water resources locations. Additionally, the width of the passages in the water path broadens significantly. And, it creates a beautiful view of the trees. In the villages which primary source of water is the aqueduct, the crossing nodes and social hangouts are formed in the place of water division and diversion.

The existence of irregular and non-geometric passages in many villages is possibly related to following the water stream's movement. On the other hand, due to the water's purity in the aqueduct's appearance and its gradual pollution, being close to the aqueduct or "springhead" is considered a value, and houses that are farther away from this point will be deprived of this privilege (Abaszadegan, 2017). Thus, the village's fabric can have a kind of physical-social hierarchy in proportion to the appearance of the aqueduct and its streams.

Village	Main Water Source	Type of Village	Management
Qehi	Qanats	Desert	Controlled
Abyaneh	Springs	Mountainous	Less control over the water streams
Ghourtan	River	Fortified	Controlled

Table 10 : Different water sources and the type of village and their management

7.2.4 Religion and Culture

The factor of religion as a non-environmental factor has had a great impact on all villages. In addition to creating religious buildings, this factor has led to the formation of privacy and introverted architecture in buildings. However, in the case of mountainous villages like Abyaneh, the buildings are extroverted. The issues of Mahramiat and privacy were solved with other architectural elements such as latticed windows or the use of bricks decoration in front of windows and Hashti as a buffer place to keep the inside of houses more private. Also, religious ceremonies in Muharram have created urban spaces for holding these ceremonies which have changed the shape of the city. The large number of mosques and Hosseiniyehs shows the importance of this issue. This is because these buildings and ceremonies usually need large urban spaces and create centers of villages. In cases such as Abyaneh, religious rituals and their performance have nearly lost their mere state of mourning and turned into tourist events that have attracted tourists to the village to watch these religious ceremonies. Religious ceremonies have also affected the Ghourtan fortified and caused the destruction of part of it. In Qehi, many religious buildings have been built. The village is in a very introverted form.

In the interview with Dr. Shieh, he highlights the profound connection between religion and culture, particularly their influence on the architectural style and layout of villages. According to Dr. Shieh, religion is an integral part of culture, intertwining with the beliefs and practices of the people. This connection is evident in various aspects of architectural development, building classification, and neighborhood divisions.

For instance, in cities like Naien, Zavareh, Ardestan, Kashan, and Natanz, which are situated in desert regions, specific architectural characteristics shaped by religious influence can be observed. In Naien, each neighborhood features a central place of significance, such as the Hosseiniyeh Tekiyeh. Similarly, in the Yazd province, unique instances can be found where religion has played a significant role. Many houses, whether in rural or urban areas, are designed in a way that they do not directly face the yard. Instead, they are situated at the end of a building or corridor. This layout ensures that when someone walks through the corridor for about 10 to 20 meters, they reach the yard. This design consideration arises from the need to protect the privacy of women who may not be wearing a hijab. It prevents them from being seen by strangers passing by or visiting the home. Aspects such as alleyways, passage widths, road hierarchies, and the placement of religious spaces like Tekiyeh, Hosseiniyeh, and prayer rooms have all influenced the architectural fabric of these areas (Shie,2020).

The direction of the qibla and the number of floors in buildings have also played a role in house construction. For example, a two-story building would provide a dominant view over neighboring structures. However, traditional buildings in our cities and villages typically consist of single-story structures, with a few exceptions of separate two-floor buildings. Furthermore, a hierarchy exists for passages, ranging from public to semi-public, semi-private, and finally private passages.

Dr. Shieh explains that in central Iran, there has been a conscious effort to prevent houses and buildings from overshadowing one another. This consideration stems from the influence of 'Mahramiat', that was discussed in the case studies (Shieh,2020).

Territory determination is amongst the basic and essential rights of each person, and failure to determine and protect it can negatively influence psychosocial health. From the Mahramiat aspect, territories can be defined at different levels, and they come in physical appearance, i.e., private, semi-private, semi-public, and public domains. These domains that people define for themselves are categories that appear directly from their perception of the public and private space. For example, in some areas, the village's privacy includes the whole village. In some villages, while women appear in special clothing when talking with their villagers, they wear their scarf or having more hijab immediately when encountering a stranger, such as people from the city. These behaviors are generally considered indicators that help determine the private and public domains of the village (Abaszadegan, 2017). Therefore, Mahramiat (seclusion) and introversion in architecture are closely related.

Overall, it is clear that religion and culture have a profound impact on the architecture and form of villages in Iran. The principle of Mahramiat, in particular, plays a significant role in shaping the private and public spaces of these communities.

Mahramiat in the village can only appear behaviorally or physically. Behavioral Mahramiat is beyond the scope of this text, but its physical manifestation influences the village landscape and should be discussed in this study. In the villages located on the Caspian Sea's coastal areas in the north of Iran, there has been no dividing wall between courtyards of the residential units and passages, as the whole village has been mentally considered a private or semi-private space. However, during the last decades, due to significant immigration of non-native people to the villages for the purpose of building villas as holiday homes or for permanent residency, the villagers no longer perceive the entire village as their private domain. For this reason, fencing and creating walls around the houses have emerged as a new phenomenon in recent years (Abaszadegan, 2017). It should be noted that Iranians have shown a tendency towards introverted architecture since ancient times due to their view towards home and family.

Basically, beliefs and specific issues of Iranians were effective in the formation of different spaces, especially residential spaces (Seyfian & Mahmoudi, 2007), and the introverted architecture of Iran has a direct impact on the village landscape.

Additionally, the hierarchical arrangement of forecourts, pre-entry spaces, entryways, vestibules, corridors, courtyard corridors, and other functional spaces in conjunction with courtyards is a common pattern in traditional buildings. It is important to note that the use of hierarchy in urban space systems and architecture by separating public spaces from private spaces and controlling accessibility has played a significant role in reinforcing the concept of Mahramiat in the spatial structure. Notably, Mahramiat is one of the most crucial physical manifestations of observing hierarchy in the mansions and cities of the Islamic period (Aghniayi et al, 2017).

Thus, this factor not only influenced the architecture of the buildings, but also had a significant impact on the urban morphology of entire villages and cities. In fact, previous studies in this field in Iran and the related literature have predominantly focused on architecture, and missed the broader scale and influence of this factor on the city/village form.

7.2.5 Security

Throughout history, Iranians have built their homes in a suitable place and preferred group life to individual life in order to deal with and prevent possible dangers and protect their lives and property against aggressors and natural disasters (Abbasside, 2017). Security is a multifaceted concept that encompasses both environmental and non-environmental factors. The location and topography of a village, as well as its historical and political context, all contribute to the perceived level of security. This is particularly evident in fortified villages, where high walls limit construction and create a distinct form of desert village with high population density. In contrast, mountainous villages like Abyaneh, located at high altitudes, offer a strategic vantage point and time to evacuate in times of danger, additionally they usually don't have easy and multiple access roads so the villagers are safer in times of danger and wars. In the case of Desert villages such as Qehi, the primary form of defense is the presence of towers in lords' houses and forts, as well as the introverted design of houses that often have only one door connecting them to the outside. These architectural features further enhance the defensive capabilities of the village.

Dr. Shieh states that security is a crucial consideration in the formation of cities and villages in Iran. He posits that the labyrinthine network of roads and passageways, in addition to providing relief from the

climate, serves as a means of obscuring the direct view of potential adversaries and thus enhances the security of the town or village. Additionally, the winding alleys also provide cool shade during hot seasons. Furthermore, situating villages on highlands also allows for dominance over lower lands (Shieh,2020) This significant perspective is further supported by the analysis of the case studies in this research.

Village	Type	Location	Security Features
Abyaneh	Mountainous	High Altitudes	Strategic vantage point, limited access roads
Qehi	Desert	Plain desert area	Towers, introverted design of houses, one door connection, windy roads
Ghourtan	Fortified	Plains inside the fort	High walls, limited access, windy and puzzle shape roads

Table 11: Effect of Security, by author

Table 11 shows the different types of villages in center of Iran and the location and security features that contribute to the perceived level of security in each village. In the case of mountainous villages, the inherent location itself contributes to their security, as their limited access roads naturally provide a level of protection. However, for villages situated in plains or desolate areas, the security dynamics are distinct. In such cases, additional measures such as towers, walls, and tighter control over house access become necessary to ensure security.

7.2.6 Economy and Ownership

The relationship between the economy and the environment is complex and multifaceted. While the economy is traditionally considered to be a non-environmental factor, it is influenced by the environment in various ways. For example, the environment can serve as a foundation for a stronger economy by providing resources, enabling trade and commerce, and fostering innovation.

The economy and ownership play a vital role in shaping the form of villages, both on a general and a smaller scale. On a general scale, villages with stronger economic conditions tend to have more substantial and well-maintained public buildings with valuable and durable architecture. Additionally, the inhabitants of such villages often possess larger and more well-equipped homes, with more decorative

features such as beautiful entrances. On a smaller scale, the economic and ownership status of individual families can also shape the architecture of their homes and, in turn, the overall appearance of the village. In the interview, as stated by Dr. Shieh (2020), sustenance and economy are determining factors in the configuration of Iranian villages. Specifically, the area of houses and the types of occupations of the people, such as farmers who possess ovens, warehouses for agricultural products, and spaces for carpet weaving in their houses, are shaped by their sustenance and economic conditions. Furthermore, the appearance and shape of buildings are also a result of the people's livelihoods.

The impact of ownership can also be examined from a historical perspective. Dr. Jabalameli (2020) explains how ownership played a role in shaping the formation of villages in the aftermath of the Mongol invasion in Iran.

The formation of villages and rural settlements in Iran was not a voluntary process where farmers chose a region and bought land to establish a community. Instead, it is rooted in historical events, specifically the Mongol invasion. After Genghis Khan and his sons destroyed many settlements, Khajeh Nasir al-Din al-Tusi, a minister to Oljaito, implemented a system called "Toyoodari" to rebuild Iran. This system involved creating statistics on the condition of Iran in various dimensions, and dividing important centers based on natural resources to revive agriculture and animal husbandry.

Under this system, Khajeh Nasir al-Din al-Tusi distributed land to those who were deemed more qualified, leading to the emergence of a feudal system known as the "Kadkhodayi" model. This model saw a powerful landowner, or "tycoon," owning all the products of farmers in return for rebuilding destroyed places and providing protective structures for the villeins and their families to live in. The goal of this system was to revive national wealth and improve the quality of life for the people by building public structures such as caravanserais, water storage, baths, and mosques. In return, a percentage of the profits from agricultural and livestock production had to be returned to the Khan.

This type of rural society continued until the Qajar era, where a person called "Khan" was appointed for each village. In the Ilkhanid, Timurid, and Safavid periods, the main duty of the Khan was to control and maintain the livelihood of the people. However, in the Qajar period, the Khan mainly demanded ransom and interests from the villagers (Jabalameli, 2020).

In summary, the economy and ownership play a significant role in shaping the form of villages. Both on a general and a smaller scale, the economic conditions and ownership status of the people living in a village can greatly influence the architecture, layout, and overall appearance of the village. It is also important to consider the relationship between the economy and the environment as the environment

can create a platform for a stronger economy which in turn shapes the village form. Additionally, from a historical perspective, the ownership of land has had a significant impact on the hierarchy of societies and the formation of villages in Iran throughout history.

7.2.7 Conclusion

Having thoroughly analysed the morphologies of three distinct types of villages in central Iran, as well as the typology of traditional urban dwellings and the urban fabric in selected case studies, an effort was made to link the case studies and generalize findings to each type of village. Because each case was initially selected to represent a different main category, the research process demonstrated that the methodology employed was a logical approach to investigating the various factors contributing to the morphology of these heritage sites. The findings revealed that each category possessed distinct characteristics, some of which were interconnected. However, in summary, they could be described as follows:

- Mountain villages: These rural settlements, located in mountainous areas and at the edge of the desert, have compact building forms with houses close together. They are typically two-story buildings with their main lighting and façade facing south. The village layouts are arranged in an east-west direction on mountain slopes to maximize sun exposure. Most mountain villages have springs and have developed around water sources, with buildings having minimal central courtyards. Small windows and brick guards are used to maintain privacy, and there is limited open space. The roofs are flat to take advantage of snow for thermal insulation and paths have a hierarchy from private to public. Building density depends on the slope of the land and is higher on steeper slopes.
- Desert villages: These settlements, which lack topographical diversity, have introverted buildings with central courtyards. Most houses are single-story with spaces that receive light from various directions to suit the hot or cold seasons. The sabbats are simple structures created for shade, and the roofs are dome-shaped or arched to reduce sunlight. Water is obtained from aqueducts and the village expansion is controlled by the water source. Paths are meandering for shade and sand storm control, and building density is highest in the center of the village and around the main mosque and service buildings. Security measures, such as towers and high walls, have been implemented. The buildings are large with prominent entrances, and privacy is maintained with no external windows or openings.

- Fortified villages: The buildings in these villages are densely packed within the walls and have small yards. They are either one or two-story buildings, and the water source is strictly controlled. Residents cannot see outside the walls, and the paths are winding and wide. The size of the buildings is small, and security is the primary consideration in the village form. Some buildings are located outside the fort, but they are now empty.

Based on observations of numerous similar cases in Iran, the current situation of the historical fabric of villages can be summarized as follows: In mountainous villages, the lack of prime land and possibly due to abundant rainfall, most of the historical fabrics have been destroyed and renovated into new forms and shapes. However, there are infrequent exceptions, such as Abyaneh, which still retains its historical form. In contrast, villages located in the desert or near it have a large amount of land with similar conditions, and therefore, the inhabitants have used the lands near the old village to develop or for new constructions. As a result, many new constructions have been built next to the old village, causing the old fabric to be abandoned or lose its popularity.

