ABSTRACT

Nowadays, response to the environmental issues today is missing. It is vital to inspire from building tradition, however it has completely been forgotten. As it is mentioned in chapter 1, the particular patterns and principles in vernacular context bear sustainability opportunities. They have been designed with particular respect to the natural environment more than anything else. And also behind every piece that they have created, they have ideas and concepts, which reflect their local cultures, traditions and life style.

In chapter 2, it is mentioned that each context has numerous potentials, which have different parameters such as, climatic and geographic constraints that they need different particular solutions. Each solution has a different concept beneficial, to catch their goals, in other words, they design according to their needs to getthe benefit of their living environment as well as close surroundings.

In chapter 3 and 4, the role of identity in designing spaceswithin cave dwelling is clarified. Importance of evolutions in formation of cave dwelling and role of habitation in this kind of settlement is discussed. Identity of creating spaces in cave contexts is essential because there is a single thought behind every piece, which brings comfortable living conditions to the living environment. Creation of spaces is with consideration of climatical and geographical factors and also availability of material within the context in order to get rid of practical failure in living conditions. Therefore, their main goal is bringing real life to the buildings. Identification of vernacular Kandovan architecture in Iran is mainly based on culture and religion and

also their capability of solving natural problems within the context, which have been discussed in chapter 4.

Form and characteristics of Kandovan dwelling are backbones of all design characteristics, identity and concept of the settlement, which have been created naturally. And also identity of creating spatial order in, interior spaces with considering the importance of the cultural concepts in every part has been conducted in analysis chapter.

Role of protection and privacy are fundamental identity of the dwelling that made occupants to shift their life style and culture to the skirt of mountain to fulfill their needs with highest range of respect to the environment in another important issue in discussion chapter.

In conclusion,the distinctive Kandovan architecture and its spatial identity, which are developed according to the contextual needs and traditions, by considering natural issues are thoroughly identified and particular concerns for future development are also discussed in this thesis.

Keywords: Cave dwelling, vernacular architecture, Kandovan, Iran

ÖZ

Günümüzde, çevresel sorunlara karşı geliştiren yanıtlar yetersiz kalmaktadır. Çağlar boyunca gelişmiş olan yapım geleneği, gelecek yapı çözümleri için örenek teşkil edebilmesine rağmen, ihmal edilmektedirler.

Bölüm 1 de belirtildiği gibi, yöresel yerleşimdeki mevcut deneyimler sürdürülebilir öneriler taşır. Yöresel mimari, doğal çevreyle uyumu dikkate alarak gelişmiştir. Bununla birlikte, geliştirilen her mimari detayda, yerel kültürlerin, geleneklerin, hayat tarzlarının, fikir ve konseptlerin izleri görülmektedir.

Tezin 2. bölümünde, yöresel mimarinin taşıdığı potansiyeller ve değerler; örneğin, iklime ve çevresel etkenlere bağlı geliştirilen özel mimari çözümler tartışılmaktadır. Her çözüm, belirli hedefleri yakalamak için geliştirilmiş faydalı farklı bir kavram içerir. Diğer bir değişle, bunlar, gerekli ihtiyaçlara cevap verebilecek şekilde tasarlanmış yaşam ortamlarını yakın doğal ve yapılaşmış çevreyle ilişkisini gözeterek geliştirilmiştir.

Sonraki bölümlerde ise, mağara yerleşimlerinde mekansal kimliğin gelişimine etken faktörler incelenmektedir. Mağara yerleşimler ve konut alanları tipolojileri, ve ayrıca geçirmiş oldukları evrim de aynı bölümde tartışılmaktadır. Mağara dokusu içerisinde, mekansal kimliğin oluşumu esası teşkil eder. Çünkü her noktada yaşama dair özel mimari çözümler görülür. Böylelikle, kullanılan mekanlar daha rahat yaşam koşullarını taşır. Yaşam mekanları tasarlanırken, iklim ve coğrafi faktörlerin yanısıra yakın çevrede bulunan yapı malzemesinin özellikleri de dikkate alınmıştır. Bu

nedenle, onların ana hedefi, yapılarına yaşamı taşımaktır. İran'daki yöresel Kandovan mimarisinin tanımlanması tezin 4. bölümünde yer almaktadır. Bu bölümde, özellikle sosyo-kültürel ve dini özelliklerinin mimarisini şekillendirmesi tartışılırken aynı zamanda dokudaki doğal ve çevresel sorunların çözüm yöntemleri de derinlemesine incelenmektedir.

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Kandovan konut formu ve özellikleri, doğal koşullarda geliştirilmiş çözümleri, mekansal kimliği ve yerleşim kavramı, ve aynı zamanda mekansal düzeni oluşturmada kullanılan organizasyon biçimi, iç mekan oluşumu, ve kültürel kimliğin mekansal izleri dikkate alınarak bu bölümde tartışılmaktadır.

Aynı bölümde, korunma ve mahremiyet ihtiyacının mekanların gelişimindeki temel rolü ve dağın eteklerinde kendi özgün yaşam tarzı ve kültürünü karşılamak için geliştirdikleri yöresel bina geleneği tartışılmaktadır.

Sonuç olarak, bu tez, geleneklerin ve çevresel faktörler etkisiyle gelişmiş olan özgün Kandovan mimarisi ve mekansal kimliğini ortaya koymaktadır. Kısaca, çevresel ve iklimsel faktörlere en doğru yanıt verecek şekilde, geleneklerin ve kültürlerin etkisiyle, doğal doku içerisinde gelişmiş olan Kandovan mimarisi, bu tezle birlikte aydınlatılmış ve geleceğine yönelik saptamalar ortaya konulmuştur.

Anahtar kelimeler: Mağara konut,yöreselmimari, Kandovan, Iran

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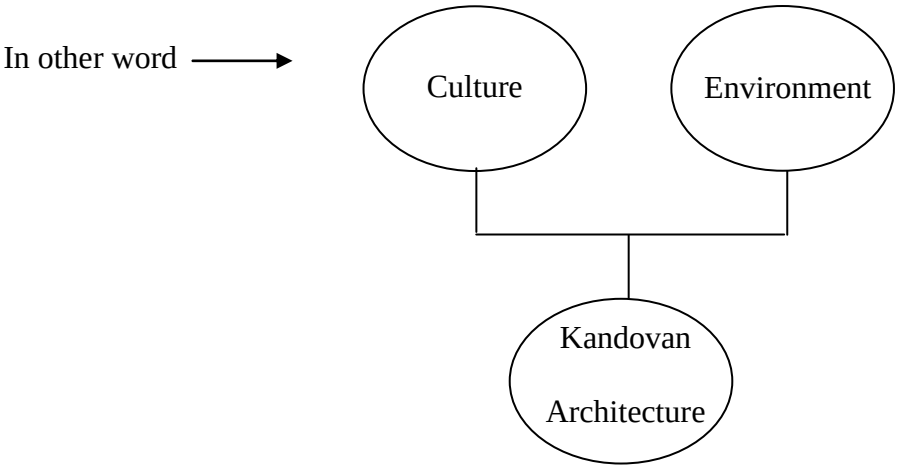
Chapter 1

INTRODUCTION

Concerning peoples need, is always the main issue in every kind of architecture in terms of benefit of living. Therefore, vernacular architecture becomes essential in architecture world. Glassie in 2000 state that: “Buildings, like poems and rituals realized the culture. Their designers rationalized their action differently”(Glassie, 2000). This can show the identity of vernacular architecture in a more strong way. In vernacular architecture despite of other built environment, no architect is involved and no style is adapted to buildings within the context. All the buildings are being designed by local inhabitants according to their needs, whichinvolve the culture they have, and their religion and beliefs and also their economical needs (providing job opportunities). All these mentioned above, affects space organization directly, for instance their occupation could affect the contextual formation in terms of their needs. For example if they are agrarian they need particular place for that, which is part of their life. Each context has different potential, which have different parameters such as, climatic and geographic difficulties that they need different solutions. Each solution has a different concept beneficial, to catch their goal. In other words, they design according to their needs to catch their benefit of living environment as well as surrounding. To achieve successful design they have to develop their design with respect to the physical, social and economical aspects, which includes: culture, religion, economy, lifestyle, gender roles, meaning, social structure, tradition and etc. (Oliver,1990). Concept is essential because there is a single thought behind every piece of their design, which brings comfortable living

conditions inside and outside the buildings. They create spaces with consideration of climatical and geographical factors and also availability of material within the context in order to get rid of practical failure in living conditions (Zargar,2009). Therefore, their main goal is bringing real life to the buildings. In this study, the main issue, which is going to be investigated, is identification of vernacular Kandovan architecture in Iran. That is mainly based on culture and religion and also their capability of solving natural problems within the context.



1.1 Backgroundof theStudy

Kandovan village has specific potential because of its character and formation. It is a setting that has been created with native inhabitants inside the mountain naturally.

They haven't touched the original nature there; they are just adapting their selves to the context. They have shifted their life inside the mountain to protect their life from enemies, and harshness of the weather. They have excavated the pieces of the mountain like a cave and start to live there. As the weather is unbearable on high hills, they have started to produce a solution for that, therefore, they moved inside the caves and lived within the nature (Sabri,2007). Their life style and their culture are different from the other villages in Iran because of the engagement of them to the

harshness of nature. Prominent concept of each unit is the main reason for conducting this research. It has the identity of engagement to the nature. That is the strongest identity of the settlement.

1.2 Problem Statement

The whole village exhibit particular pattern; in other word it is representing similarities all around the environment. Space organization inside the unit is first living room, which contains kitchen as well; the next at the corner of the living room is bed room. All the units around the village share same idea for interior spaces with same quality; just in some cases the size is different. Role of men and women are defined according to their ability, both work inside and outside of the house. The only difference is their occupation (Sabri,2007). These are the general things about this village that in all the books and all the articles related to this topic can be found. What is not considered is the main idea of creation of this village, which is engagement with nature. However is this term sufficient for living? By having a strong concept from nature can they build their living environment in terms of identity? How can they adapt their culture to the harshness of the nature? Is it enough to live inside the cave with their approach of interior space? Is it convenient for them to adjust their lifestyle to the harsh type of living there? What are the main concepts for the space organizations and order?

The only things that have been investigated deeply before were, domestic routines, life style, and culture (includes religion, language, traditions, economy, etc.) and climatical factors. Therefore, nobody look into the identity of the spaces and adaptation of it to the way of their life. The reason why they have preferred to live

inside the mountain, far from flat places? Did they decide to live there by chance or have they been forced by any physical aspects?

1.3 Aims and Objectives

Distinctive character of Kandovan architecture evolves a particular house identity in terms of natural enforcement. The aim of this study is tosimultaneously highlight the characteristics of the solid identification of natural formation of the settlement with consideration of socio-cultural and geographical conditions;in order to discover if their ideas and concepts are sufficient,in terms of environmental values, spatial organization, formation and use of space.

1.4Methodology

Data collection methods in this study are classified as: Literature survey, field survey, observation, interview, semi-Structure questionnaire, taking photos and conducting sketches. These stages have done, according to the problem of the study.

Literature survey have done from books, magazines, guide books, articles, journals, E libraries and DVD from Kandovan, which all of the particul0arly were about Kandovan settlement, general issues on cave dwellings, vernacular architecture, vernacular architecture of Iran mainly and socio-economical factors of vernacular settlements.

1.4.1 Field survey

As field survey, the first thing for understandingKandovan settlement is to observe it and experiencing the atmosphere by walking around the village and getting into their unit. To see the climate, topography, accessibility to the buildings, their culture, life style, language that there are using, quality of interior spaces, organization of spaces, gender role inside and outside their “homes”, traditions and in general the whole conditions of the site. Therefore, without empirical and observation method it is

impossible to conclude anything based on theory on this case. The first and main method was empirical investigation within the field. The situation of the buildings and the way they live had been observed in most of the cases around to settlement in order to find out common solutions and differences between both outcrops and users of outcrops. However by having difficulties of getting closer to their private areas, because of their religion and beliefs only eight outcrops have been investigated deeply concluded with sketch plans and section, the other part of the settlement have been only observed very well. In observation method, photos had been taken from their life within the context, from units mostly from exterior of the spaces, again because of religion restricts. However they were few units, which have been observed both internally and externally by taking photos and sketches from plan organization of each unit to catch their concept of space organization have been conducted. Sample of conducted first sketches arein appendix A.

1.4.2Interviews

Questions were mostly about their job, culture, religion, age, and their problems, their ideas about living conditions, their traditions about marriage and etc. The problems that they have, clarified by themselves in order to have meaning. As they were complaining, the problem and the research gap became more obvious. By having interview with thirty five local occupants the problems started to appear according to their lifestyle. The average ages of the occupants who have been questioned were between 15-55 years old. At the end, problems have been classified into: Cultural, social, traditional, economical, geographical, climatical factors.

1.4.3 Semi-Structure Questionnaire

This stage is also important because of the research. It was semi-structure questionnaire. Each person did the questions by having conversation with author. The questions area was around the problem. They have been asked about their

conditions inside and outside their homes, also their suggestion for development of the village, their facilities within the context, such as health center and education centers. These are the main questions. Generally questions based on their culture and the way of their life in simplest way, such as their occupation, their income, differences between women and men in terms of duties, age of marriage, age of working for both women and men and also their ideas about furnishing interior spaces. Another important question was their satisfaction, in term of living comfort both inside and outside of the outcrops. However some questions have been eliminated after finalizing data'sbecause of the area and focus of the research, such as information's about health center and education facilities and other public functions; in order to have a chance to focus on essence of their private lifestyle by considering their socio-cultural impacts. After all these the next stage is evaluation of the data's, which has been done (For further information see appendix b and c).

1.5 Limitationofthe Study

The first limitation of this study is vernacular architecture, which is referring to rural architecture, buildings without architects. However it is limited in the field of cave dwellings not all kinds of vernacular architecture around the world. Specifically cave dwellings in Iran. The next limitation is identification; this is referring to the ideas of the design not the other things, building and architectural styles. It means that this research is limiting itself to the identity of vernacular features in architecture. The next one is place limitation that is; village of Iran, that is called Kandovan therefore, the scale limitation of it is neighborhood. No other places and no other examples will be explored in this thesis. The desire of the thesis will be concept boundary, of vernacular architecture in Kandovan case in Iran. The other important limitation is cultural issues, which means that the whole study is based on cultural issues of the

Kandovan occupants. It refers to their traditions, life style, domestic routines, politics, socio-economical issues and meaning of their life style.

Another limitation of the study is climatic issues. There are no evaluated facts in the climatic issues. All the information is just general impacts of climatic issues in vernacular architecture.

Privacy is another issue in the limitation. Privacy of the occupants within the case study in terms of religious background is one of the important facts. Religion and their beliefs was a barrier for conducting the drawing with scales. The other difficulty from this limitation was the ignorance of the female habitants of the settlement to be interviewed; therefore only eight buildings have been investigated. The drawings are without scale and they are just sketches.

All the analysis is based on socio-cultural issues and natural formation of the settlement, therefore there is no study on structural characteristics of the units, and moreover there is no concern about structural characteristics of the whole settlement as well.

Although because of the characteristics of the units, which they came naturally and they are valuable in terms of piece of earth and they should be restored in order not be demolished, in this study the focus is the life style of the habitants and their adaptation to the formation of the nature. Future of the study may concern conservation as well, however in this thesis, it is not mentioned.

1.6 Significance of the Study

The role of this research is very important in the contemporary architecture because of the problems that the world is facing today. Response to the environmental issues today is missing. It is vital to inspire from this kind of tradition however it is completely forgotten. Nevertheless it is opposite in vernacular architecture. The whole pattern in vernacular context is sustainable. They have been designed with particular respect to the environment more than anything else. And also behind every piece that they have created they have ideas and concepts that are reflected to their culture and their traditions, their life style and their meaning. This case study could be a good example for presenting its concepts and the identity in a more clarified manner. Therefore, needs of learning from past and adaptation of their ideas to the built environment is vital. That could be adaptation of human needs to the architecture as well, which is very rare today.

Chapter 2

LEARNING FROM THE VERNACULAR ARCHITECTURE

2.1 General OverviewontheVernacular Architecture

Architecture is survival of the mankind (Filarate, 1965). Need of shelter is one of the main issues in architecture even from Adam and Eve period. Therefore, need of shelter because of harshness and peculiarity of earth conditions, which are unbearable, is vital (Ozkan, 2006).

Vernacular architecture has been almost started from the beginning of human life on the earth. It is human constructs, which is mostly related to the social, cultural and economical factors, of a particular society (Lawrence, 2006). In one simple sentence it is: “Architecture of people” (Dincyurek, 2002). Needs of protection from animals, enemies and climate conditions, needs of having shelter and owning a space and also needs of privacy are some of fundamental reason for humans to construct (Ozkan, 2006).

In general vernacular architecture represents the buildings, which arises by native inhabitants by applying local material and techniques (Oktay, 2006).

In other words Brunskill in 1992 point out that: “Vernacular architecture is related to the traditions rather than academic inspirations” (Brunskill, 1992). This defines the fact that the main actors of the built environments are inhabitants and they construct

in unity with the whole context and only with inspiration of the surrounding (Rapaport, 1999).

There are several aspects, which affect built environment in vernacular architecture: “Basic needs, family types, position of women, privacy, and social intercourse” (Rapaport, 1969). These factors are mainly related to the daily needs not aesthetical features in architecture (Rapaport, 1969).

All the things mentioned above are the factors, which are mostly used in all kind of vernacular architecture; however there are more things that formulate the shape of the buildings within the context. They are: culture, economy, geography, climate, housing typology, interior quality, spatial organization, local inhabitants, material use, construction techniques and design characteristics.

2.2 Social and CulturalFactors for the Development of the Vernacular Architecture

The social rules for each community can be named as culture. Or another description can be tradition of each society. Culture refers to many things in one society, the world views of the people within group, their economy their religion and tradition and the comfort type of living for specific area, the politics can be considered as cultural effect of a society because it directly refers to needs of the people, their economy and language. The family cycle and the role of each family member also is an important factor, the other term is meaning in of a certain built environment in their culture and also routines of the domestic people related to basic social unit of society (Oliver,1990). Therefore, culture within any context is an important fact because all the people are directly connected to their culture. Some people are more

flexible and they can adapt themselves to the new culture when they enter however in these cases still the attachment is obvious.

In vernacular development finding out the importance of culture is simple because of the unity of the contextual form. With the help of similarities always it is possible to guess the cultural effect on vernacular contexts(Lewcock, 1987).

2.2.1 Tradition in Vernacular Architecture

Tradition in one sentence means present thoughts and action of a certain society. In terms of transmission of the traditions Paul Oliver states that: "In all societies traditions are valued for the continuity that they symbolized between the past and present. The means by, which traditions are transmitted between generations are fundamental" (Oliver,1990).

Traditions are evidences of existence of settlement organization, rites of utilization, building types, construction techniques, which are specialized by gender roles of the constructors. Also uniqueness of spaces relation of the buildings that represents symbolic values (Dobrowolski, 1977). In general buildings are symbols of a tradition of a society, which handed down from one generation to the next one. The other term is, the skills and the knowledge's, which from the past continued to today and they use the same methods (Oliver,1990).

2.2.2 Meaning in Vernacular Architecture

Meaning in vernacular architecture means message guide from the buildings that help the visitors understand the functions and identity of the building. The meaning can be shared in one community to spread the unity all around there are three levels of meaning the first one is high level that is related to the philosophy mostly. The second one is medium level that is related to identity and status and latent aspect of the setting. The last one is low level that is refer to social situation every day, privacy

and accessibility. The meaning is being used mostly from the second one, medium level because it is related to the identity and status mostly. In general as Paul Oliver illustrate that: “Building becomes a vehicle for the communication of meaning” (Oliver, 1997). In one sentence it could be simplified as symbolyc way of communication whithin different settelments.

2.2.3 Domestic Routines in Vernacular Architecture

Daily activity of people is called domestic routine. These activities are the things that people do every day of their lives such as sleeping, eating, communicating, cleaning, playing and etc. Therefore, they need different spaces for each function such as cleaning need to have place like bath room or eating and preparation needs to have a place like kitchen. The role of domestic routine is obvious here, which shows daily activities directly affected the Vernacular developments(Pader, 1997). “Therefore domestic routines both enable and constrain social life” (Giddens, 1985), in every settlement there are constrains of relationships, which have been affected by domestic routines. Any changes on routines can change the relationships and any changes on the relationships can change the routines therefore, both of them are parallel to each other. By implementing any changes on each of these the function needs are changing as well. For instance, house holders are the ones, who define all the necessity of the functions indide the house. The house with three users has different funtions with the one with more than three funtions. Routines inside the buildings have direct connection with the spatial organization of the spaces, which is different in every house (Pader, 1997).

2.2.4 Gender Role in Vernacular Architecture

“Classifying living things and languages into male and female, it can be defined in terms of social and relationships, behavioral characteristics or symbolic construct of both male and female” (Prussin,1997). Both males and females responsibilities is

called gender role inside the houses. Gender roles is a term for behavioral of each gender in society. Each male and female has different responsibilities and duties inside and outside the house this could affect the building directly due to their responsibilities each character needs to spend time and do his or her duties in that space. Therefore, some functions create according the role of female and male inside the house. For instance for cooking female needs private place to cook it means she needs her own territory the same as for men working outside is always men's responsibilities moreover they need place to rest after all. All these functions are coming out due to the role of people inside the house (Prussin,1990)

2.2.5 Family Typesand Cycle in Vernacular Architecture

Rosin in 1990 indicates that: "Family is level of organization universal in human societies. Often accomplishing the tasks of production and re-production central to the persistence of a social order, the way in, which its core membership is constituted by kinship and marriage are highly variant" (Rosin, 1990).

Family cycle reformed by three main factors: marriages, births and deaths. Houses are small towns, which they have different kind of societies inside. Elements of the society are the people who are using the house therefore their needs are needs of the society. That's the reason for designing the houses according to social needs in order to have the spaces speak with their requirements. In each of marriage, birth and death facts there some rules, which could affect house societies both internal and externally (Oliver, 1987). Therefore family variants are one of the main factors that affect directly the formation of vernacular architecture (Rosin, 1990).

2.2.6 Religionand Beliefs in Vernacular Architecture

An initial definition of religion as SanjoyMazumdar debates that: "Beliefs are ideas of truth or fact without empirical grounded or scientific evidence proof and religion is set of social beliefs (What is appropriate and what is not)" (Mazumdar, 1990).It

means beliefs are set frompeoples believes, that would be achieved by practicing their believes, however religion is grounded by set of beliefs with proofs (Roger , 2006).

Religions around the world have developed as impression of human paths, appropriate lifestyles for a certain society and ideas about "how, where and what activities would enable believers to reach the good in this world and beyond" (Rapoport, 1969). Most religion and beliefs are refers to:

Role of human

Needs of worshiping God

Place of God

Evaluation of ourselves

They are effecting built environment directly and indirectly in vernacular architecture. According to people needs to have placed for worshiping God they need to design the worshiping area in a way that would be visible. The other thing is they are using symbols in their houses to show their beliefs. Therefore, vernacular contexts are being effected by Religion and belief of the people the consciously and unconsciously (Mazumdar, 1984).

2.2.7 Politics in Vernacular Architecture

Politics is fundamental decisions in any society or social group of people and, Anthony King states that: "especially the way resources are distributed, whether by the use of persuasion authority, power representation or physical force" (King, 1990). Politics can be in houses or bigger society from region to region or to state and international society. Politics are always for the beneficial of the users and society therefore, some rules has accepted like forbidden of drinking alcohol in some

countries or using proper clothing. In architecture they have started to build these forbidden things as well, which is called politics in Vernacular development (Aysan & Teymur, 1990). Politics always take place in realm of social life by making some decisions on race, family, education, language, gender roles, culture and etc. To have similar rules in a region therefore, everybody obey those rules and regulation in order to live in an impartial atmosphere. In every society all the rules and politics are different and they are much related to their culture and religion therefore, from their politics also it is possible to understand their culture and way of thinking.

2.2.8 Socio- Economical Issues in Vernacular Architecture

Economy is one of the most important factors in each society because the meaning of it always refers to management of something for instance labor management, house or house hold managements these shows that from the beginning the meaning of it refers to managing everything is based on economy. It has always influences the built environment due to management of the house. In houses that house hold is earning money with agriculture the focus of the building here is designing the field to make money. Or house hold that is earning money by pastoralism and hunting they have to find fertile lands in order to feed their traps. Therefore, it is mostly related to the inhabitants of the particular settlement directly. In order to earn money they have to construct their environment accordingly or they have to choose their living spaces by consideration to their expertise's (Vellinga, Oliver, & Bridge, 2007). Economy is the primary factor that is related with Socio-Cultural issues directly.

2.3Topographical factorson the Developmentof the Vernacular Architecture

Another issue that would be considered in the formation and development of a vernacular context is topography, which is modifying factor not determinate in this study.

Importance of the geography would be more visible while the condition of each context effect the buildings directly. It is about the topographical and physical characteristics of the land. The rural patterns always develop in parallel with the geographical conditions of the site. Most of the time divisions of the lands are based on the level of them from the sea. They are categorized in this way: High land, mid land (hill lands) ,flat land and coastal lands (Ghobadian, 2003).

In the high land settlements the fundamental building material is stone, because of its availability on the mountains.

On the coastal lands the chosen materials are predominantly sand and timber. Use of sand is popular because it's abundances and convinces to the context, and also they use timber to be adapted to the moisture of the whether out there.

Topographical condition is the other fundamental term of a certain land. VahidGhobadian in 2003 states that: "Lumps and dents of a land is called topography, which is appearance of changes on the earth's crust" (Ghobadian, 2003). After all the changes on earth different topography appears which has different types and categories. Some of lumps of the lands became hills and mountain and people created habitation there. Some dents of the earth became oceans, lakes and rivers,

and some of them stayed as flat lands. In vernacular architecture mostly on hill land topographies there are three different typology of living condition according to the comfort of users in terms of accessibility to the nearest water, accessibility to cultivable soil, accessibility to the fertile agricultural land, accessibility to the main transportation roads and finally place of the village mostly constructed on the most safest part of the land (in order to achieve protection from wild animals, natural disasters and potential attack by foreigners). (Figure 1, 2, 3)

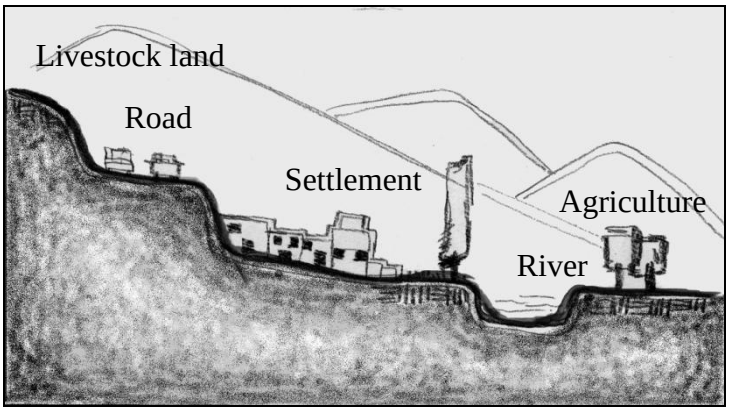


Figure 1: First formation of hilly settlement

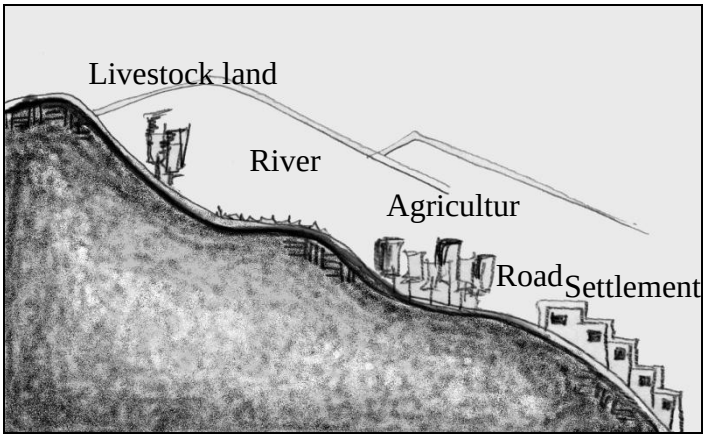


Figure 2: Second formation of the hilly settlement

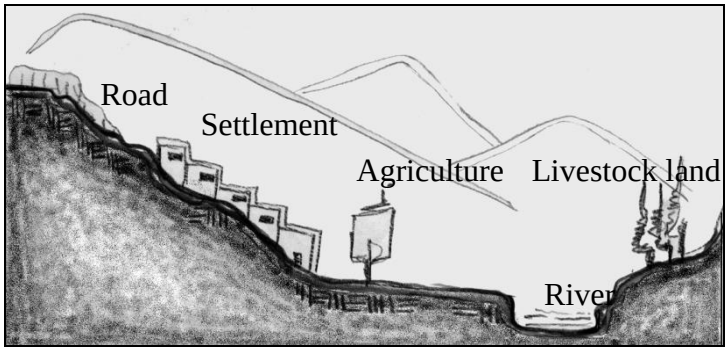


Figure 3: Third formation of hilly settlement

From all these terms mentioned above, importance of the geography would be clearer with the help of material use and climatical conditions.

