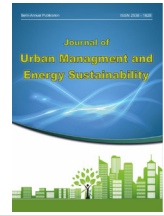


Journal of Urban Management and Energy Sustainability (JUMES)

Homepage: <http://www.ijumes.com>



ORIGINAL RESEARCH PAPER

Comparative analysis and comparison of rural housing index types in Sistan and Baluchestan province from the point of view of the impact of environmental factors on the structure of the building

Mohammad Ali Ghasri^{1*}, Farzaneh Dadgar²

1 Assistant Professor, Faculty of Art and Architecture, University of Sistan and Baluchestan

2 Instructor, Faculty of Art and Architecture, University of Sistan and Baluchestan

ARTICLE INFO

Article History:

Received 2023-12-20

Revised 2024-01-30

Accepted 2024-03-05

Keywords:

Anatomy, environmental conditions, Rural housing, Sistan and Baluchestan, typology.

ABSTRACT

Native housing in general and rural housing in particular are affected by the environmental conditions and people's ways of living as well as various cultural, social, economic and climatic aspects, which rural housing in Sistan and Baluchestan province as one of the most extensive provinces of the country. The rule is not an exception. The current research has been carried out with the descriptive-analytical method and the investigation and analysis of the types of rural housing in the villages of the province from the perspective of the impact of environmental factors, using field impressions, observation and library information. The main questions that the research sought to answer are, what are the typical types of rural housing in Sistan and Baluchestan province? What is the main difference between the types of rural housing in Sistan and the types of rural housing in Baluchestan region? And finally, what were the effects of environmental factors on the formation of species? The results of the research showed that the types of rural houses in Sistan region are mostly linear and rectangular, and in Baluchestan region, they are mostly linear and oval. Also, the roofs in Sistan have a dome cover due to the lack of vegetation and trees, and in Baluchestan, due to the presence of trees, the roofs are flat. In the Sistan region, Badgir, Durche, Kharkhane and Surak are used to use the 120-day winds, while in Baluchestan, the use of these elements is not common.

DOI: [10.22034/ijumes.2024.2003446.1145](https://doi.org/10.22034/ijumes.2024.2003446.1145)

Running Title: Rural housing index types in Sistan and Baluchestan province



NUMBER OF REFERENCES

25



NUMBER OF FIGURES

05



NUMBER OF TABLES

02

*Corresponding Author:

Email: magh@arts.usb.ac.ir

Phone: +989155411101

ORCID: <https://orcid.org/0000-0003-4118-5550>

INTRODUCTION

The variety of geographical, climatic and cultural conditions in Iran has caused that each region has its own unique and special architecture in urban and rural scales. The biggest difference between urban and rural architecture is the greater integration of life, production and livelihood in rural houses (Soltani et al., 2013), (Memarian et al., 2016). In relation to rural housing, the difference in the structure and body of architecture can be seen even in a limited area or neighboring villages, and this has caused the creation of unique types of rural housing (Soltani et al., 2013). The diversity of geographical, climatic and cultural conditions in Iran has made each region have its own unique and special architecture in urban and rural scales. (Brigadiar Pour, 2000) The biggest difference between urban and rural architecture is the greater integration of life, production and livelihood in rural houses (Sertipour, 2017), (Mansuri et al., 2019). In relation to rural housing, the difference in the structure and body of architecture can be seen even in a limited area or neighboring villages, and this has caused the creation of unique types of rural housing (Sertipour, 2017) (Heydari and Todhir, 2018) (Fateh and Dariush, 2019). Therefore, knowing the factors that cause the emergence of different rural types helps architects to design spaces suitable for the rural space and build rural dwellings according to their needs and available possibilities. (Silvermith, 2017) (Ismailnejad and Karimi, 2018) Native and rural architecture has a strong and direct connection with the people's culture and their daily life. When these buildings are studied and examined, they seem primitive and very simple, but the fact is that this building They were built by people who used all their facilities, intelligence and capacities and their living place and used all the connections between themselves to build them (Haji Ebrahim Zargar, 2000)(Ghasri and Dadgar, 2023). Sistan and Baluchestan province, as the largest province of the country, generally has two general regions, Sistan in the north and

Baluchestan in the south, and these two regions, while having climatic and cultural similarities, each has unique characteristics. (Oshohi et al., 2016)(Ghaffari and Miri, 2016) This issue has led to the emergence of different types of rural architecture depending on the environmental conditions. In this research, the meaning of "environmental conditions" is all aspects of the environment, such as geographical, cultural, social, climatic and economic aspects, each of which in turn has influenced the structure of rural housing. (Owaisi et al., 2019) On the one hand, this article seeks to document this type of architecture in the vast province of Sistan and Baluchestan, and on the other hand, it seeks to compare the types of rural housing indicators in two regions of Sistan and Baluchestan, it is worth mentioning that these two regions, while having some similarities, they have major differences in terms of climate, culture and even people's livelihood system, which has directly or indirectly influenced the types of rural architecture. The architecture of rural houses is the result of years of effort, thoughtfulness and experience. (Tarshabi et al., 2020) (Ekhtiyari and haji Heydari, 2019) The analysis of rural settlements before the present era proves that this type of architecture has features of sustainable architecture, its introduction and analysis can solve some problems in the context of settlements. Sometimes cities and villages help. The effort to preserve or promote traditional and native architectural values can lead to the formation and creation of a collection of desirable villages (Sertipour, 2017) (Sargazi et al., 2019) (Rahimi-pour et al., 2019). Due to the accumulation of new housing by subordinate organizations in the villages, the necessity of designing houses in accordance with the native context of the village and in accordance with the environmental conditions as well as the wishes and needs of the village people is an undeniable necessity. So far, several researches have been conducted in the field of understanding the rural architecture of Sistan and Baluchestan province from differ-

ent aspects, but in this research, less has been focused on comparative comparison and joint analysis of housing types in Baluchestan region and Sistan region, which is the main goal of the present research. Is. The main questions that the research sought to answer are, what are the types of rural housing indicators in Sistan and Baluchestan province? Compared to each other, what are the main differences and similarities between the types of rural housing in Sistan and the types of rural housing in Baluchestan region? And finally, what were the effects of environmental factors on the formation of species?