The same is true for fortified villages, where people started to move outside the walls without intentionally destroying the old villages. This is why it is easier to find villages with old fabric in the desert, although in most cases, the historical center has been ruined. Conversely, in mountain villages, modern buildings and structures have often been built on top of the old fabric, disregarding local forms and architecture. The fact that Abyaneh, due to general luck and possibly the efforts of the locals, has partly maintained its capabilities and suffered less damage, highlights the need for more people, officials, and residents to pay attention to Ghourtan and Qehi. Both villages have many charming features that can attract tourists but are currently ignored. By addressing these issues sooner, the damage to these areas can be prevented, and their historical and important fabrics can be preserved.

To sum up, the study of three types of villages in central Iran - mountain, desert, and fortified - highlights the diversity and complexity of rural heritage. Each of these villages has unique characteristics and morphologies that reflect the local geography, climate, and social practices. Understanding and preserving these differences is crucial to maintaining the diversity of cultural heritage.

Preserving the structure of historical and rural areas, encompassing both cultural and social aspects, is crucial in our contemporary society. The conservation of existing buildings and historical fabrics represents the most important initial step in this endeavor. These monuments and historical fabrics serve as the only remaining evidence of Iran's urban identity, and should be viewed as integral components of any urban development strategy. However, the current state of historical fabrics in these villages is

threatened by modernization and new developments. As cities expand and populations grow, there is increasing pressure to develop and urbanize rural areas. Many historical buildings and fabrics have been demolished or renovated to make way for new constructions that do not reflect local architecture or cultural practices. This has resulted in the loss of important cultural heritage and a homogenization of the built environment.

To address this issue, more attention needs to be given to preserving the unique features of historical and rural areas. This requires a concerted effort from both government officials and local residents. Governments can play a role in protecting and preserving these areas through legislation, funding, and education.

By prioritizing preservation efforts and promoting heritage tourism, the value of these areas becomes more tangible for the locals, thus, these areas can be saved for future generations to enjoy and appreciate. These villages not only provide valuable insights into Iran's history and culture, but they also have economic and social benefits. Heritage tourism can attract visitors and create jobs, contributing to local economies. Nevertheless, it is crucial to approach heritage tourism with caution and careful consideration, as it can lead to undesirable outcomes such as the loss of authenticity and the deterioration of the physical and cultural aspects of these heritages. Furthermore, preserving these areas can help maintain community identity and social cohesion, creating a sense of pride and belonging among residents. In conclusion, the preservation of historical and rural areas is crucial for maintaining cultural and social heritage. By studying and preserving the unique features of different types of villages, we can ensure the diversity and richness of Iran's cultural heritage is preserved for generations to come.

Type of Village	Characteristics	Historical Fabric Status
Mountain Village	Compact building forms, two-story buildings, main lighting and façade facing south, east-west village layout on mountain slopes, flat roofs, hierarchy of paths, building density depends on land slope, limited open space	Most historical fabrics have been destroyed and renovated, but there are exceptions like Abyaneh
Desert Village	Introverted buildings with central courtyards, single-story buildings, dome-shaped or arched roofs, meandering paths, highest building density in center of village, security measures like towers and high walls, prominent entrances, no external windows or openings	Large amount of land allows for development next to old village, causing old fabric to be abandoned or lose popularity
Fortified Village	Densely packed buildings within walls, one or two-story buildings, winding and wide paths, small yards, controlled water source, residents cannot see outside walls, small building size, security is primary consideration	People started to move outside walls, causing old fabric to be ignored or ruined

Table 12 Type of the village and its features by author

7.3 Research Objectives and Problem

The thesis focuses on the insufficient research on the urban morphology of villages in central Iran, specifically the impact of different factors on the form and shape of the villages. The research focuses on urban morphology schools, namely English, Italian, and French. Additionally, it incorporates previous studies, such as Conzen's research on Alnwick, where his study analyzed the historical development and spatial layout of the town. It examined factors such as land use patterns, street networks, building styles, and the evolution of the urban fabric over time. Our objective was to enhance the existing understanding of urban morphology by integrating and utilizing the key elements derived from previous studies and the main schools of thought. These elements, namely form, resolution, and time/history, have been recognized as the fundamental components of urban morphological research according to Moudon, a distinguished researcher in the field, in 1997. By incorporating these elements, we aimed to provide an updated and comprehensive analysis of the topic in the following manner:

- Form: All three schools consider the physical shape, layout, and structure of urban areas as important elements of analysis. In this research, forms are examined to understand the physical attributes, spatial composition, and overall layout of the villages under study.
- Resolution: The schools may differ in their approaches to scale and detail, but they all recognize the importance of examining the spatial components of urban areas. This research acknowledges the significance of resolution in analyzing the villages at different scales, ranging from the broader macro-level topography to the intricate micro-level plots and architecture.
- History: The schools acknowledge the historical development and context of cities as essential factors in understanding their current form and structure. This research investigating the historical context, evolution, and cultural influences that have shaped the urban fabric of the villages in central Iran.

By recognizing the significance of form, resolution, and history, we can intertwine these elements throughout the analysis.

The research objectives were achieved through a combination of literature review and field studies using various data collection methods. The results of the research provide new insights into the factors that influence the urban form of villages in central Iran (the Isfahan and the Yazd provinces), and the findings and conclusions are presented in the thesis. In figure number 193 the research logic behind the thesis is presented.

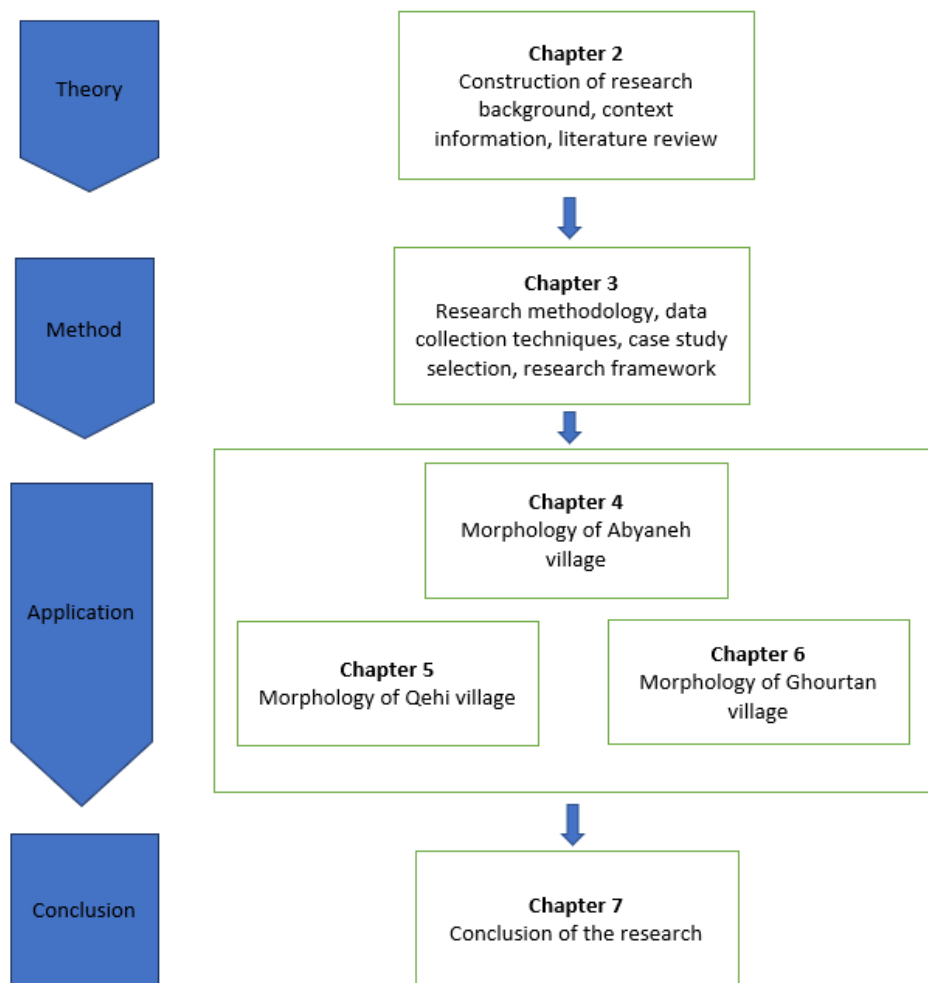


Figure 195 : Plan of research structure, by author

The research revealed that the formation of cities and villages is not exclusively influenced by environmental factors such as climate, but also by non-environmental factors, including religion. This finding emphasizes the significant role played by religion and culture in shaping the urban form and architectural styles of villages. It suggests that the study of the development and evolution of these communities should take into account these important factors, which were not adequately considered in previous studies that mainly focused on architecture alone. Therefore, the findings indicate that a comprehensive understanding of the various factors shaping the form of villages necessitates the consideration of both environmental and non-environmental factors. The research makes a clear contribution to the field by demonstrating the important influence of non-environmental factors on the

form of villages and architecture of buildings. The objectives and summary of results by thesis are presented in Table 12.

objective	results
Main influential factors on different types of villages - To explore how the primary cores of the villages have been formed -To explore how the villages' forms have been developed through history	Climate Water Religious and culture -Primary core of the case studies has been found -The direction and development of the case studies has been explained
Explore and classify what are the environmental and non-environmental factors affecting villages form	Climate, water, topography has been classified as environmental and Religious, culture, security and ownership as non-environmental factors
Examine how the environmental and non-environmental factors have affected the village morphology	The factors were evaluated in chapter four, five and six, with different maps and drawings in different layers and resolutions (blocks, passages, plots) for each village.
Recommendations about assessing the current state of each case study and making necessary suggestions to benefit the country's heritage.	Promoting sensible heritage tourism, increasing residents' knowledge about their heritage, implementing government plans that consider various factors, and making suggestions for future studies are all important steps in preserving cultural heritage.

Table 12 : Research objectives and results

7.4 Significance and Contributions of the Research

The present thesis is a significant contribution to the field of urban morphology in Iran, with a specific focus on historic villages that have received limited research attention. It brings important contributions to the documentation of cultural heritage, sustainable development, tourism potential, community empowerment, and academic knowledge. By offering valuable insights into the urban morphology of Iranian villages, this thesis establishes a solid basis for further research, policy development, Village

management and practical applications in the fields of architecture and urban planning. The research presented in this thesis contributes to the advancement of knowledge in urban morphology, as elaborated in the following sections.

7.4.1 Contribution to Research Methods

The methodology employed in this study emphasizes urban morphology elements and makes a valuable contribution to the field by offering a systematic and structured approach to examining the physical form and structure of traditional villages. By identifying and analyzing specific elements such as building typologies, street patterns, and architectural features, this methodology helps reveal the underlying design principles and cultural influences that have shaped the morphology of these villages. Consequently, it enhances our understanding of the distinctive characteristics and heritage value of these settlements.

Furthermore, this study introduces a qualitative approach to the field of village morphology, allowing for a more profound exploration of the cultural significance and social dynamics of small villages. Through field observations and interviews with both locals and experts, the researcher gains firsthand insights into the lived experiences, community traditions, and social interactions within these villages.

Chapters 3 to 6 of the thesis establish and utilize methods based on three key elements of urban morphology (form, resolution, and time), which can be found in all studies (Moudon, 1997). In this thesis, we encountered a challenge in developing a method that encompasses the elements of urban morphology, specifically tailored for small villages with traditional forms within the context of Iran. Nonetheless, we successfully overcome this challenge by devising a method that entails creating plans at different scales while placing emphasis on specific factors relevant to each village. Through an investigation of three villages in the study, our framework demonstrated its applicability to small villages.

The use of maps and drawings as a research tool is a useful method, as it provides a spatial context for the study. By utilizing various maps, the researcher gains insights into the evolution and spatial organization of the villages over time or for each factor. Maps aid in identifying patterns, blocks, and connections between different elements of urban morphology, thereby facilitating a comprehensive understanding of the physical layout of the villages.

7.4.2 Contribution to Theory

The thesis enhances our academic knowledge and understanding of urban morphology, specifically in the context of Iranian villages. Through rigorous research, data analysis, and presentation of findings, it expands the existing body of knowledge in this field. This research serves as a valuable resource for future studies, facilitating a deeper comprehension of the urban morphology of villages in Iran.

Moreover, the thesis makes a notable theoretical contribution by delving into various factors and reasons that influence village morphology, thereby augmenting the existing knowledge base. It includes a comprehensive comparison of urban morphology of different types of villages in center of Iran, which not only aids future research in other regions of the country but also provides a valuable tool for refining methods to understand the diverse forms of villages across this region.

One of the key contributions of this study lies in the introduction of the concept of 'non-environmental' factors within the field of urban morphology theory. By conducting extensive library research and expert interviews, the study brings attention to the significant impact of factors such as Mahramiat on the development of urban forms. While previous investigations predominantly focused on religious and Mahramiat factors at the architectural scale, this study illuminates their broader importance and highlights the necessity of considering them in research endeavors on larger scales, particularly in the context of urban environments.

This fresh perspective builds upon established theories of urban morphology and underlines the imperative of incorporating these non-environmental factors into future planning and design efforts. The study reveals that Mahramiat and other related cultural factors play a crucial role in shaping the physical and spatial characteristics of cities. Consequently, understanding and incorporating these factors into urban planning can lead to more comprehensive and contextually sensitive designs, addressing the social, cultural dimensions of urban spaces.