2.4Climaticalfactors on the Developmentof the Vernacular Architecture

From the beginning of the time, humans were affected by climate. Their very first idea was protection from the harshness of the weather. They constructed a shelter for protecting themselves. Therefore, it is documented that the first element which effect built environment directly is weather (Lauren, 2003).

There are several aspects that effect building formation, location and direction in climatic issues, they are categorized as:

- Wind direction
- Sun direction
- Humidity
- Air pressure
- Temperature
- Rain fall (Yaldiz, 2009)

Therefore it is clear that, variations in natural environment which is called climate conditions could be cause to have different building approaches in vernacular architecture.

In vernacular architecture in all the regions there are some elements, which are showing the effect of climate. For instance in hot and dry climate in, they use thick wall not to let cool weather be consumed in the very hot weather out there. There are other elements such as wind catcher inside the building in the same region. The function of it, is to bring the wind inside the building and most of the time because of the thickness of the walls the wind become cool until it get out of the wind catcher (Zandi, 2006).

The other example could be from moderate and humid weather. They construct the building with empty space underneath it therefore; the building doesn't touch the ground. The aim is that, since the weather is rainy most of the time there, the humidity of it couldn't have a chance to get inside. The other thing that they usually do in this region is the slope of the roof. It is between 50-60 percent in order not to let the rain water get inside from the roof (Ghobadian, 2005).

These examples show that every region with different climate has different approach in terms of vernacular architecture. Therefore, climate could be documented as initial term in vernacular settlements.

2.5 Vernacular Housing Typology

Each vernacular context represents different housing typology. Different settlements have different characteristics in terms of housing. Each of them is being affected by the force of the societal and environmental factors. Therefore, the only similarity, which they have, could be the idea of having a shelter. However the shape of the buildings or in other word types of the building are directly related to what users desired. In each settlement house could be constructed back to back or face to face. They could be in different direction and develop irregularly, or they could have common units, which can be used by two buildings at the same time (Hanson, 2003).

In housing typology of vernacular context there are three major functions that they are back bone of these devisions: Interior quality, Spatial organization and design characteristics of the spaces (Ghobadian, 2006).

2.5.1 Spatial Organization

In spatial organization fundamental element, which formulate spatial organization is cell. A single building in any contextual settlement constructed with cells, starting from one cell and it may continue in order to fulfill the requirements of the occupants, therefore, it becomes more than one cell. Basic level is a cell and it continues to reach an organized shape, which is consist of number of them (Cuisenier, 1990). Each building has different pattern in terms of cells relationships. It means in all the settlement it is vital to obey the hierarchy of the spaces because of their different use.For analyzing spatial organization the primary unit is cell and relationship of it with outside and the other units. For instance: In figure 4 all the relationships of two cell houses is drawn. Their relationship to the other or their relationships to outside is showing that cells could have direct relation like b, c, and d

figures. The other alternative is that they could have connection just only with outside like a, e and f figures or they could have both connection to each other and to outside together like b, c and d figures.

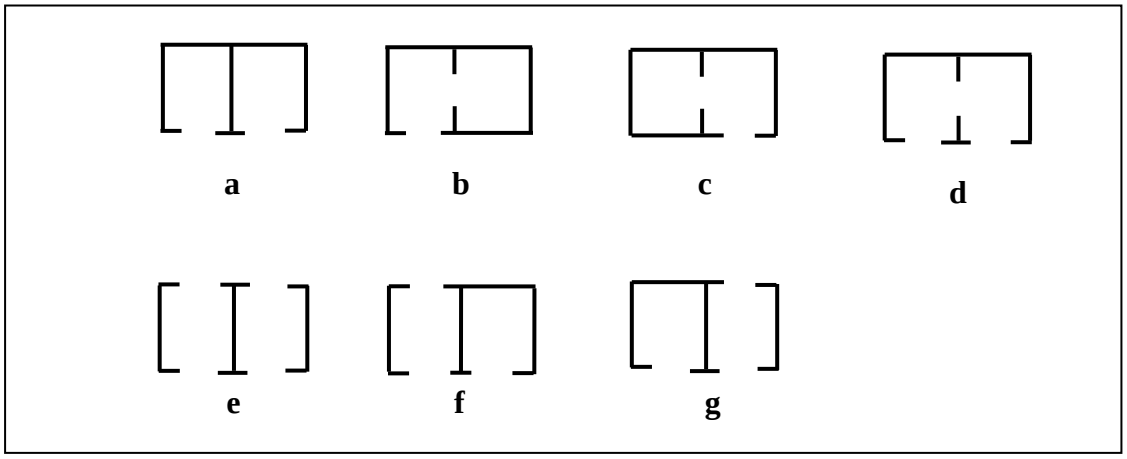


Figure 4: Cells relationships and connection to outdoor spaces(Cuisenier, 1990)

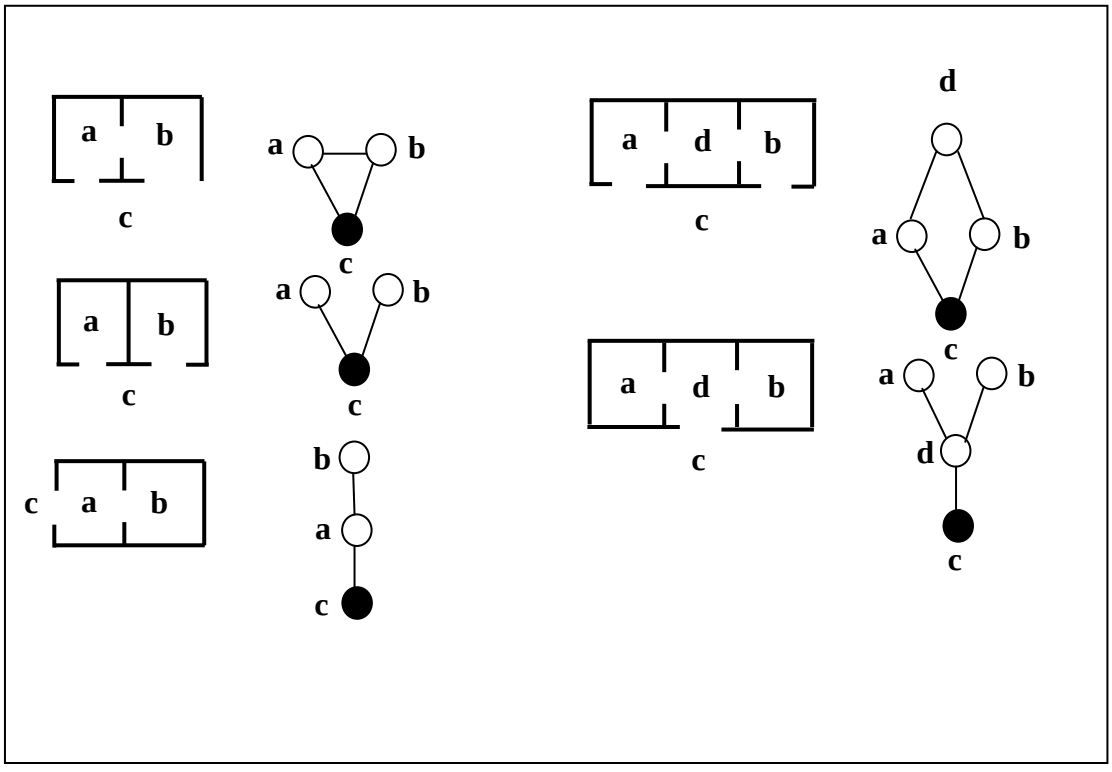


Figure 5: Cells relationships and connection to outdoor spaces(Cuisenier, 1990)

There are three types of cell connection: Mono cell, combined cell and compound cell. In figure 5 float of spaces in each other and also their connection internally and externally are shown. Some of them like the second example are mono cell, which means they don't have any internal connection. They just have connection to the outside. The next one is combined cell, which means it has both internal and external connection just by two cells like the first example. The third one, which is compound cell contain of three cells that is connected to outside and inside together. Like two examples on the right side of figure 5(Oliver, 1987).

In general spatial organization in the rural settlements defines the float of the spaces inside of each other with influences from the nature. However terminologies above can only be used for this study because different cultures they use different solutions.

2.5.2Form Characteristics

The idea of design characteristics came from design principles, which is directly refers to nature. In vernacular architecture everything inspired from nature, therefore, design principles are also based on nature. Ordering the functions is the key word of quality of spaces both in physical and mental procedures.All organized spaces should have a meaning and order. Fulfillment of the simple message for transition of the functions in a simple way is called order in designing a space, which consist of different ideal solutions in order to have a successful spatial organization (Arnheim, 1977). They are categorized by: Symmetry, hierarchy, rhythm, datum, unity, transformation, harmony, contrast and etc. (Ching, 1996)

In each deign, use of the principles is essential because of aesthetical need, therefore, in vernacular architecture the main issue, is not to have architect however just by considering social, and environmental factors in every approaches in rural settlement

design principles are visible. The reason is that each context has got a unique interpretation with the whole context.

2.6Useof Building Materials

In vernacular architecture use of material always refers to the availability of the material in its local context. In formation of the rural settlement the material usage is one of the main issues because in most of the cases the building material is in harmony with the context. One of the scholars Aran in 2000 indicates that: "During the selection of indigenous building materials from natural environment, the builder is primarily concern with whether they can be easily carried to the building site, if they can be worked by means of tools available to him, and if they can easily joined together" (Aran, 2000).

What makes inhabitants to use the available material in the settelment is the accessibility to the material and the ease to carry them to the construction site (Oktay, 2006).

Different regions have different preferable material use because of ease transportation to the site. Therefore, desired material for hot and dry climate is adobe. The reason is availability of sand in this climatic region. The next region is moderate and humid climate and desired material for it, is wood and straw, again because of availability of them. The next region could be cold climate that preferable material use in it is stone because of the both availability and characteristic of it(Ghobadian, 2006).

2.7 Construction Techniques

The other factor, which is very important in rural settlements, is construction technique that they use. It is obvious that each context has different construction technique according to their tradition. It is very similar to the material use because, what they have from the past as tradition and what they have available in their surrounding produce their construction techniques.

It is possible to combine material use and construction techniques in a common category because this heading is directly related to the material use. Each material need specific technique to be built, and each context has different material available there (Ghobadian, 2006).

Figure 6: Carved part of the volcanic rocks. (Erfani, 2007)

Chapter conclusion:

Hence in this chapter cultural issues, geographical impacts, climatical issues, design characteristics, spatial organization, building material and construction techniques have beeninvestigated. Although all these issues have affected the settlement directly, however mentioned dwelling capable to introduce it self as cave dwelling. All the principles are similar in compare to the other vernacular settlement however, it is not built form of living environment and it is derived from the nature. Therefore, identity of the cultural, climatical and geographical impacts are different. This typology of living environment has unique characteristics with specific solutions and thought.

The idea of creating living space was to get benefit from volcanic rocks, which they were part of the nature. The main thing was the talent to carve the mountain no to destroy it and make them consistance infront of environmental factors (Figure 6). They produce openings inside the blocks to have ventilation and natural light, this is another issue to be thought. In general , the uniqueness of this village is to cope with the originality of the context.

Chapter 3

THOROUGH ANALYSIS OF THE CAVE DWELLING FORMATION

Cave dwellings hold a very hard regard to the environment after man adapting themselves to ice age. They have tested living on ice age period; however their needs were to live in more safe places with easier conditions of life. After invention of fire and cloths humans started to get the idea of adaptation to the environment mostly caves. It was a revolution for humanity to create a close relationship between living areas and environment. They started to perceive spaces, therefore, for having more safety in their life they started to produce living environment both inside and under the hills and mountains. The main idea behind it was to be more protected from their enemies, which were, wild animals mostly at that ages. They utilized the environment by moving their basic needs there. They have created interior spaces in order to sleep and eat (initial needs of human). Therefore, they started to invent tools for making their desired living areas. They designed their first excavating tool to dig out the earth or carve the mountain and hills. Their ideal formation was to create spaces that connected with corridors. Most of the time best choice for excavation was rocks generated with **limestone** and **dolomites.** Their very first idea for entering to the units was either from side or above the carved shelter. The elevated formation of these dwellings gave them opportunity to be protected from animal migrations. One of the oldest examples of such settlements is located in France (Tobolczyk, 2008).

These cave settlements dated from 450,000 BC, and they weren't very similar to today's cave dwellings. Accessibility to the units was really hard therefore; sometimes they had to crawl till get into their houses. Doors and windows weren't described on the façade of units; they were only holes from top and side of the block. In some cases; they used skin of animals as tent for protection of the entrances (Rudofsky, 1977).

In cave shelters usages of rock and earth structural properties are appreciable. They are using unique type of structure, which is even being used nowadays. All the cave settlements are formed by excavations there is no structural elements in construction process. Interior spaces of cave dwellings most of the time consist of sunken floor (earth covered), beamed wall and roof material is changeable to their desired need or availability of the material (Mulligan, 1997).

Cave shelters have a very long story in European culture. By using thick walls in all of the cave settlements the users feels more secure and safe. One of the benefits that underground dwellings have in compare to settlements above the ground is having warm winters and cool summers. It is because of stability of the temperature within the rocky settlements according to their moderate influences that it has (Rocks around has this characteristics). One of the most disadvantages of these dwellings is dampness of the rocks. Water vapor is being created by influences of household activities, such as washing and also cooking. If there is not going to be any maintenance then vegetation is going to start growing up on the interior spaces. Therefore, even by having disadvantages of living in these settlements maintenance is very important (Oliver,1990).

3.1 Typology of the Cave Dwellings

In general typology of these cave shelters divided into 6 main categories(Mulligan, 1997):

a. Semi-underground

b. Earth shelter

c. Rock shelter

d. Cliff dwelling

e. Pit dwelling

f. Dual aspect (All in figure 7)

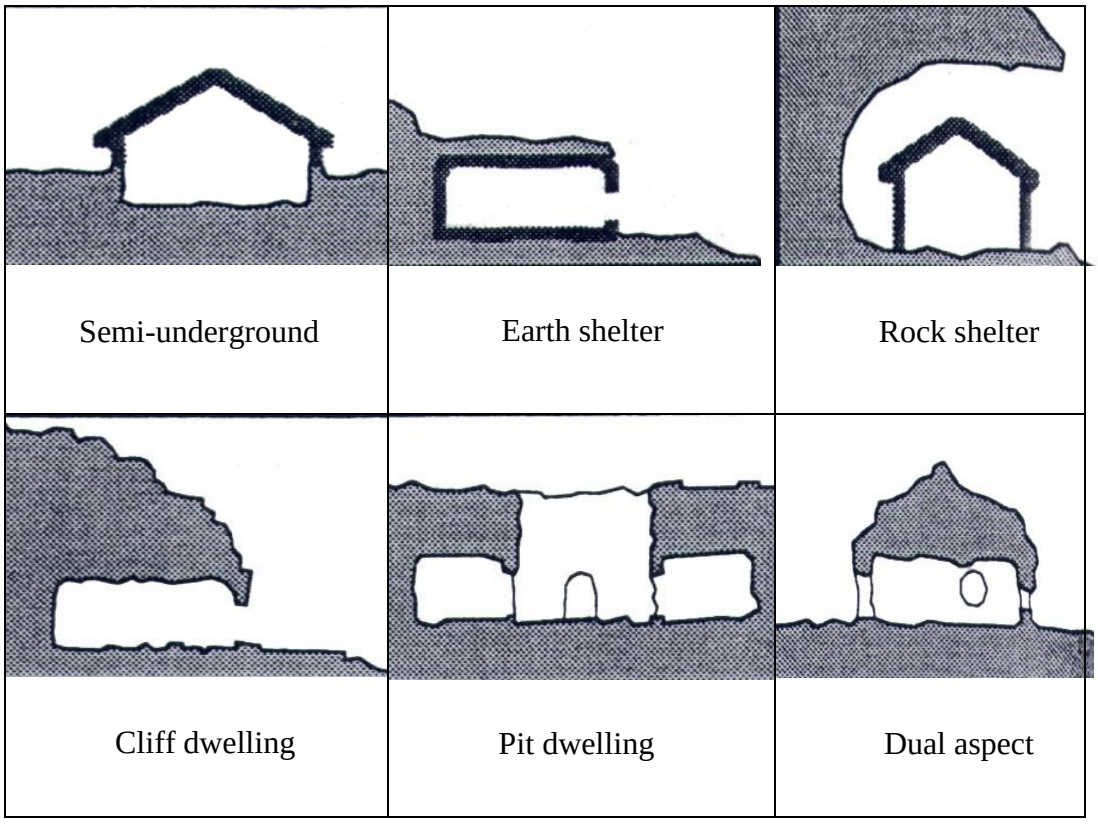


Figure 7 : Typology of these cave shelters

(Mulligan, 1997)

Earth shelter, cliff dwellings and rock shelter:

These dwellings are mostly made of loess, which is wind-blown deposited with soft texture of rocks. They are mostly come from the close river in the site. In one of the example in China, which is called Yao Dong these wind-blown losses came from a river close to that, which is called Yellow river and it had 70 million in habitant in the cave dwellings. Also in Shanxi, Gansu and Qinghai there were dwellings with 5 million populations. Today China has 40 million Chinese inhabitants who are still living in the rock shelter, earth shelter and cliff dwellings (Figure 7).Units were mostly vault constructions that were made of stone and adobe blocks mostly (Mulligan, 1997).

Chinese cave dwellings are mostly constructed horizontally to the slope of the hills and they have been excavated vertically after. In these types of dwellings, units are side by side and they are with same array in the formation within the site. In this thesis the case study, which is Kandovan is take place in Cliff dwellings category however the material of the rocks in Kandovan dwelling is different it is volcanic rocks, which is called Ignimbrite rock. The other difference that Kandovan has is its vertical formation. Units in Kandovan are most of the time in vertical position.

Pit dwellings and semi-underground:

In these settlements, dwellings are mostly situated on flat site. They have court yard in the middle, which the whole complex is located below the ground level. Court yards in these dwellings are rectangular shape. Courtyards are using as back bones among different spaces. Some of the big pits have the potential to be shared even within 10 families, each of them in one pit. The interior spaces is in a way that eldest of a household occupies the north pit. Each pit has its own privacy therefore, each of them has different kitchen and services (Figure7) (Mulligan, 1997).

Dual aspect:

In these settlements like earth shelter and cliff dwelling inhabitants excavate the original hill or mountain in order to live inside. However, it has some differences with them, which is the shape of the units are not horizontal inside the hills. They are vertical and they are completely divided units. They are mostly volcanic rocks, which after years become stable. The best example of these settlements is Cappadocia in Turkey. Most of the units consist of two or more than two stories and each floor has different function. In categorizing the settlement of Kandovan has some resemblances with Cappadocia with just few differences. It is in earth shelter settlements however the vertical formation of the units in dual aspects is very similar to Kandovan dwellings.

In each region, the cave formation is unique and different according to the climate conditions or formation of the mountain. Each of them has different characteristics. Differences are mostly on excavation method of each dwelling whether it has been done vertically or horizontally they are in the same categorization of the vernacular architecture. The other differences that they have, is their façade look. Each settlement has its own type according to cultural issues and also availability of the material.

3.2General Overviewof Cave Dwellingsin Different Partsof the World

Different parts of the world have the capability to have cave dwellings because of the similar characteristics of the earth. Mountain always were the safest part of the earth for living condition because of its heights and character, therefore, the very first idea of living were migrating inside the earth. In different part of earth different migrants

with different ideas started to subsist inside the nature. People with different nation and culture lived in the same conditions to protect themselves from wildness of nature in different manner.

Different parts of the world shared same ideas; the only difference is their culture, therefore, there are different examples around the world to express their culture and identity of the nature. These examples categorized in: Asia, Europe, America, Africa, and Australia.

Asian examples: Seven well-known cave dwellings around Asia in this study follow as:

1. Guyaju in china (Figure 7)
2. Yao Dong in china (Figure 8)
3. Bamiyan in Afghanistan (Figure 9)
4. Vardzia in Georgia (Figure 10)
5. Cappadocia in Turkey (Figure 11)
6. Kandovan in Iran (Figure 12)
7. Hile var in Iran (Figure 13)

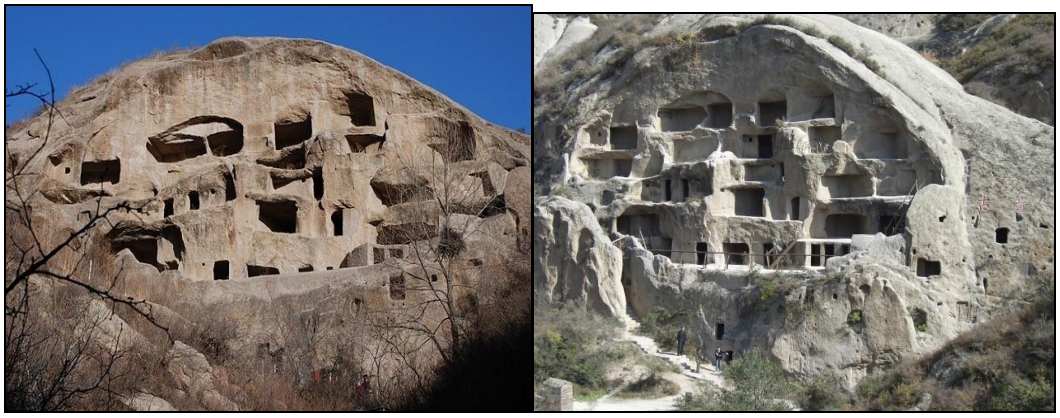


Figure 8: Guyaju in China

(David, 2010)

Guyaju is located 92 kilometer from Beijing. It is one of the largest cave dwellings around China; it gave protection to 110 families of occupantsby (David, 2010).

It is considered as cliff dwellings because of its formation and location. It is located on the steep part of the mountain and it has been carved horizontally.All the units are very close to each other, and most of them are single units with only one hall (Figure 8).

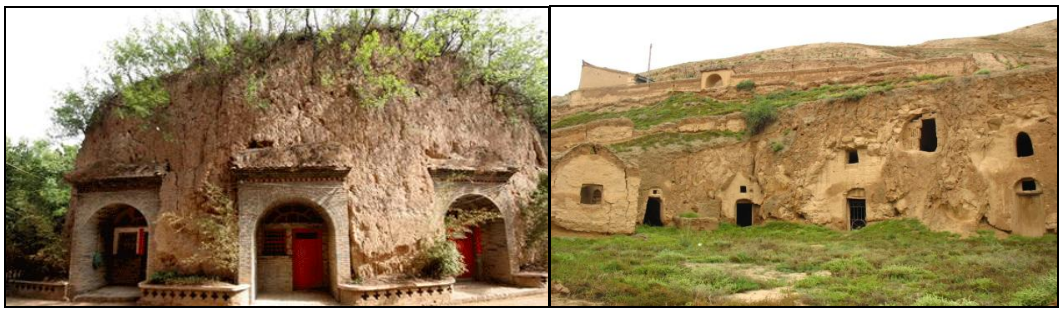


Figure 9: Yao Dong in china

(Cave houses, 2008)

Yao Dong is located in northern part of China. It is basically developed horizontally to the skirt of the mountain, and it is one of the cliff dwelling examples (Cave houses, 2008). This dwelling is called adobe shelter because of the material of the mountain, which is mostly adobe (Figure 9).

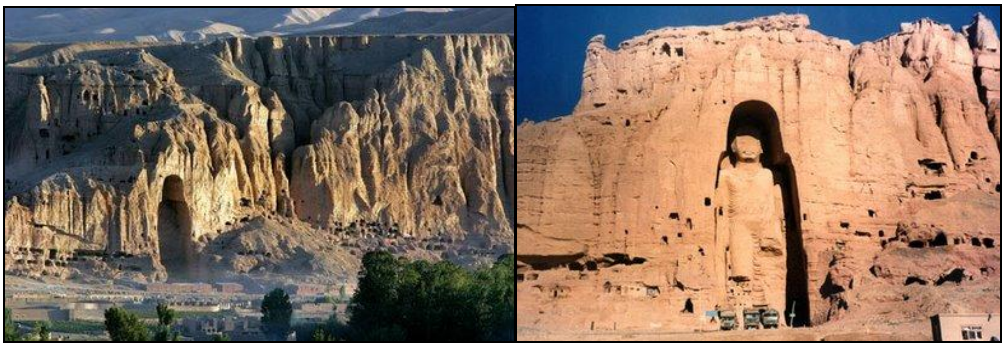


Figure 10: Bamiyan in Afghanistan

(David, 2010)

Bimiyan is located 240 kilometer from north Kabul in Afghanistan and it is the largest town in the district of Hazarajat. This place was built vertically and it was a place that people worshiped Buddha there. It was both shelters for people and worshiping place. There were numbers of Buddha statues there that they are ruined today by (David, 2010). It is also known as cliff cave dwelling (Figure 10).

Figure 11: Vardzia in Georgia

(David, 2010)

It is located in southern part of Georgia. It is one the good examples of rock shelter dwelling. It has been built to be next to the river and be protected from Mongols. It was thirteen stories dwelling with six thousand units. It is mentioned as cliff dwelling by (David, 2010). All the accessibilities to the units are from outside and all of them are connected (Figure 11).

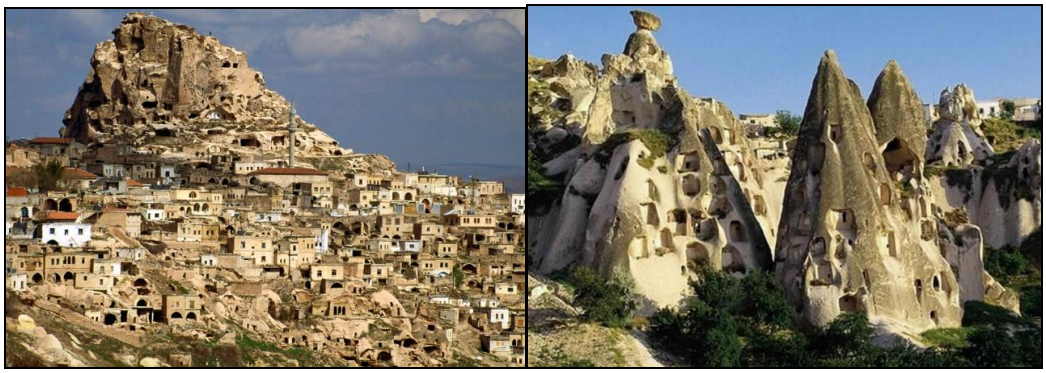


Figure 12: Cappadocia in Turkey

(Cave Dwellings of Cappadocia Turkey, 2010)

The next example, which is one of the most popular cave settlements around the world, is Cappadocia in Turkey. As it mentioned above this dwelling is one of the good example of dual aspect category, which has all the functions in one of the units, which is very similar to a fairy chimney by (Cave Dwellings of Cappadocia Turkey, 2010).

Most of the units are separated from each other and they stand by their own structure. They are remaining of the volcanic rocks, and inhabitants excavated the interior spaces in order to live there (Figure12).

Figure 13: Kandovan in Iran

(Erfani, 2007)

This dwelling is located on north-west part of Iran and it is known as dual aspect dwelling. Generally it is made of Tuff volcanic rocks, which is excavated by

occupants by (Erfani, 2007). Protection is the main concept of converting the function of it to living environment. Nowadays still it has habitation and living functions inside (Figure 13).

Figure 14: Hile var in Iran

(Erfani, 2007)

The other example is Hile var pit dwelling, which is underground dwelling with court yard. It is one of the good examples of this kind. It is located in South part of Iran. Today it is empty, however in the history of this settlement inhabitants dug out the ground and started to live there because of climatic conditions (hot and dry condition) by (Erfani,2007). In the middle of each pit there is a court yard, which is connected to all the functions around and it is circulation function and also it is somehow connection point of a pit (Figure 14).