MATERIALS AND METHODS

Methodology

The research method is descriptive-analytical. The method of collecting information is field and library method. In this research, first with the library method and based on the resources of the cultural heritage and tourism organization of the province and books and articles, the villages with valuable historical context were identified, and then with the field method, the residential types that are prominent in each region and village. They are collected and finally analyzed. In the final step the main components of buildings up to the main aim extracted and interpreted into the main structural framework.

Research background

In research, Aghmadzadeh and Ahmadzadeh (2016) conducted a typology of rural housing in Sawadkogh city from the point of view of architecture and structure. will be investigated. Ghafari and Miri (2016), in the investigation of spatial-spatial processes in the typology of rural housing in the study area in Chaharmahal and Bakhtiari province, analyzed the role of spatial-spatial factors on the typology of rural housing, as well as the nature and scope of these Structural changes and transformations have been discussed in alignment with today's relations. Mansouri and others (2019), in research titled, housing typology and native construction techniques in the historical village of Elgan,

have come to the conclusion that among the spatial-spatial parameters, socio-cultural and economic components are more than – natural-ecological have had an effect on the type of rural housing in the study area. In research, Rahimipour and others (2019) have studied the typology of rural housing in Borujerd city based on local patterns of physical structure with the aim of identifying, introducing and documenting the local pattern of architecture and structure in rural housing of this city. Owaisi Kikhah and others (2019) have studied the typology of the organization of native housing space in Sistan in terms of the formation of open and closed space. In this research, whose information and data have been extracted from more than 900 villages in Sistan region, by using field survey and comparing information based on shape similarities, the classification of native rural housing in Sistan has been done. In research, Qasri and Dadgar (2023) analyzed the types of rural housing in the Sistan region and provided models and solutions for contemporary architecture. In addition to that, other researchers also conducted studies in the field of native and rural architecture of Sistan region, which can be mentioned by Toder et al. 2008, Heydari et al. Sattarzadeh (2008), in research on housing indicators in Sistan and Baluchestan province, studied demographic indicators of housing both quantitatively and qualitatively, and proposed solutions to improve it. Qasri et al. (2016), in research entitled typology of rural housing in Baluchestan with a climatic approach, introduced some types of rural housing in Baluchestan. Tarshabi et al. (1400) have investigated the flexibility of native rural housing in Baluchestan, Iran. In this research, the types of rural housing spaces in Baluchestan have been analyzed from the perspective of multiple functions and flexibility factor. Esmailnejad et al. (2018) have analyzed the spatial pattern of rural housing in hot and dry areas with a focus on Sistan and Baluchestan province, and by examining the compatibility of native housing with climatic elements, they have concluded that the native

housing of Sarbaz city is the most compatible. Dared and Saravan, Iranshahr, Nikshahr, Kanarak, Delgan, Hirmand, Zahak, Zahedan and Zabul have moderate compatibility and in Chabahar and Bampur region there is minimum compatibility between local housing and climate.

DISCUSSION AND FINDINGS

Case Study

Sistan and Baluchestan with an area of about 187,502 square kilometers, equivalent to eleven and a half percent of the country's area, is considered the second province in terms of area in Iran. This province is limited to the Oman Sea from the south, South Khorasan province from the north, Pakistan and Afghanistan from the east, and Hormozgan and Kerman provinces from the west. According to the latest country divisions, this province has 19 cities, 37 urban centers, 48 districts, 112 villages and 9839 settlements (National Statistics Center of Iran, 2021). The types of rural housing examined in this research are located in the cities of Zabul, Zahk, Hirmand, Zahedan, Khash, Zablei, Saravan, Delgan, Chabahar and Kanarak, whose names and locations in Sistan and Baluchestan province are shown in

the image below. has arrived (Fig. 1).

Investigating the characteristics and different types of rural housing in Sistan

The 5000-year-old Sistan region is located in the north of Sistan and Baluchestan province (Arya, 2013) and has an area of about 8117 square kilometers, less than 5% of the province's area. But according to the geographical and climatic conditions and its unique and special architectural style, it should be examined separately. The height of the Sistan plain is only 489 meters above the sea level and it is limited to the border of Afghanistan from the north, east and southeast, Zahedan city from the south, Lut desert and Birjand city from the west and northwest. Natural, geographical and climatic features, especially the so-called 120-day winds, are the most important factors that have influenced the settlement of the population and the physical structure of the region. In the north of the region (Sistan), the presence of Hamon Lake and Hirmand River has created fertile plains and chain-like settlements, and the quality of water distribution and irrigation network have also played a major role in the emergence of settlements. Due to the fact that the amount of water decreases