7.4.3 Contribution to Action

A field study conducted in central Iran has made a practical contribution by enhancing the understanding of cultural heritage. The thesis underscores the significance of preserving cultural heritage and highlights the imperative of safeguarding traditional urban and architectural characteristics. It emphasizes the importance of incorporating local solutions that align with the environmental demands and cultural values of the community in future planning endeavors. This research draws attention to the value of maintaining the cultural identity of these settlements in the face of modernization.

Understanding the urban morphology of Iranian villages can unlock tourism and economic opportunities. While overtourism can have detrimental effects, such as overcrowding and overuse (Damjanović,2020), the absence of tourism altogether appears to pose even greater risks. The thesis has shown that the historical fabric in Abyaneh, which relies on tourism income, has a much better maintenance level compared to other cases.

The findings of this research have significant implications for both the Cultural Heritage Organization and the Housing Corporation organization of Iran, which are responsible for the preservation and development of these villages. Additionally, the residents themselves stand to benefit from the study as it addresses the risks facing their heritage and contributes to the preservation of their culture. Moreover, the study provides a comprehensive understanding of the urban morphology of the main types of villages in central Iran, further expanding the field's body of knowledge.

The research provides valuable insights into the primary challenges and issues facing these heritage sites and identifies the necessary actions to address them. This deeper understanding of the complexities of historic villages and the impact of urban morphology on their preservation and renovation is a critical step forward in ensuring the protection and conservation of these valuable cultural heritage sites. The study also discusses the effect of current government plans to avoid future mistakes.

The findings of this study hold value for architects and urban designers who have previously lacked exposure to the work of urban morphologists in the realm of heritage villages. Consequently, this investigation has yielded a deeper comprehension of the significance of urban morphological research in enhancing awareness of the historical fabric and traditional settlement patterns in both urban and architectural design.

7.5 Analysis of Current Situation: Insights and Future Recommendations

The present study has revealed a concerning state of protection and preservation of the historical fabric in the studied villages. Despite this, it has been observed that the level of protection and maintenance in Abyaneh is comparatively better than the other villages. This improvement is attributed to the implementation of various restoration and protection measures in Abyaneh. Similarly, although to a lesser extent, some minor protection and restoration efforts have been carried out in Qehi. However, the situation in Ghourtan village appears to be more alarming, with the lack of adequate protection and preservation measures. This highlights the urgency for the implementation of effective measures to

address the preservation and maintenance of the historical fabric in these villages, particularly in Ghourtan and Qehi.

The increased recognition of Abyaneh village as a tourist destination in recent years has had a significant impact on the local community. The influx of tourist income has heightened awareness among the residents of the valuable cultural heritage present in the village, leading to an increased appreciation for its cultural significance. This increased appreciation has, in turn, driven preservation efforts, with the government playing a key role in these efforts, despite limited resources and funding. While these preservation measures may be small in scale, they have had a positive impact on the preservation of the cultural heritage of the village.

In contrast, the conservation efforts in the village of Qehi have been inadequate and insufficient to protect the valuable cultural heritage present in the village. The government has taken only minor measures to preserve the cultural heritage, which have not been enough to adequately protect the important historical buildings in the village. As a result, many of these buildings are in danger of being lost forever, posing a threat to the cultural heritage of the village and the region as a whole. The need for increased conservation and preservation efforts in Qehi is therefore imperative to ensure the protection and preservation of the cultural heritage of the village for future generations.

Ghourtan has received even less attention and virtually no preservation or restoration measures have been implemented. Evidence of neglect can be observed in the form of extensive damage to the village's fort, caused by both natural disasters and human intervention. The lack of attention paid to the village can be attributed to the country's general disregard for both the tourism industry and the protection of historical monuments. Furthermore, insufficient information has been provided to the residents, and the private sector has not shown interest in investing in the preservation of the village.

In the development of the new units, no attention has been paid to the local about the importance of this heritages, especially in the case of Ghourtan and Qehi, where the flat land around the historical core has been largely expanded in an unplanned manner. The historical fabric of Qehi has been almost lost between the two new parts of the village. Ghourtan Fort is also being destroyed. In the case of Abyaneh, the situation is to a certain degree better. The new fabric, though worthless, has spread far beyond the historical center.

The rapid construction of new residential areas in villages has tragically neglected the preservation of cultural heritage. This is particularly evident in the villages of Ghourtan. In Qehi, where unplanned development has resulted in the loss of much of their historical fabric. The flat land surrounding the

historical core in these villages has been extensively developed, with little regard for the preservation of cultural heritage.

The situation in Ghourtan is equally concerning, with the iconic Ghourtan fortified being ignored in new development plans and construction. This lack of attention has further contributed to the decline of the fort, putting the village's cultural heritage at risk. In contrast, the village of Abyaneh has seen some improvements in preservation efforts, although the new construction that has spread beyond the historical center is of little value, characterized by a uniform exterior design.

It is imperative that the local communities be made aware of the importance of cultural heritage and that preservation efforts be prioritized in all development projects. This will ensure that the valuable cultural heritage of these villages is protected and preserved for future generations.

Village	Quality of protection and maintenance	Tourism income	Awareness of value	Government measures	New development impact
Abyaneh	Relatively better	Increased recognition as tourist destination	Increased local awareness	Some benefits from limited measures	Better than other villages, but new construction is of little value
Qehi	Minor protection and restoration	No significant recognition	No significant increase	Insufficient efforts, buildings at risk of destruction	Unplanned expansion resulted in loss of historical fabric
Ghourtan	Almost no protection and restoration	No significant recognition	No significant increase	No conservation measures, structures destroyed	Unplanned development resulted in loss of fort

Table 13 :Current evaluation of the selected case studies, by author

7.6 Evaluations of Government Plans

The government has introduced a plan for the villages and entrusted it to consulting engineering companies, which is known as the Hadi plan. The Hadi Plan is a comprehensive strategy that reorganizes and modifies existing structures, while also determining the location and scale of future expansion, and how the land should be utilized for different purposes like residential, commercial, agricultural, and production. Additionally, it takes into account the necessary facilities, equipment, and general needs of the village. This plan approves spatial planning plans, rural settlements, and regional comprehensive plans (Majlis, 2022).

Thus, these plans were implemented by the government with the goal of improving and organizing rural structures in Iran. These plans were designed to thoroughly assess the existing conditions in each village and prioritize its development in a targeted manner. However, there was no specific attention given to the heritage and historical values of the villages in these plans.

Despite being implemented in numerous rural areas of Iran, the outcomes of the Hadi plans have been disappointing. The objectives set forth in these plans have not been fully realized, leaving many rural communities with suboptimal living conditions and inadequate infrastructure. Furthermore, the lack of consideration for the cultural heritage and historical values of the villages in these plans has led to the neglect and decline of these valuable assets.

It is crucial that the government re-examine and improve the implementation of the Hadi plans to ensure that they effectively achieve their intended goals and improve the quality of life for rural communities in Iran, while also taking into account the importance of preserving the cultural heritage and historical values of these villages.

According to Dr. Shieh (2020), almost 80% of the factors in the Hadi plans have not received enough attention, leading to their unsatisfactory outcome. The plans have both supporters and opponents, with supporters believing that they can provide a clear understanding of the village's needs and shape its economy, livelihood, culture, and nature. However, critics argue that these plans require extensive country planning and the consideration of various factors and timing schedules. The meager budgets allocated for the implementation of these plans, combined with the lack of adequate knowledge, have resulted in unsuccessful outcomes.

Teimourimanesh, Eng. (2020), who was in charge of more than 20 Hadi plans and a number of urban projects in Iran, believes that the quality and results of these plans have not been sufficient. He points out that not all necessary factors have been considered, and that the plans have not received enough credit or been useful. He emphasizes the need for extensive country planning with the right timing schedules, taking into account various factors, for the Hadi plans to be successful.

Despite the criticisms, the Hadi plans have created a general and statistical framework, which can be considered a positive outcome. However, to truly benefit from these plans, it is necessary to give them enough attention, allocate sufficient budgets, and ensure that the necessary knowledge and expertise are in place to design and implement them properly.

7.7 Recommendation for Future studies and Limits

The results of these studies should be made publicly available and accessible to decision makers and designers, providing them with in-depth knowledge of the morphological characteristics of development sites and their limitations. In many cases, Urgent action is imperative to prevent the loss of these historically significant structures. This information can then inform the creation of new building proposals in village areas, promoting the harmonious integration of the new urban form with the existing morphological context. For future studies, it is recommended to take into consideration the following points:

- Exploration of other types of villages in the region, as well as in other regions throughout the country.
- Given the significant number and value of these heritage sites, it is crucial for the government to implement national research projects with well-defined objectives aimed at documenting and preserving these heritages for future development plans.
- Emphasis should be placed on documenting the most valuable and endangered heritage sites, in order to preserve their history before it is lost forever.

The limitations of this study were largely due to restricted access to key government reports and materials, such as aerial photos and architectural plans. Furthermore, the pandemic created significant challenges, including difficulty in accessing case studies, restricted site surveys, and legal restrictions

that prevented visits to the interiors of many buildings. These limitations impacted the research methodology and posed significant obstacles to the collection and analysis of data, resulting in a less comprehensive examination of the subject matter.

This research delves into the morphology of villages in a specific region of Iran, analyzing the main factors that have contributed to their development over time, including both environmental and non-environmental factors. By employing urban morphology techniques, this study provides a comprehensive understanding of the various types of villages in the region, which are an integral part of Iran's cultural heritage and require preservation for future generations.

Moreover, this research offers a qualitative investigation into the fields of urban morphological study and urban design. The methodology employed holds great potential for closing the gap in knowledge concerning the urban morphology of historic villages in Iran, and underscores the importance of preserving these sites for future planning.

Given the numerous heritage sites at risk of being lost or forgotten, it is recommended that local authorities prioritize commissioning university-led research projects to extensively study these villages. Conducting these studies at scale would provide a comprehensive documentation of the current state of these villages, which can serve as a foundation for future protection efforts.

Ultimately, Iran boasts a rich history and diverse array of villages and cities scattered throughout its vast territory. To ensure that these invaluable cultural treasures are not forgotten, it is imperative that we conduct further research and documentation for preservation purposes. Additionally, by studying the solutions that were devised by previous generations throughout history, we can incorporate these lessons into our future planning efforts, thereby safeguarding the authenticity of these settlements.

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Appendix A - Villages Names

The following is a list of the 43 villages that underwent review during the initial stage:

- | | |
|---------------|--------------------|
| 1. Abyaneh | 23. Kahang |
| 2. Amiran | 24. Kelishad |
| 3. Anarak | 25. Kharanaq |
| 4. Anarestan | 26. Khashooyie |
| 5. Arjak | 27. Khom pich |
| 6. Azhie | 28. Khorchan |
| 7. Bagherabad | 29. Khor |
| 8. Barz | 30. Khooydak |
| 9. Chamnoor | 31. Khozaq |
| 10. Dare bid | 32. Komjan |
| 11. Doorak | 33. Matin abad |
| 12. Esamieh | 34. Mazraekalantar |
| 13. Fahraj | 35. Mazraeshoor |
| 14. Garmeh | 36. Mesr |
| 15. Gharetape | 37. Mirjafar |
| 16. Ghourtan | 38. Mollabashi |
| 17. Qehi | 39. Saryazd |
| 18. Harizeh | 40. Sarv |
| 19. Hanjan | 41. Varposht |
| 20. Iraaj | 42. Yarand |
| 21. Izadkhast | 43. Yek Langi |
| 22. Kafran | |

The following is a list of 15 villages that were selected for study and visited during the second stage of the case study selection process:

1. Abyaneh
2. Anarak
3. Arjak
4. Ashin
5. Esamieh
6. Fahraj
7. Garmeh
8. Ghourtan
9. Qehi
10. Iraaj
11. Izadkhast
12. Kharanaq
13. Khashooyie
14. Saryazd
15. Varposht