European examples: Two well-known cave dwellings around Europe are:

1. Sassi di Matera in Italy (Figure 15)
2. Tufa in Spain (Figure 16)

Figure 15: Sassi di Matera in Italy

(David, 2010)

The Sassioriginally is suspected to be the first human settlements in Italy. It is situated in the old city of Matera. Many of these units are actually only caves, and the streets in some parts of itSassi are located on the rooftops of other houses. The town created on the slope of the mountain by a river that is now a small stream by (David, 2010).Still people sustained to live in the Sassi. It used to be one of the main examples of rock shelter (Figure 15).

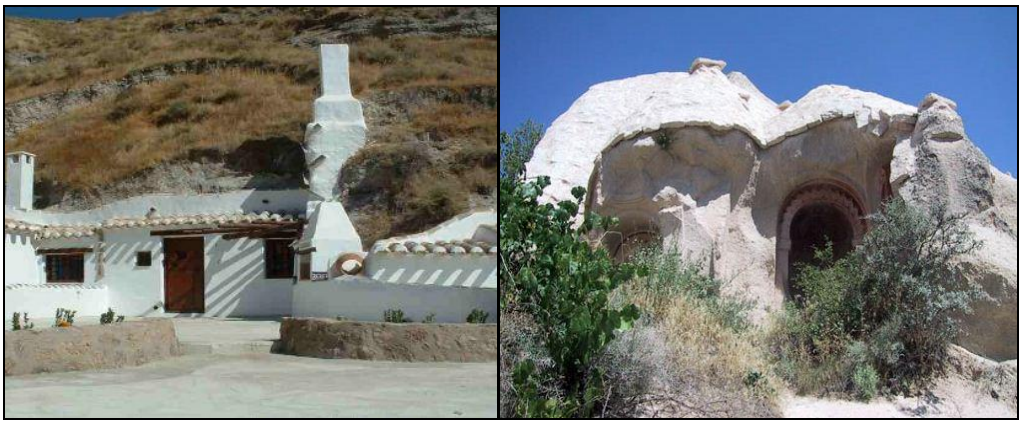


Figure 16: Tufa in Spain

(Brown, 2010)

It is one of the cliff dwelling examples in Spain, which in compare to the other examples is very small cave dwelling. Nowadays, the function of it has been changed to a church and it doesn't have any habitation function by (Brown, 2010). It is

located on the very low part of mountain skirt and as a size it is considered as a small cliff dwelling. The whole dwelling is ruined only this church survived (Figure 16).

American examples: Two well-known cave dwellings around America are:

1. Mesa verde in Colorado (Figure 17)
2. Gila in Colorado (Figure 18)

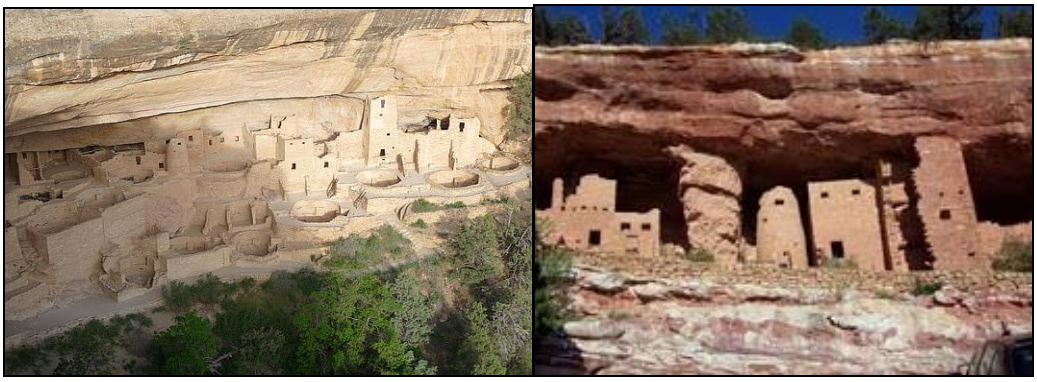


Figure 17: Mesa verde in Colorado

(Brown, 2010)

The other example of cave shelter is Mesa Verde in Colorado (Figure 17). This example is take place in rock shelter category. All the dwellings were constructed under the mountain however they have their own roof. It means as it is shown in the figure 17(rock shelter) there is a unit constructed under mountain structure by (Brown, 2010).

This settlement is a very good example of rock shelter, which is constructed on 12th century and it had around 5000 population of inhabitant however, today it doesn't have any users.

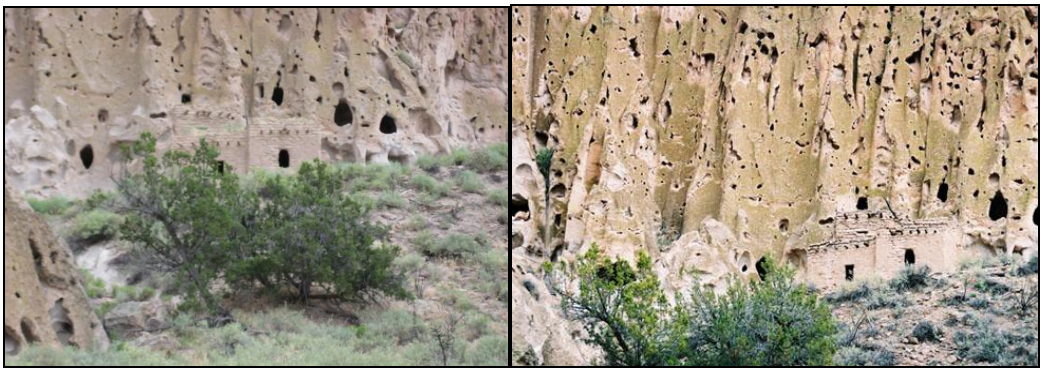


Figure 18: Gila in Colorado

(Tobolczyk, 2008)

The other example is Gila cliff dwelling in New Mexico. In this settlement the dwellings were inside the mountain mostly and the accessibility to their units was really hard because they had no passage or pathway within the dwellings. Even for getting to their unit they had to climb the mountain by (Tobolczyk, 2008).

African examples: Twowell-known cave dwellings around Africa are:

1. Matmata in Tunisia
2. Bandiagara Escarpment in Mali

Figure 19: Matmata in Tunisia

(David, 2010)

Another example of cave dwelling is the Matmata, which is situated in a small town in southern Tunisia. It is known as pit cave dwelling (Figure 19). These structures are formed by digging a hole on the ground. Then all the caves are constructed around

the main pit in the middle. These caves are rooms and some homes include several pits, which are connected with each other by corridors by (David, 2010).

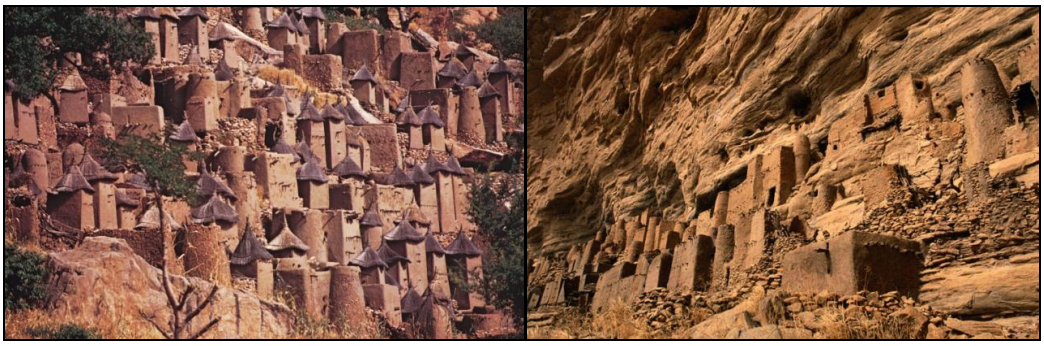


Figure 20: Bandiagara Escarpment in Mali

(David, 2010)

The Bandiagara Escarpment is located in Dogon country of Mali. It is known as dual aspect dwellings with the material of sandstone (Figure 20). It is about 500 meters above the lower sandy flats to the south. Thisdistrict located on the steepest slope of the mountain and it is populated today by the Dogon people by (David, 2010).

Australian examples: None

Chapter conclusion:

From the entire examples above it is clear that they share similar characteristics, however it is changeable in different example. Their differences are categorized in the, climatic conditions, users, topographical, geographical, cultural issues. The main concept in all of them was being protected from enemies and harshness of the nature, however achievement were different. In the hot and dry conditions the dug out the ground in order to have thermal comfort and in the examples that they were threaten by enemies more they created their living environment on the steepest part of the mountain. The only thing that is considerable is using the nature. They shared same

idea of getting benefit from nature. Therefore, by having different situation they shared one main concept, which is adaptation of life style to the nature.

In this study, the chosen example is Kandovan, which has same characteristics with same threats that all of them were facing. The thorough investigation on Kandovan example would provide accurate information about unique identity of its architecture.

Chapter 4

INTERROGATIONS OF CONTEXTUAL CHARACTERISTICS OF "KANDOVAN DWELLING"

4.1 General InformationAbout Kandovan Village

Kandovan village is located on the north-west part of Iran, which has 38 degree from the north. It is on the 62 kilometer of Tabriz city in north corner of Iran (Figure 21 and 22). The population of it is around 180 families, which are approximately 900 people.

Figure 21: Geographical map showingIran (Iran map, 2011)

Figure 22: Political map showing Iran (Iran map, 2011)

The word 'Kandovan' is derived from KANDIJAN that is referring to the history of 'Kandovan' mountain. After sedimentation of lavas from volcano, 'Kandovan' mountain has been created, and it was called 'Kandijan'. 'Kend' or 'Kent' in local

dialect, which is Turkish, means village and ‘Jan’ means life that shows the meaning refers to regeneration of village after volcano that people moved there (Sabri,2007).

It is a setting that has been created by native inhabitants inside the skirt of the mountain by excavating the original volcanic rock of the mountain (Figure 23). The natural identity of the village is kept; they are just adapting themselves to the context. They have shifted their life inside the Mountain to protect their life from enemies, and harshness of the weather. They have carved the pieces of the mountain like a cave and start to live there. As the weather is unbearable on high hills, they have started to produce a solution for that, therefore,skirt of the mountain preferred to be used by locals (Parham Baghayi, 2006).

Figure 23: Kandovan village

(Erfani, 2007)

4.2 Impacts ofEnvironmental Factorsonthe Developmentsof Kandovan Vernacular Architecture

The environmental factors such as climatic issues, which contains of wind and sun and topographical issues in Kandovan village are affected by geographical

conditions, which it has. As it is mentioned, it is located on the skirts of Sahand Mountain. Therefore,climateis considered as cold and humid, that means it has warm summer and cold winter (Gorji & Sanayi, 2009). This village is in between Sahand Mountain and Oroumie plain. Starting from the higher part of the mountain,to the lower part climate is getting warmer, which is Oroumie plain (Figure 24).

Figure 24: Sahand Mountain and Oroumie plain in front of it.

(Iran Nature In Detail , 2009)

Wind direction is mostly from east to west and vice versa in this village. All the blocks are facing to the north and south on the different levels of the hill, therefore, all of them are being protected by other blocks and pathways are developed by considering the wind conditions (Gorji & Sanayi, 2009).

There are three main winds in the settlement; their local names are **Agyel**, **Shahiyel**, **and Danageran**. **Agyel** wind is coming from south-west direction, which is moderate wind, and it is mostly blow in the summer time. **Shahiyel** wind is coming from west and it is the cool one. The last one is **Danageran** wind, which is coming from east direction and it is the coldest one (Sabri, 2007).

4.2.1GeographicalContext

Kandovan village is derived from the nature of Sahand Mountain. Geology of the Kandovan settlement is remarkable, about 12 million years ago Sahand Mountain created from natural deformation of the earth. It was volcanic mountain at that time. All the volcanic rocks after the volcanoes from Sahand Mountain started to live as a very hard kind of rocks in the nature, which is called "Tuff" rock. After being in the harsh nature under hard rains and wind the soft part of the big rocks ruined and the part, which were more stable stand there in the nature. Then it was a time for the migrants to move there inside the nature to be protected from the nature and enemies (Sabri, 2007).They carved the ashes from volcano after that and started to live there. What exist there today, are the units that had more stability to the nature (Bahman, 1937).

There are two types of soil in Kandovan village; the first is the one that created from the decomposer of the original rocks, therefore, it is local soil. The second is the one that, from time to time came there with the help of rain falls and deformation of the rivers. In general the most part of the Kandovan village is covered with **Ignimbrite** soil, which is welded part of old volcanic rocks that survived. All the volcanic rocks are subset of it, such as Tuff, Yellowstone Tuff, Bishop Tuff and etc. Mainly the material of the units isfrom mentioned material (Figure 25) (Katharine F, 2007).

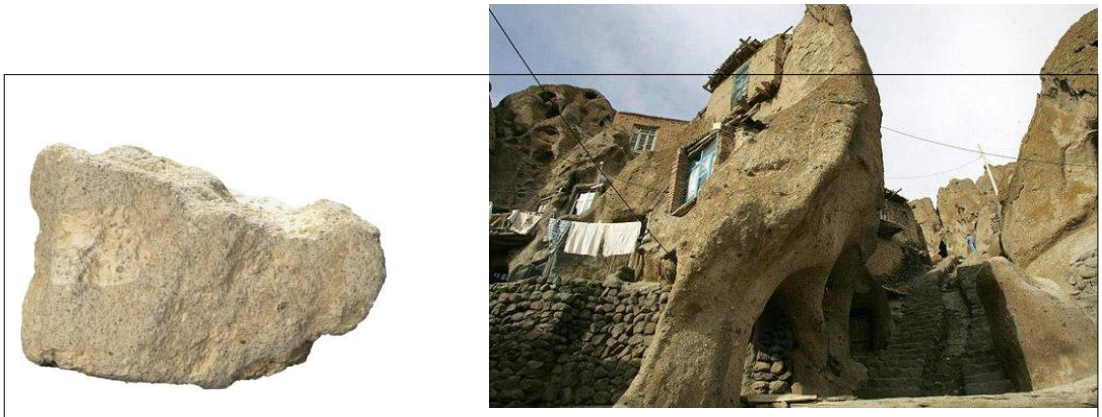


Figure 25: Ignimbrite rock

(Auckland, 2005)

The other thing that would be also in consideration is in geographical issues is vegetation on Sahand mountain from the high part of it to the plain of Oroumie that Kandovan village is in between of these two part. Generally vegetation is start from the part that the degree of the slope on Sahand is not that vertical. Parts with more slopes are covered with large amount of grass and herb, therefore, in the spring time mostly the vision of the mountain is completely green. As the slope getting softer the shape of the vegetation also changes. On the lower part of the mountain there are amount of trees, which they are not too crowded and the space between them is considerable. On the lowest part of Sahand there are vast lands with a good quality of soil, which is good for agriculture; therefore, it is mostly being used for Kandovan inhabitants to do farming there (Gorji & Sanayi, 2009).

4.2.2TopographicalContext

Main issue in topographical issue always is changes of the topography of a land, the place that topography changes in it could be the places, which topography is getting higher such as mountain and the places, which topography getting lower such as lakes and seas and etc. In Kandovan case as it mentioned, the topography changes is completely obvious according to the height of Sahand Mountain and its continuation until Oroumie Plain therefore, a lots of level changes it has. The other thing that

would be very essential in topographical issues of Kandovan is Oroumie Lake and the rivers, which they go to it. Oroumie Lake is located of the west side of Kandovan and south-west of Sahand Mountain. Rivers, which they go to Oroumie Lake, are divided by two categories. The first one is **North Rivers** and the second one is **south** rivers. In northern part there is AjichayRiver, which is the main river in the north part and it is come from the highest part of the Sahand Mountain. There are secondary rivers, which at the end they combine with AjichayRiver. And they are Dojanchay, Paj, Karmo and LighvanRiver. Southern rivers, which they come from north-west of Sahand, are: Varkesh, Soufian, Daryan and Oskou. The one, which is called Oskou has two branches one of them is Oskouchay and the other one is Kandovan river that passes through Kandovan village (Figure 26& 27) and it divide the agricultural lands from the living area of the village (Arefi, 1995).

Figure 26: Map Kandovanits rivers

(Google earth, 2011)

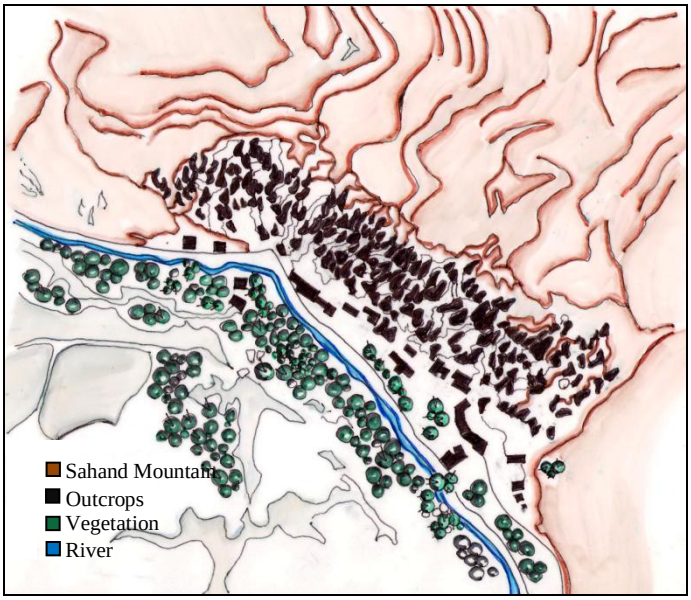


Figure 27: Kandovan map with boundary and river

4.3 Impactsof Social Factorsof KandovanSettlement

Paul Oliver in 1995 indicates that: In many societies traditional issues and cultural background is tended to be initial (Oliver, 1990). The way that the culture moved from each generation to the other, is the way that people decide to construct their environment. Therefore, social needs and social factors have a direct connection, which they are connected from the roots.

Social factors in Kandovan village likewise of the other dwelling are divided in their **language**, their **religion**, **gender roles** and their **occupation** and the other cultural issues (Sabri, 2007).

The main language of Kandovan inhabitants is Turkish language, which is called Azeri in the local language, which is famous by Turkish of south. Kandovan inhabitants are still keeping their heritage not to lose it. As the language in the whole

Iran is changing according to the Persian people, they are keeping their culture alive (Arefi, 1995).

Another issue is their religion. In the whole country religion of people is Islam, therefore, in the architecture is also tangible. They need to adapt their religion with surrounding mostly in villages because they are more connected to the traditions and religious thought from their ancestors. They need worshiping space in the buildings and also they are in needs of mosque in their neighborhood. In Kandovan case although they are Muslim and they have these beliefs yet they couldn't shape their buildings and surrounding with their beliefs. As mentioned above Kandovan settlement belongs to nature and it has been created by the force of nature therefore, the only thing that inhabitants could do for religious adaptation was to specify some of spaces for worshiping a god. They couldn't change the orientation of the units toward Mecca to construct their mosque therefore, their solutions were very primary. They have chosen the unit, which is towards the north (Mecca) (Sabri, 2007).

Gender role is another social discussion, which is directly affects the built forms directly. In Kandovansettlement form interior divisions are related to the gender roles. For example, separation of the spaces from each other is being done by hanging fabric sheet from ceiling in order to divide the spaces that specifically women using. The other example could be place of hearth in the units. They are carving a middle part of the living space to have their hearth there (Figure 28). The reason of having it in the middle is gender role, because women are working inside the house they mostly cook and weave the carpets (Figure 29) therefore, interior formation is mainly based on the women's need (Gorji & Sanayi, 2009).

Figure 28: Place of hearth within the units

Figure 29: Carpet weaving in the units by women

The next social effect is occupation, which affects every kind of architecture whether is dwelling or not. In Kandovan, men's occupation is animal husbandry and farming therefore, in their buildings they are in need of shelter for some of their animals and a place for herbs and their feeds. This is the first requirement for men's occupation. The next thing could be storage place in the units. As most of them sell their handicraft stuff and manmade spices therefore, they need to store them somewhere. Most of them have both selling areas and living areas in the same units therefore; they need these functions inside (Zargar, 2009).

The next consideration is women occupation. As mentioned above, most of the women work inside the house, they weave carpets and they make handmade bags and cloths with local animal wools. Therefore, they need a place for these functions. It is obvious that because of lack of spaces in the units they don't have a chance to add different forms for different functions; however in spatial organization of the interiors they pay attention to create space with the necessary instruments for it. After making stage, they have to sell the goods inside of their units or in the other part of the village. Therefore, if they have to sell them inside, they need a place to store them.

The other important duty that women have is housekeeping as wife and as mother. Therefore, the main place that they need is kitchen andhearth for making local bread. Therefore, likewise the other functions in all of their houses they pay a lot of attention to the place of the kitchen and the oven. In some of the units, kitchens are on the corner of the living room and the oven is in the middle of it therefore, they use it as heater as well. In the other units they locate their kitchen outside of the house in different unit. In this case there is a chance for the woman to cook more freely (Zargar, 2009).

Figure 30: Hand craft goods of Kandovan inhabitants

In all the cases, relation between the occupation and the interior quality is obvious. In the cases like Kandovan, the chances for adding an extra unit for each functions is less, therefore, all the influences from jobs and the other factors affect interiors.

4.4 Impactsof Socio-Economical Factorsof Kandovan Settlement

Economic factors in the settlement are based on **agriculture**, **hand crafts**(Figure 30) and **animal husbandry.** In agriculture and animal husbandry mainly farmers use the lands in front of village, which is on the low part of the Sahand Mountain. As it mentioned in the previous part, the position of the River is vital. Kandovan River is passing in-between the village and agricultural land. Therefore, process of watering for the ones, which is next to the river, is being done with the river; however the one, which is far from river, should be watered naturally by rain fall.

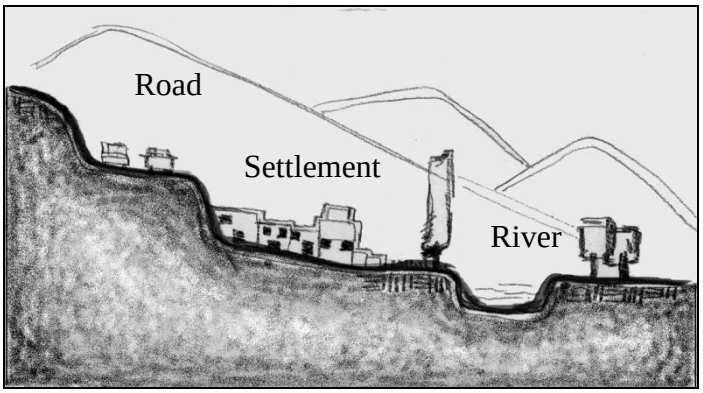


Figure 31: Village relationship whit its surroundings

The main agricultural products are: potato, wheat, pea and fettle. They have 315 hectares agricultural land that from its territory they produce 280 ton of wheat and fettles a year (Arefi, 1995). They also produce flowers and fruits such as peach and walnuts, which they produce them around 76 ton a year.

Low lands around Kandovan village are the best place for feeding the livestock (Figure 31). The main animals in the flocks are: sheep and goats. From ranching they produce 38 ton of meat a year, which is good for a village.

Local inhabitants work on their lands from beginning of the spring until the end of the fall and after that they start their animal husbandry and also hand craft making.

The main hand craft goods of the Kandovan are: Carpets, and silk weaving. They are being produced mostly by females; therefore they need special unit for weaving and working. They sell all the hand craft things inside the village or they export them to the other part of Iran.

The last economical issue in this settlement is production of local dairy that is also being exported to the other cities of Iran (Zargar, 2009).

4.5 Impacts of CulturalFactorsof Kandovan Settlement

In Kandovan village there are lots of cultural and traditional facts, which affect the social and architectural life in the dwellings. Although they are living in harsh nature, they have activities related to their beliefs and the culture that they transmit them from their traditions.

Their cultural idol is based on how their social life generated and also how their contrivance to save their social life in terms of idols. Therefore, their socio-cultural life is categorized by: **Family type, finding mates, marriage, and domestic routines**(Parham Baghayi, 2006).

All the tradition in the socio-cultural cycle implement in 4 stages: Birth, maturity, marriage and death. The ones, which they are public bein done in a public life of the village like marriage and they have ceremonies for the whole settlement, however the one that are more private and is within one single family take place just in that family. The other thing, which could effect the traditions of social life is “season”. In different season of the year traditions are different because of the weather conditions. Therefore for having ceremonial acitivities they need public spaces as well (Gorji & Sanayi, 2009).

Family type is social order in one society as mentioned before (Rosin, 1990). In each society, there are families that they live together, although each of them have different rules, routines, occupation and beliefs but they are living in a larger society therefore, they have to obey certain rules, which effect the built form directly. For instance in marriage is one of the forces in family type, which effect the built environment directly. Greatest son of the family should live with his parents after he got married; therefore, they need to add one unit to their house. In Kandovan because of natural obstacles, is impossible to construct another building next to the previous one, therefore, their solution is to create an area for them inside the house or if, their house consists of two or more units, they can change the function of previous one to their son’s home (Zargar, 2009).

Finding mates in Kandovan, like the other religious villages of Iran, have two thoughts. One of them, which are similar in most of societies like Kandovan, is that relatives should marry because they belong together and before they born god sign off their marriage in the sky, therefore, the first belief is that some of the cousins

belongs together. The next one, unlike the other religious vernacular areas is that males and females can find their mates themselves. Although, it is possible for both of them, but the one who decide is the boy. After he chose his mate then they send a message to the girl's family and he asks their permission for the marriage. After he got the permission then they have a ceremony for the proposal from her family. Each routines obey several rules and regulation, which affect built environments directly. For new married couples they have to find a place at first for a year next to them, and after that they have to move to their house. Hence choosing an outcrop at first is very important according to number of family members. Bigger outcrops could be picked by larger families in order not to face any problem(Parham Baghayi, 2006).

Marriage in Kandovan today is a bit different than before, as it mentioned above there are two types of beliefs for their marriage of is cousins marriage, which is called kinship marriage and the other one is marriage from out side of the family. Today most of the marriages are from the outside of the families even 18 percent of the marriage now is out of the village. The reason of that, they want to enlarge their relationships and also their trading areas, therefore,males find their mates from villages on the neighborhood (Parham Baghayi, 2006). After marriage there are the other traditions that they have for both bride and groom. In the first month of their marriage, bride should cook for the whole family (groom's family) to show her abilities in cooking, therefore, they need to live in groom's parents house, or as it mentioned if they have another units next to their house they have to move there to be close to groom's parents house. Therefore they need to consider marriage ceremonies from beginning of choosing an outcrop and formulating the spatial organization, they have to consider extra room or extra space. The next thing is how they call family members after marriage. Both bride and groom should call opposite

father as “uncle” and they have to call opposite mother as “ ghaein nane”. They have to obey these traditions to be welcome in each family (Zargar, 2009).

In domestic routines within the village they have family order in the context, it means that they live with their kinships in a certain region of the settlement, and they name the regions by kinships. All the relatives are living together from the oldest to the yougest. Although they devided the village in regions by their names but they are using common life style in the whole setting. They obey simillar rules and they follow the same routines inside and outside the houses (Parham Baghayi, 2006). According to their religion, they have certain rules inside the houses. For instance women are intimate just with several men such as: husband, father,brother, uncle and grandfarther, the other men in the family are not intimate for them such as cousins. Therefore, they have to have their scarfs put on infront of them. These religious devisions define their family cycle inside their houses. They can’t live with the ones who are her intimates in the same house. Therefore privacy within the units is vital. By adding an extra space as kitchen or having secondary entrance, they tried to have more private life for women inside the outcrops.

Kandovan inhabitants are living very close to each other because of the formation of the village and hard living conditions there they live closely. They have a lots of activies to spend time with the whole inhabitants. Like marriage, birth, death and also they have some ceremonies on specific dates that each year they get together. Such as winter ceremonies, spring ceremonies. Most of the activities take place on Wednesdays because in persian language it is called Chaharshanbe, which means 4th Saturday, and 4 in their beliefs is a holy number because it came from four intial origins of life that they are water, earth, wind and fire. Therefore, they try to have

their celebrations mostly on Wednesdays (Arefi, 1995). Therefore they have some open public spaces for ceremonies of the whole village that they are mostly located on the entrances of the village. The river also is passing through the entrance therefore; the quality of space is comfortable for social activities. Sometimes they sit together and they sing and sometimes they play their local games there.

For birth and death ceremonies, they think about the other members of the village as part of their family therefore, they become really upset when they lose one of the inhabitants of the village and they become really delighted by the birth of a child. Moreover, in all the steps of birth and death they are together. Even while family of new born child want to choose a name for a new comer, they have special ceremony that with the elder of the village they do it in order to have their blessing with their child in his or her life time (Zargar, 2009).