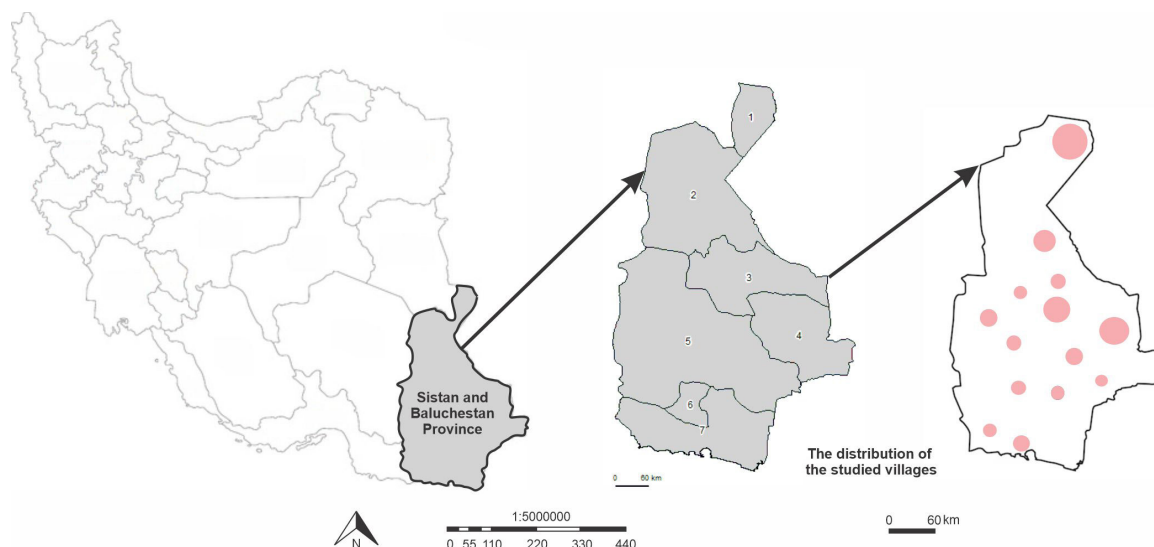


Figure.1: The distribution of the studied villages in Sistan and Baluchestan province

from east and northeast to west and southwest. Therefore, the number of settlements and population decreases from east to southwest. The production system that has been formed since a long time due to the agricultural traditions in this region has caused the emergence of relatively large and densely populated villages in the northern region. These centers that have arisen naturally and in connection with the market products in the villages are considered the centers of the villagers. The development of government and service facilities have also played an important role in the faster growth of these centers, which can be mentioned in Zabul, Hirmand and Zahak.

Typology of housing in the villages of Sistan

The people of Sistan show great skill in adapting to the environmental and climatic conditions. Their houses are created in an admirable manner compatible with the harsh climate of the region. Most of the houses have a ventilator whose vertical channel passes between two walls and opens into the room. The roofs are dome shaped.

Most of the openings, including the entrance door, are installed on the southeast side, that is, against the direction of the wind (Afshar Sistani, 1981). The reason for this problem is that due to sandstorms, it is better that the house does not open to the outside, and on the other hand, the environment without tree and plant cover outside the house requires less physical and visual communication. Usually, to prevent adverse natural factors such as 120-day winds and very hot and scorching weather in summer, as well as cold weather in winter, houses are built with east-west extension. The materials used in most of the rural houses in Sistan are clay and clay, and the thickness of the walls is very high, about 3 to 4 bricks. This type of architecture is very compatible with the climate of the region. Due to the thickness of the walls, in winter and summer, cold and heat cannot penetrate inside the house. One of the characteristics of Sistan houses in using local winds is the use of wind deflectors. This important element directs the right wind into the house in the hot season and makes the house cooler. (Fig. 2)



Figure.2: Separation of animal and human spaces in Sistan and the combination of dome roofs and windbreaks in Sistan

Room: In Sistan, rooms have different characteristics according to their function. According to their area, dimensions and shape, the rooms have been used for living, party, sleeping, storage, etc. and the attic is usually a room built on the first floor and usually used as a winter room or the work room is used in the spring season. It is customary that the winter rooms were located on the north and west sides of the yard, which received the light from the east and south, and the summer rooms were located on the back side facing the sun, and the kitchen - the same as today's kitchen - is usually near the rooms. A winter residence has been built. The spaces are located in different fronts of the courtyard with a specific order and were directly or indirectly related to the courtyard. Due to the presence of storms carrying sand, the openings are usually very small, especially on the unfavorable wind side, and sometimes lighting is done only through an entrance door or windows with a height of 80-100 cm. small openings have been used both for maintaining privacy and as a climatic solution against strong winds and the scorching sun of Sistan. Another important point is the flexibility of the spaces and the multi-functional use of the rooms. For example, some rooms have been used as kitchens in addition to sleeping, living and resting spaces.

Entrance: The entrance spaces in the houses of Sistan region are inviting and are usually decorated with patterned bricks. The entrance hall is usually not common in this area and the entrance is usually considered as a corridor or corridor, from which access to the roof, courtyard, livestock space and toilet is provided.

Yard: Yard is an influential element in the spatial organization of houses in Sistan. The role of movement, communication and the space of division are among its other features. According to this article, based on the overall size of the house and the required spaces, the area and dimensions of the yard have also changed. The shape of the yard is usually rectangular.

Kitchen: In Sistani houses, the kitchen is either considered as a separate space or it is combined with the living and sleeping space.

Tanurkhane: Perhaps it can be boldly claimed that for the people of Sistan, throughout history and even now, in all urban and rural areas, it has a special importance as an identity and cultural sign, and for this reason, Tanurkhane is one of the It is the important space of the house. its location is built in a corner of the yard with a special space for firewood accumulation.

Considering that the weather is hot in the Sistan region for about 6 months of the year, in the traditional architecture of Sistan, various techniques are used, including the construction of wind turbines (with the local name of Kulak), Durche and Kharkhaneh, while taking advantage of the positive characteristics of the wind. To cool the houses, they prevented dust particles from entering the space to a great extent (Molanaei et al. 2015).

Dorcheh: In the northern part of the domed roofs of the old houses of Sistan, which are often in the shade, there are holes that are known as Dorcheh. These circles are built in the wall behind the house and facing the wind. The function of these rings is to move the hot air accumulated under the roof and cool the air inside (ibid., 2015).