Appendix B – Abyaneh maps

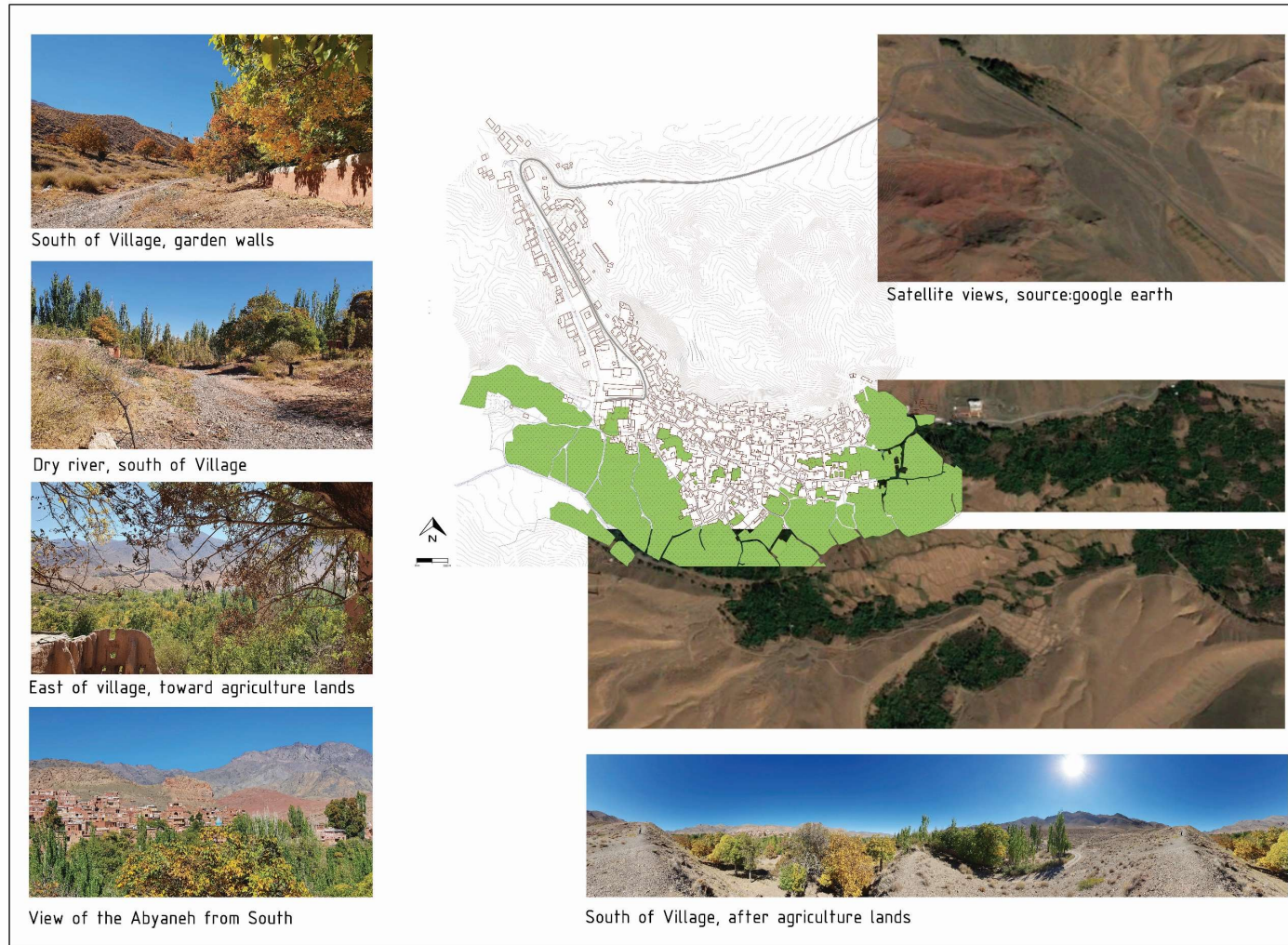


Figure 73: Abyaneh and its harmonic form with the sounding environment, map was drawn based on published map by Miras organization, photos by author

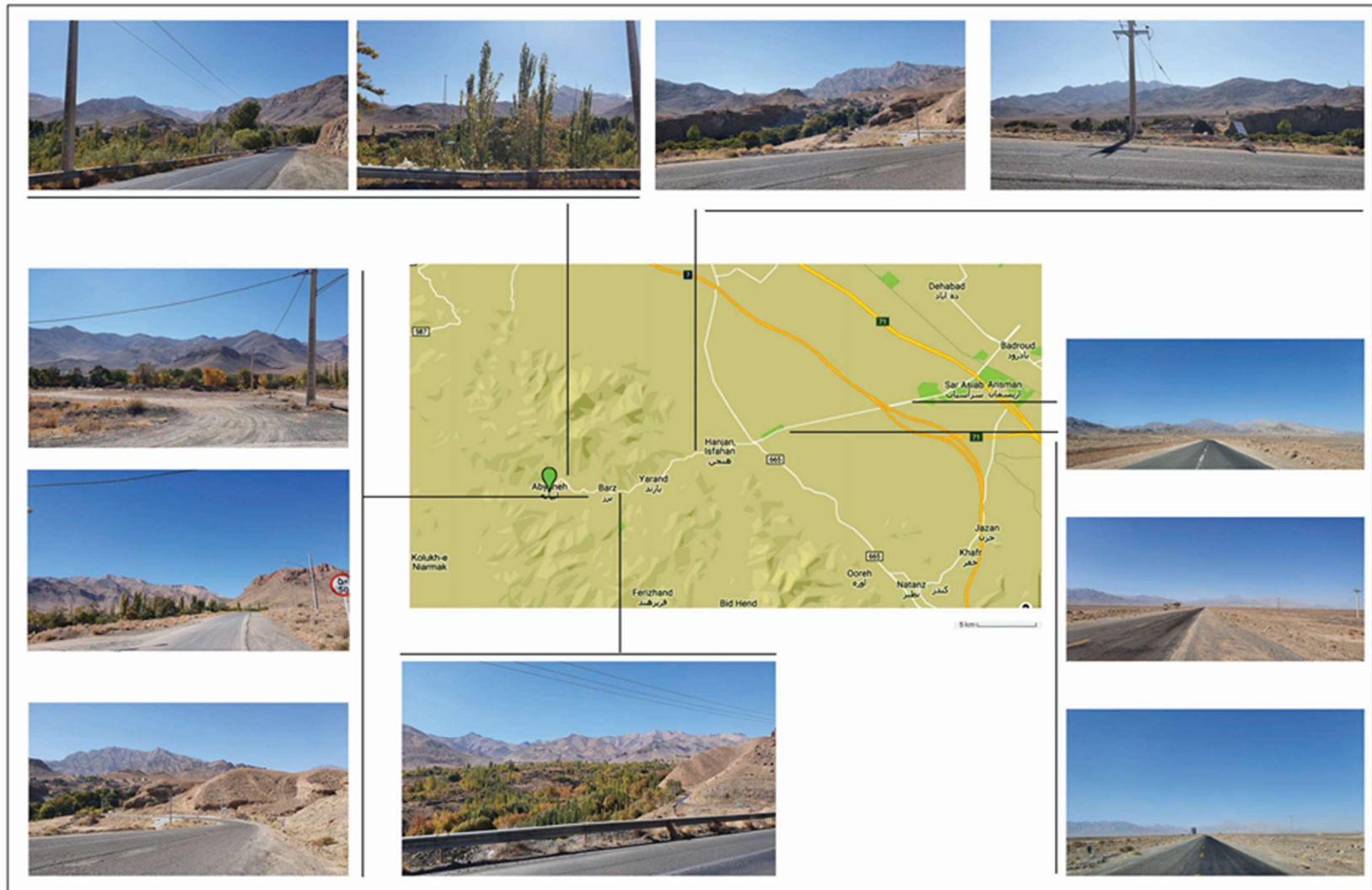


Figure 75: Road towards Abyaneh, from exit of the highway to the village, photos by author, map from google

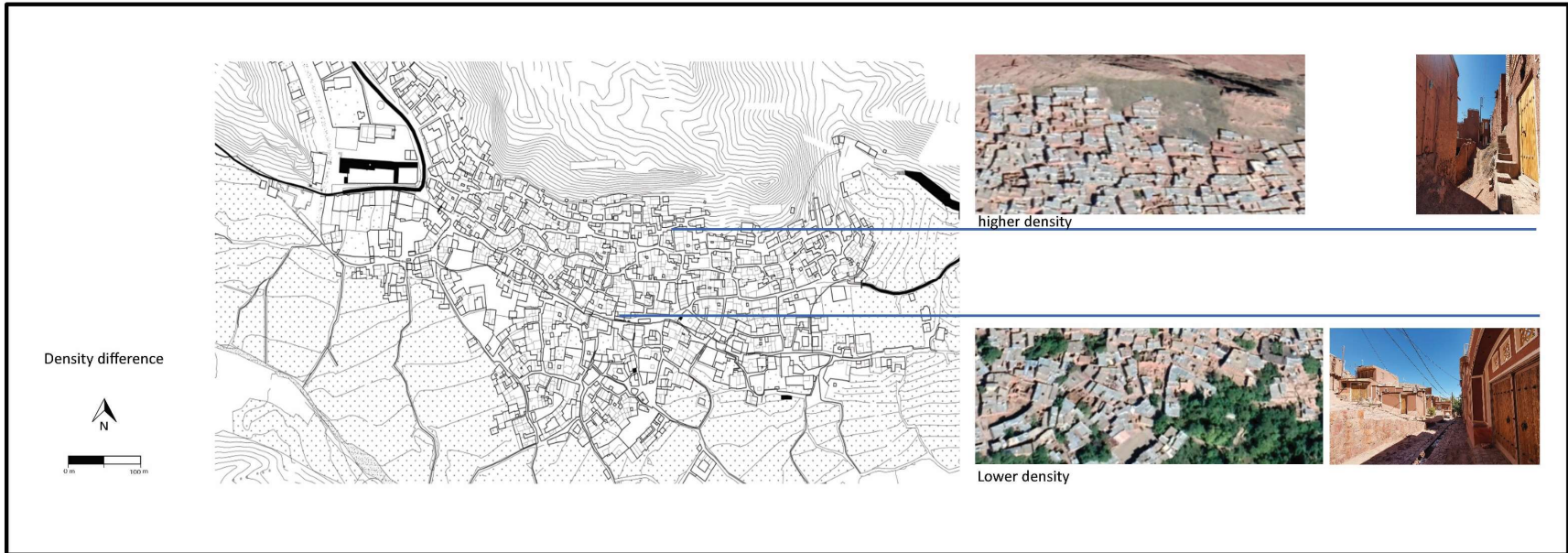


Figure 79: Different density of construction in Abyaneh, satellite photos by Google, photos by author