According to their social activity, they need spaces for public spaces to shop together, to talk, to find mates and even trade their hand crafts there. Therefore, they created lots of open and semi-open spaces in front of the village in order to have a chance to communicate more.

From the entire socio-cultural and environmental explanation above, role of them becomes more perceivable in terms of formulating interior and exterior spaces. For each tradition, belief, meaning, economic factor, rules and routines they have particular ceremony or activity. Essence of socio-cultural background is readable in every part of the organization of both interior and exterior organizations.

Chapter 5

IDENTIFICATION OF THE VERNACULAR KANDOVAN CAVE DWELLING IN IRAN

5.1 Formal and functional Analysis of Kandovan cave dwelling

Main living spaces in Kandovan dwellings are defines as spaces, which inhabitants are spend their time there for daily activities such as eating, sleeping, hosting, praying, cooking, washing, playing, doing hand crafts and socializing. Moreover, these activities are taking place in **entrance of the unit, main hall, kitchen, toilets and bathrooms, shelter for animals**. Therefore, as mentioned above, they don't have a chance to construct their built environments in their desired way, the only thing that they could do is to form their living environment in more ideal way.

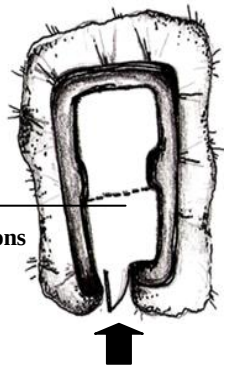
In this study, eight different outcrops have been investigated and according to them, inhabitants formulate their living environment. Their concepts exhibit particular resemblances due to their shared culture in general.However, ininterior spaces, functions are different in terms of proportion and scale of the functions. The reason of these differences generally depends on the domestic routines and family types in different buildings. Spaces are designed according to the number of the occupants, who are living in the same outcrop.

5.1.1 Interior Space Typology of Kandovan Outcrops

In general, interior spaces of outcrops are categorized in 3 different types:

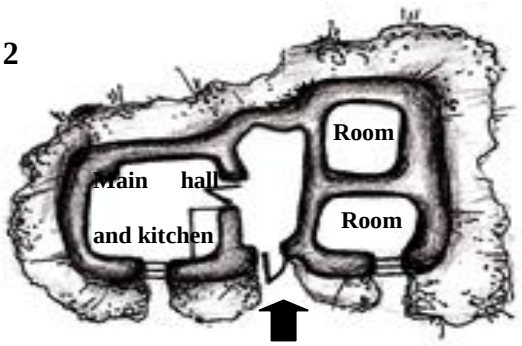
1. Combined linear outcrop
2. Divided linear outcrop
3. Separated centralized outcrop

Table 1: Combined linear outcrop

1 **Main hall** **With all functions**  **Entrance**	Combined linear outcrop In this type, there is just one living space, which consist all the functions inside. After entering to the space there is a big hall that on the right side is cooking section, and end part is sleeping section and as it mentioned middle part is the main hall for hosting and socializing.

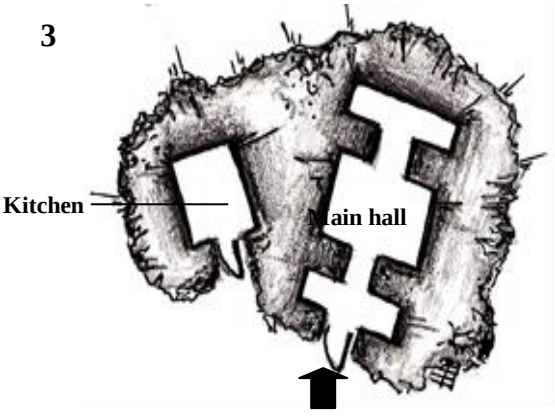
The first one is combined linear outcrop, which is a single big hall with all the functions inside a commonhall. First function is entry to the main hall, which is called entrance part, it is located right after the door next function is a big hall that consists of cooking area on the right side and the sleeping area at the end of the hall and the middle part is being used for hosting and socializing the inhabitants (Table 1).

Table 2: Divided linear outcrop

2  **Entrance**	Divided linear outcrop In this example because of conditions of the units and number of inhabitants living spaces divided Into two units, entrance is the transition between them, on one side there are sleeping rooms and the other side are main hall and the kitchen.

The second type is divided linear outcrop, by help of the original form of the outcrop it has been divided into two pieces. One of them is belong to private activities and the other one is, for public activities. Therefore, living spaces are separate (Table 2).

Table 3: Separated centralized outcrop

3  **Entrance**	Separated centralized outcrop In this type two units are within one outcrop that consists of separate cooking space on the left part. On the right side first there is space for entrance then main hall after that sleeping room.

Third type isseparated centralized outcrop, which is divided into two pieces on purpose. The reason behind it is to divide the cooking area from the living spaces therefore; women have a chance to cook more freely. The other unit is the living

units, which consist of entrance hall then a corridor after that main hall for hosting and at the end is sleeping room, which is connected to the main hall with a corridor (Table 3).

In the definition of living spaces, they have the other function that they are completely belongs to their dwellings. The first one is **Astana.** It is a place that is related to entrance hall, however is has a small difference with the other entrances, it is shown in table 4. It is both entrance and washing area (laundry). In the large units like examples in table 1 and 2 because entrance hall is big and separate therefore, with a single small wall they divide the washing area from the living spaces, therefore, entrance hall is being used for two functions, both entering and washing. In the smaller units the idea is the same like example in table 1. Entrance or Astana is not separated with corridor from the other function just with that small wall the Astana and living hall is being separated (Hosseinzadeh, 2000).

The next function is **Matbakh.** It is fire place or cooking place of the units. This area named as dirty area of the units therefore, most of the time it is outside of the main living spaces, the place of it is shown in table 4. Only in units like example in table 1 there are inside the living space. However in this case they divide the dirty area from the whole living spaces with skin of animals or by a curtain.

The other extra function that these outcrops have is **Sandoghkhane**(Figure 32).This space is different part of the units such as next to the washing area or at the very back part of the units. They are storages for storing weekly nourishments shown the place of it is shown in table 4. They are keeping the fresh nourishment of the week in this area (Hosseinzadeh, 2000).

Figure 32: View of sandoghkhane

In general, they have three types of storages, the first one is **sandoghkhane** as it mentioned above. The second one is **uncovered storage**. In this one they put all the nourishments on top of each other in with a pressure in order not to let the water get into the stored thing. They are mainly on the basement of each unit. The third one is the **main storage** of the settlement that all the inhabitants store their agricultural products there. They are special units in a south-east part of a village for all of them to store products (Firouz, 1991).

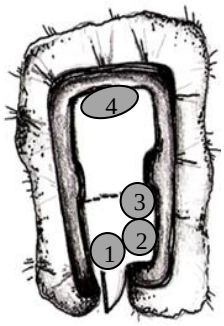
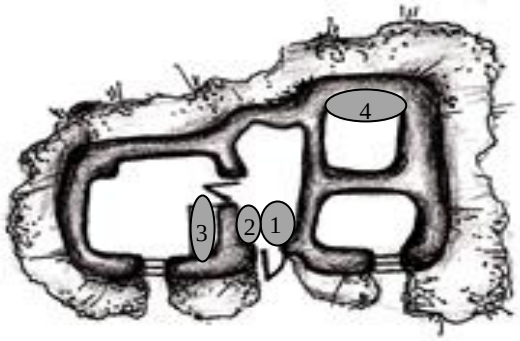
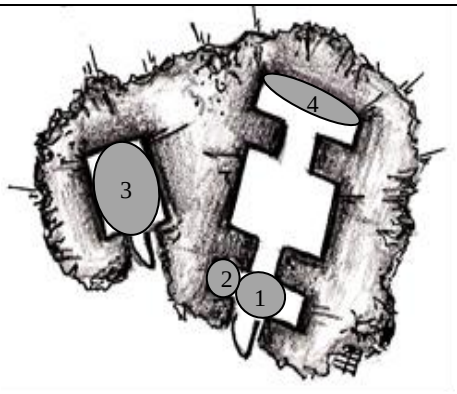
The next function in their living spaces is **Yuk yeri**. This space is specially for storing the sleeping things like blankets and pillows and also it is a place for keeping their cloths is shown in table 4. This space is a subtraction on the wall of the main hall and all of the stuff is inside of the whole and with a curtain they are separating this space with main hall.

The other space within living spaces is shelves. Interior spaces are most of the time small and everything is very compacted because of the force of the form of the outcrops. Therefore, it is impossible to add lots of additional elements inside. By this

limitation they produce a practical way to use the spaces efficiently therefore, instead of adding shelves, they are carved interior walls in order to make some subtractions on the walls therefore, they can put some candles, lights, flower boxes and other necessary stuff there (Figure 33).

Figure 33: Subtracted shelf on the interior wall

Table 4: Astana, Sandoghkhane, Matbakh and Yuk Yeri place in three main types of interior spaces

Combined linear outcrop  	1. Astana (Entrance) 2. Sandoghkhane (Storage) 3. Matbakh (Kitchen) 4. Yuk Yeri (Sleeping stuff storage)
Divided linear outcrop  	1. Astana (Entrance) 2. Sandoghkhane (Storage) 3. Matbakh (Kitchen) 4. Yuk Yeri (Sleeping stuff storage)
 Separated centralized outcrop	1. Astana (Entrance) 2. Sandoghkhane (Storage) 3. Matbakh (Kitchen) 4. Yuk Yeri (Sleeping stuff storage)

Role of these four spaces within the outcrops are vital because of the size limitation in each main living spaces, they have created these four functions in order to use interior spaces efficiently. Therefore these functions could be mentioned as sub functions of main livings (Table 4); the reason is that each of them is inside one of the main living function.

There are eight different outcrops, which have been investigated in this study. They are shown in the map of Kandovan (figure 34):

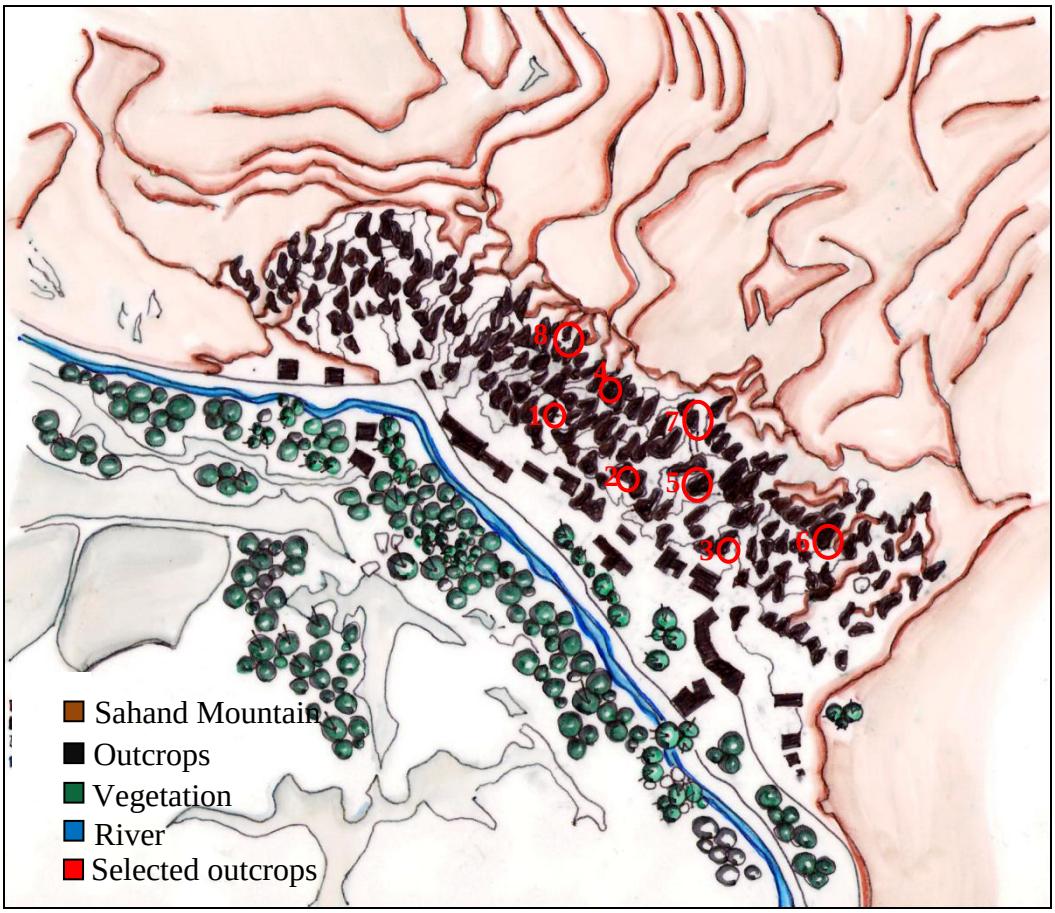


Figure 34: Map of Kandovan settlement

5.1.2 Entrance

As it mentioned above entrance or astana in Kandovan outcrops are the space, which is sometimes separate from other functions.Sometimes it is part of the main hall and also in some cases it is a transition hall, which is connecting the other functions

together. Therefore, the main characteristic of this function is divider element, which is dividing the outdoor spaces from indoor spaces. It has cultural and religious reasons behind it in order not to let people outside watch the female inhabitants inside the outcrops.

In this study, eight different house units (outcrops) have been investigated. Each of them has different character in terms of entrance hall definition. First example is two story building that has all the main function such as entrance hall, kitchen, main hall, toilet on the first floor and stable and storage are on the ground floor.

There are eight different houses in Kandovan dwelling has been investigated each of them has different characteristics the first one is in terms of entrance (Table 5).

Table 5: Entrance hall analysis

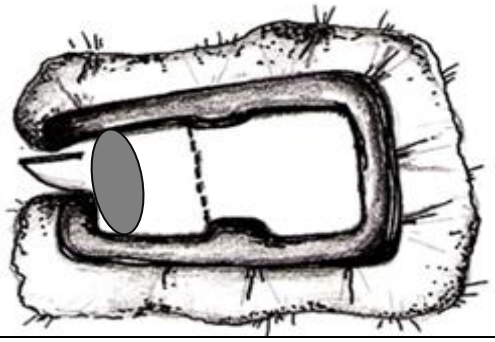
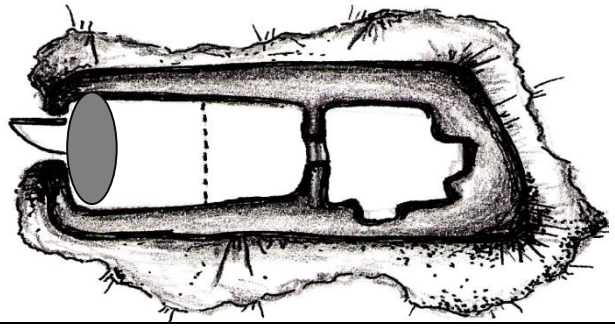
1 	In this example there is only one space that all the functions are distributed is the similar hall. Gray part is entrance hall. Entrance also is inside the main hall and there is no boundary for it. In this case in order to respect their religious beliefs they use curtain for separation.
2 	Entrance is inside the main hall just sleeping room is separated. Therefore, they are using same method for this one as well. By using curtain they are dividing the main hall from the entrance hall.

Table 5: Entrance hall analysis continuation

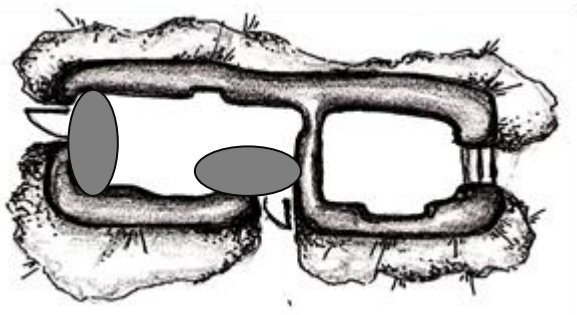
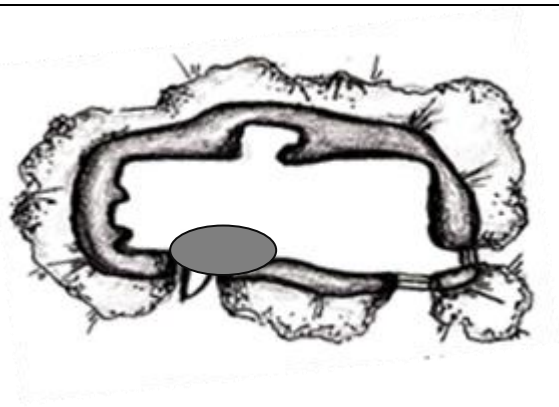
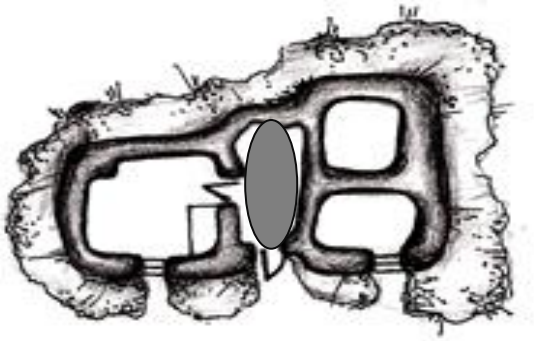
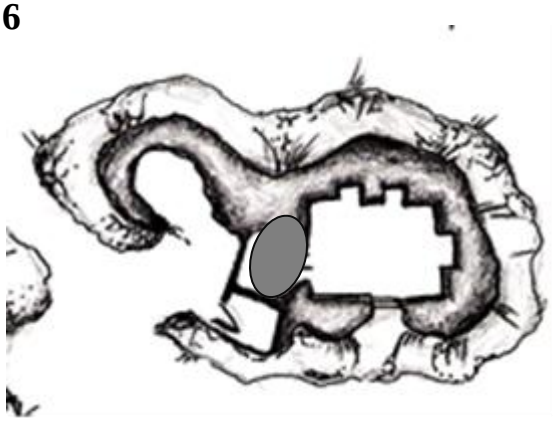
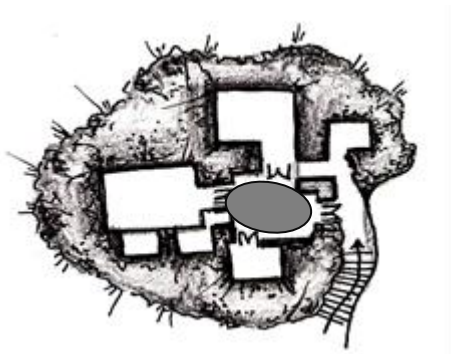
3 	There are two main doors in the unit. One of them is the main one, which is located on the left side and the other one is the secondary one, which is being used by women. The main one similar to previous ones is being separated by curtain from the main hall.
4 	Entrance hall is parallel with main hall; therefore, there is no chance for it to be in a big form. In this manner it gives opportunity to the whole unit to be separated into 2 pieces. Left side is sleeping part and more private part and the on the right side is main hall located.
5 	Entrance hall is a transition element for the other units. It means all the functions are separated from each other by having entrance hall in the middle. It has its own privacy and barriers.
6 	Entrance hall is in front of the main hall; however the divider is not curtain. There is a wall in-between them; therefore, entrance and living areas are completely separated. Privacy in this example is more that the first example because of the separator element.

Table 5: Entrance hall analysis continuation

7 	This unit similar to the previous one has separated unit for the entrance hall. However connection of it to the main hall is more secure than the previous one. It has a corridor in-between; therefore, there is no way to get to the main hall directly.
8 	Location of the entrance hall in this example is completely different in this unit. It is in the heart of all the functions therefore, each unit has its own entrance and they are all in more private manner.

From all investigations in "entrance" space, role of meaning is remarkable. Meaning of having boundary in between indoor spaces and outdoor spaces is sensible. Although they have difficulties in formulating the shape of spaces, they tried to share common solutions in all of them, which is meaning of entrance in their culture. It should be a boundary from outdoor spaces.

In all eight outcrops the solution was not the same. Some of them like unit number one or two are facing separation of outdoor and indoor spaces according to form of the outcrop, however in five, six, seven and eight examples form of the outcrop help them to solve this problem. Still they produced a particular solution in terms of entrance "meaning".

5.1.3 Hall

Hall is the place, which family members get together inside of it. It is usually being used most of the day and night hours. The whole family uses it (figure 35,36). It is being used as a place for making hand crafts things by females and being used for men as resting area. The other usage that it has isbeing used for hosting. All the guests gathered in this area and they have a chance to socialize with members of that house. In some cases, which have been investigated in this study, main hall is directly connected to the rooms and in some cases it is just a separate area (Table 6).

Figure 35: Hall example of outcrop no ‘8’Figure 36: Hall example of outcrop’3’

Table 6: Hall analysis

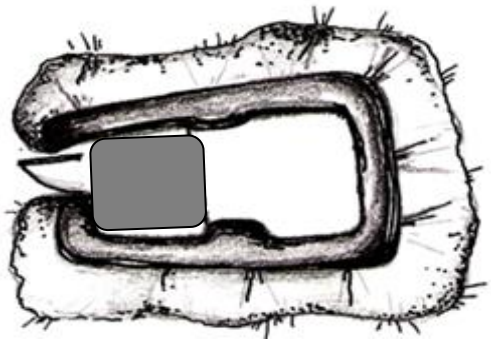
1 	Hall is in the heart of the house and it has direct access to the sleeping area as well, however with a small deformation of the wall these two spaces became a bit separated. Main aim of having deformation is to divide them however because of the limited space they couldn’t have this separation more obvious.

Table 6: Hall analysis continuation

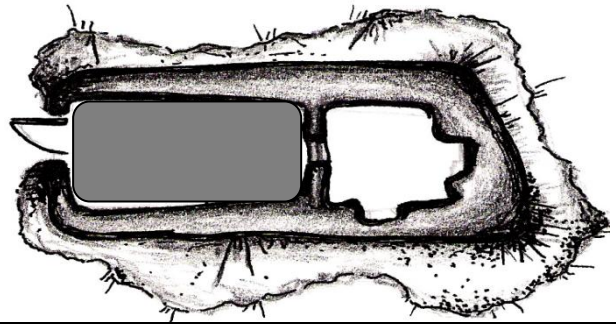
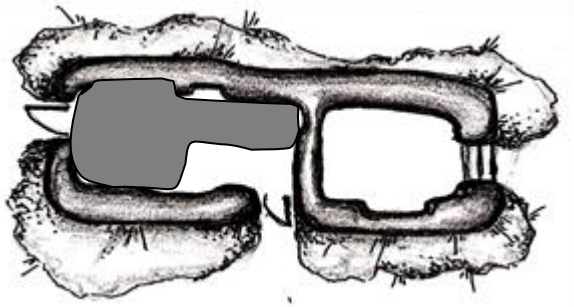
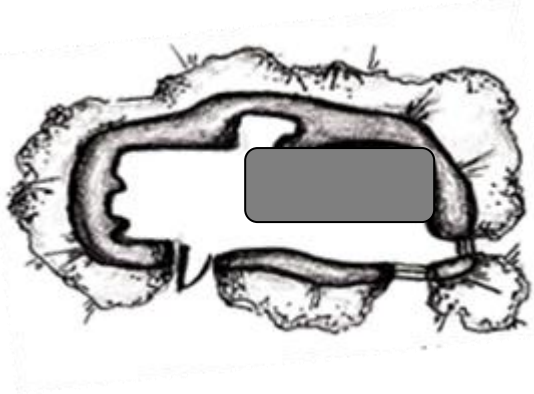
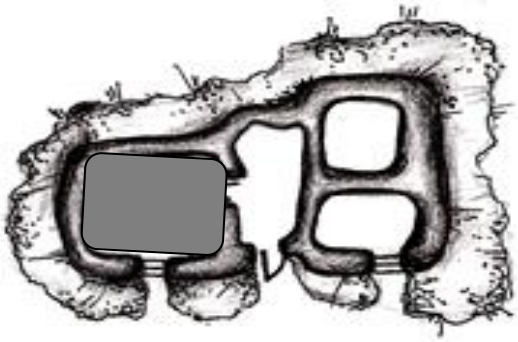
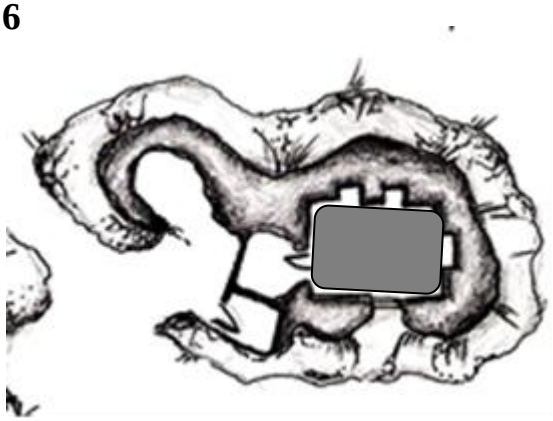
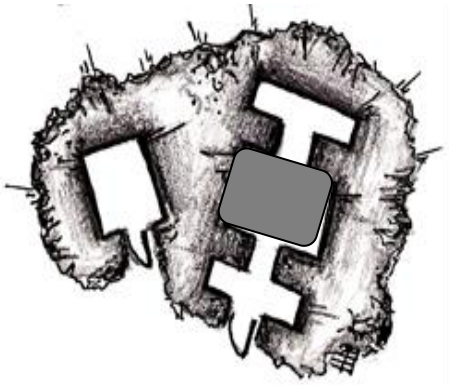
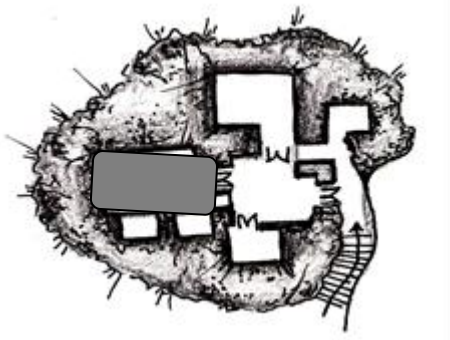
2 	Hall has a direct connection with entrance however sleeping unit is completely separate from the main hall. The solution here is more practical.
3 	Hall and also it has different entrance as well therefore, woman of the house would have a chance to cook in a more private space.
4 	Hall and sleeping area have direct connection however they are being divided by the place of door. The only difference, which it has with the first example, is the scenario inside the house. In this case the functions are not accessible at the end of each other.
5 	All the functions are sitting in different shapes and they don't have overlaps of functions. Main hall also has a different unit, which is separated from the sleeping part with entrance hall.

Table 6: Hall analysis continuation

6 	Functions are back to back somehow. However the way that they have been disconnected is different. From entrance hall to the main hall there is a door as a divider.
7 	Similar to the previous example this has similar solution just with a small difference. In the previous example the divider was door however here divider is corridors. Everything has been divided and defined separate units.
8 	Hall has been separated from the other functions by doors and corridors. Main hall has a separate unit and it is connected to the other functions from transitions unit.

As the result of this part, the main character of "hall" is a meaning of bringing all common activities of habitants together, such as: socializing, hosting and spending time together. Therefore size of this space in compare to the other functions is larger, in order to invite all the users, who share a similar outcrop together. This function is take place in a more public manner therefore barriers around it, is more flexible. In all eight examples it is the heart of the unit in order to exhibit its identity, which is unifying the family structure.

5.1.4 Kitchen

Kitchen or Matbakh is one of the main functions in their house for female users. They cook there, they spend time there and also they sometimes rest there. Some buildings of Kandovan have the chance to have a separate space for cooking and spending time there. Others don't have this characteristic. They are mainly next to the entrance hall and sometimes outside of the entrance unit and sometimes inside the entrance hall. In most of the cases, if there is a chance by formation of the outcrops to place the kitchen in separate unit they do it. They place it outside of the main building; the reason is that because of lack of ventilation inside the outcrops they prefer to place it out of the house. In table 7, typology of them has been investigated.