Kharkhaneh: In Sistan, houses called Kharkhaneh have been used to cool the air and turn hot and dry air into cool and humid air, which functioned like a water cooler. Cool has entered the interior of the house (ibid., 2015).

The general form of buildings in this area is divided into 4 types: linear, L-shaped, U-shaped, central courtyard (Fig. 3).

Architectural types of housing in Baluchestan

In this section, he examines the different types of housing in the Baluchestan region and explains each of them to the basic principles of construction in different regions of Baluchestan. The statistical population in this research is the center and south of Sistan and Baluchestan province, that is, Baluchestan region. The sample community includes 25 villages selected in 11 cities. Baluchestan consists of 11 counties, 14 cities, 24 districts and 75 villages. This part of Sistan and Baluchestan province, which has an area

of 172,305 square kilometers, borders Sistan and Afghanistan from the north, Pakistan from the east, the Oman Sea from the south, and Kerman (Roodbar-Bashagard) from the west, and is about 10.45 It includes the percentage of the total area of the country. The natural border of Baluchestan is in the north of the heights of Malik Siah Kouh and the beginning of Chale Sistan, in the west of Dasht Lut and Jazmurian, in the south of the Oman Sea, and in the east, there is no natural border and the country of Pakistan is located. Its length and width from Kohak to the eastern end of Jazmurian is 590 kilometers. Baluchestan has about 300 km of water border with the Oman Sea and about 978 km of land border with its eastern neighbors Pakistan and Afghanistan. The general climate of Baluchestan is hot and dry, and in the coastal areas of the Oman Sea, it is hot and humid. Its southern areas are affected by Indian monsoons in summer with heavy rains. The air temperature in most of the cities is hot or very hot in the summer and its winters are relatively moderate and in some high areas with extreme cold; Western rain-bringing winds in winter cause scattered rain on the surface of Baluchestan (Qasri et al., 2015).

Investigation of residential units in Baluchestan

Most of the residential units that are made of clay and mud by local architects have common features in order to deal with adverse climatic factors and create favorable conditions for living. It should be noted that recently it has become customary to build buildings in an urban form by people who go to far and near cities or even abroad for work or study, and sometimes the buildings are built by Pakistani architects and there is no coordination with the climatic and cultural conditions. It does not have a region. Usually, the buildings are stretched in the east-west direction, which means windows are installed in the south and north levels and usually have a covered porch, the role of which is to create a shadow on the external surfaces and prevent direct sunlight from entering the rooms. it is day The windows are usually small with a height of about 70 cm from the floor of the room, the ceiling height of the room is about 3 meters, and the walls are made of raw clay, which is usually more than 40 cm in diameter, and the ceiling is made of wood and straw. These residential units have no fence and the boundaries of each unit are defined by the neighbors

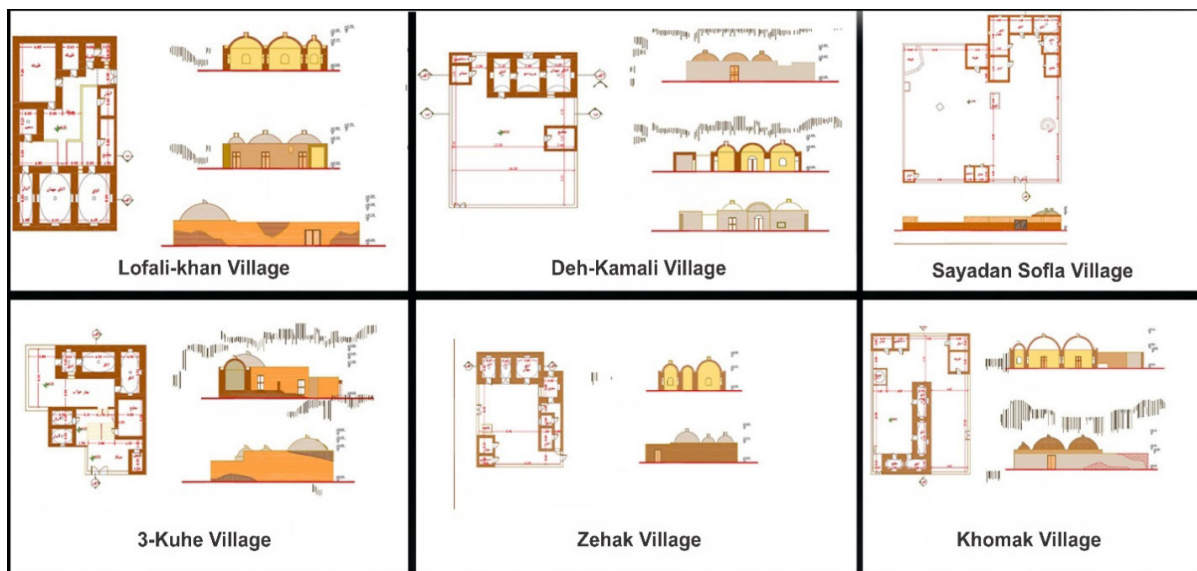


Figure.3: Species harvested in Sistan region

without any specific physical form. The area of each residential unit is relatively large, including the approximate area of the yard, and the required elements and spaces are scattered on the surface and at a distance. The villages of Iranshahr region often have a scattered physical structure and are located in almost flat lands. The people of these villages are often engaged in agriculture and animal husbandry. Preliminary studies show that the villages of this region do not have much history in terms of physical characteristics compared to other ancient and traditional villages (central Iran). Because it is not long ago that the people of this region have started to move from living in huts and tents to building stable and durable homes. In some areas of Saravan, Khash, Sarbaz and Nikshahr cities, some villages have been established in mountainous contexts or uneven lands or on the banks of seasonal rivers. Therefore, the study of residential architecture in the villages of the region has been carried out, taking into account the effectiveness of rural houses from the aforementioned factors in terms of physical form, settlement pattern, settlement direction, consumable materials and other factors.