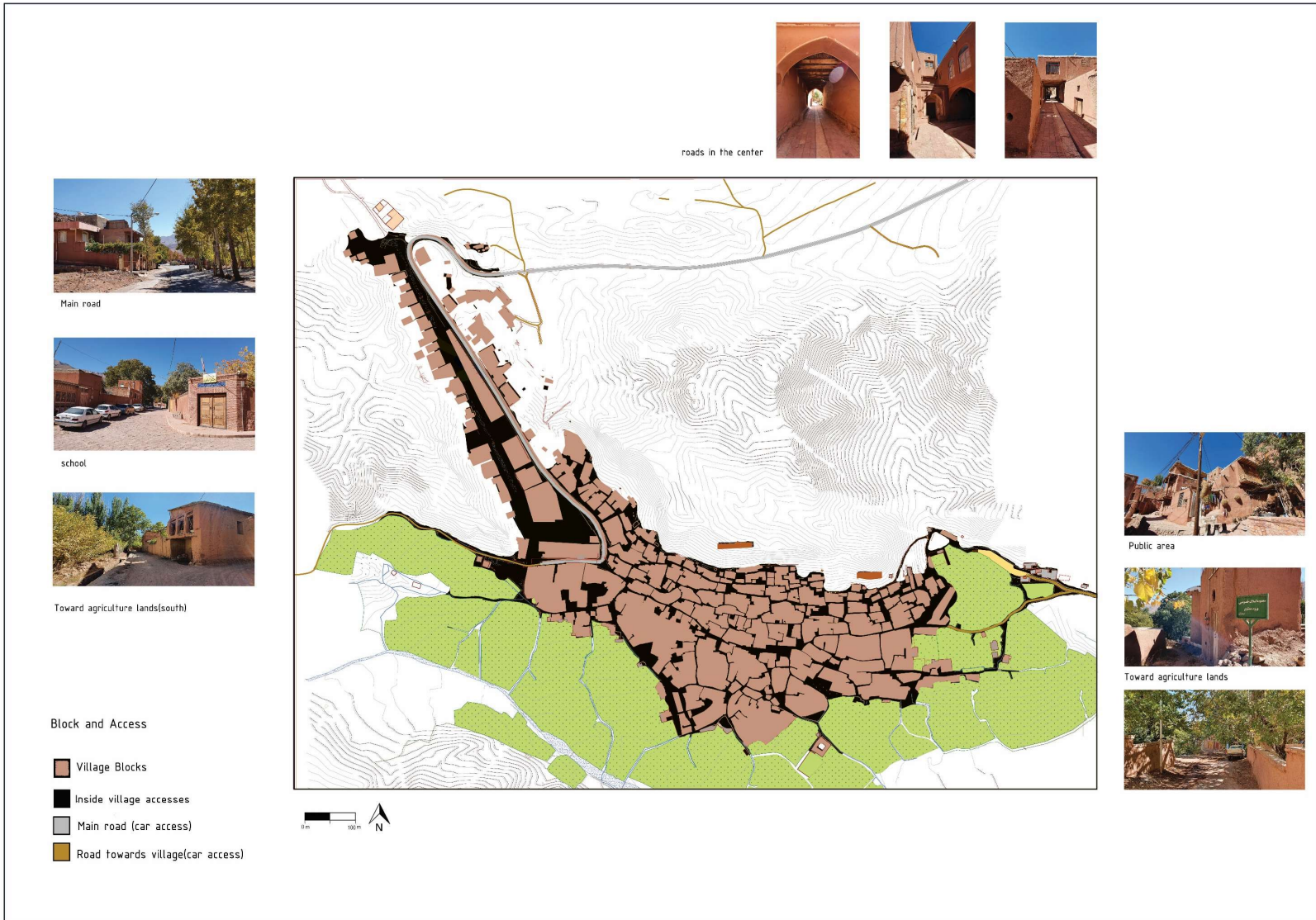


Figure 82: Blocks and access in Abyaneh, photos by author

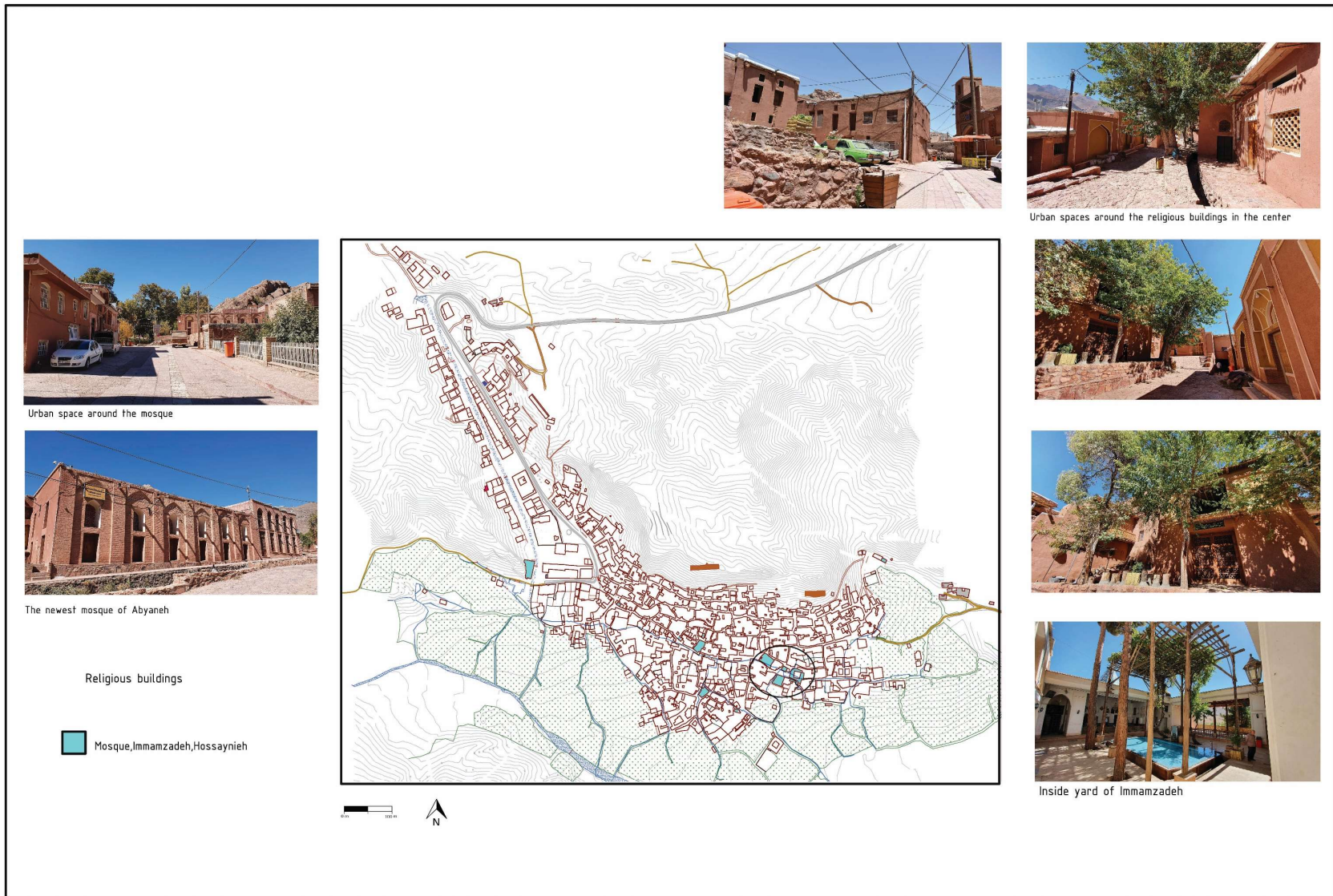


Figure 84: Religious buildings of Abyaneh

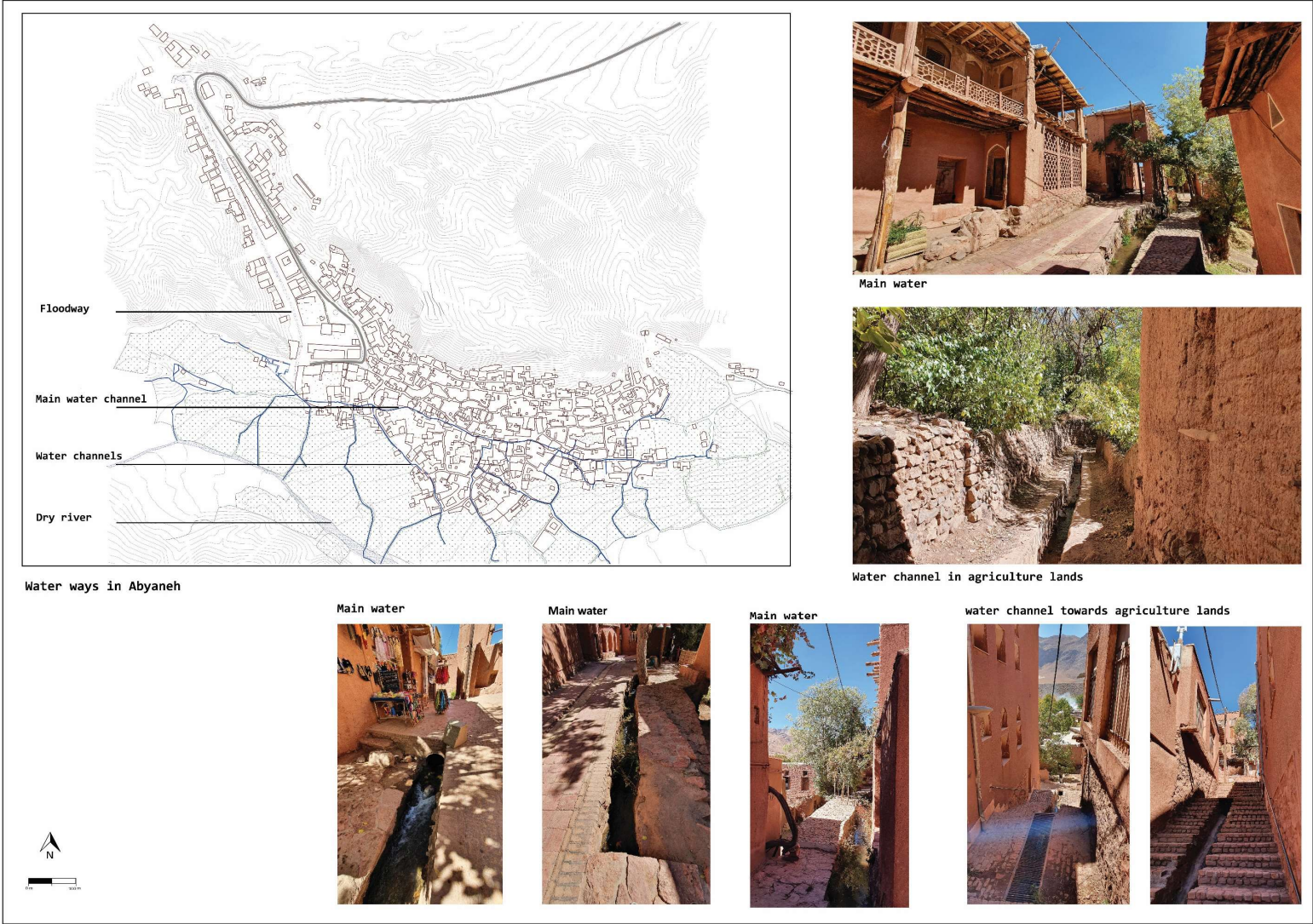


Figure 86 :Water in Abyaneh, by author

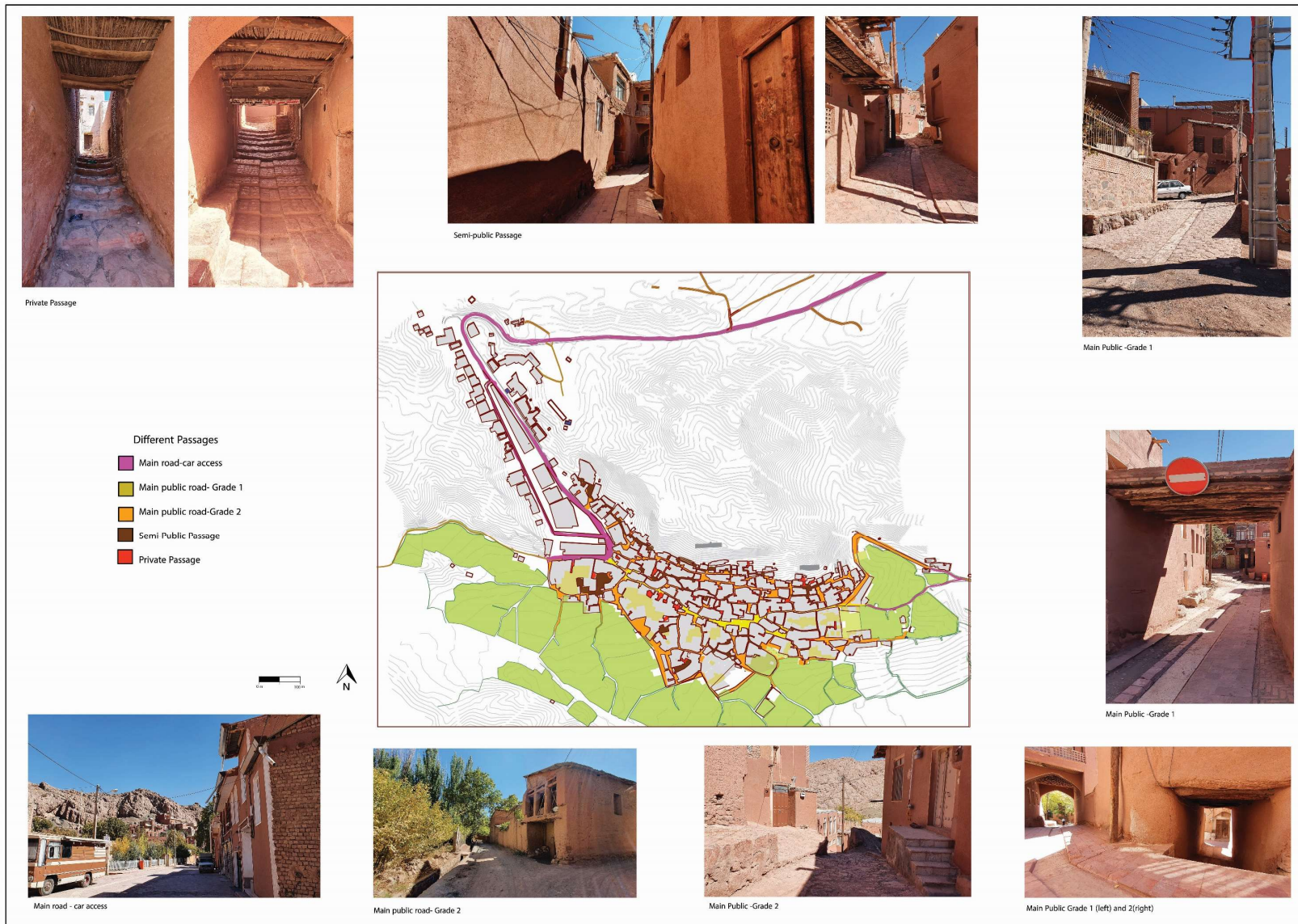


Figure 88: Different types of passages in Abyaneh, by author