Table 7: Kitchen analysis

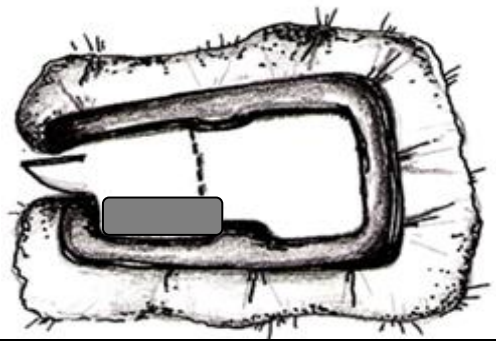
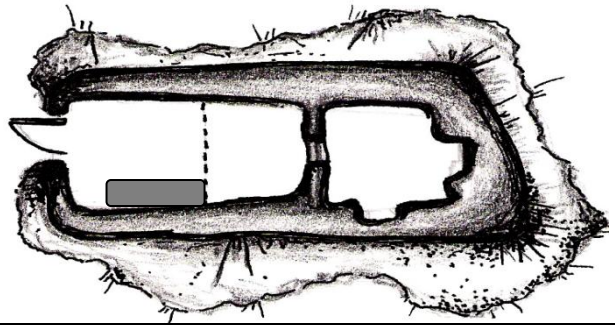
1 	In this example Matbakh is located inside of the entrance hall. It is located there according to the force of the formation of the building.
2 	Kitchen is inside of the entrance hall. The only difference that it has is that it has been separated from the main hall by level difference and sleeping area is separated from a wall from the other function therefore, without ventilation situation on the bedrooms are better in terms of smell.

Table 7: Kitchen analysis continuation

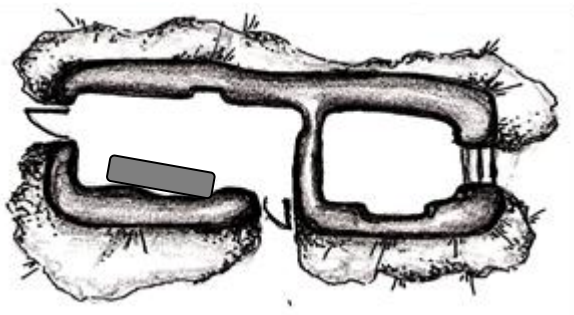
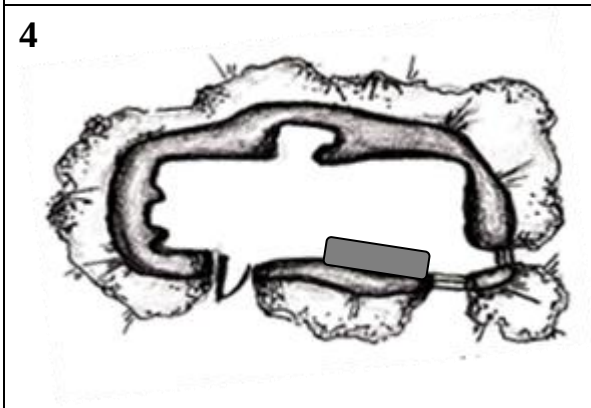
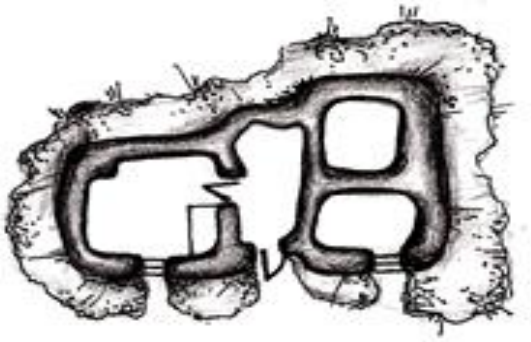
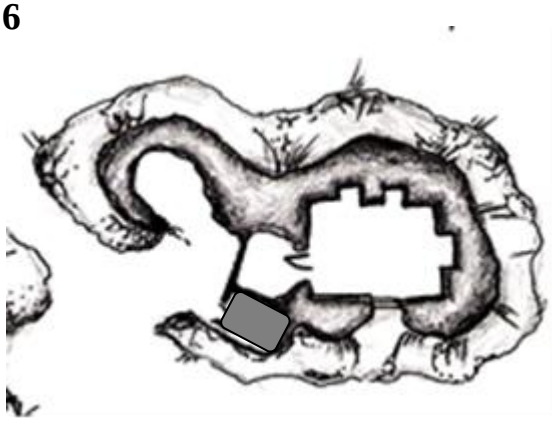
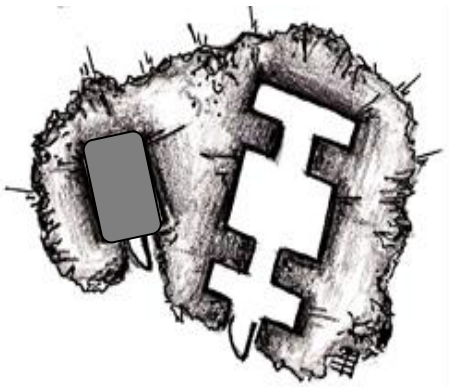
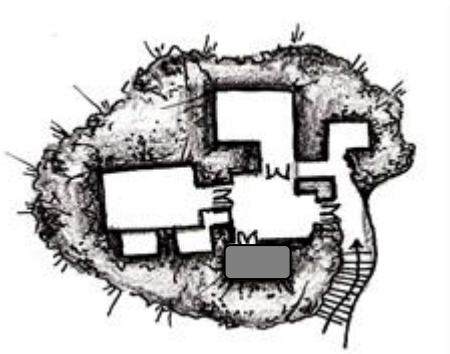
3 	Kitchen is inside the entrance hall. Difference of it with the previous example is that there are 2 doors for the unit. Therefore, for entering to the kitchen it is really easy to enter from its own door.
4 	Kitchen is in the middle of main hall and sleeping area and entrance hall therefore, this unit has ventilation problem.
	Kitchen is inside the main hall and it is separated from sleeping area and entrance hall. Therefore, there is a possibility for a woman to communicate and cook in the same time.
6 	This outcrop has separate unit as Kitchen function therefore, ventilation problem is not being considered in this example. Kitchen unit in this example is one of the private spaces because of the place of it, which is completely separated.

Table 7: Kitchen analysis continuation

7 	Kitchen is a separated unit. No ventilation problem and kitchen become more private in this case.
8 	It has also the same characteristics similar to the previous examples. Private characteristic and also no ventilation problem are similar in these three examples.

As it mentioned before kitchen is called women's private room in local expression, therefore the meaning of this function is not just cooking area. It is place, which is being used by female users most of the day. Therefore according to their beliefs, women could not be in direct contact with the men, mostly foreigners. Indeed they need to prevent a private space for them to protect them from outdoor spaces and also more public indoor spaces such as main hall.

In one, two, three example although they couldn't touch the original form of the outcrop to make an extra space for kitchen, they tried to separate the unit with curtain from other functions. In examples number six, seven and eight, they strongly separated main living spaces from the kitchen.

5.1.5 Sleeping Area

Another important living space is sleeping area, which is being used by all the occupants of the house. Most of the time the place of them, is on the ending part of the outcrop which is called the more private part of the unit. It accessibility to it from outdoor spaces is impossible, that's why it is mentioned as the private space in the outcrop.

Sleeping area is connected to the hall in the examples that have been investigated and it is better to have concrete boundary to have more privacy. In some examples divisions between hall and sleeping area is just with a curtain, however in Kandovan dwellings users need a private space for their own as well (Table 8).

These eight examples are representatives of how each unit's system is working, and how does the sleeping area connect to the other spaces.

Table 8: Sleeping area analysis

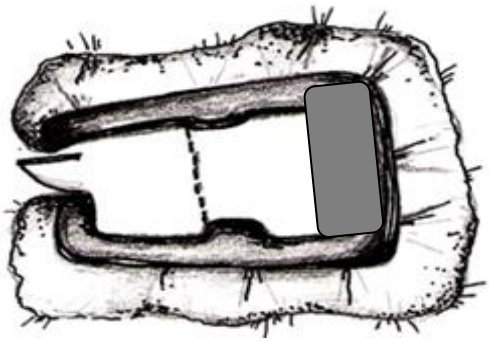
1 	Sleeping area is located at the end of the outcrop. It is attached directly to the main hall without any boundary in front of it.

Table 8: Sleeping analysis continuation

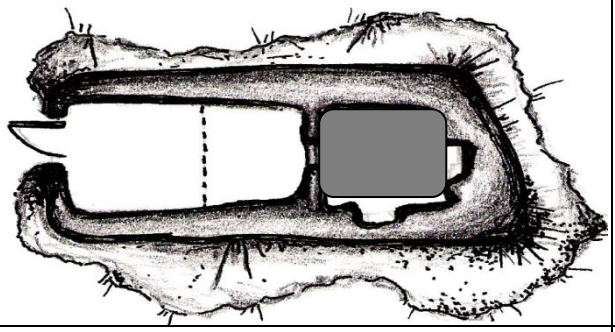
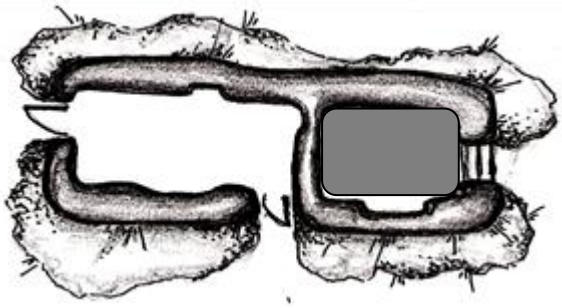
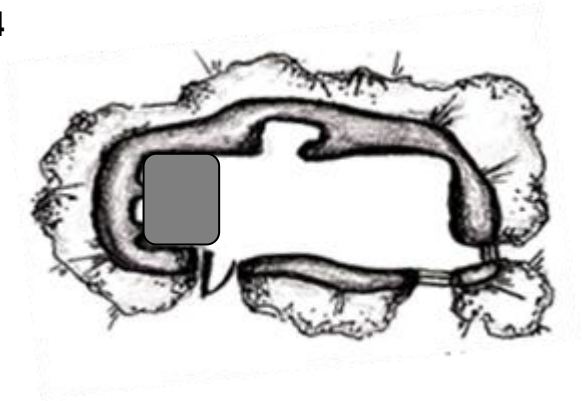
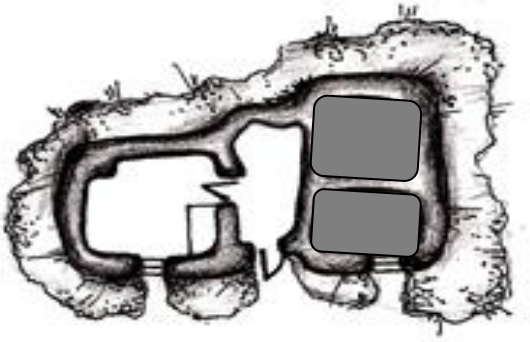
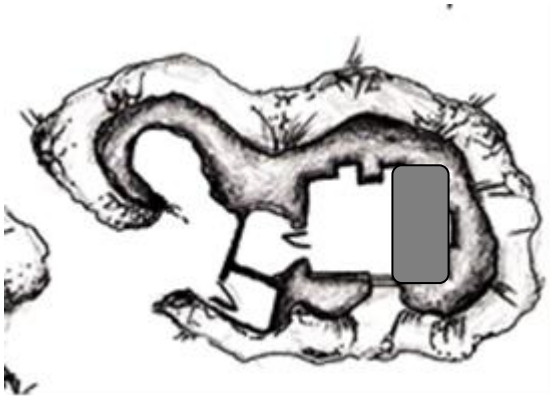
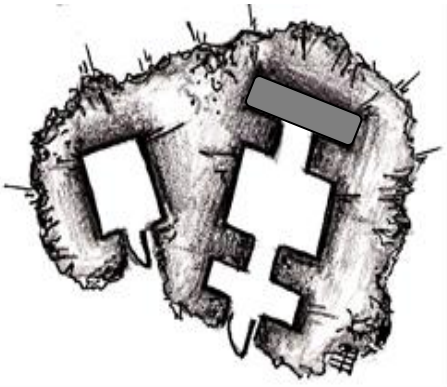
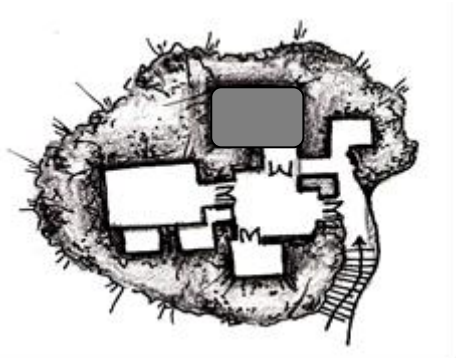
2 	Sleeping part again is at the end of the outcrop in the most private part of the unit. Although it is connected to the main hall, it has been divided by a wall. Therefore occupants feel more secure in this example.
3 	Similar to the previous example sleeping area is located at the end of the outcrop, however it has an access to the outside from the other entrance, which is located next to that. This entrance is only be used by the occupants for keeping the privacy.
4 	Sleeping part here is connected to an entrance and main hall at the same time, therefore privacy in this example is a bit critical. Hierarchy of the interior spaces is not that obvious. All of them are located randomly without considering cultural needs of the occupants.
5 	Location of the sleeping part here is very dominant and separated. There is a big boundary in front of the sleeping area, therefore division between mentioned function from the other functions is in strong way. Occupants feel more secure in this type of solutions.

Table 8: Sleeping analysis continuation

6 	Sleeping area is located at the end point of the functions in this outcrop. Similar to one of the examples there is no boundary between main hall and sleeping area, however division of the main hall from entry part with a wall make sleeping area more private.
7 	Tis example sleeping area has both wall and corridor in front of it. Therefore it can be a good example of having privacy for occupants. In order to reach to a sleeping area they should pass through several functions such as, main hall and corridors.
8 	Sleeping area and other functions have the chance to be completely separated in this example because of the solution that is has. Every function is divided by having a boundary around it by walls. Private and public functions are more clear in this example.

Sleeping areas are the most private part of the unit, which is commonly being used by the whole family members. In all eight examples as it mentioned before they tried to separate this space from the other functions in order to give the meaning of secure place to it.

In example number one and four, achievement of the organizations weren't similar to the other, particularly sleeping area. The problem there was form of the outcrop. The first one, sleeping area is right after main hall without any separative wall and the

second one, sleeping area is next to the entry part. Therefore solutions are different from the other examples. They managed to keep them at the end of the unit, in order to have it in a more private manner. However the other six examples are solved in a similar way. All of them are separated with a wall, to be more quiet and private.

5.1.6 Toilets and Bathrooms

Toilet and bathrooms are one of the wet functions in every building and they need a separated unit to be divided from the clean spaces. In Kandovan, they used to have toilets on the basement therefore, all the dirty things would have a chance to go back to the earth and they used them as manure for their agricultural sites (Figure 37). There was no pipe system in the units all of them used to have it on the basement. Moreover, today it is completely changed they have it on the same level of living spaces because of the difficulty of accessibility to it. All the pathways are very hard to climb,therefore; they preferred to have bathrooms next to the other functions. Most of the units has opening on the ground, which has a connection to the main water element of the dwellings and all the dirty waters go to the village dirty waters.

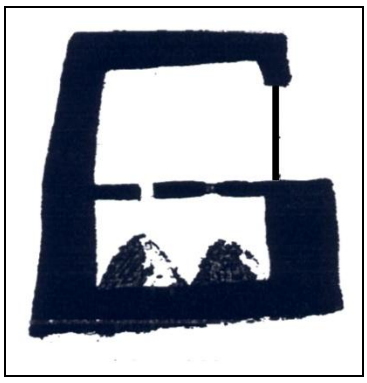


Figure 36: Section of toilets in Kandovan before.

By (Zargar, 2009)

In this study in table 9 all the typology of them has been investigated.

Table 9: Toilets and bathrooms analysis

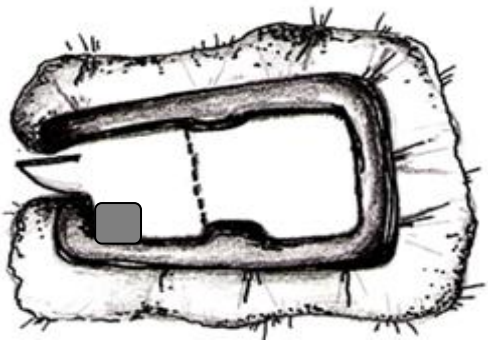
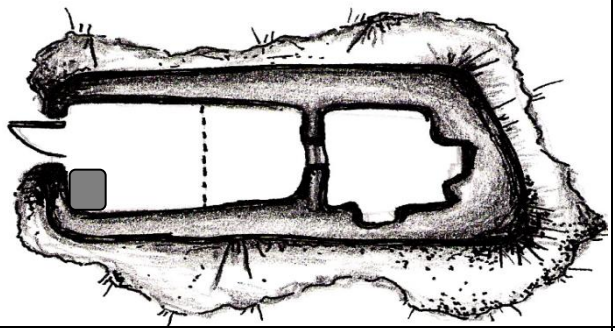
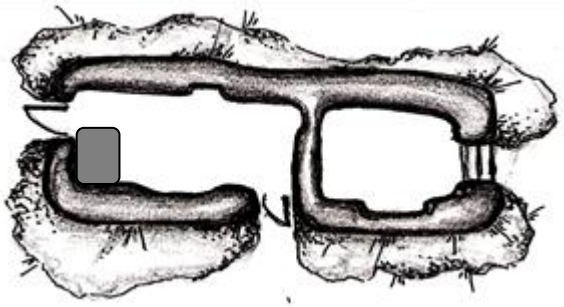
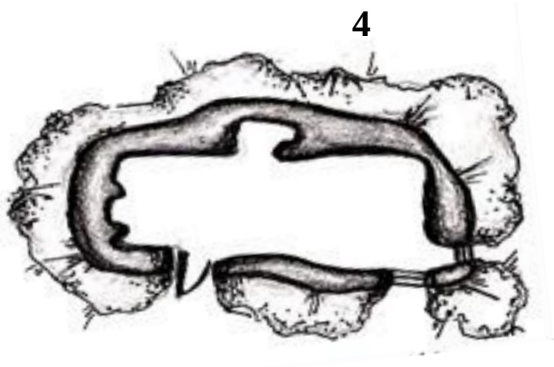
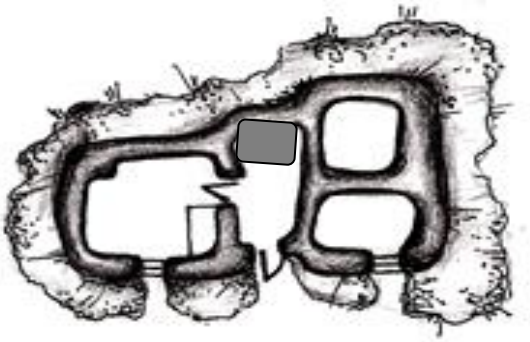
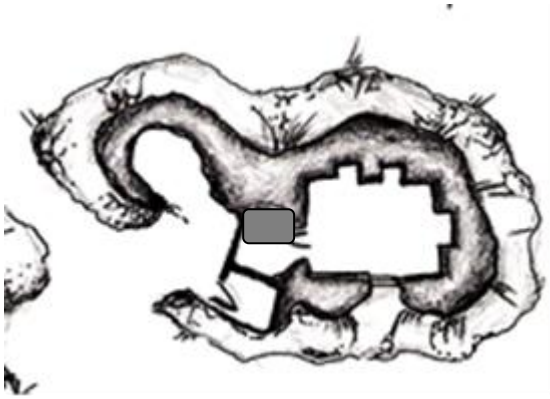
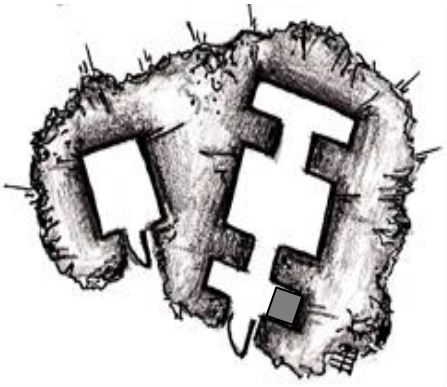
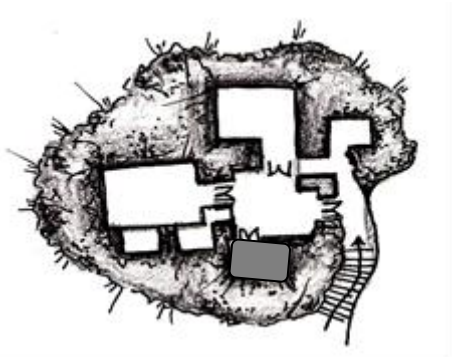
1 	Toilet and bathroom are in the entrance hall away from main hall and sleeping area therefore, there is no divider for them.
2 	Toilet is inside the entrance hall. It is also away from main hall and sleeping area. It is separated from main hall by level difference of the ground and it is separated from the sleeping unit by a wall.
3 	Toilet is inside the entrance hall again. It has direct access to the main hall however it doesn't have this access with the sleeping area because of the wall.
4 	As all the functions flow in each other, toilet also flows inside the other units such as main hall and sleeping area. 

Table 9: Toilets and bathrooms analysis continuation

	Toilet is separate from sleeping units and also living area however it is in the middle of entrance hall.
6 	It has the toilet separate from main hall and sleeping area and it is located in the entrance hall.
7 	This case has similar characteristics with two previous examples. Toilet is within the entrance hall and separated from main hall and sleeping unit.
8 	Each unit has different function and each of them are separated. Toilet also is located out of the other living functions.

Toilets and bathrooms are spaces, which used to be on the basement floor as it is mentioned before. However in investigation of these eight examples it becomes more clear that having it next to the other functions, is more convenient In terms of circulation difficulties. Therefore all these outcrops are organized by having bathrooms inside or next to the other main living functions.

5.1.7 Shelterfor Animals

As it is mentioned in previous chapter, one of the important occupations of Kandovan habitants is animal husbandry. Therefore, in some of the units, they have an extra function as shelter for animals to keep their animals next to them. According to the characteristics of this function, they keep their animals far from the living spaces. Therefore, in cases those habitants are doing livestock there is an extra function on their outcrops, which is a shelter for animals.

In this case, they had to choose outcrops, which had the potential to be two stories in order to keep animals on the basement floor and the other living functions on the ground level.

In this study, from eight case studies, which has been illustrated only four of them have stable units on the basement floor. This shows that the other four outcrops members have different occupation.

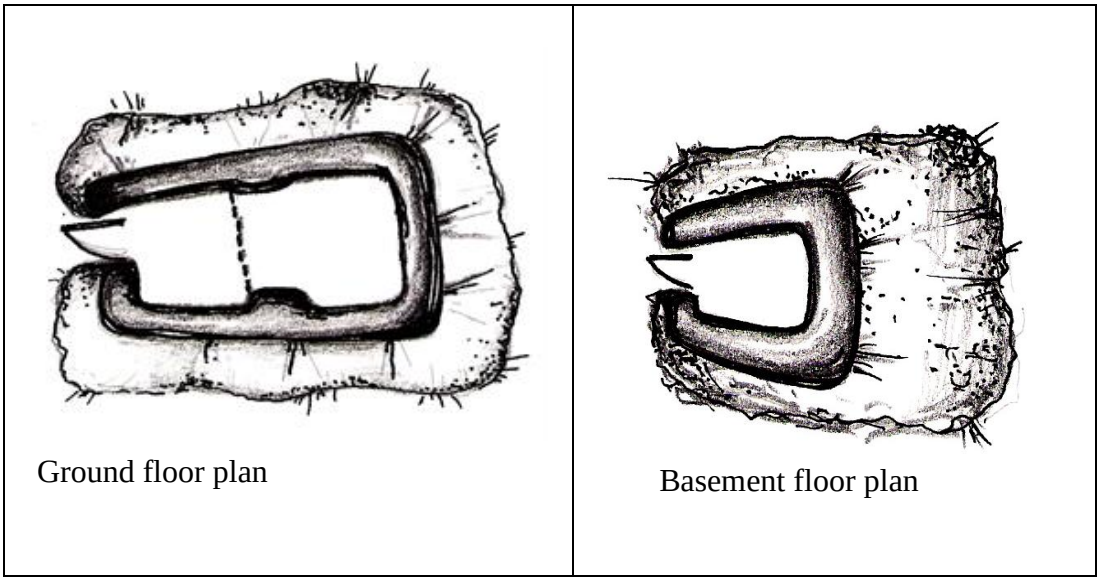


Figure 37: Shelter for animals inoutcrop number one

This is case study is plan 1 and as it is shown on figure 38 it has 2 stories that on the ground floor all the living areas located such as main hall, kitchen and sleeping area. On the basement floor plan, stable or shelter for the animals located in order to be separated

from all living functions. Accessibility to the stable is possible only by going down from the original mountain. There is no indoor staircase to the basement floor. Function of this unit is stable and at the same time storage for the nourishments.

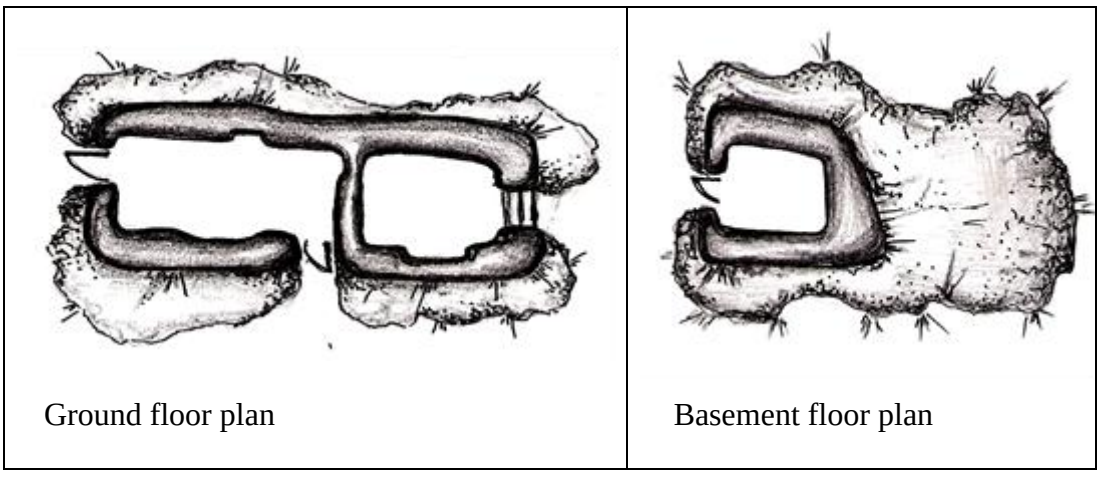


Figure 38: Shelter for animals outcrop number three

This is plan 3 that again has this extra function inside as it is shown on the figure 39. Similar to the previous example ground floor is being used as living area with kitchen, entrance hall, main hall and sleeping functions inside. Basement floor is for keeping the animals and storing the nourishments because of the characteristics of it. It has to be separated from the other functions of the building.

Accessibility to the basement floor is only possible from outdoor space by help of mountain ramp. There is no other indoor accessibility to the basement floor.

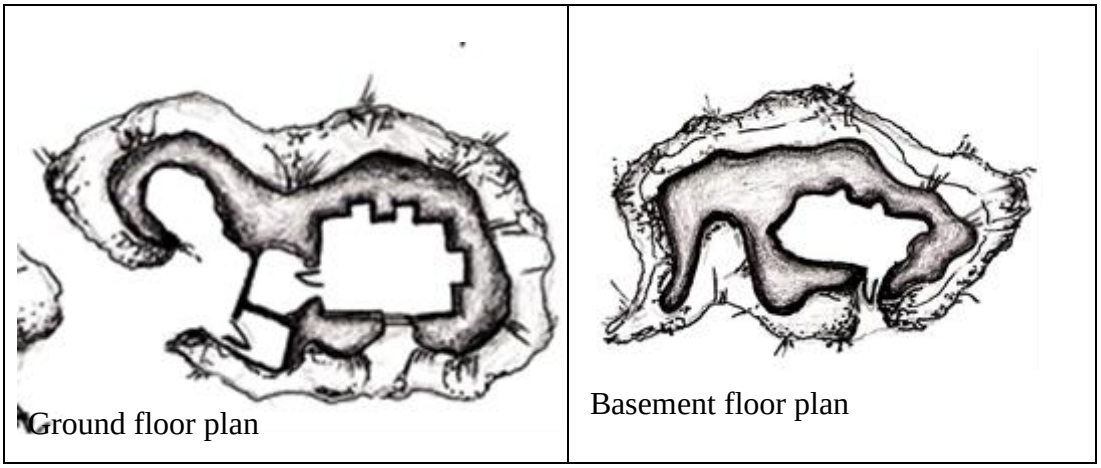


Figure 39: Shelter for animals in Outcrop number six

This example is plan 6 and again this one also has the extra function on the basement floor plan (figure 40). This one because of the thickness of the outcrop walls shape of the basement is different from ground floor in terms of structural concerns. Direction of the entrance to the living spaces is different from direction of the entrance to the stable therefore, in terms of accessibility they don't have to turn all around the outcrop to go one level down to rich the entrance. Distance is less than the previous examples.