Several types of patterns are mainly used in the construction of rural houses in the region:

1- Houses made of clay and mud with a domed roof; 2- Houses that have clay walls and flat roofs; 3- Capri houses

1- The houses of the first type mostly have a rectangular plan and linear organization and are made of one or more rooms with multiple functions; Most of the houses are built facing south or southeast. The climate of the region and the lack of access to suitable materials for covering the roof (such as wooden beams) is the reason for changing the shape of the houses and using a dome or a cradle arch. Usually, due to the hot and dry climate of the region, there are no openings in the western walls, and the openings in the north and south sides are 80 by 80 centimeters.

Usually, the rooms are not connected from the inside, the dimensions of the rooms are 12

to 20 square meters, and all the rooms are connected through the open space outside. According to the type of covering and the skill of the architect, the roof of the rooms is in the form of a dome or a semi-cylindrical opening. The floor of the rooms is often level with the outside of the building and sometimes 20 cm higher than the yard, and the height of the ceiling of the rooms is 70.3 (dome) and the materials used are clay. The thickness of the walls is 50 cm, the surfaces of the walls are lined with straw and do not have any facades; The parapet of the roof is 40 cm high and sometimes a mesh is made for resting at night in cold seasons. There is also a space in the yard covered with leaves and palm wood to keep livestock. This space is at the end of the ground and away from the residential space. contract. In some rural houses, capers are used for the kitchen. In every rural house, there is a space for sleeping, this space is located in front of the entrance door of the rooms.

2- The houses of the second type are the same as the first type, with the difference that the roof consists of wooden beams made of date palms and mats made of thin palm leaves and the final covering is flower straw. This type of cover is used when there is close access to the grove or the possibility of obtaining other types of wooden beams.

3- Capers are made from a combination of several tree branches or reeds as the skeleton of the building and mats as a covering on the skeleton. Capers are generally square and rectangular and they are made with dimensions of approximately 4 x 6 meters. Their floor is covered with mats and their entrance door is built in the form of a rectangular square, the height of a normal man. In the summer, the opposite side usually opens the entrance door, which causes the air flow to cool the caper (Sattarzadeh,2018), (Fig.4)

Architectural indicators of rural houses in Baluchestan
In this research, according to the vastness of the Baluchestan region and the geographical, cultural and climatic diversity, the species in the Baluchestan region are divided into 3 northern, central and southern regions.

Indicator types of rural housing in North Baluchestan region:

Due to the hot summers and cold winters, the villages in Northern Baluchestan usually have a compact structure, which mostly have flat roofs covered with beams, and in newer types, iron beams are used instead of wooden beams. According to the harvested species and the absence of constant winds in summer in this area, they have used holes in the wall of the building to create blinds, but they have kept these holes smaller to prevent the hot summer sun and winter cold. Although the suitable pattern of housing for this region is the central courtyard form due to the hot and dry climate, but it is less common in Baluchestan region due to several reasons. The species mostly have a linear form, which includes living spaces such as the living room and sleeping room and their service spaces such as the kitchen, and sometimes it does not have a proper orientation, and in some species, the sides of the building are open from all four directions; that this organization can be caused by economic problems,

which has prevented the construction of suitable and sufficient rooms for mostly large families in this region, or it can be related to the tribal structures and system, which usually still exist in Baluchestan region, unlike Sistan. It is common. There is no specific space as a sanitary service or a bathroom in most of the houses. Due to the continuity of the tribal system, it is sometimes observed that tents and huts are erected next to the black residential building, which shows that the villagers need more space for their lives or it fulfills the pitfalls. And sometimes it is even seen that some villagers prefer to live in the black tent due to the more suitable living conditions due to the hot weather of the region. The materials used in the old types are harvested canvas, but in the new types, materials such as bricks and cement blocks are often used. It should be noted that due to the vastness of Northern Baluchestan, the aforementioned points cannot be generalized to the entire region, even though in some parts of it, unlike other villages, we witness rock texture and architecture. Tamin rock architecture,



Figure.4: Brick and adobe houses with wooden roofs, Traditional and temporary mobile homes, Two-story houses with Pakistani architectural style

around Taftan mountain, is one of the most beautiful types of architecture in Darastan and the country. The texture of this village, which has received the attention of the cultural heritage, is formed in the form of three scattered neighborhoods, each neighborhood is compact in itself, and the buildings are built on the existing slope and sometimes in the form of stairs, and the materials of the walls are made of local stones, and the roof covering is made using wooden beams in a flat shape. In some parts of this village, we see cave-like shelters that, although they are no longer used, offer a unique example of the compatibility of man and nature, as well as a clever example of the influence of architecture on the climate. Below and in picture number 14, some key species of this region are presented.

Indicator types of rural housing in central Baluchestan region:

The climate of this region is not affected by North and South Baluchestan, because it has not benefited from both the winter cold and summer heat of North Baluchestan and the hot and humid weather and heavy seasonal rains of South Baluchestan, and as a result, it has created a middle texture. Is. Due to the large number of nomadic nomads in this region, especially in the past decades, we have seen the formation of villages that have a lot of historical history; because due to the seasonal migration of nomads and the lack of uniformity, the rural fabric is formed densely and compactly; Except in the situation where the village was formed from the beginning due to a suitable location and the presence of water and other environmental, economic and strategic factors. The formation of most of the houses in this area is only to meet the need for shelter and money for life, and usually the spaces are used in a multi-purpose way. The buildings are not structurally resistant in any way, so that in some types, layered walls with roofs made of wood and timber are seen. Openings are intended only for passing and creating blinds without any standards or decorations. The rooms also range from 1 to 4 depending on the financial

capacity and size of the household, and usually a space as a guest house is often seen in them, which shows the importance of the guest among the hospitable people of this region. Another exception that exists are the types harvested from the villages of Sarbaz city, which have different architectural characteristics, because the texture of the villages in this region is formed based on relatively strong local and regional slopes and the absence of flat lands. . This feature has given the villages of this region a beautiful compact and stepped texture. Also, the narrow roads that have been formed along the roads are a communication way between the buildings and during the rainy season, it usually disrupts the traffic on the communication road of these villages with other villages and the roads inside the village.