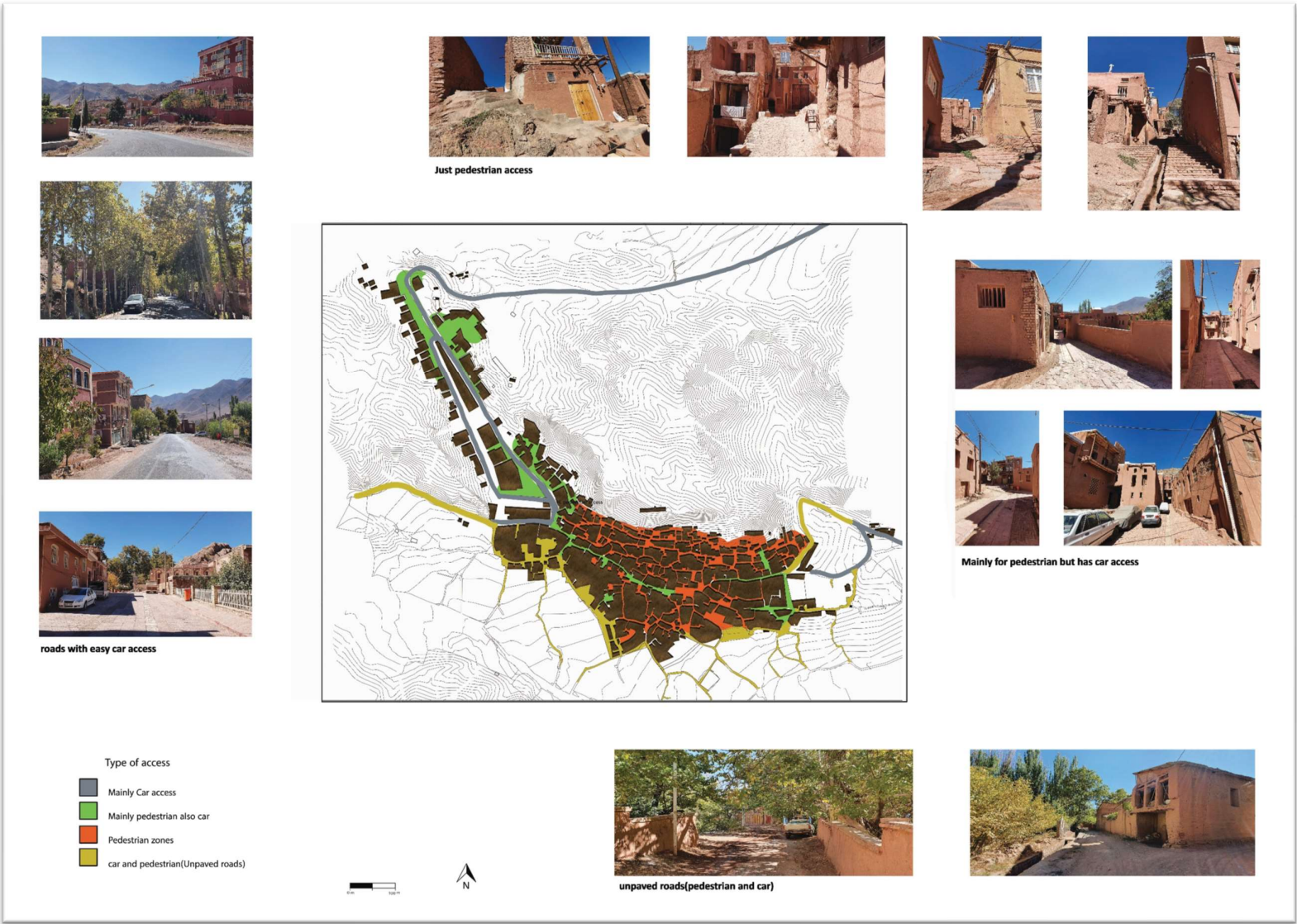


Figure 94: Accessibility in Abyaneh: Cars and Pedestrians, by author



Figure 95: Location of Sabaats in Abyaneh by author

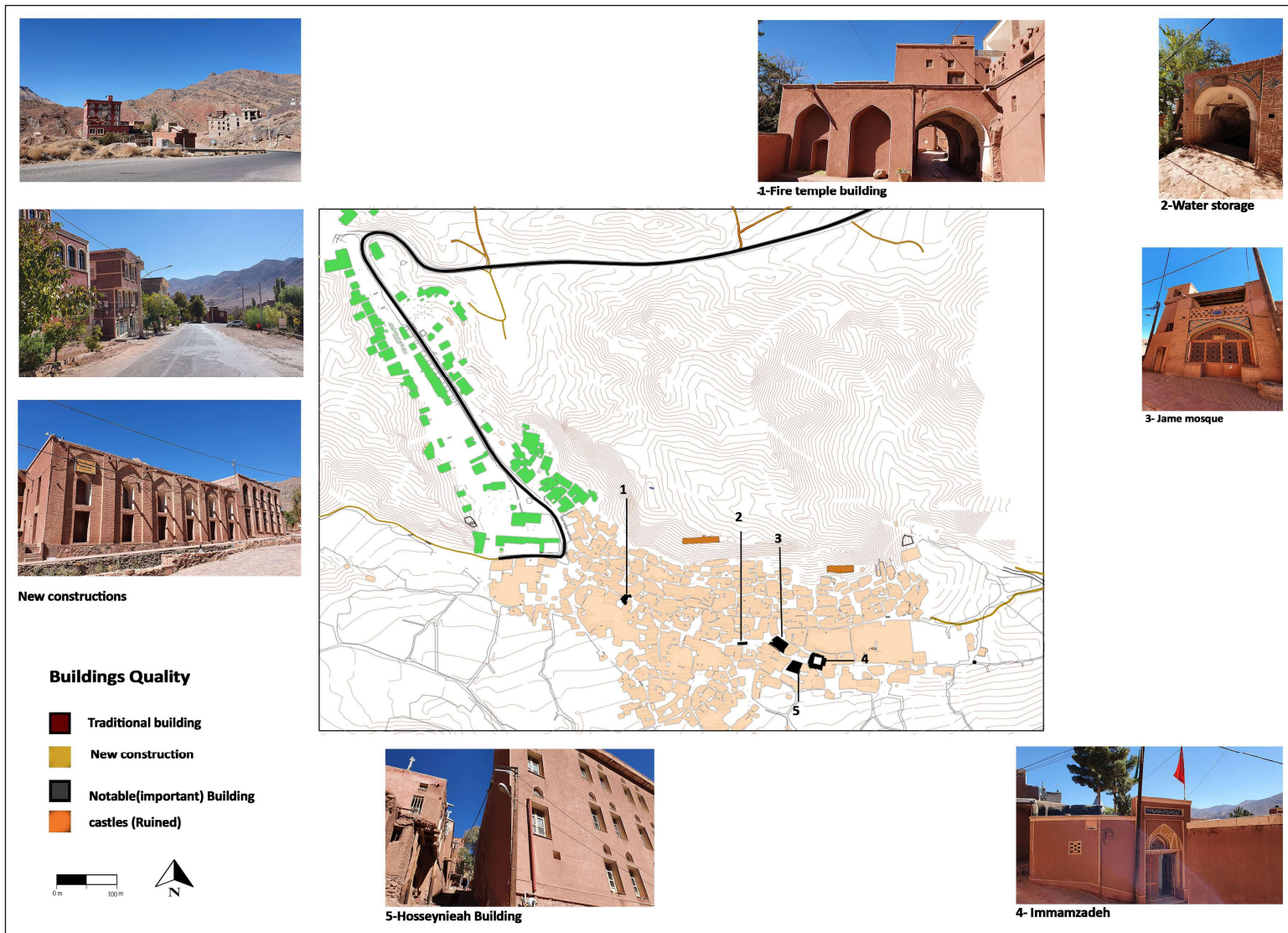


Figure 101: Building quality in Abyaneh, by author

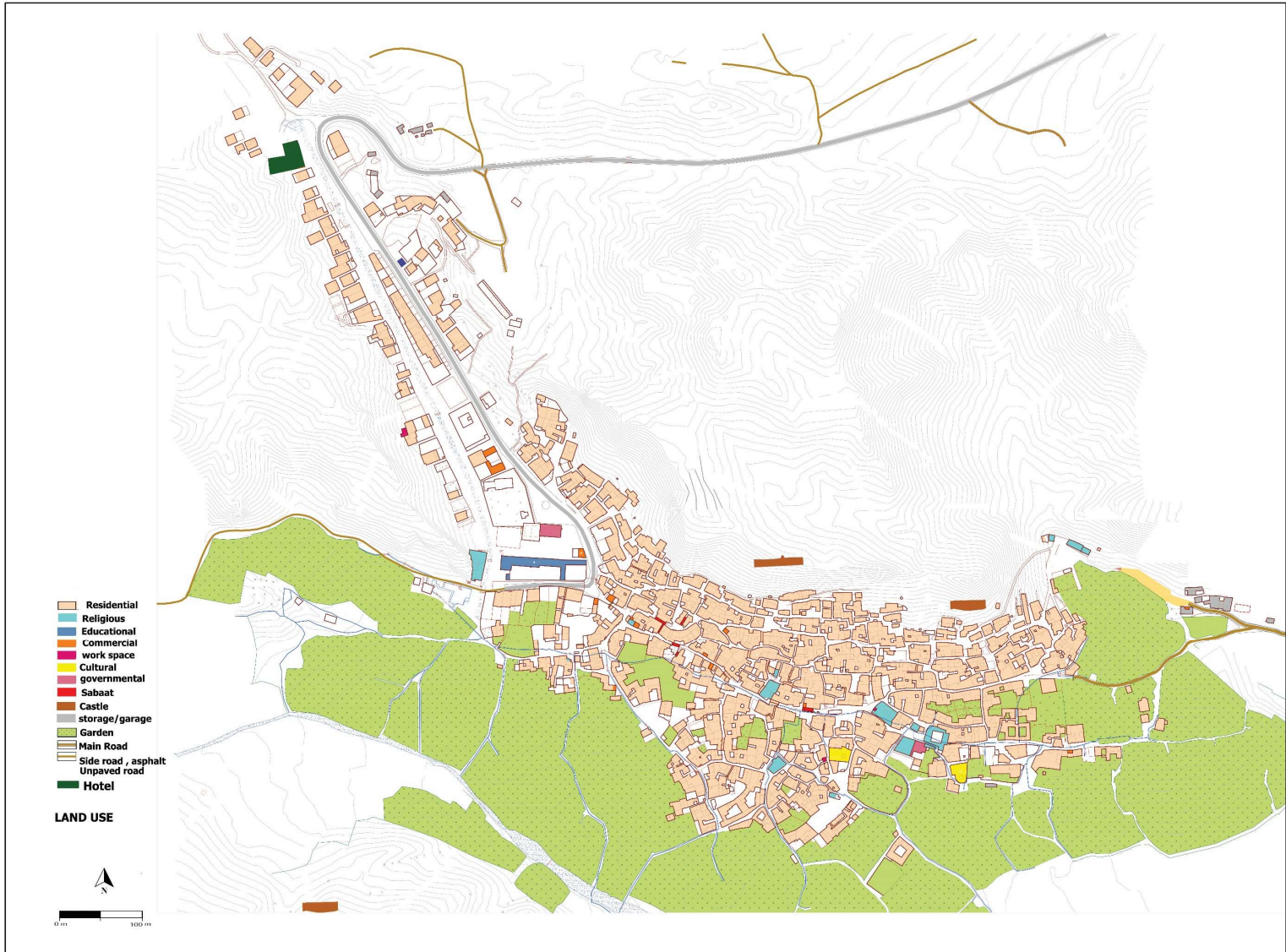


Figure 107: Land use map in Abyaneh, edit and draw by author based on Map of Miras organization