Similar to the previous examples, all the living spaces are on the ground floor and storage plus shelter for animal function is on the basement floor.

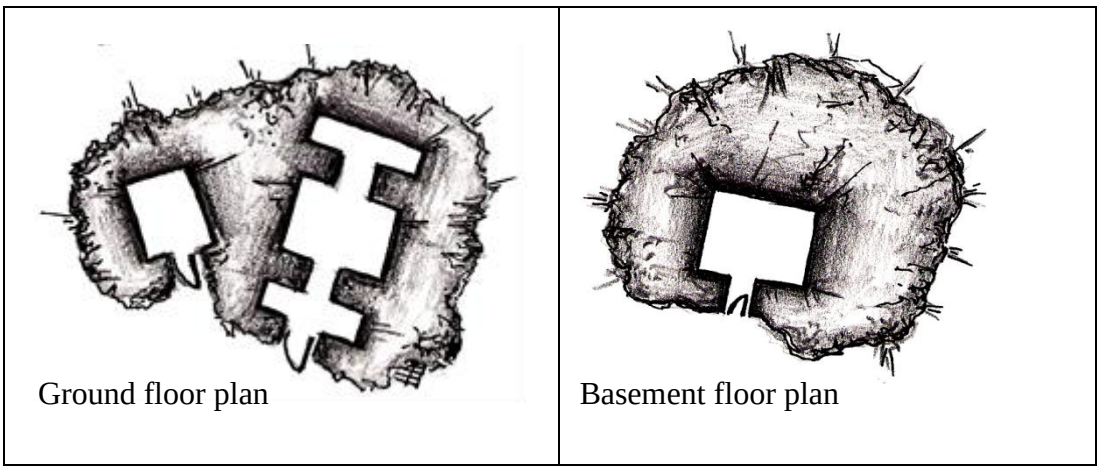


Figure 40: Shelter for animal in outcrop number seven

This is the last example of the outcrops, which has two different stories, one of them is being used for living spaces and the other one is being used for stable (Figure 41).

Accessibility to the basement floor again is from outdoor spaces in this example on the same place that on the ground floor entrance is located.

Functionally ground floor consists of main hall, sleeping area and kitchen and basement floor is a place for keeping the animals and storing the nourishment.

From all examples above, there is one common terminology that all the outcrops are representatives of the users. Here in this section is more sensible because these 4 different units that consist of 2 stories that one of them belong to the stable shows that the habitants there are ranchers. In other examples, for instance without stables

outcrops are representative of none rancher units. Maybe their occupation is farming or the other things.

5.2 House Form of Kandovan

House typology generally in this part is related to the form of the outcrops. Formulation of the spatial organization has developed by limitation of their forms. The one that are smaller could be used by smaller families and the bigger one can be shared between numbers of occupants. Therefore, important factor is formation of them.

House typology in Kandovan dwellings can be classified in three categories according to the use of it. They are categorized as:

1. Single cell
2. Composite single family cell
3. Compound multi-family cells

Single one level outcrop, which belongs to a single family, it has limited shape and size.. Second one is outcrop with two or more that two stories and the third one is outcrops, which consist two or more units underneath the same outcrop.

Single cell: As it is shown on figure 42 the first type of the houses. The height of the outcrop is not that high therefore, there is a chance to have it as on story unit. Accessibility to the outside is possible directly from the ground level on the same level of the outdoor space. Example of it is shown on figure 43. Also it is shown on the section in figure 40 that the whole unit is one step above the ground. The reason of shifting it up just on step is not to let the rain water come inside.

Single one level outcrop, which belongs to a single family and most of the time old wife and husbands use it because of the limited shape and size that is has shown in figure 42. Second one is outcrop with two or more that two stories and the third one is outcrops, which consist two or more units underneath the same outcrop.

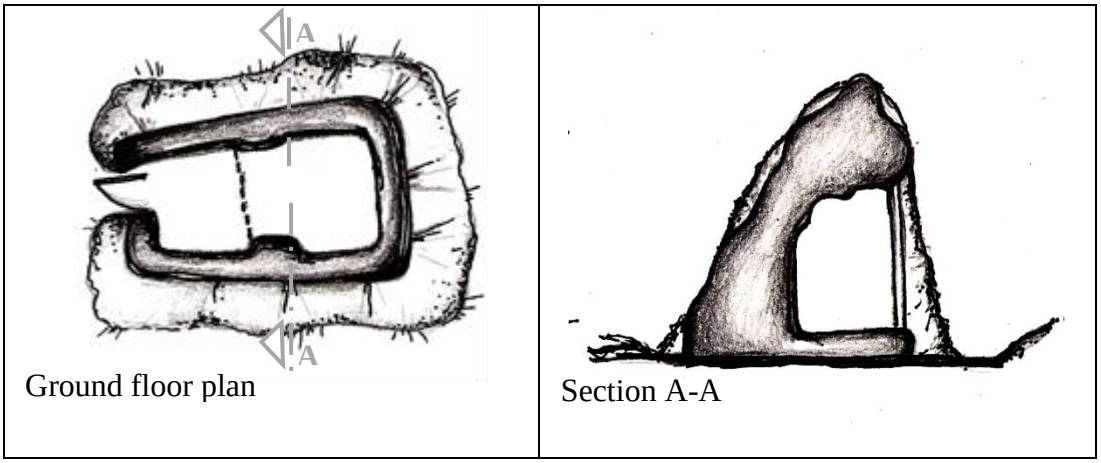


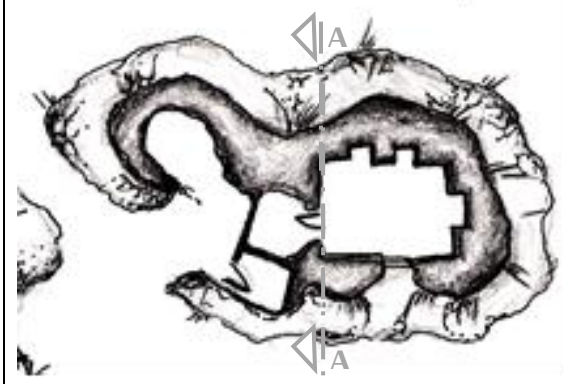
Figure 41: Single cell type

Figure 42: Example of single cell outcrop

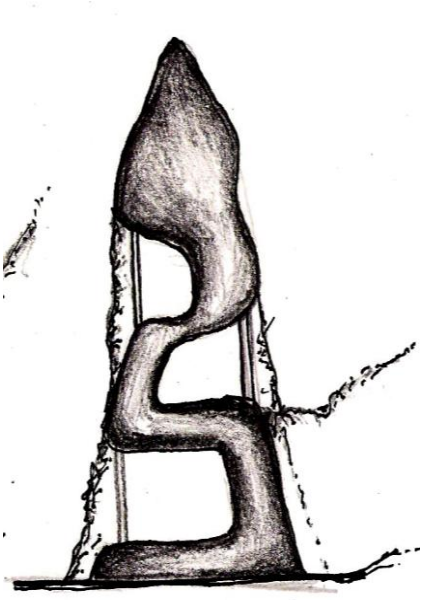
Composite single family cell: In the second typology of housing as it is shown on figure 44, outcrop has two or more than two story and functions distributed on different levels. In this example on the ground floor all the living spaces are

organized such as main hall, kitchen, entrance hall and sleeping area and on the basement of the unit stable located. There is also one more floor on the first floor, which is empty now because of that, it is not shown on the figure 45. Maybe later on they would use it as living space for the greatest son of the family after he gets married.

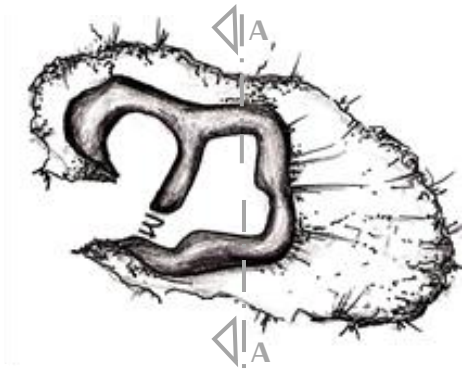
Accessibility to each floor is from outside. In this case there is no designed stair case around it they can climb the original ramp of the mountain to rich basement floor and first floor around the outcrop.



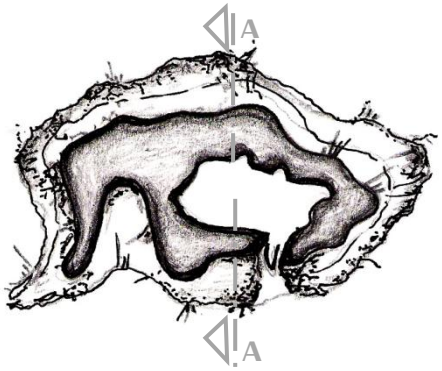
Ground floor plan



Section A-A



First floor plan



Basement floor plan

Figure 43: Composite single family cell

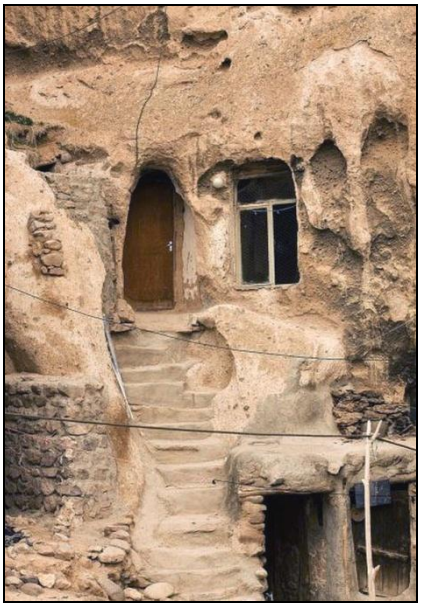
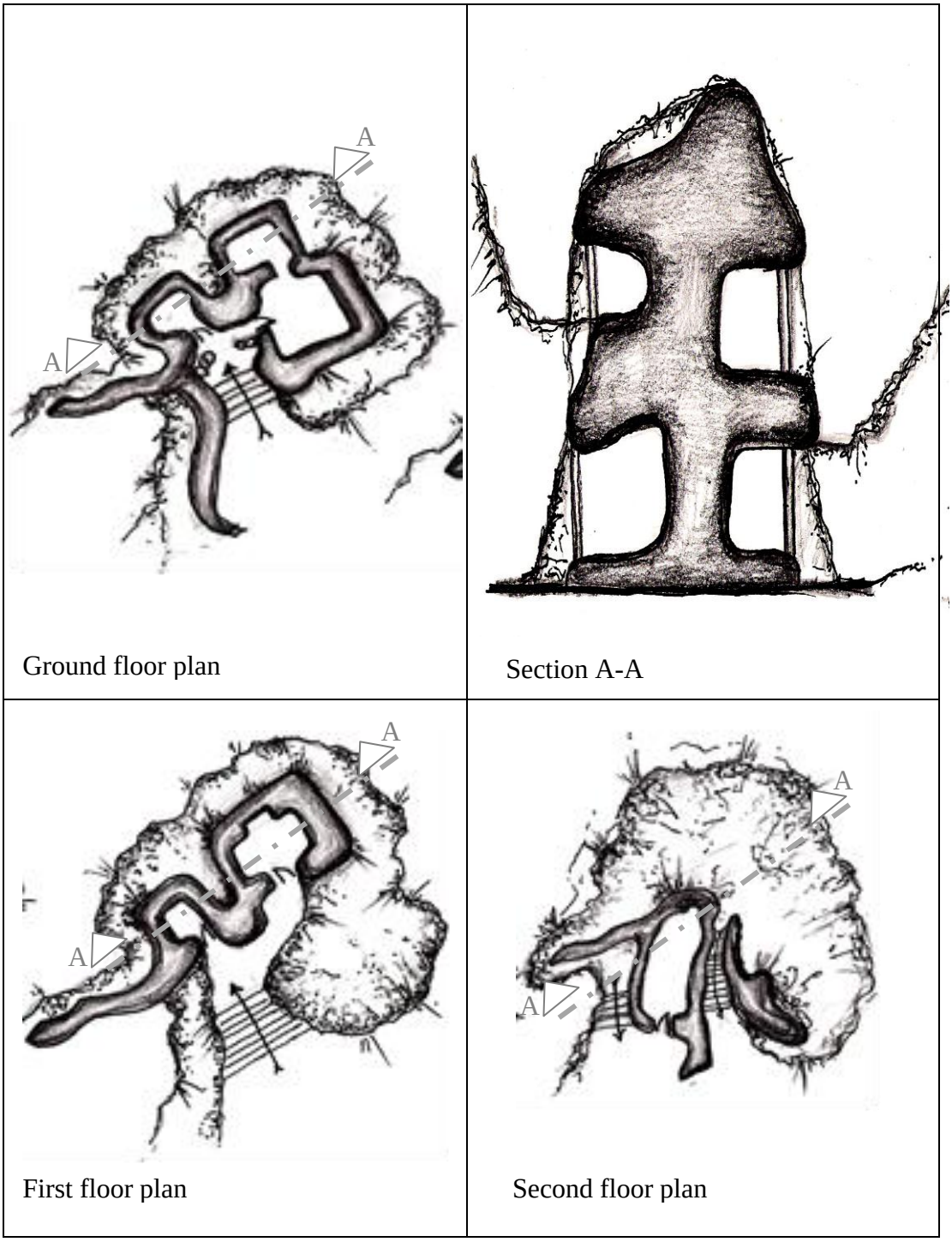


Figure 44: Example of composite single family cell

In this kind of typology they used to have toilets and stable together on the basement floor before (Figure 45), however because of the hard accessibility they have changed the position of the toilets on the same level that they live in order to make life easier there.

Compound multi-family cell: This House typology is the last kind of housing in Kandovan dwelling that has two or more than two different units underneath the same outcrop as it is shown on figure 46. It means that size is one of the major factors in the house typology of Kandovan. This outcrop is bigger than the other types therefore, they could have a chance to carve ground floor for two or more families and on the upper floor also with consideration of structure they could also carve it for one or even more than one families. One example is shown on figure 47.



Ground floor plan

Section A-A

First floor plan

Second floor plan

Figure 45: Compound multi-family cell

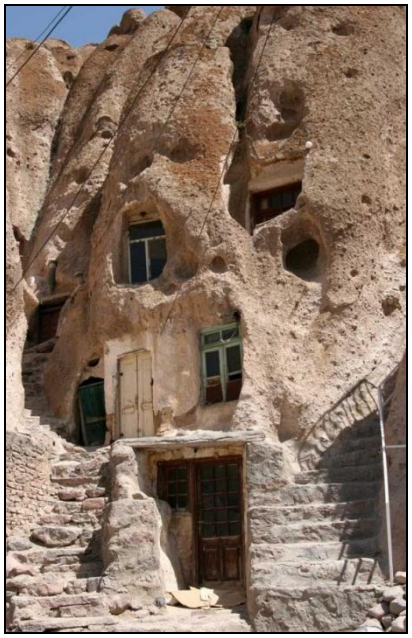


Figure 46: Example of compound multi-functional outcrop

This kind of housing is not common there, because there are few outcrops with big sizes. Therefore, most of the examples are from type 1 and type 2. They are numbers of type 1 and also numbers of type 2.

From all terms mentioned above, form of the outcrop is playing an important role for both choosing an outcrop for living and organizing it out the same time. For instance according to number of family members, occupation of habitants and traditions inside the family routines they have to formulate interior spaces. Therefore these factors are the parameters for choosing an outcrop.

5.3 Spatial Organization

Spatial organization as it mentioned in chapter 2 is the relationships of the spaces with each other and also their connection and accessibility to the outside (Desyllas, 1989). The other main issue in analysis of the spatial organization is relationship of

the whole building with the street pattern and outside. It means street line or in this case pathways lines with the building.

In this part cell relationships (spaces), private and public relation and also outcrops relationships with the street line is being investigated.

5.3.1 Cell Relations

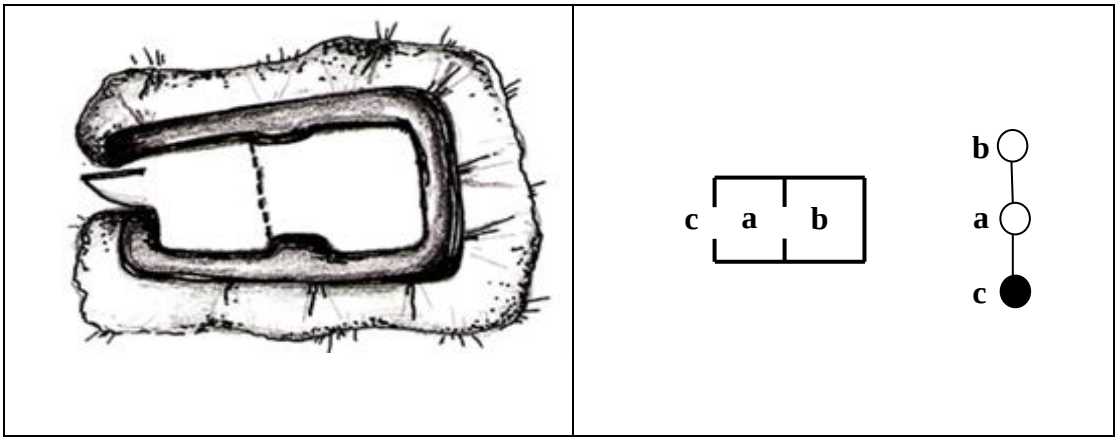


Figure 47: Plan 1 cell relation analysis

As it mentioned above in analysis of the spatial organization what is important is the relations of the spaces within each other and to the outside. Therefore, by cell relation figures there is chance to demonstrate all of the interior to interior and interior to exterior relationships.

In figure 48 first plan, is being investigated. Relationships of the interior spaces in this example are in a linear manner and all of them sit next to each other in a row. Possible accessibility to each function is from the previous function it means there is only one way to reach each function, which is from the function in the backside. On the right side of the figure 48 spaces of the mentioned plan is being simplified and as

it is shown. Outside of the building named as “c” and main hall with its functions that are entrance hall, toilet and kitchen named as “a” and sleeping part named as “b”. From the figure it is obvious that richness to function “c” is possible only from function “a” and opposite. However “a” is accessible both by “b” and “c” functions. It means that sleeping area is in connection only with main hall not outside, which is showing its characteristics. It is a private space therefore, in forming the interior spaces the idea was to put the private functions in a more private place with no connection to the outside and the other functions such as main hall that are more public could have a direct relation to the outside of the building.

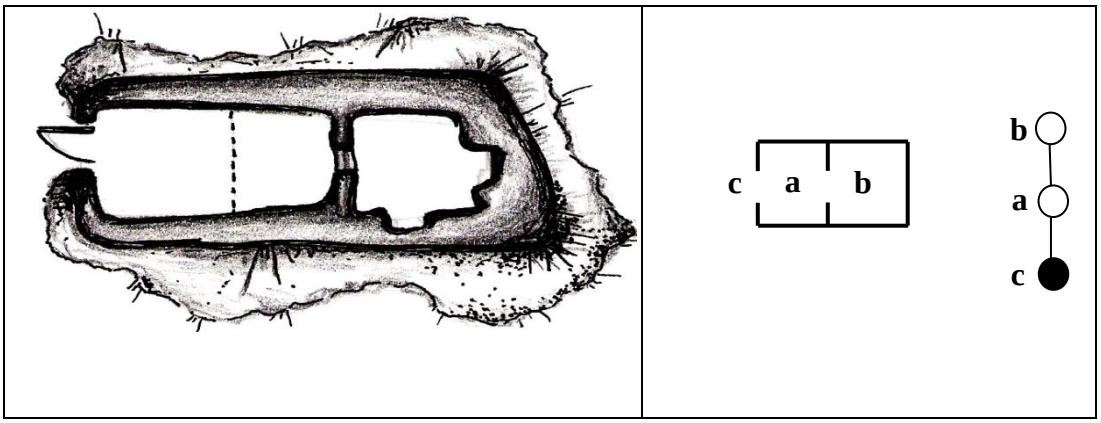


Figure 48: Plan 2 cell relation analysis

In plan 2 figure 49, formations of the functions similar to the previous example are back to back in row. From outside to the entrance hall after that kitchen and toilets and then main hall and from the hall in a more secure way from a wall sleeping area located.

As it is shown in the right part of the figure 49 similar to the previous example accessibility to the spaces is from function “a”. İt means that function “a” that is the main hall is located in the heart of the outcrop. Therefore, accessibility from the outside, which is cell “c” is possible only by passing through cell “a” then from cell

“a” to cell “b”, which is the sleeping area of the unit. In this example again the idea is to protect the sleeping area, which is most private part of them from outdoor spaces. This example express the concept privacy more than the previous example because as a solution they separated the sleeping part from the other function, which are cell “a” and “c” by a wall with a door. Therefore, habitants who live there could use the sleeping part as the private space. Mainlyfemales, because of theirreligion.

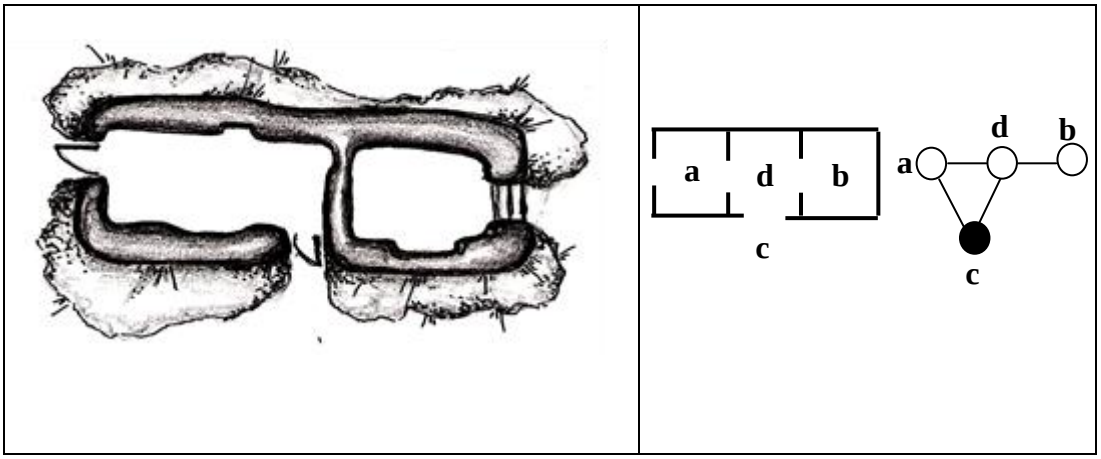


Figure 49: Plan 3 cell relation analysis

In this outcrop connection of the indoor spaces and also outdoor spaces are different. There are two different entrances to two different direction of the building that each has its own character (Figure 50). The first entrance is on the west part of the building and the second one is located on the south part of the outcrop. The one on the west is next to the entrance hall and kitchen, the south one is located on the end of the main hall. The reason behind it, is that no stranger could come to the building from west one therefore, house wife would have a chance to have a private atmosphere in the kitchen while she is cooking. All the guest and men come from the south entrance to the house. Place of the sleeping part is on the east side of the unit and with a wall it has been separated from the other spaces.

As cell relationships on the right side of the figure 48, it is shown as “a” spaces as entrance hall and kitchen, “d” as main hall, “b” as sleeping space and “c” is outside of the unit. Therefore, from the figure 48scenario of the interior relation is that, main hall or “d” is the heart of the spaces it has connection to entrance and kitchen as “a” and at the same time it is in relation with sleeping part, which is “b” and from all of the it has direct connection to “c” space, which is outdoor space of the unit. There is another connection to the “c” space from “a” unit as entrance and kitchen of the outcrop.

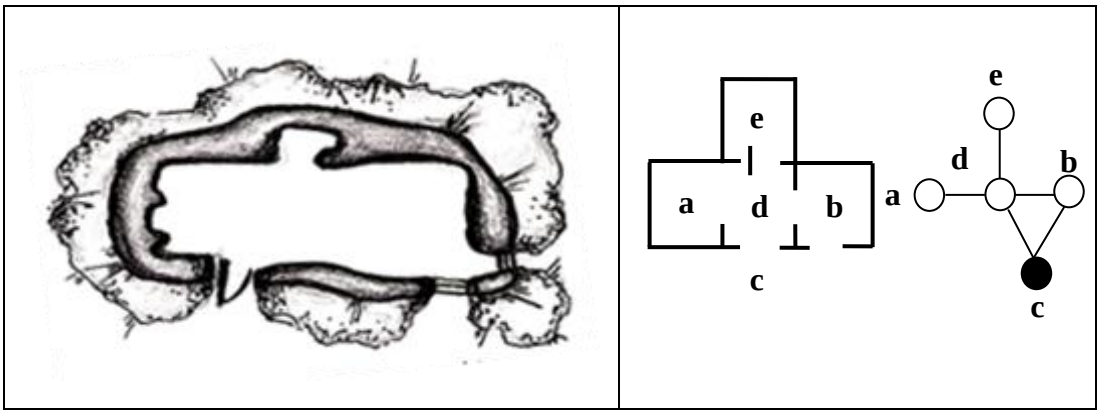


Figure 50: Plan 4 cell relation analysis

This example exactly similar to the previous case study has two different entrances; however both of them are on the south part of the building. One of them is inside the kitchen and the other one is in the main hall (Figure 51). Although privacy is one of the initial functions in the spatial organization of these units, however there are different solutions for the interior spaces, which show the different approaches. This outcrop has a little difficulty in having private spaces inside because of the place of the entrances. One of them, which are located on the south-west of the building, is very close to the sleeping area and it doesn’t have any boundary around it

therefore,in compare to the figure 49 the privacy in this example is less. The other entrance on the south-east again although is being used only by house wife, it is next to the other entrance therefore, strangers have the chance to see what is going on inside the cooking space.

As cell relationships, similar to the previous example cell “c” as the outdoor space is connected to both “a” entrance hall and main hall, ”e” as terrace, “d” as the kitchen. Interior spatial organization is again back to back all the functions inside “a”, “b” and “d” has back to back relationship in a single ro. Again heart of the spaces is “d” space, which is main hall of the outcrop and there is an opportunity to rich to a desire function from it.

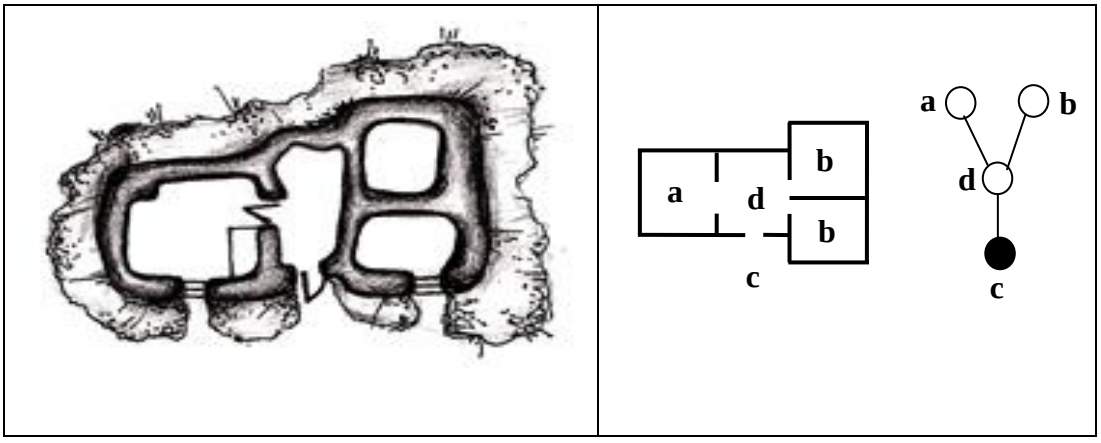


Figure 51: Plan 5 cell relation analysis

This outcrop has the most secure way of solution because of it spatial organization. Relationships of all spaces are from the circulation area through a door. Therefore, in this manner all of them are separated and each of them has privacy. Entrance hall is in the middle of the functions and in this example entrance hall is the heart of the unit, which is shown in figure 52. Sleeping part of this outcrop has been divided in to, two sub spaces therefore, habitant use each sleeping space individually. Kitchen

and main hall are combined in a similar unit therefore;house wife has more chance to communicate with the other family members inside the unit while she is working.