Indicator types of rural housing in South Baluchestan region:

In this climate, the heat and harsh weather in summer are annoying and its winters are milder, although Chabahar city is famous among all the southern ports of the country for its favorable weather conditions in all seasons of the year. In this area, materials with low heat capacity and light color are used, and the harshness of the air requires a scattered texture for air flow. Usually, fences are not found except low hedges around rural houses. And in order to use the air flow between the beach and the sea, sometimes the houses are built with two floors. Most of the species harvested in this area have linear and L-shaped patterns. (Fig. 5)

RESULT AND CONCLUSION

Analysis and summary of findings and comparative comparison of rural housing types in Sistan and Baluchestan region

In this section, the summation and analysis of different types of rural housing in Sistan region and Baluchestan region from different physical and architectural aspects, separately and compared to each other are discussed. In the table below, a comparative comparison of the most significant species of Sistan and Baluchestan re-

gion in terms of size, plan, view and orientation to sunlight and wind has been done (Table. 1).

As mentioned in the table above, the dominant species in Sistan region are El-Shakl and Yushakl and in Baluchestan region, Khati and El-Shakl. The openings in the Sistan region are in the opposite direction of unfavorable winds and have relatively small dimensions, and in

Baluchestan, they are in the north and south directions, and the dimensions of the openings in South Baluchestan are more because of the wind. The length of buildings in both regions is often east-west; Of course, in the rugged and mountainous areas of Baluchestan, the orientation depends on the slope and environmental conditions (Table. 2).

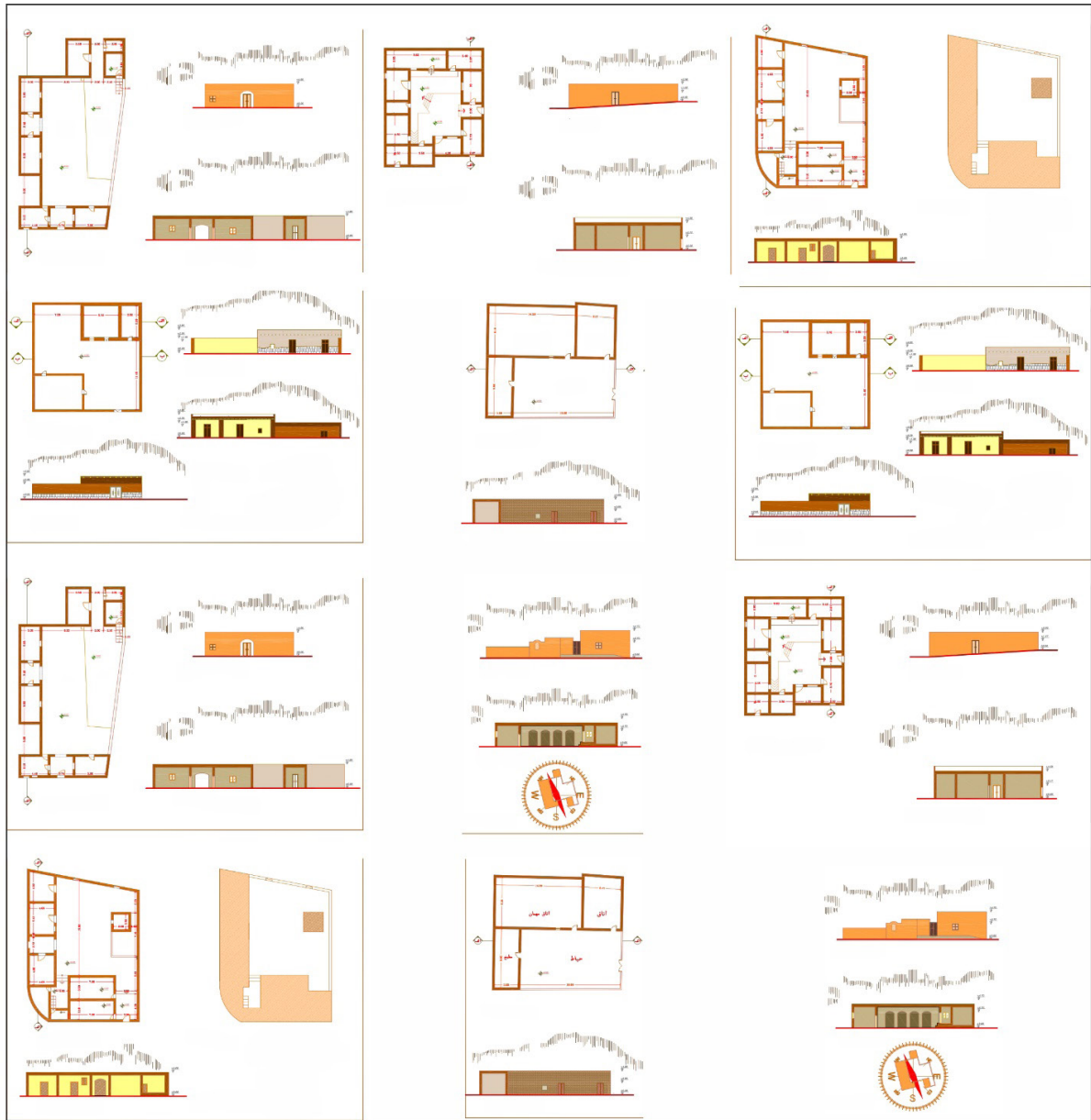


Figure.5: Species harvested in Bluchestan region

In the above table, while presenting the types and percentage of abundance of species in the region of Sistan and Baluchestan, a comparative comparison of architectural features, including spaces, architectural index elements and building orientation is presented. Rural housing in Sistan, due to the lack of underground water

sources, is often compact and dense, around the only sources of daily water, Hamon Lake and Hirmand River, over the course of several thousand years, and the people of this region are often sedentary and the household economy is based on agriculture. Livestock farming and even fishing has been relied on. While in the region

Table.1: Analysis of findings and comparative comparison of species in Sistan and Baluchestan region

	Plan	Plan Type	Building Volume	Lighting method	Wind Diagram	Facade	Door & Windows Form
Sistan							
North Baluchestan							
Central Baluchestan							
South Baluchestan							

of Baluchestan, the dominant livelihood system of the people is tribal, and in many regions, the rural system and single-family settlement do not have much history, and the household economy in northern and central Baluchestan is based on animal husbandry and agriculture, and in South Baluchestan, in addition to these,

Fishing is concentrated and sometimes, the use of caper and black chador is still common on the side or inside the courtyards of houses. In Sistan region, L-shaped and U-shaped types are used, respectively, and in Baluchestan, linear and L-shaped types are used more. Due to the presence of 120-day winds and the absence of

Table.2: Comparative comparison of rural housing types in Sistan region and Baluchestan region

Sistan and Baluchestan Province	Types of species indicators (in order of frequency)	micro spaces	Wall	the floor	ceiling	Decorations	Other architectural features	Orientation of the building	Openings	
Sistan	L shape 45%, A shape 35%, linear shape 15%, central courtyard 5%	Small room (bedroom), large room (living room), kitchen, toilet, second space, oven	Clay and mud with a thickness of 2 to 3 clays	Clay, soil, cement	Dome, vault	Brick and brick decorations, mesh	The buildings are mostly one-story, Kalk (Badgir Sistani), Tanverkhane, Soret, Durcheh, Kharkhaneh	Compact texture, stretching the east-west building	Small openings in the opposite direction of the 120-day winds	
Baluchestan region	Linear shape 40%, L shape 30%, A shape 25%, central courtyard 5%,	North Baluchestan	Small room (bedroom), large room (living room), kitchen, toilet, second space	Clay and mud approximately 60-80 cm thick	Soil	flat (wooden beam + mat, flower straw)	Brick decorations, mesh,	The buildings are one-story, sometimes with black tents in the yard, often without a fence or yard wall	Semi-compact texture, stretching east-west	Opening in medium dimensions in the direction of north and south
		Central Baluchestan	Small room (bedroom), large room (living room), kitchen, toilet, livestock area, porch, bedroom	Clay and mud approximately 60-80 cm thick	Soil	flat (wooden beam + mat, flower straw)	Brick decorations, mesh,	The buildings are one-story, usually without fences and courtyard walls, sometimes black tents or capers in the yard	Semi-Dense Fabric Stretching East-West	Opening with medium dimensions in the direction of north and south
		South Baluchestan	Small room (bedroom), large room (living room), kitchen, toilet, livestock area, porch	Clay and mud approximately 60-80 cm thick	Soil	flat (wooden beam + mat, flower straw)	Brick decorations, mesh,	The buildings are sometimes two-story, usually without fences and courtyard walls	semi-dense fabric stretching east-west	Large opening in the direction of north and south

trees in the Sistan region, the domed roof and windbreaks are considered as the most important signs and indicators of identity in the housing of the villages in the Sistan region, while in Baluchestan, wooden beams are used to cover the roof and the roofs are often flat. Considering the existence of large and large households and even multi-family dwellings, as well as taking into account the difficult economic and income conditions in both regions of Sistan and Baluchestan, the number of rooms and even the formation and growth of housing patterns over time, function It has been one of these conditions. The vast province of Sistan and Baluchestan has unique geographical, climatic and cultural characteristics, which has caused the diversity of rural housing architecture in different parts of the province. The region of Sistan, which covers a small part of the north of the province in terms of its size, has very special conditions in terms of special and difficult climatic conditions for life and the presence of 120-day winds in Sistan, and this itself causes the emergence of unique species. And the smartness of rural housing is to adapt to difficult environmental conditions. On the other hand, the vast region of Baluchestan is very diverse in terms of climate, geography and architecture. The main differences in the types of housing in the rural architecture of Sistan and Baluchestan, in addition to the impact of environmental, geographical and climatic conditions, are related to the economic, cultural, life and livelihood systems of the people of these two regions. Because in the Sistan region with a 5 thousand year old civilization, due to the existence of the Hamon lake, people have often lived in one place, and on the opposite point in Baluchestan, the dominant system is a tribe, and the villages and village houses in this region are old. Lower. The different geography and climate, as well as the lack of tree cover in the Sistan region and the presence of trees in Baluchestan, have caused different architectural styles in these two regions.

REFERENCES

- Afshar Sistani, Iraj (1981) *A look at Sistan and Baluchestan (the land of hard-working free people)*. Tehran. Published by Amin Khazarai, 1361.
- Arya, Munir (2013) *Sistan in the passage of time (Safarin to Seljuqs)*. Tehran, Raz Nahan.
- Brigadier Pour, Mohsen (2000). *Evaluation and analysis of rural housing in Sistan and Baluchestan province and proposal for future direction*. *Geography*, 8(27), 96-135.
- Ekhtiyari, Jamshid, Haji Heydari, Abolfazl. (2019). *Numerical analytical investigation of the humidity effect of Kharkhana in Sistan native housing*. *Housing and Village Environment*, 39(169), 89-100.
- Fateh, Mohammad, Dariush, Babak (2019). *Rural architecture*. Tehran: Science and knowledge. two.
- Ghaffari, Sidramine, and Miri, Asieh (2016). *Spatial-spatial processes in the typology of rural housing under study: (Chaharmahal and Bakhtiari Province, West Kiar District)*. *Physical Planning and Development*, 2(3 (serial 7)), 117-128.
- Ghasri, M. A., & Dadgar, F. (2023). *Analysis of the Architectural Style of Historical and Traditional Housing in the Sistan Region with a Climatic Approach and Proposing Criteria and Models for Contemporary Architecture*. *Iranian Journal of Archaeological Studies*, 13(1), 65-76. doi: 10.22111/ijas.2023.45788.127
- Haji Ebrahim Zargar, Akbar. (2000). *An introduction to the knowledge of rural architecture in Iran*. Tehran Publications: Shahid Beheshti University, Printing and Publishing Center.
- Heydari, Abolfazl, and Todhir, Jamshid (2019). *Investigating and understanding the effect of kharkhaneh on the wind speed in native housing in Sistan*. *Geography and Urban-Regional Studies*, 10(35), 49-64.
- Housing Foundation of the Islamic Revolution of Iran. (2013). *Research project on typology of rural housing in Sistan and Baluchestan province*. Tehran: Islamic Revolution Housing Foundation.
- Ismailnejad, Morteza, Karimi, Sadegh (2018). *Analysis of the spatial pattern of rural housing in arid regions with climatic conditions (case study: Sistan and Baluchestan province)*. *Geographical explorations of desert areas*. 7.2.

- Mansouri, Kaveh, Rahimi-Kelhrodi, Farshid Tavakoli, Seyed Farid. (2019). Housing typology and local construction techniques in the historical village of Elgan. *Hot and dry climate architecture*. 43-61. 8.12.
- Memarian, Gholamhossein (2017). Dehghani Tafti, Mohsen. In search of a new meaning for the concept of type and typology in architecture. Case study: Hall type house in Taft city. *Housing and village environment*. 37. 162. 21-38.
- Memarian, Gholamhossein and Mohammad Moradi, Asghar and Hossein Alipour, Seyed Mostafa and Heydari, Abolfazl and Dodi, Saeeda (2016) analysis of wind behavior in the natural ventilation of native houses in Qala Navi village of Sistan with the help of CFD. *Housing and Village Environment*, Volume 36, Number 157.
- Molanaei, Salahuddin, Soleimani, Sara (2015). Valuable elements of native architecture of Sistan region based on climatic components of sustainable architecture. *Bagh Nazar Magazine*, No. 41, October and November.
- Oshohi, Nadia, Masoumeh Ahmadzadeh (2016). Typology of rural housing in Sawad-kuh city in terms of architecture and structure. *Housing and environment of the village* No. 160, Fall.
- Owaisi Kikha, Zohra, Kavesh, Hossein Ali, Haji Heydari, Abolfazl, Toder, Jamshid. (2019). Typology of spatial organization of native housing in Sistan in terms of the formation of open and closed space. *housing and village environment*; 39(171): 61-72.
- Qasri, Mohammad Ali, Mir Gholami, Morteza, Gole Bacha, Mohammad Amin (2016). Typology of rural housing in Baluchestan with a climatic approach. *The 5th Civil, Architecture and Urban Development Congress*.
- Rahimipour, Nilofar, Attarian, Koresh, and Dehban, Mohammad (2019). Typology of rural housing in Borujerd city based on native structural-physical patterns (case example: Lower Kushki village). *Housing and Village Environment*, 39(171), 35-48.
- Sargazi, Mohammad Ali, Tahbaz, Mansoura, and Zargar, Akbar. (2019). Adaptive behaviors and summer thermal comfort in the interior spaces of native architecture of Sistan region. *Architecture of hot and dry climate*, 8(12), 169-195.
- Sattarzadeh, Dawood (2018). Housing indicators in Sistan and Baluchestan province. *Geographical Journal of Zagros Landscape*, 1(1), 85-100.
- Sertipour, Mohsen (2017). Analytical survey of rural housing in the province. *Page number 49. Number 52*.
- Silversmith, Abdul Hamid (2017). *Introduction to Islamic identity in architecture*. Tehran: Ministry of Housing and Urban Development.
- Soltani, Mehrdad, Sidamir Mansouri, Farzin, Ahmed Ali. (2013). Adapting the role of models and concepts to experience in the architectural space. *Quarterly Scientific Research Journal of Nazar Research Center for Architectural Art and Urban Planning*. Number 21 / 9th year / summer 2013 / adapting the role of the model and concepts based on experience in the architectural space / 3-14.
- Tarshabi, Karim Bakhsh, Akrami, Gholamreza, and Ainifar, Alireza. (2020). Flexibility in native housing in rural Baluchestan, Iran. *Architecture of hot and dry climate*, 9(13), 103-117.

COPYRIGHTS

©2023 The author(s). This is an open access article distributed under the terms of the Creative Commons Attribution (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, as long as the original authors and source are cited. No permission is required from the authors or the publishers.



HOW TO CITE THIS ARTICLE

Ghasri, M. A., & Dadgar, F. (2024). Comparative analysis and comparison of rural housing index types in Sistan and Baluchestan province from the point of view of the impact of environmental factors on the structure of the building. *International Journal of Urban Management and Energy Sustainability*, (), -.

DOI: [10.22034/ijumes.2024.2003446.1145](https://doi.org/10.22034/ijumes.2024.2003446.1145)