Appendix C – Qehi maps



Figure 114: Roads towards Qehi, photos by author

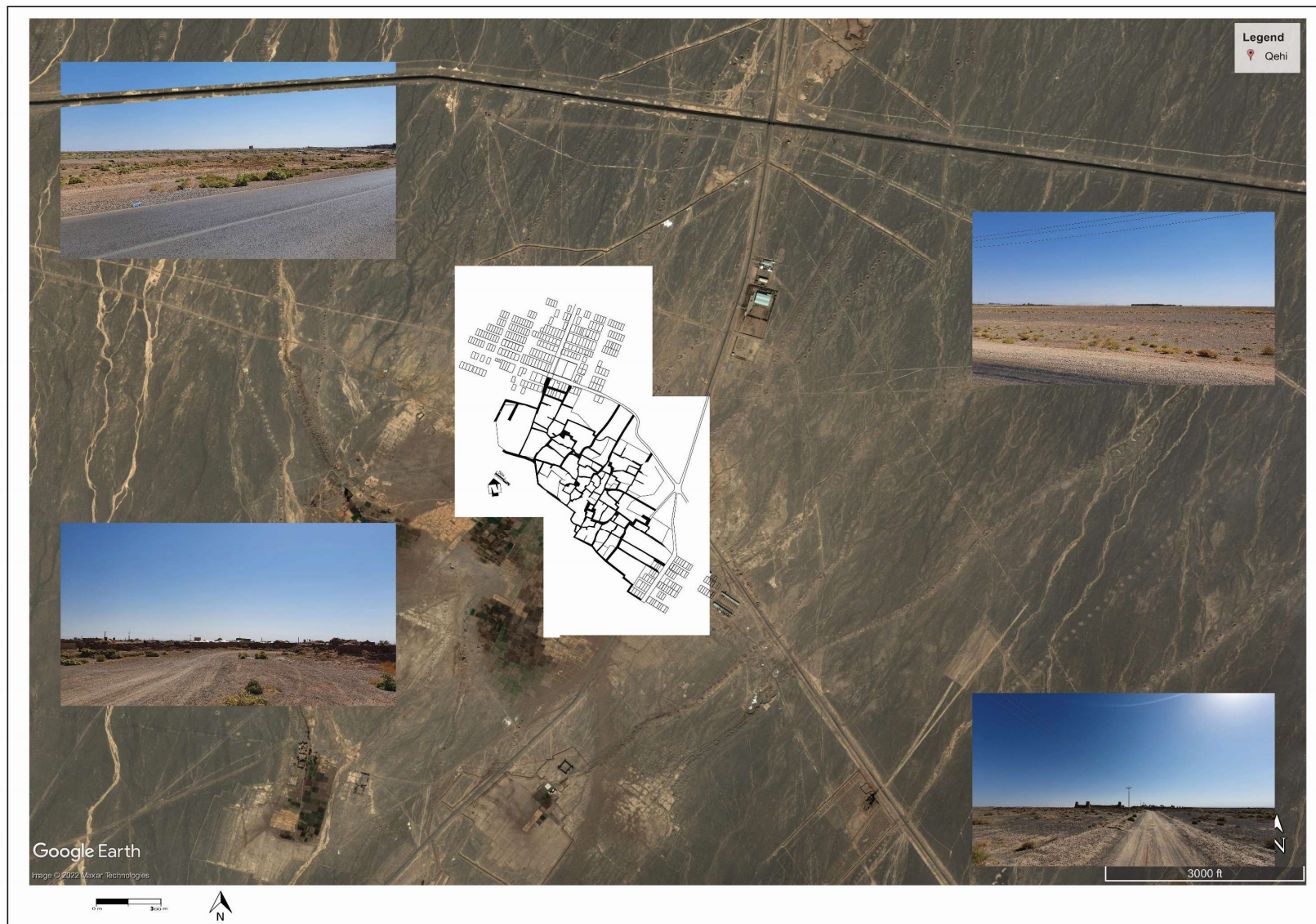


Figure 115: Nearby environment of Qehi, by author
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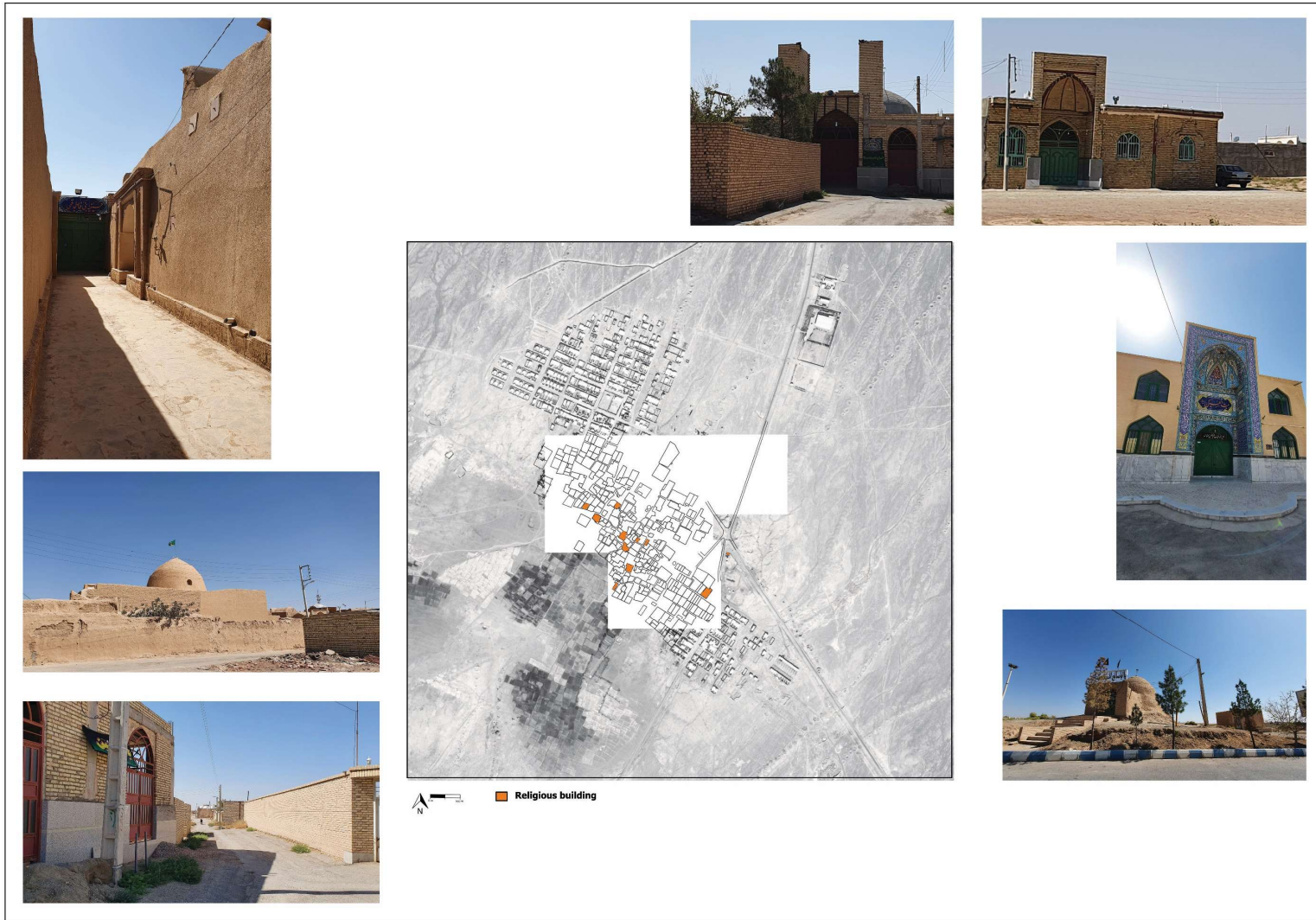


Figure 127: Religious buildings in Qehi, by author



Figure 130: Water in Qehi village, by author

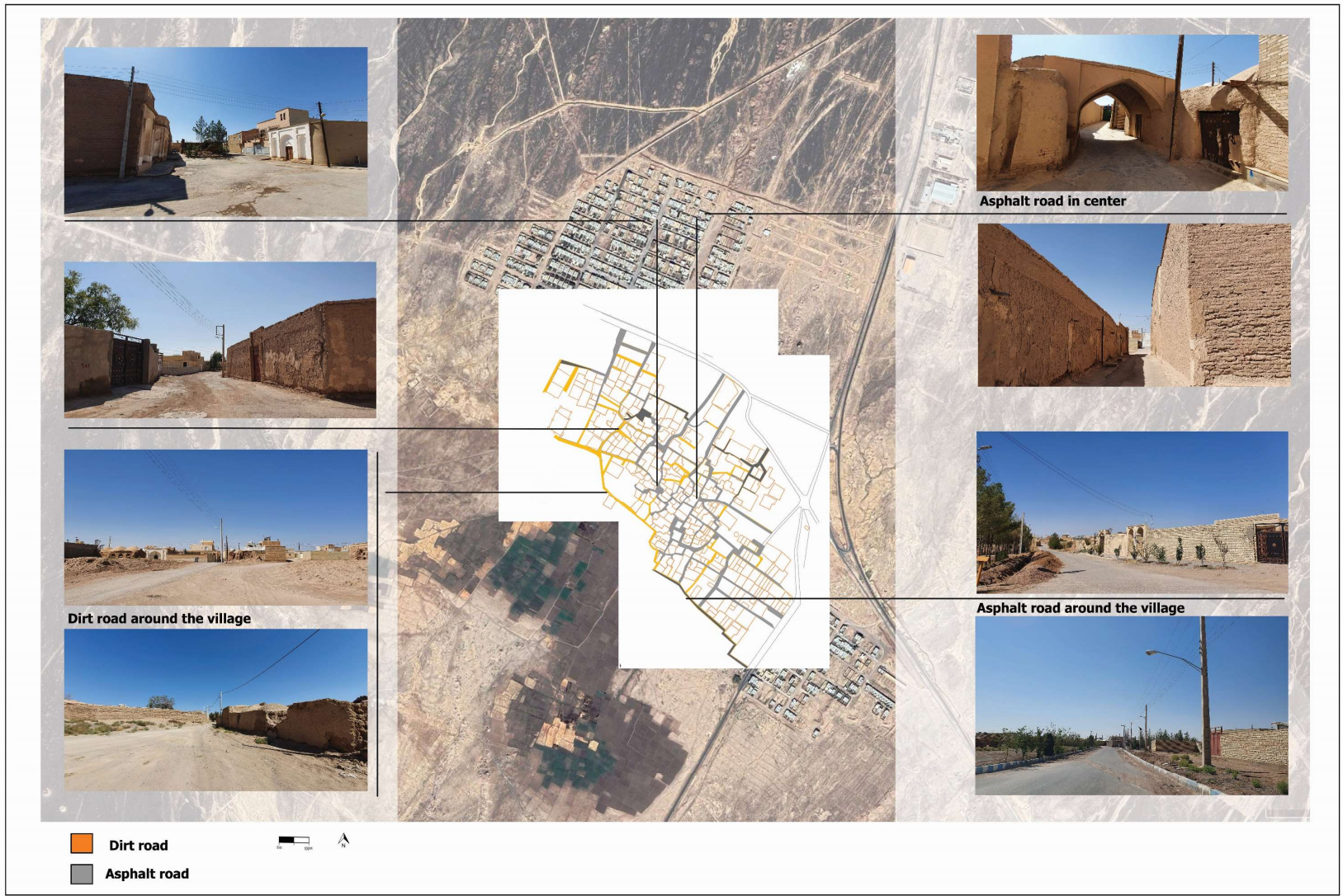


Figure 131 : Road cover quality in Qehi, by author

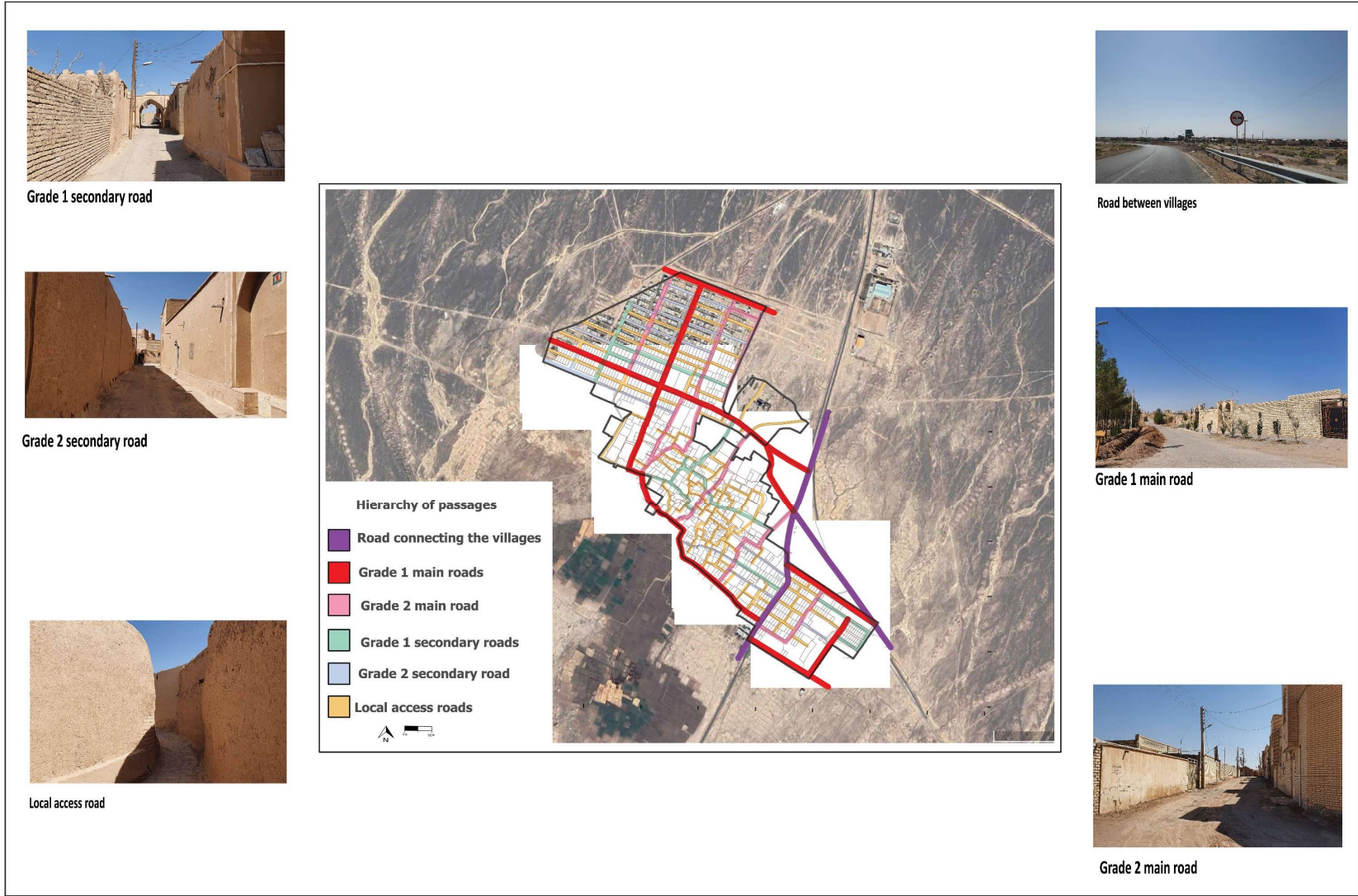


Figure 137: Hierarchy of passages in Qehi, by author

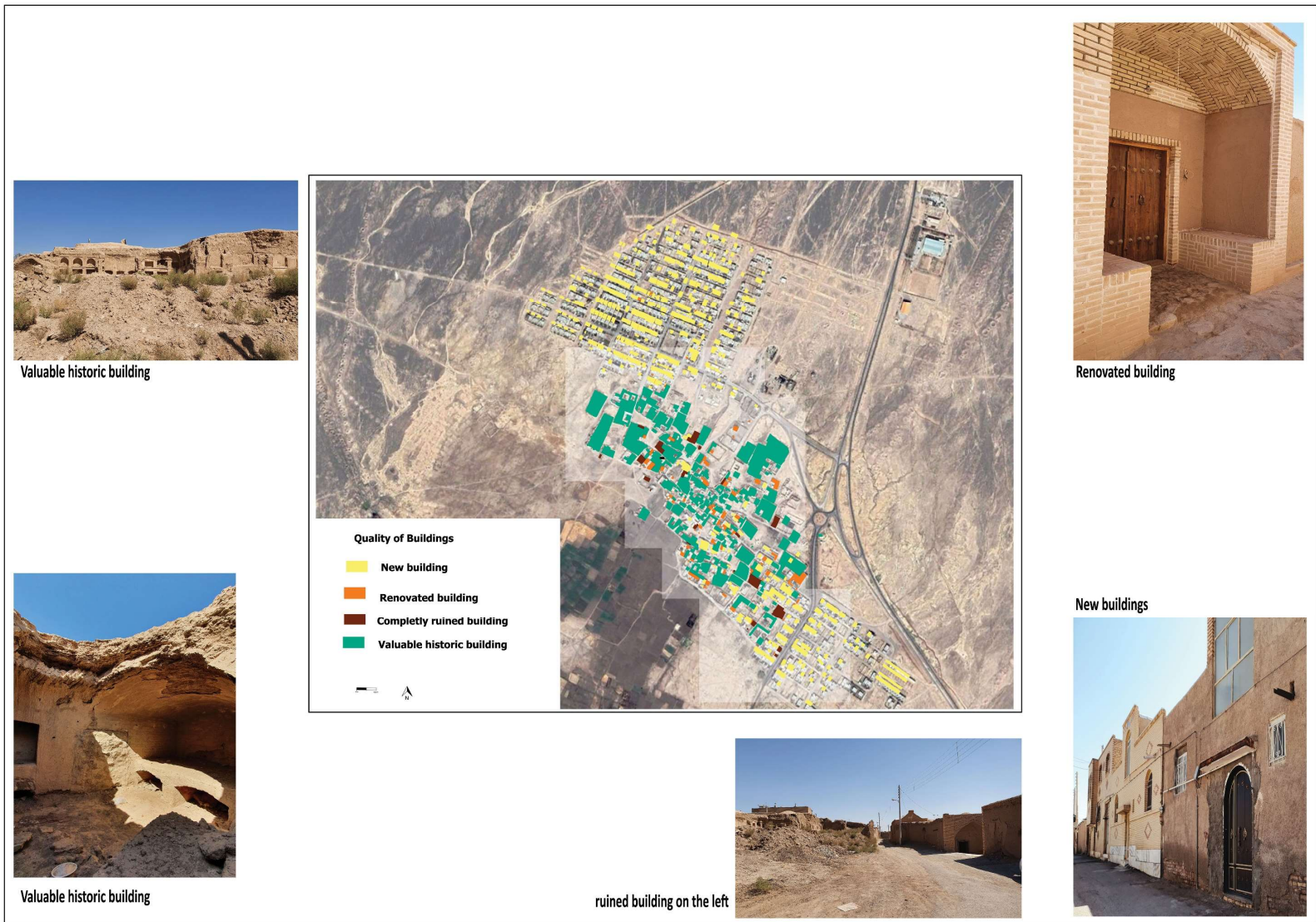


Figure 148: Quality of buildings, by author



Figure 155 : Land uses in Qehi, by author

Appendix D – Ghourtan maps



Figure 172: Blocks in Ghourtan, by author

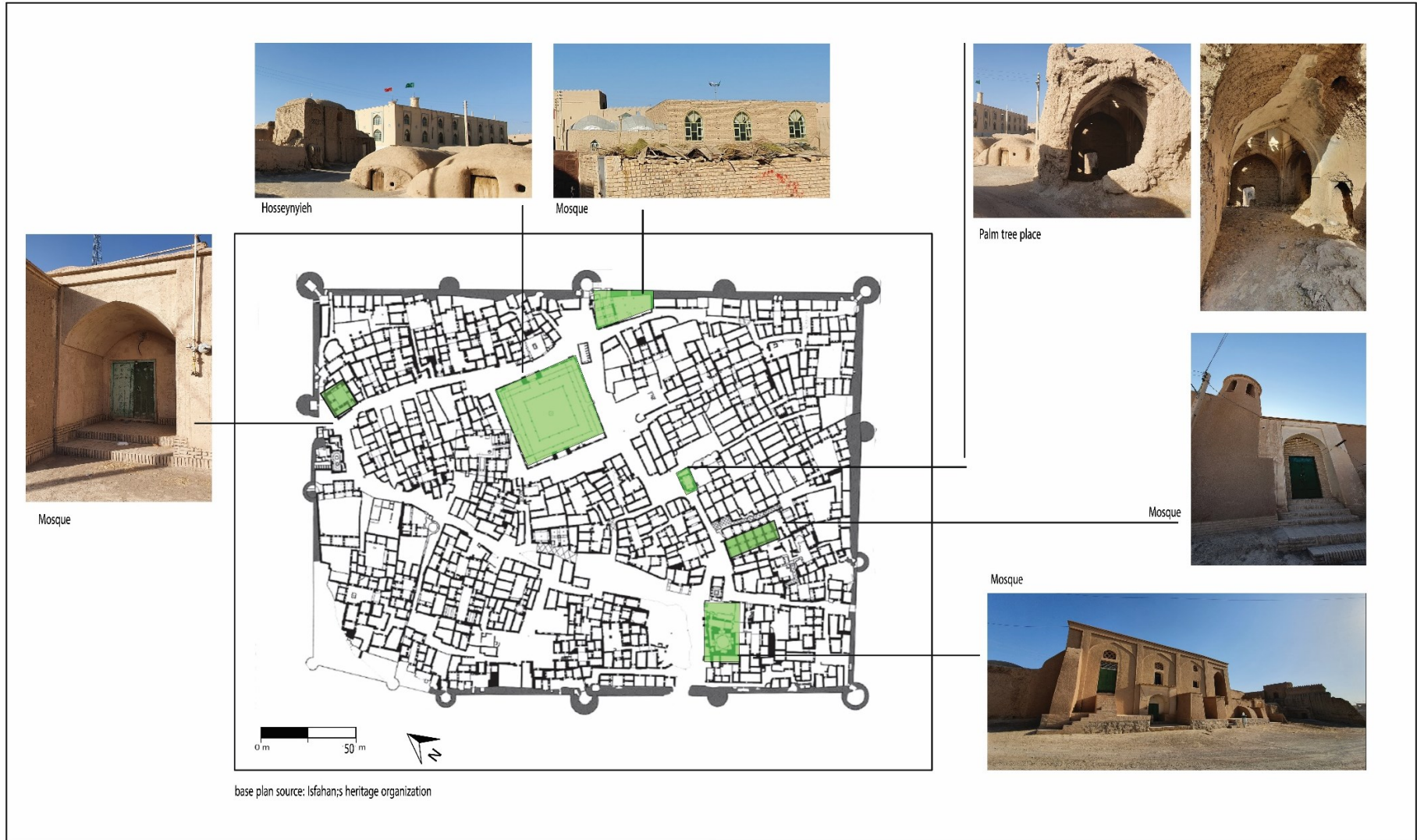


Figure 173: Religious buildings in Ghourtan, by author based on the map by Miras organization.

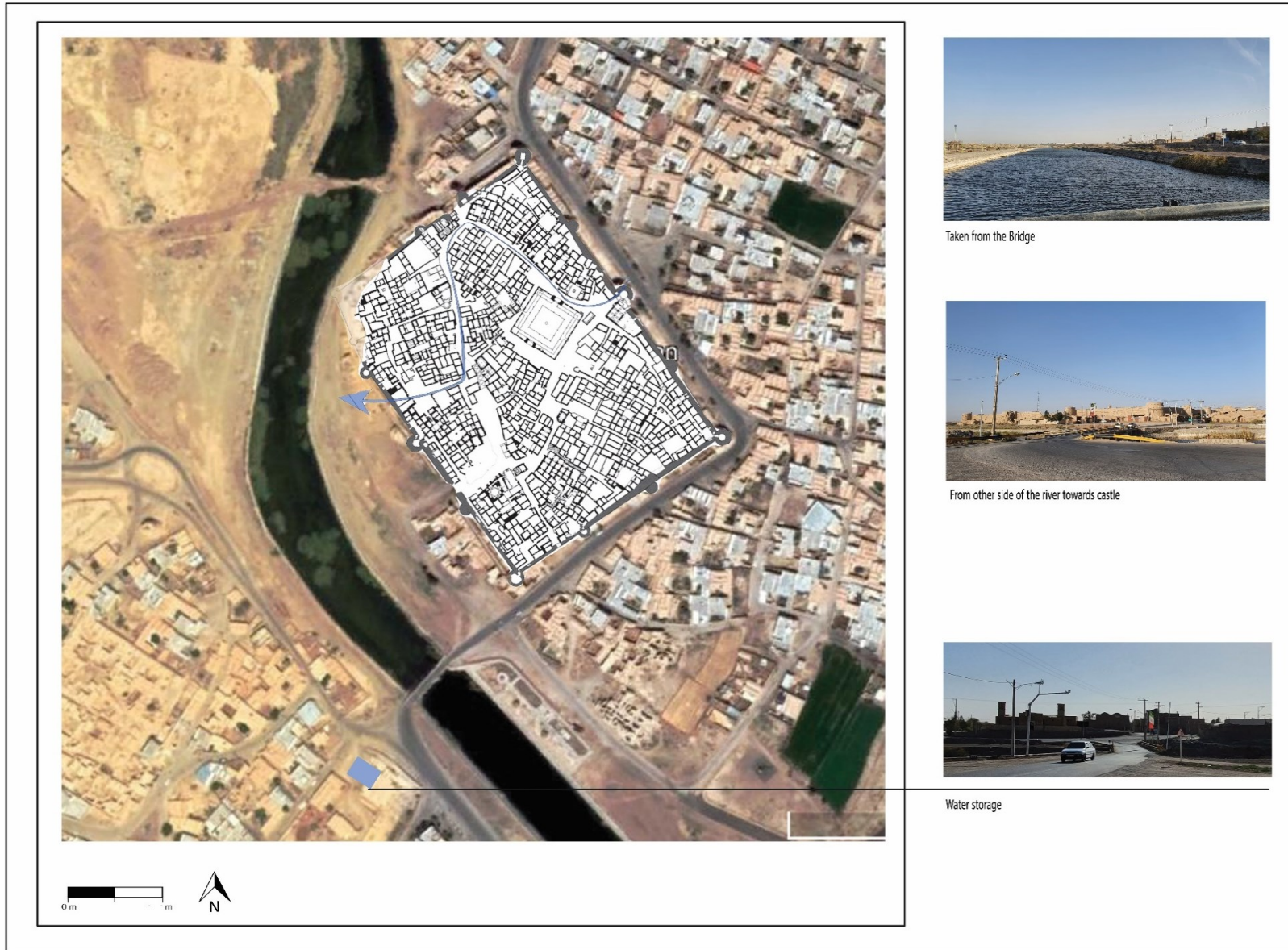


Figure 174 : Water in Ghourtan, by author



Figure 176: Roads in Ghourtan, by author

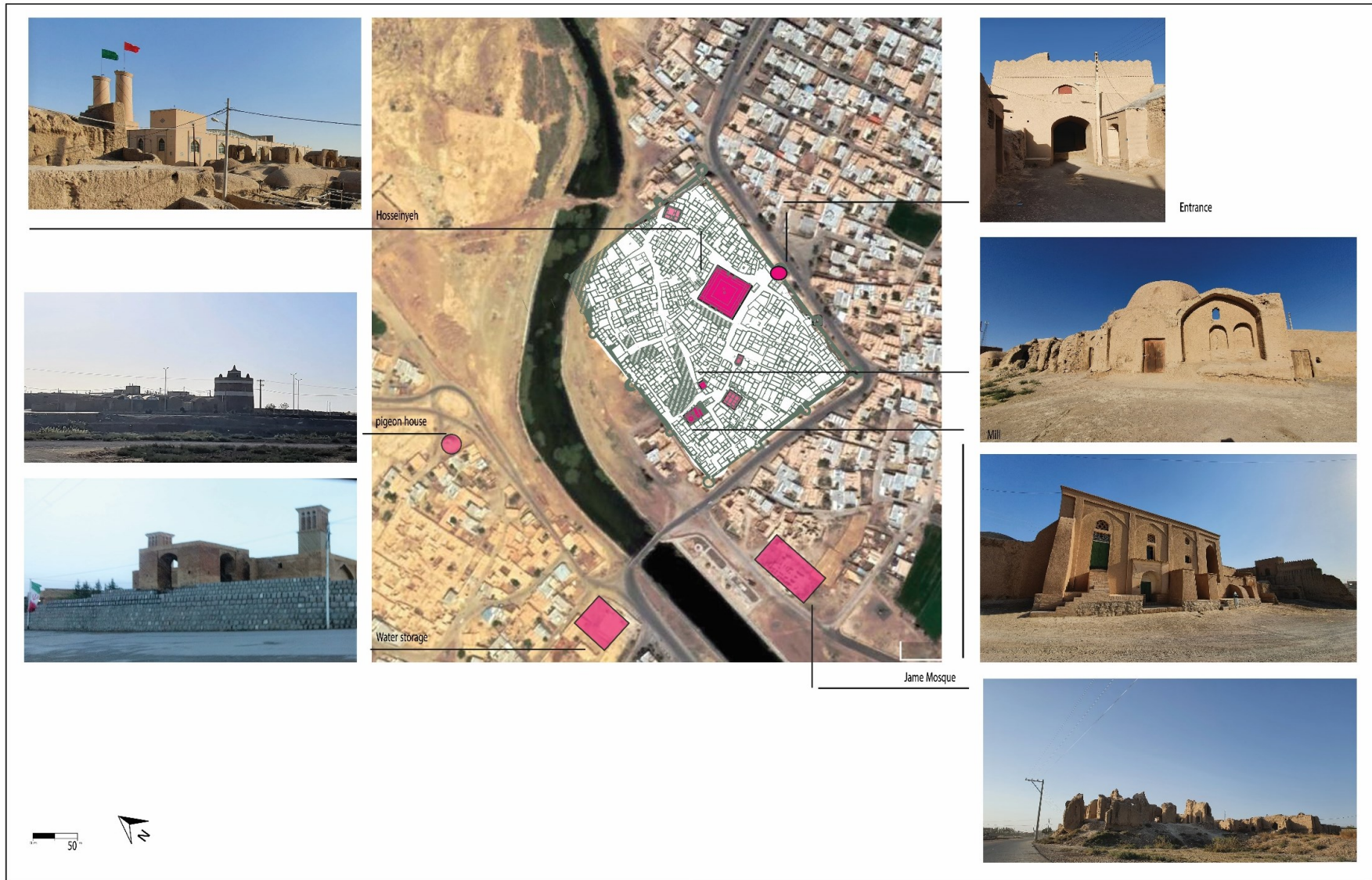


Figure 186: Notable buildings in Ghourtan, by author