As cell relation, “d” as the main hall is in the middle of all units and it has direct connection to the other function such as “a” as main hall and “b” as sleeping unit and also “c” as outdoor spaces. Connections of the other functions are from “d” to each other. For instance from “a” to “b”,they have to get to the transition unit, which is “d” and then, they can go to “b”. For getting out also they have to be in “d” first then from “d” they can go to “c”, which outdoor space. In this case family members feels more secure and safe inside the house because even they leave the door open no stranger could see the living areas of the house.

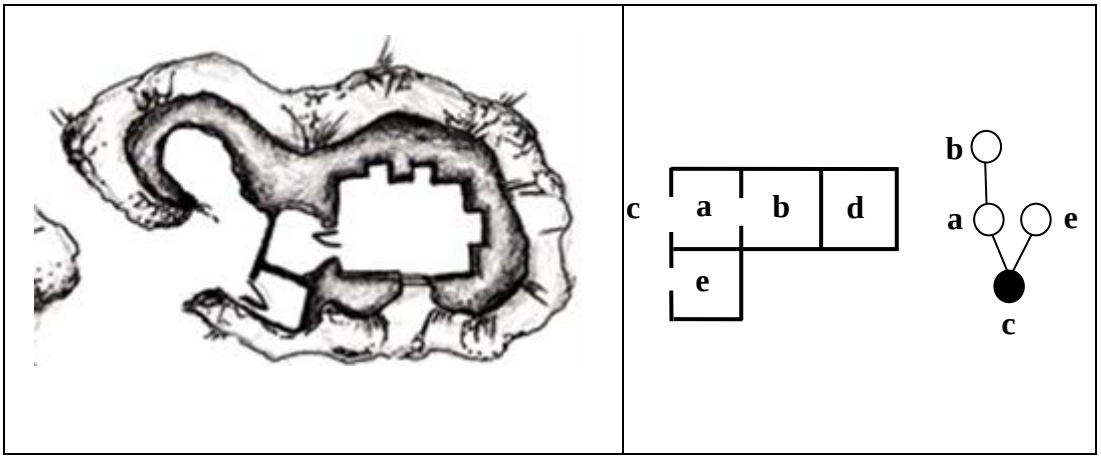


Figure 52: Plan 6 cell relation analysis

In this outcrop there are two different parts at the same time that is shown in figure 53. Entrance hall and main hall and sleeping part are taking place back to back in a row and kitchen is completely in a different unit. There three reasons for this organization. The first on is separate the cooking area from the living space not to let the smell stay inside the living environment and second reason is that to keep the house wife in separate unit again for religious beliefs therefore, no one could have a

chance to see her communicate with her. The third and the last reason is that force of the environment in this example was in a way that habitants could carve it in desired way with concerns to their culture.

As cell relation because it has two different parts that they sit next to each other cell relationship can be divided in to two pieces in order to be analyzed separately in figure 51. First figure shows that relation of the living spaces is from “c” to “a” to “b” and also “c” to “e”, which “c” represents outdoor space and “a” represent entry part. Therefore, both of them have direct access to outdoor space that means from outdoor space to the entry part and from entry part to the main hall and sleeping part. This figureis representative of the importance of the kitchen separate unit and the heart of the units, which is main hall. Again same as previous examples sleeping area doesn’t have any accessibility to the outdoor spaces for privacy issues.

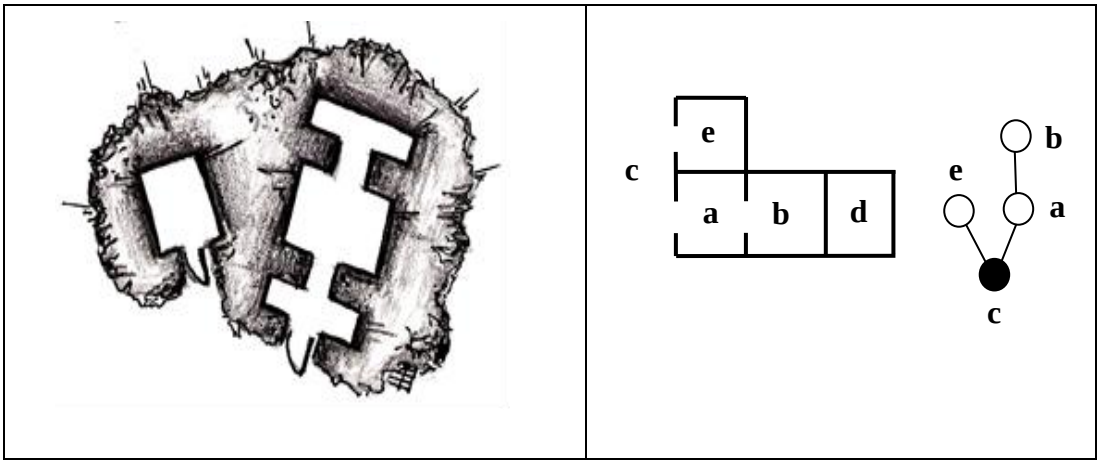


Figure 53: Plan 7 cell relation analysis

This outcrop is very similar to the previous example. It has two different parts, one of them belongs to the kitchen on the west side of the unit and the other one consists of entrance hall main hall and sleeping area shown in figure 54. Accessibility to the functions inside is possible in different ways. West part is very simple because it is only being used by house wife and it is a place for cooking therefore, from outside

there is only one way to get in, directly from outdoor space to the kitchen. It is one of the private spaces of this unit. The second part of the out crop is the living are and guests and men can use it. All the functions in this part sit back to back in a single row.

As cell relation similar to the previous case study, it is shown on the right part of the figure 54. Outdoor spaceis named as “c”. Spatial organization of the spaces is, from “a” to “b”, “b” to “d” and from both “a” and “e” to “c”. It means from kitchen to the outdoor space and from outdoor to kitchen. Again main hall is the heat of the outcrop and there is no possibility to rich the sleeping area directly. Outdoor space as “c” is only connected to the entrance hall and kitchen; therefore, the other living spaces are in a more private manner. “d” function, which is sleeping area similar to the previous example is in the most private place, at the end of the row.

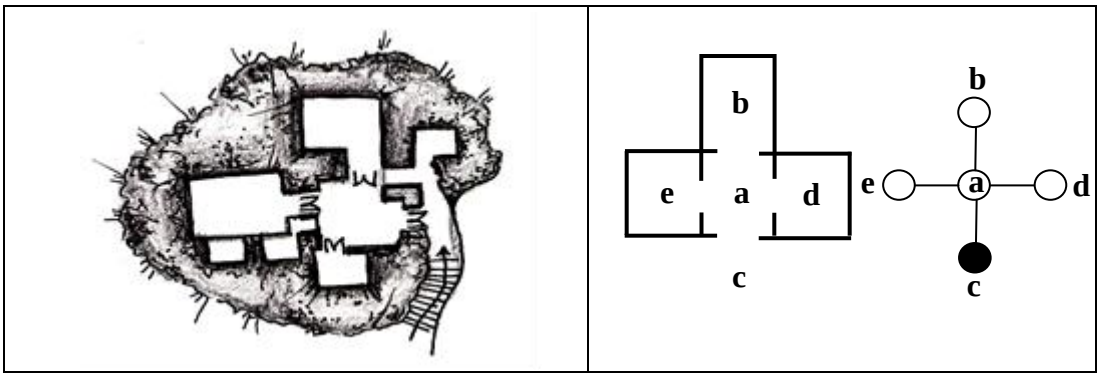


Figure 54: Plan 8 cell relation analysis

This unit as it mentioned before every function has different space therefore, this is the most convenient way of thinking for the Kandovan dwellings in terms of socio-cultural issues. Each space is separated and house wife is in the more secure atmosphere. Accessibility to each function is possible by passing through the

entrance hall. Entrance hall is the heart of the outcrop and the other living functions distributed around it as it is shown in figure 55. All the spaces, which are directly related to the woman's activity inside the house is separated and located in private manner.

As cell relationship in this example "a" as the entrance hall is the heart of functions and it is a transition unit in this kind of solution. There is no connection between "b" as main hall and "d" as the sleeping part they are connected indirectly with the help of "a" unit as it is shown on the right side of the figure 53. The only connection to the outdoor space as the "c" unit is from "a". Therefore, all "e", "b", "d" and "c" functions are connected through a single unit.

From the entire cell analysis there is one single terminology, which is common in all of the organizations. Security of the place of women is of the most important issues in the spatial organization of the spaces. This is based on the gender role and socio-cultural issues of the settlement that they are very connected to them. Religion also is playing a very important role in the spatial organization, which affects the interior spaces directly. Although because of limitation in formation of the building façade and building shapes they are very keen on organizing the spatial quality of the spaces related to their cultural issues and beliefs that they kept them generation to generation.

5.4 Accessibilityto the Units

Circulation and pathways in Kandovan dwelling are divided in to three different subjects: **stairs, ramps, original mountain rocks**.

All of these pathways and circulation areas are similar in any kind of them. In between the outcrops pathways are very narrow and it has high slopes stairs or ramps or mountain rocks. That is really hard to climb (Figure 56,57).

Most of the pathways in between the outcrops are stairs, which is constructed by the original material of the mountain in order to be bearable in terms of climatical issues. The reason that all the pathways between the outcrops are too narrow is that formation of the outcrops originally was too compacted and if they excavated too much space in between each of them they would have destroyed most of the outcrops. In order to use all of them, they just had a chance to carve a very tiny space between them as circulation function.

Figure 55: Stair between outcrops

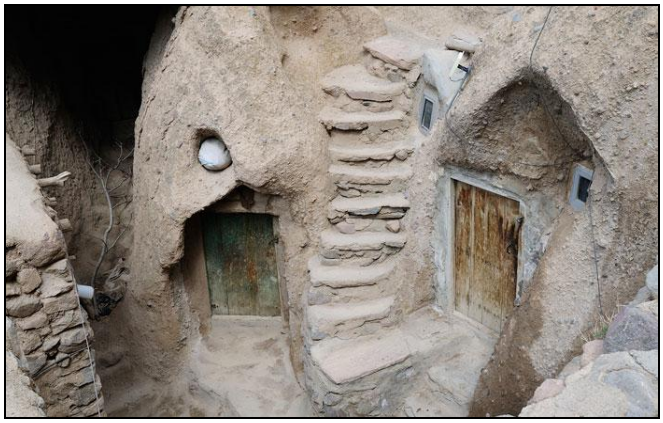


Figure 56: Stairs between outcrops

The other issue is more public areas as the entrances to the dwelling or gathering areas that are larger than the pathways in between the outcrops. They are places for passing through, however in larger manner. These kind of pathways are mostly constructed by original material of the mountain however, they just used stairs in these cases in order to have more safety on winter time because of the slope of the mountain ramps become slippery and dangerous (Figure 58).

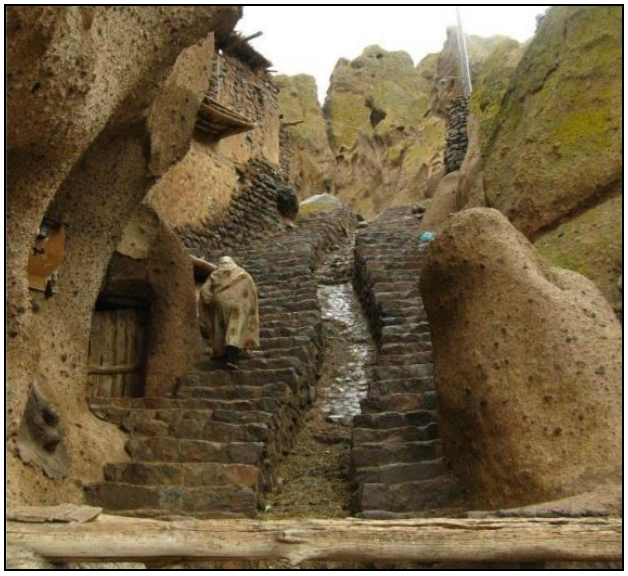


Figure 57: Public pathway
(Erfani, 2007)

Public pathways are most of the time larger than pathways between the outcrops therefore; they have a chance to locate their swage canal in between the stairs as it is shown in figure 58.

Therefore, rather than just a pathways all the time public pathways constructed with a subtraction in the middle as the swage purposes.

5.6 Neighborhood Connections

In Kandovan dwelling all the outcrops are organized in a very compacted manner, therefore, in most of the time families live in a certain district in order to be close to each other. It means the outcrops that they chose are in the same district and close to each other. If they could not find a certain part to live together to be with the other members of the family they have to be separated in different part. However according to the characteristics of the dwelling that all the outcrops are very close and compacted, still they have a chance to live close to their family members.

The other important characteristic of the settlement is that, as all the outcrops are very close, formation of the pathways and paves much influenced by this formation. In this example, which is a part of a settlement it shown the connection of the units and their closeness that gives the opportunity to the habitants to meet the others a lot by passing through this dangerous pathways with high risers. Therefore, even for passing a very short distance they have to pass through numbers of outcrops. Although they have a very hard situation to have an access to any place, however they have a chance to meet the other habitants more. That’s why in the social life they are all acting as a part of a big family.

Here in figure 59, 60 the situation in the settlement that all the outcrops have is shown. All of them are located in very close and compacted neighborhood as it is shown on the mentioned figure.

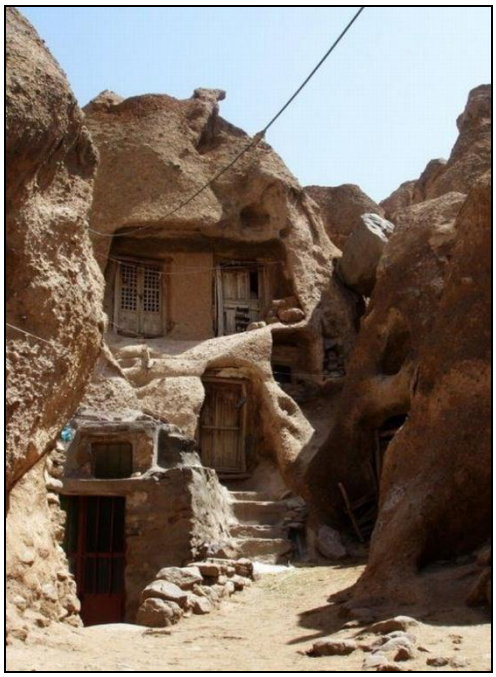


Figure 58: Example of neighborhood connections

Figure 60: Examples of neighborhood connections

They divided the whole settlement into to 12 different districts such as **Jabasi, Aga abasi, Gilejan, Haji abasi, Kablayi, Mirzaali, Khalil abasi, Patek, Nowrooz, Haji ghasem, Safar abasi**and**Dikbashi.** These are the names of the districts that shows in each of them family members of the mentioned district are living. Although they are

divided into 12 different districts however they are all named themselves Kandovan dwellers and they believe that this division is just their names, they are much closer.

5.7 Conclusion of Analysis Chapter

As the summary of the analysis above it is clear that organization of the interior spaces based on several things such as: form of the outcrops and also socio-cultural issues.

Therefore, for each space design there is a scenario, which clarifies their ideas, lifestyle, background, tradition, meaning and routines.

In all eight cases, common culture and environment were visible, in terms of space organization, spatial relationship and also interior scenarios. They shared a similar solution in all part of the settlement by means of variation of indoor private and public spaces with hierarchy of space use. They tried to solve every problem inside their outcrops by attaching their culture to it, by providing separator walls, separator curtains, carving spaces and subtraction from ground or walls, in order to catch the meaning of home in their outcrops. However in some cases they faced some failures in terms of natural enforcement and socio-cultural impacts.

From the entire analysis it is perceivable that privacy is one of the main factors in the settlement, they have some cultural impacts, which are directly related to their religion and beliefs, and therefore, using spaces in more private manner is vital in every unit. Formation of the buildings are in a close manner, therefore, they don’t have any private area around them. Hence, inside the buildings they tried to organize spaces to have more private rooms and sections mostly for women.

In general, social comfort inside the outcrops is directly related to the privacy of the users, which has religious background, in order keep women far from public. Different house form and different house type have the similar interior solutions that reflect importance of the religion and culture.

The appearance of the outcrops classified in three main categories, single cell, composite single functional outcrop and compound multi-functional outcrop. These three categories are representatives of the appearance of the outcrops in the settlement in terms of natural formation. All of them share the same character; however the only difference between them is the size. Although, their attitude is same as form, their size and their facade appearances are different. All of them with mentioned differences give common identity to users.

In general constraint of engagement to natural form of cave is one of the main typical characteristics of the Kandovan architecture, which effect both interior and exterior appearance and scenario.

Chapter 6

DISCUSSION

As it is discussed in the previous chapters, the identity of the cave dwelling of Kandovan is thoroughly examined by considering several aspects, such as: culture, tradition, religion and beliefs, gender roles, politics, domestic routines, socio-economic issues, etc.

Although this settlement was developed by a number of shared design principles and tools, there are too many facts and priorities that bring particular solutions resulted with the different outcrops. Common culture, traditions, politics, economy, geography and climate weren't sufficient to have typical solutions. One of the reasons is the impacts of the nature to the outcrops and variation of domestic routines within a family life style.

Although these variations and solutions developed several typologies, it is possible to classify the Kandovan architecture according to their formation. In general, interior spaces in Kandovan dwellings categorized in three main types:

1. Combined linear outcrop
2. Divided linear outcrop
3. Separated centralized outcrop

These three groups of interior spaces could be a representative of all the routines inside the units. Each of them is a solution for the formulation of the interior spaces, for the same outcrop. The limitation of the already existing form is the biggest

problem in the development of spatial organization of their houses. However, it is tried to achieve a comfortable living space by encompassing all cultural impacts in it at the same time.

In the combined linear outcrop the limitation is more, because of the simplicity of the outcrop and also size problem, which is smaller than the other kinds. Therefore,it is tried to combine the functions inside without any barrier between them. The order of the organization here is the important fact that makes spaces more private or more public in the meaning of living spaces.

Divided linear outcrops are very similar to the previous one; however size of the outcrops in this category is comparatively bigger, therefore they had the chance to divide the different functions withseparative walls. It means by the help of the original shape of the outcrop they could give a certain room to a desired function. The occupants of this category that are mostly females are more satisfied from these solutions in terms of privacy concerns.

Separated centralized outcrops are the ones that as the size could be shared by more than single families.However bigger families are living there and more private spaces are completely separated. Even the kitchen, which is called women’s room, is sitting alone with having a separated entrance. This type is the most ideal outcrop for the inhabitants, because of priority having both public and private space separated.

As mentioned in chapter 5 living spaces in Kandovan dwellings are defines as spaces, which inhabitants are spending their time there for daily activities such as eating, sleeping, hosting, praying, cooking, washing, playing, doing hand crafts and

socializing. Moreover, these activities are also possible to take place in other parts of the entry part of the unit, main hall, kitchen, toilets and bathrooms and stable. Therefore, as mentioned above, localsdo not have the opportunity to shape the form of their habitats.Instead of developing a form for their spaces, they just carved them and they haven't manipulated the form of the original structure.

Therefore all the living spaces, which have been investigated with consideration of their cultural aspects, have different characteristics in terms of internal relationships and connection of them to the outdoors spaces. All the living spaces have meaning for them by considering their background.

The first living space as entrance, defines the character as, theentry part of the outcrop. In all of the examples, they tried to separate this function from the other functions in order to have more privacy in the other function of the outcrop.

Although the shape and formation of each outcrop was unique and completely different from the others, they almost used similar solutions for all of them. In some cases, as they have a chance to separate this unit from the other part, they did have extra space for it; however in single linear outcrops, they didn't have a chance to add an extra piece to the outcrop. Therefore, they tried to make this separation by a curtain or with a level difference. In the linear combined outcrops, this function has extra space for it.It is considered as a separated function. Similar to the linear combined outcrops, in the separated centralized, outcrops the idea is the same. Entry part is divided from the other function by having extra space.

Differences between the entry parts of the different outcrops are location of them, how they have been separated and relationship of them to the other functions. By having form differences, the idea behind all of them is the same.In allexamples the starting point of each unit is the entry part and they are connected directly or indirectly to the main hall and also they have direct access to the outdoor space.

The next space that has been investigated is hall. It is locally called as the hearth of the functions. It brings all the functions together. In most of the time hall is the transition unit between entry part and sleeping part, which means transition between the most private part and the most public part of the house.

In the single combined examples again hall is between the entry part and sleeping part. There is no wall in between them. They are located back to back in a row position. Therefore it could be named as a transition hall between the functions as well.

In the divided linear outcrop it is completely opposite, sometimes it is transition and sometimes it is located on the corner of the outcrop. The other significance of this typology is that, the hall is a separated space with its boundaries around; therefore by having this characteristic, the other functions of the outcrop become more private in terms of internal relationships.

Separated centralized outcrops also give more privacy to the users. The reason is that, thehall is separated with boundaries from sleeping part and kitchen part.

The next function is kitchen or “matbakh”, which is one of the main functions in their house for females. They cook there and they spend most of their time there. It is also possible to be used as resting area for women.Some buildings of Kandovan have the chance to have a separate space for cooking area.

In combined linear outcrops kitchen is in the middle of entry part, therefore the meaning of having private space, which is being used by the female users is missing here. In these examples, curtain is commonly used for having more privacy. Although it cannot be as secured as having wall around types, it is tried to solve this problem by having curtains around.

Divided linear outcrops, as well, of their formation and characteristics, they gave a chance to the occupants to create an extra space for the women. This solution is more acceptable in terms of having privacy by considering their religion and beliefs.

The last one, which is separated centralized outcrop, has the similar characteristics to the previous one. Place of the kitchen is always away from other functions, even more than the previous typology therefore, it is the better solution for solving private and public relationship of interior spaces.

Another important living part is sleeping area, which is being used by all the occupants of the house. Most of the time the place of it, is on the ending part of the outcrop, which is precededas the most private part of the unit. It is impossible to have an access to this part from outside. Sleeping area is predominantly connected to the hall physically, it is better to have defined boundary to have more privacy. In some

examples, mostly divisions between hall and sleeping area are just with a curtain; however in Kandovan dwellings users need a private space for their own.

In this function, importance of the privacy are more than the others, however in combined linear outcrops, they have difficulties of having particular private space. The reason is that sleeping area is connected to the main hall all the time and in this typology all the functions are located in row therefore without having any boundary when it is compared to the other functions reaching to them is very simple, in fact the occupants might not feel secure.

In divided linear outcrops, position of sleeping area is in a more private manner and it has been separated by walls, because there is no size and form problem in these outcrops, therefore it is impossible to isolate this function completely.

Separated centralized outcrops are the one that have a chance to locate everything separately. Therefore, every function is isolated by having an extra space. Being in securedatmosphere is the positive point of this typology.

Toilet and bathrooms are one of the wet functions in every building and they need to be separated from other functions in order to achieve hygiene in these units. In Kandovan, they used to have toilets on the basement level, all the dirty things would have a chance to go back to the earth, and later onit is possible to use them as manure for their agricultural sites. There was neither pipe system nor mechanical system in the units at all. Nowadays this solution is completely changed and they have it on the same level of living spaces,ease to have an access. All the pathways are very hard to climb, therefore; they preferred to have bathrooms next to the other functions.

In all combined linear, divided linear and separated centralized outcrops they tried to separate this function from the other functions by having boundary around it. Rarely, it is possible to observe the direct linkage between them.

The stable in Kandovan architecture cannot be ignored due to the main occupation, which is animal husbandry. Therefore, in some of the units, they have an extra function as shelter for animals. According to the characteristics of this function, they keep their animals far from the living spaces. Therefore it could be observed in the cased, which main occupation of the habitants is animal husbandry.

They had to choose outcrops, which had the potential to be two stories in order to keep animals on the basement floor and the other living functions on the ground level to get heating from basement as well.

Size of the outcrops is determinant factor for occupant to keep animals inside. The one with potential of being two or more than two stories could be used for mentioned function.

Formation of the houses isin accordance with natural and a cultural characteristic of the settlement is another important issue that should be discussed. Organization of the spaces has been developed according to the enforcement of the already existing natural form. Size of the outcrops are determined the number of families, who are occupying a shared outcrop.

As it is mentioned before,the house forms in Kandovan dwellings can be classified in three categories:

1. Single cell
2. Composite single family cell
3. Compound multi-family cells

Most of the outcrops in Kandovan settlement are single cell. Composite and compound outcrops are the ones, which formed in larger scales.Therefore users of them are more than one family most of the time. In order to understand the formation them, the questions below are answered:

-What is important in the house form?

- How did they achieve to live in outcrops?

- Which outcrops is being used by whom?

- How did they prefer to choose outcrop?

Bigger families take place in composite outcrops and their relatives share mostly compound multi-family outcrop in order to be close to each other. Therefore, the continuation of family routines and meaning of living in a familiar atmosphere are fundamental concerns for desired outcrop.

Particular spatial organization is developed in order to provide the acceptable proximity and relationship among the spaces connections and accessibilities.The main issue in analysis of the spatial organization is relationship of the whole building with the street and the close surrounding.

From the entire cell analysis, there is one mainconcern, which is common in all of the organizations. Security and privacyof the place forfemalesare of the most determinant sector in the development of spatial organization. This is based on the gender issues and socio-cultural background of it, that they are strongly connected. The role of religion also is also very important in the formation of spatial organization. Despite the limited development of the building façade and building shapes they are very keen on organizing the spatial quality of the spaces, whichare sustaining their building traditions.

Spatial organization in all type of houses has a basic principle, which is directly connected to the identity of perceiving a space, as a part of their life. Accessibility to the outside all the time is through entrance hall. Accessibility to all functions inside is through main hall, which is called heart of the functions. The other functions are most of the time separated because of different usage of them. Therefore, in all eight case studies, with all the resemblances and differences, this principle of organization is the same.

Circulation and pathways in Kandovan dwelling are divided into three different subjects: **stairs, ramps and original mountain rocks**.

Most of the pathways among the outcrops are stairs, which is developed by the local material from the close surrounding, in order to be bearable in terms of climatical issues.

Main characteristics of the pathways in Kandovan dwelling can be categorized as:

Narrow ramps, narrow stairways, high riser stairways, slippery ramps, unstable stairs, long ramps, and rocky stairs.

As a difference from other rural settlements of Iran, the accessibility to this settlement is not easy, which is achieved due to the geographical and topographical constraints,already thoroughly discussed.

The last issue in Kandovan settlement is neighborhood connection of the outcrops. As it mentioned before, according to cultural impacts they are very keen of living together closely, it is caught because of formation of the settlement. Narrow pathways and closeness of the units is one of the main important facts that make the settlement compacted.

In general constraint of engagement to natural form of cave is one of the main typical characteristics of the Kandovan architecture.

Chapter 7

CONCLUSION

Kandovan settlement with its alternative solutions within the same context, exhibit a distinctive character among the cave dwellings in the world. Kandovan settlement has kept its locals without reflecting the changes on socio-cultural tendencies of the context.

Although, Kandovan dwelling life style is mainly based on, social life, cultural experiences and geographical constraints, and existing rigid natural form of the outcrops, the identity of the settlement itself is developing occupation, traditions, routines, politics, meaning and roles to the locals. In order to provide quality of life with certain concepts, that the relationships between the locals and the nature is achieved successfully.

Moreover, the recent way of living, is consequences of their past, which are carried out until today by having almost untouched cultural issues that is the main distinctive characteristic of them. Although, Kandovan settlement is negatively affected the general changes, it’s identity of using spaces by the original shape of the nature is kept as the main idea of their socio-cultural background. Belongingnessto the context as the main distinguished character of the locals is appreciable.

Identity of use of space in Kandovan is essential, which brings comfortable living conditions, to the buildings. Creation of spaces is with consideration of climaticaland geographical factors and also the availability of the building material within the context in order to get rid of practical failure in living conditions. Occupants are

capable enough to solve natural problems within the context by considering their culture.

In fact, there are several concerns on fundamental backbones of the village like, different approaches in the similar conditions, failure of having privacy within the neighborhood, not having standards for living spaces because of rigid form of the outcrops, failure of tendencies to have comfortable living environment, imbalanced space organizations and difficulties of solving transportation paths, occupants have adapted themselves to these failures to keep their culture alive.

In the appearance of the buildings, there is the response of them to the identity of the nature. They are mainly restricted in terms of reshaping and reorganizing, however they have been formulated in a way to have the highest profit of using the spaces. Spaces are like piece of nature that locals have chosen those pieces as their “homes”.

Houses or in other word outcrops, were designed in a way to fulfill the needs of the users. The way,that they have been carved; the way that the outcrops were organized, is the representative of their culture, religion, background and social life. Their typical life style is within the spatial organizations inside the buildings. The furniture, colors, materials and texture inside the units all provide a specific character, which is directly related to their culture.

Although, theorientation of the units wasdeveloped in accordance with the nature, they tried to use the interior spaces in a particular way in order to get more lightinside the spaces.Mostly the houses are faced to the south direction for achieving

more sun light inside. They have minimized the size of the openings in order to be protected from wind and the other climatic issues.

Role of the female users inside the house is clearly perceivable in the whole settlement; they have a specific place as “matbakh” or kitchen to have it specifically for them.They are using these spaces for different functionsand it is also a place for cooking, resting, working and weaving. Therefore, in the spatial organizations, although, they don’t have a chance to balance the interior spaces in their ideal way, they give more attention to the place and size of the kitchen.

Privacy is one of the main factors in the settlement, they have some cultural impacts, which are directly related to their religion and beliefs, and therefore, using spaces in more private manner is vital in every unit. Formation of the buildings are in a close manner, therefore, they don’t have any private area around them. Therefore, inside the buildings they tried to organize spaces to have more private rooms and sections mostly for women.

In general, social comfort inside the outcrops is directly related to the privacy of the users, which has religious background, in order keep women far from public. Different house form and different house type have the similar interior solutions that reflect importance of the religion and culture.

The appearance of the outcrops classified in three main categories, single cell, composite single functional outcrop and compound multi-functional outcrop. These three categories are representatives of the appearance of the outcrops in the settlement in terms of natural formation. All of them share the same character;

however the only difference between them is the size. Although, their attitude is same as form, their size and their facade appearances are different. All of them with mentioned differences give common identity to users.

By this perspective, there are several impacts that would be considered by paying attention to the environmental factors and cultural issues. These concerns could be valuable for future development of Kandovan settlement.

These suggested impacts could be categorized to provide comfortable living environment in the future of Kandovan:

-Providing balance between interior spaces in terms of size

-Having more openings on facadesby considering structural problems

-Providing more comfortable transitions between the spaces by considering structural problems.

-Providing staircase inside the outcrops

-Restoring the deteriorated part of the settlement

-Providing more privacy to the interior spaces by adding walls instead of curtains

-Considering the natural environment more

-Reflecting the identity of the culture and environment within the whole context not only inside the units

-Keeping the context alive by maintaining the units

-Considering local's need and adapt those needs to the context and vice versa

As a result of these discussion, it is also should be mentioned that using identity of spaces is remarkable in Kandovan in term of vernacular characteristics by considering traditions and environment at the same time. Vernacular concept of this

village is developed by the help of environment and locals with the highest range of respect to the environmental factors in order to meet their cultural needs inside the buildings. Besides creating such a settlement is not enough to cultural and environmental identity, it needmaintenance to have tendency to live there.

Lastly in this thesis the particular recommendation of distinctive Kandovan architecture follows by:

- It is in danger of being demolished
- It needs a particular attention
- It needs more studies on rehabilitation

This thesis will provide fundamental information for the further study, which could fulfill the main gaps of socio-cultural, topographical and also natural constraints.

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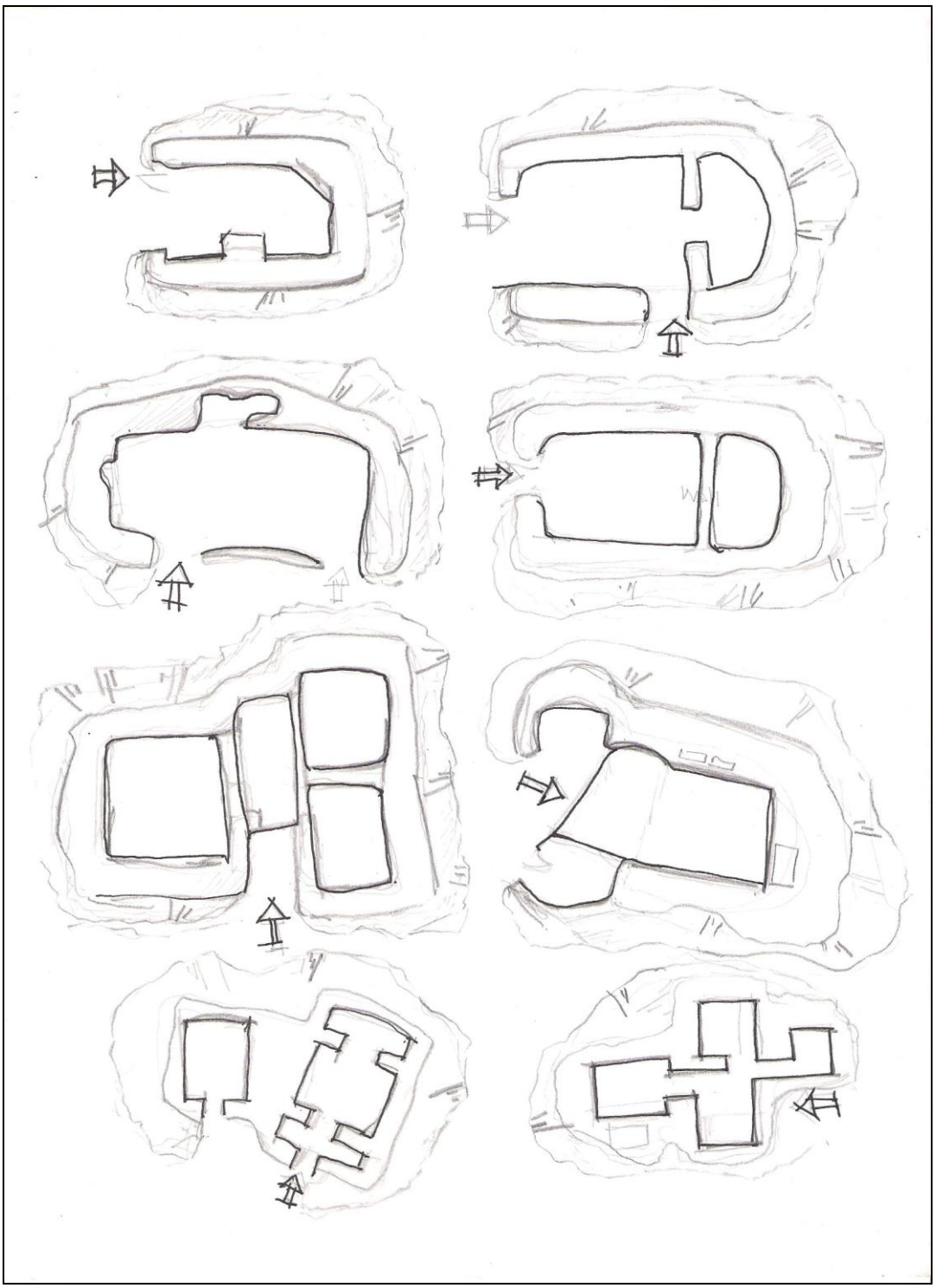
APPENDICES

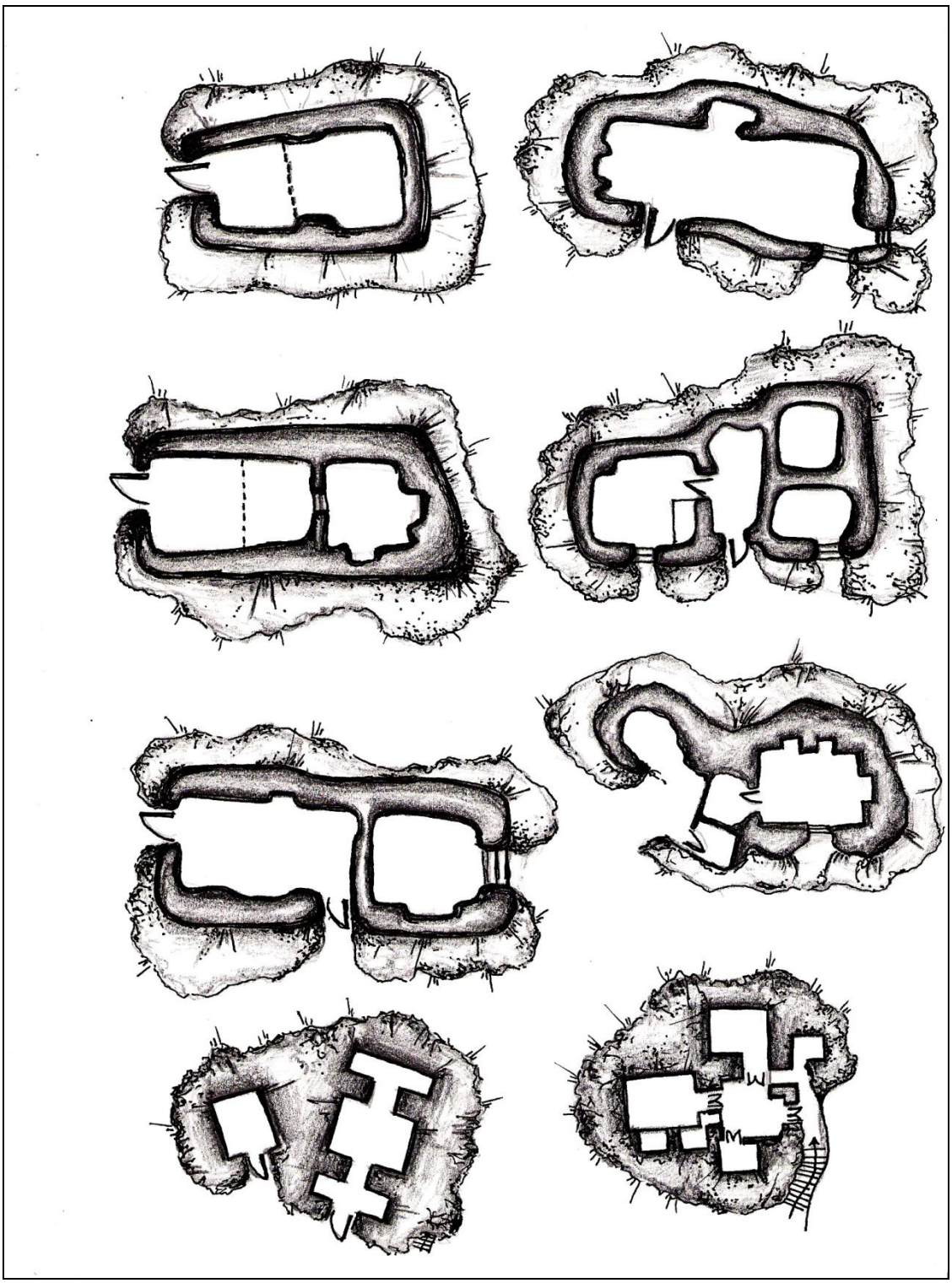
APPENDIX A: Sketches:

First sketches of eight different case study:



Sketches:

Improved version of sketches:



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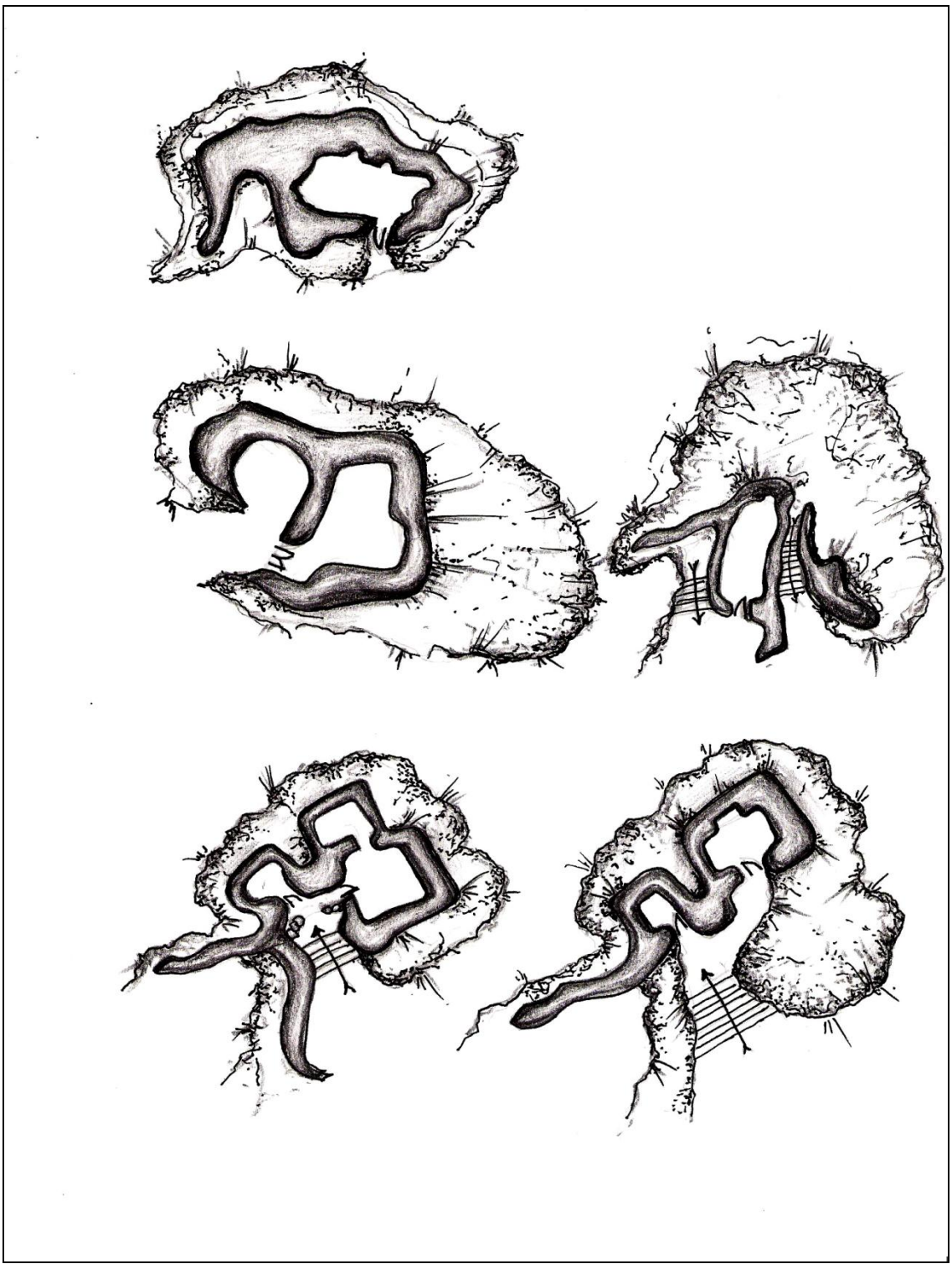

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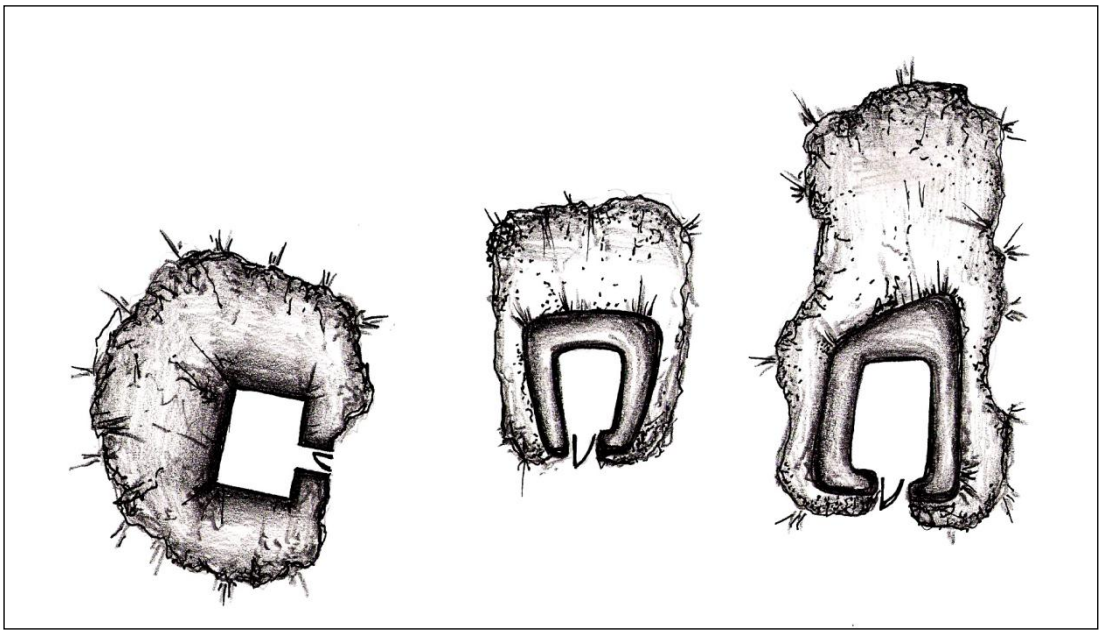

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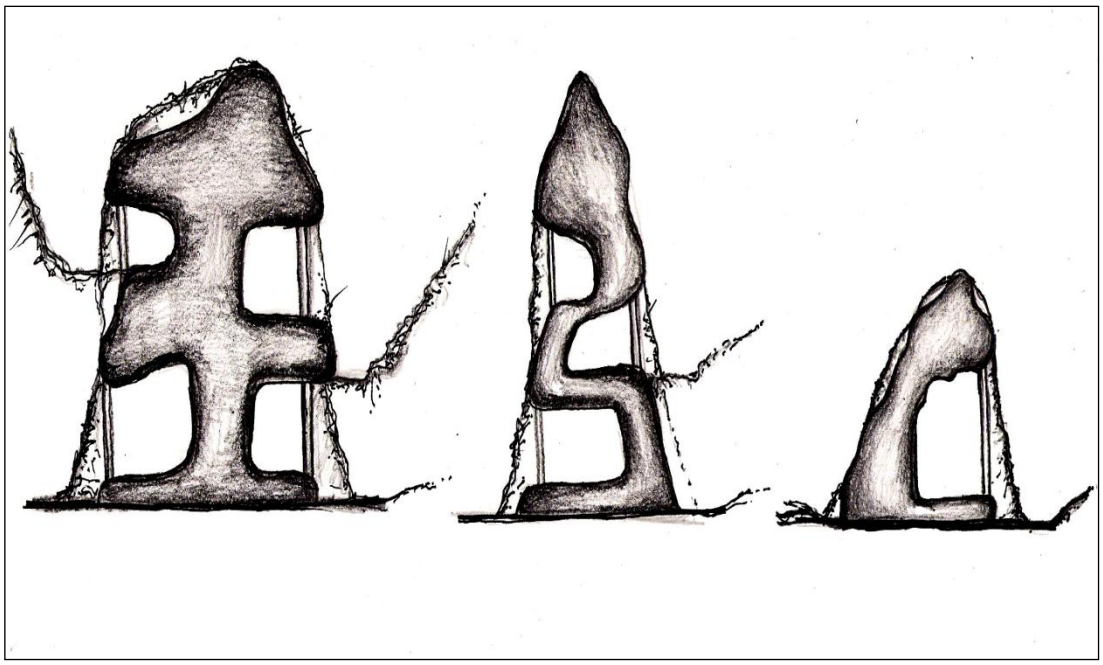
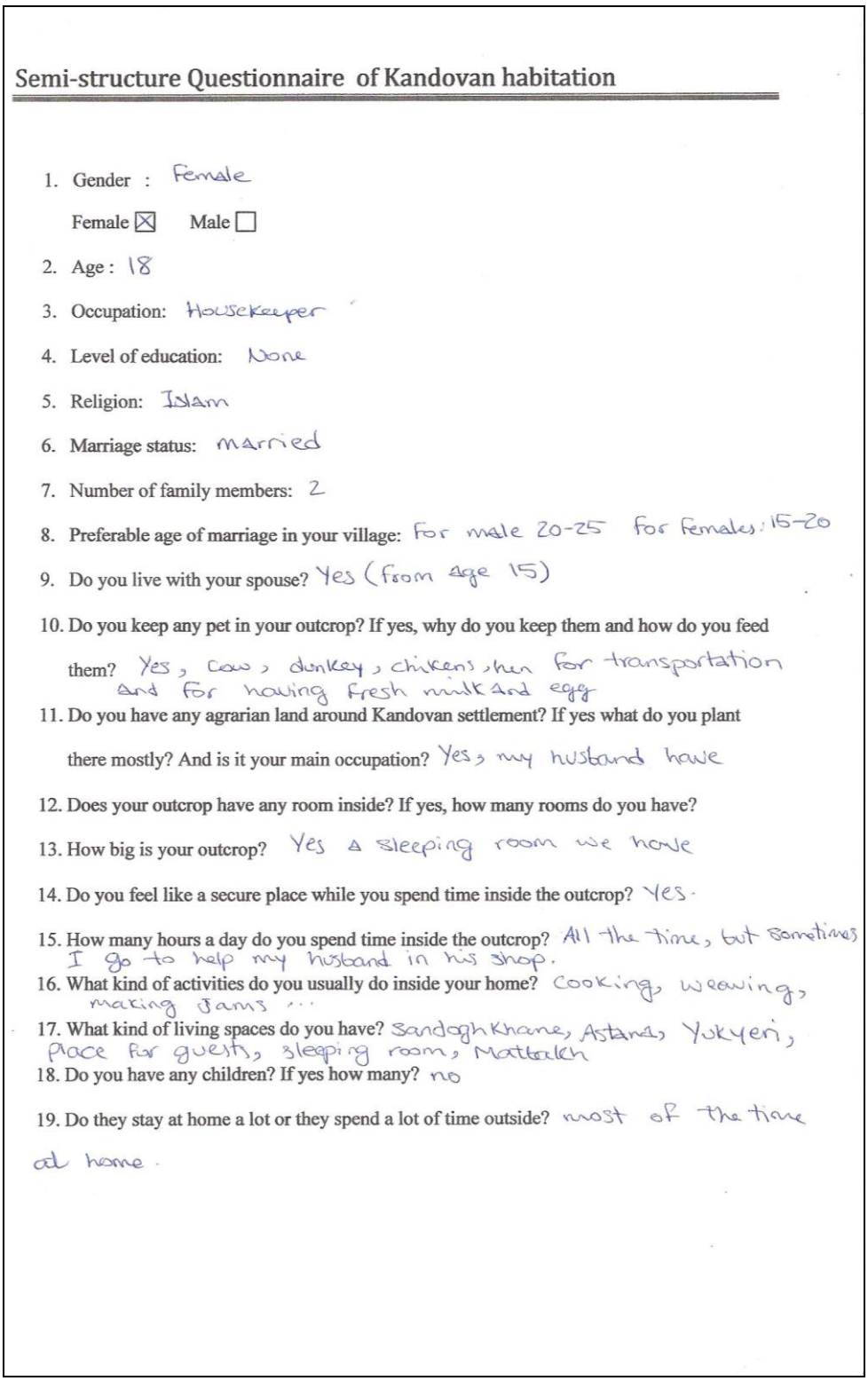


APPENDIX B:Questionnaire samples:

Sample 1:



Semi-structure Questionnaire of Kandovan habitation

1. Gender : Female

   Female ☒ Male ☐

2. Age : 18
3. Occupation: Housekeeper
4. Level of education: None
5. Religion: Islam
6. Marriage status: married
7. Number of family members: 2
8. Preferable age of marriage in your village: For male 20-25 For females: 15-20
9. Do you live with your spouse? Yes (from age 15)
10. Do you keep any pet in your outcrop? If yes, why do you keep them and how do you feed them? Yes, cow, donkey, chickens, hen for transportation and for having fresh milk and egg
11. Do you have any agrarian land around Kandovan settlement? If yes what do you plant there mostly? And is it your main occupation? Yes, my husband have
12. Does your outcrop have any room inside? If yes, how many rooms do you have?
13. How big is your outcrop? Yes a sleeping room we have
14. Do you feel like a secure place while you spend time inside the outcrop? Yes.
15. How many hours a day do you spend time inside the outcrop? All the time, but sometimes I go to help my husband in his shop.
16. What kind of activities do you usually do inside your home? Cooking, weaving, making jams ...
17. What kind of living spaces do you have? Sandogh Khane, Astane, Yukyeri, place for guests, sleeping room, Matbakh
18. Do you have any children? If yes how many? no
19. Do they stay at home a lot or they spend a lot of time outside? most of the time at home.

Semi-structure Questionnaire of Kandovan habitation

20. Are they going to school? If yes, where and how do they go to the school? —

21. Is there any special space for children to play in your house? —

22. Are they working parallel to their education? —

23. What kind of transportation do you use inside your village? Nothing but animals

24. Do you feel comfortable while climbing up the mountain to reach your outcrop? Yes, I have to

25. Do you have private atmosphere inside your units? Yes

26. What kind of handmade stuff do you produce? Carpet, bags, scarfs, cloths

27. What kind of technologies do you use in your house? TV, radio

28. What kind of difficulties do you have inside your house? And what kind of difficulties do you have inside the settlement? Transportation, lack of Sunshine, water problem

29. What do you need the most for having more comfortable living space in your settlement? I need to have children, I need to live without tourists

30. Do you have any problem for heating and cooling the interior spaces? Yes we have problems

31. What kind of cooling and heating materials are you using? Oven,

32. Do you have any commercial units within the context? If yes, what kind of buildings and what are the functions of them? Yes we have, restaurants, shops, mosque

33. Do you have any health center units? If not, you have any difficulties of not having it? Yes we have

34. How do you proceed the shape and form of the outcrops generally? they are like mountain

35. Can you sketch the interior organization of your home for me? —

36. What kind of changes do you need in order to have comfortable living spaces? No Stairs, No ramps- more Facilities

37. What is your main wish in order to express your difficulties? to have more private space

38. Do you feel satisfy, when you think you belong to this part of the nature? Yes

39. Do you feel yourself as a part of nature? Yes

Sample 2:

Semi-structure Questionnaire of Kandovan habitation

1. Gender : Male

   Female ☐ Male ☒

2. Age : 45
3. Occupation: Farmer
4. Level of education: Finished elementry school
5. Religion: Islam
6. Marriage status: Married
7. Number of family members: 5
8. Preferable age of marriage in your village: For male : 20-23 For female: 15-18
9. Do you live with your spouse? Yes
10. Do you keep any pet in your outcrop? If yes, why do you keep them and how do you feed them? Yes, chiken on the basement, For having fresh egg
11. Do you have any agrarian land around Kandovan settlement? If yes what do you plant there mostly? And is it your main occupation? Yes, I have. Fruits, beans, etc this is my main occupation
12. Does your outcrop have any room inside? If yes, how many rooms do you have? Yes, It has 1 room For sleeping.
13. How big is your outcrop? Not big (Single cell)
14. Do you feel like a secure place while you spend time inside the outcrop? Yes
15. How many hours a day do you spend time inside the outcrop? A lot
16. What kind of activities do you usually do inside your home? Sleeping, playing with my children, weawling carpets
17. What kind of living spaces do you have? Astana, Sandogh khane, Shelter for animal Yuk yeri, matbakh
18. Do you have any children? If yes how many? yes, 2 girls, 1 boy
19. Do they stay at home a lot or they spend a lot of time outside? girls are spending time with their mother inside most of the time. My son is helping me with Farming

Semi-structure Questionnaire of Kandovan habitation

20. Are they going to school? If yes, where and how do they go to the school?
Yes, School near the village
21. Is there any special space for children to play in your house? No, outside they can play
22. Are they working parallel to their education? Yes, girls are helping my wife and my son helping me.
23. What kind of transportation do you use inside your village? Animals like donky
24. Do you feel comfortable while climbing up the mountain to reach your outcrop? yes, I got use to it.
25. Do you have private atmosphere inside your units? Yes, it is the most private part of the world.
26. What kind of handmade stuff do you produce? Carpet.
27. What kind of technologies do you use in your house? TV.
28. What kind of difficulties do you have inside your house? And what kind of difficulties do you have inside the settlement? In the village we have transportation problem. Inside the house tourists are killing us.
29. What do you need the most for having more comfortable living space in your settlement? Private atmosphere
30. Do you have any problem for heating and cooling the interior spaces? Yes, we have. Becaue we dont have enough facilities
31. What kind of cooling and heating materials are you using? Oven
32. Do you have any commercial units within the context? If yes, what kind of buildings and what are the functions of them? Yes, Mosque, Shops
33. Do you have any health center units? If not, you have any difficulties of not having it?
Yes, web have
34. How do you proceed the shape and form of the outcrops generally? Something from god
35. Can you sketch the interior organization of your home for me? —
36. What kind of changes do you need in order to have comfortable living spaces? having water system, gas system and more technology
37. What is your main wish in order to express your difficulties? to get rid of tourists
38. Do you feel satisfy, when you think you belong to this part of the nature? Offcourse
39. Do you feel yourself as a part of nature? Yes we are the nature.

APPENDIX C

Questionnaire result: