

Survey of Native Rural Housing Architecture in Sistan Region

1. Sami Hasani Darband

E-mail: Samihasanidarband@Gmail.com

Master student of architecture, Faculty of Art and Architecture ,Iran, Aeen Kamal University,
Orumiyeh

2. Sepideh Sharif Khajehpasha (Corresponding Author)

E-mail: Sepideh63Sharif@Gmail.com

Ph.D. Candidate of Architecture, Faculty of Art and Architecture, Iran, Aeen Kamal University,
Orumiyeh

DOI: 10.26821/IJSRC.11.6.2023.110503

Abstract

Recognizing and preserving the values of native architecture especially rural architecture, while protecting the national historical capitals of the country, helps to discover the secrets and hidden truths of this architecture, the permanent principles remaining from the past flow into the new body, and preserve the identity and authenticity of rural architecture. In this article, the climatic elements used in the implementation of rural housing in Sistan and the techniques and types of dealing with harsh and difficult environmental conditions have been examined and described, and the studies show that the native architects of Sistan have used the prevailing climatic phenomenon of the region in the best possible way and the native rural housing of this region has been built like in other parts of our country based on the weather conditions and the facilities that the environment provides for native architects.

Key words: Sistan, native housing, rural housing, climatic architecture

Introduction

The climatic conditions of each region have always been one of the key issues in the field of architecture in the past. Architects should pay attention to the sun, wind, rain, cold of winter and heat of summer in order to provide the conditions for human comfort, and to implement the building, they had to pay attention to the existing facilities and local and available materials. That means, in each climate, the shape of the building has been subject to the climatic conditions of the region, and the shape of building, materials, and implementation details are selected and designed in such a way that maximum use is made of the climate and environmental conditions and human comfort is achieved in that climate. In fact, the native architecture of each region has been created under the influence of the climatic, geographical and cultural conditions of that region and represents centuries of experience in the optimal use of materials, construction methods and climatic considerations, and neglecting this issue can cause the destruction of this type of architecture and the experience of local architects will be forgotten. (Ma'quli and Ahmadzadeh 1396:87) Therefore, recognizing and preserving the values of native architecture, especially rural architecture, while protecting the country's historical treasures, helps to discover the secrets and hidden truths of this architecture, stabilizes principles left from the past and flow into the new body, and the identity and authenticity of rural architecture be preserved. In this research, after getting ourselves familiar with the weather

conditions of the Sistan region, we will describe the characteristics of climatic housing and the climatic elements used in the body of the buildings. (Chanok et al , 1400)

Climatic specification of Sistan region

According to climate statistics, Sistan and Baluchistan is one of the hot and dry regions of Iran. This province consists of two completely distinct regions that differ from each other historically, socially and culturally. (Afshar Sistani , 1382:2) Politically, Sistan is divided between Afghanistan, Pakistan and Iran. The larger and more watery part of Sistan is located in the territory of Afghanistan, a small part of it is located in the territory of Pakistan, and a part is located in the territory of our country, Iran, which has an area of 36,000 square kilometers. The conditions and climate of this region are consistent with the conditions of desert and semi-desert regions. It is said that the climate and weather of Sistan was not so harsh in the past and the climate has changed and has become dry probably since about 6 centuries ago. (Malekzadeh , 1380:8)

In the Sistan region, there are more than 300 dry days per year on average, and there is no rain in seven months of the year. The wind flows in Sistan in all seasons and the 120-day winds in Sistan are the result of high-pressure western masses that blow from the Northwest to the Southeast in the summer. The maximum speed of these winds reaches 100 K/H in Tir Month, which causes movement of loose sands and creates sand storms on the way, and the longest period of dust storms is 80.7 days on average every year. (Davtalab, 1394:10)

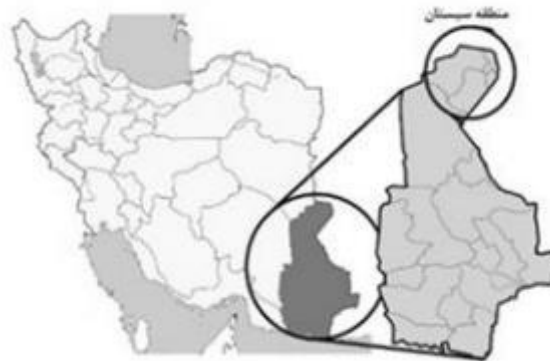


Image 1: The location of Sistan on the map of Iran

Local housing in Sistan region

Like other parts of our country, native housing in the Sistan region has been built with an emphasis on the weather conditions and the facilities that the environment provides to the native architect. One of the principles of native architecture that can be mentioned is the maximum use of natural energy and the minimum use of fossil energy. This is obvious in the Sistan region. Native architects of Sistan have used the dominant climatic phenomenon of the region in the best possible way.

According to the studies and information obtained from the native houses in the villages and the specification of the general architectural form of the native houses in the region, the houses in the Sistan region can be categorized as follows:

1. Linear, L, and U-shaped plans (common type) , central and castle plans (special type)
- 2: Domed roofs
- 3: Using the elements involved in creating wind for natural ventilation
- 4: Using moonlight (Mahtabi)

5. (small) Shop (Dokancheh)

6: The large diameter of the walls

7: Netted shelter on the roof

8: Small openings

Linear, L, and U-shaped plans

In the architecture of Sistan, the linear and L-shaped plan is the main form of the house plan, which the rooms are usually placed in the corner of the yard and the access to the rooms is possible through the yard. In some cases, the plan is U-shaped, which the rooms are located around the central courtyard. (Vali Beyg and Rastegar Zhaleh, 1397:28) Houses in Sistan are mostly built on the same floor or as an upper floor, and it depends on the social status and wealth of the owner, so that people with a high social class build their houses vertically and in two units. They build houses on the upper and lower floors, and the lower social classes build their houses on the level of grand floor. (GolMohamadi, 1390:90) The total area of native housing in this area is small and it's only intended to meet needs such as sleep and food. (Ebrahimzadeh,

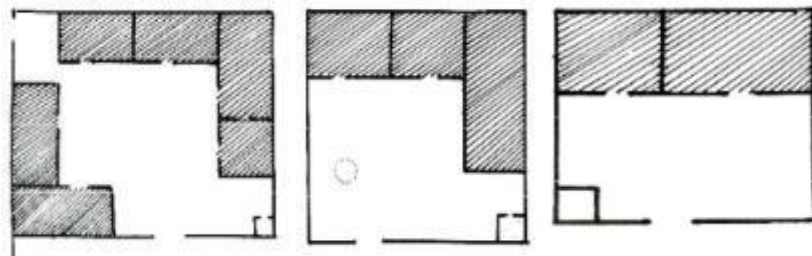


Image 2: Linear, L, and U-shaped plans



Image 3: Linea house (on the right) , L-shaped (in the middle) , U-shaped (on the left)

Central yard type

In general, the central yard is completely introverted and all its facades face the yard. This type includes a complete set of rooms with biological uses and services, that main living spaces are located on the Northwest front to use wind energy for natural ventilation. The owners of this type of residential units were mostly the lords of the region, and the mentioned type is mostly seen in villages with compact texture. In this way, the side views of the building

control the sunlight and create shadows on different levels. Also, due to the compactness and density of the building in the winter, the spaces protect each other against the flow of cold air. (Oveysi Kikha et al, 1399)

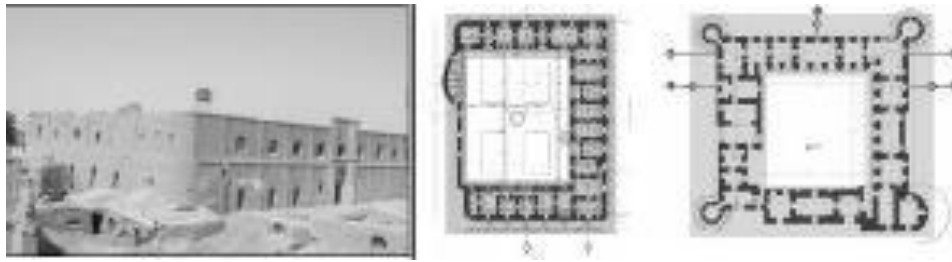


Image 4: Central yard type

Castle type

In the past eras of Sistan, a kind of castle building known as Sardari House was built. This type is special for local rulers and is an imported type of architecture. This type is not a product of collective culture and was formed by the ruling class with a kind of personal taste against the local culture and native buildings, and it has little compatibility with local architecture, so this type has had a great impact on social class and the economic power of the person in the formation of this type which can be seen scattered in the region. In this type, which is usually one floor, the plan of the building is placed inside a long-fenced yard having an extroverted form. Also, in some examples, spaces in the corner of the ground are considered for service works. For some examples of this type, three entrances have been considered for the outer, inner and service sections. The entrance to the surrounding space is from the north side of the building and through a deep porch. (Oveysi Kikha et al, 1399)

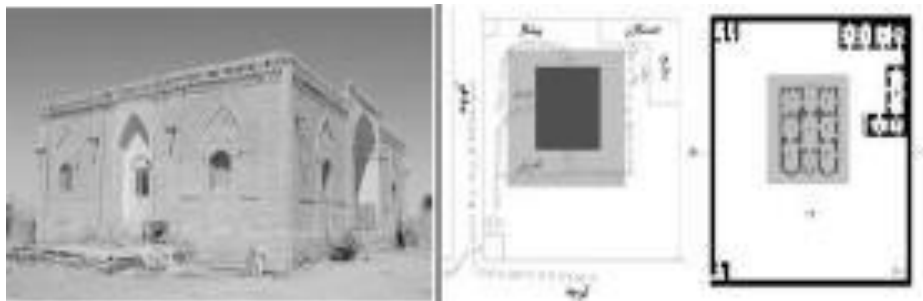
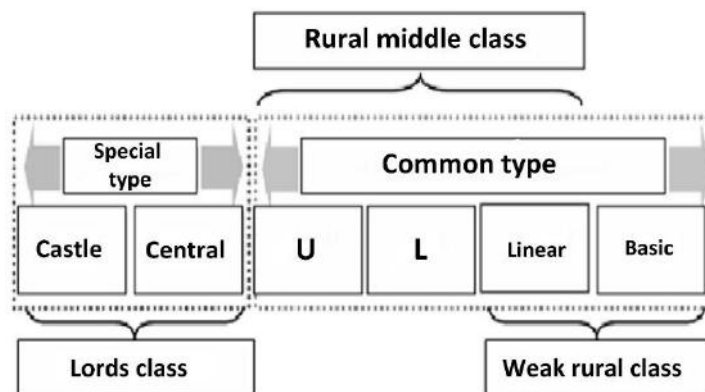


Image 5: Castle type



Shape 1 : Common and special types of local houses in Sistan and the categorization of their users (Oveysi Kikha et al, 1399)

Domed roofs

One of the specifications of Sistani houses is the dome-covered roof, because the roof can be easily covered by using the local materials of the region, which include clay and mud. It is definitely considered the best type of covering due to the location of a part of the domed roof in the shade. The domes of this area are of a special type that their special feature is execution on a rectangular plan.



Image 6: Arched and domed roofs

Using wind flow to cool indoor spaces

Native housing in the Sistan region has been built with an emphasis on design based on internal air flow and the use of wind for centuries. It seems that the recognition and analysis of the internal air flow in the native housing of this region and its adaptation in the rural housing today can solve a large part of the biological problems in this region.

Introducing the elements involved in creating wind in the indoor space

1. Dorcheh or Daricheh
2. Surak
3. Kulak
4. Kharkhaneh

Dorcheh or Daricheh

Sometimes in the Northern part of the domed roofs, which is always in the shade, there are openings, which are known as Dorcheh or Daricheh. These circles can be seen in the back wall of the houses facing the wind and in the always-shaded area. The work of these rings has been to move the hot air accumulated under the roof and cool the air inside.



Image 7: Dorcheh on dome and wall

Surak

On the wall of Sistani houses, a valve similar to the letter S is installed, which is called Surak. Suraks are combined in different ways in the facade of the building and they are also considered as simple decorations on flat and simple brick walls. When the hole is on the wall facing the North wind, it is for air entry, and if it is on the other walls, it is for air exit. The structure of Surak is such that it restricts the view into the space, prevents animals from entering, and by reducing the wind speed in its throat, it settles the dust and dirt in the air. Sometimes a hole is created at the bottom of Surak to collect dust. This element is one of the innovations of Sistani architects. (Chanok et al , 1400)

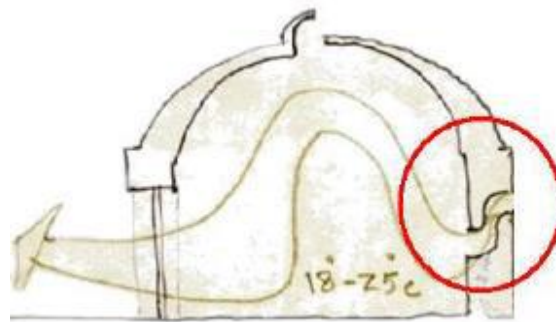


Image 8: Function of Surak

Kulak

Kulak is a one-way wind draft native to Sistan that is found on the roof of houses. The valve of Kulak is always towards the North and the Northwest winds. Kulak directs the wind to the interior in a simple way and causes the building to be ventilated and reduces the temperature. During construction, care must be taken that Kulaks of two neighboring buildings are not in the same line, so it does not prevent the wind from reaching the next Kulak. On the days with dusty weather, they put a net in front of the opening of the wind trap and put some moist thorn behind it, and in winter, they close the entrance of these wind traps to prevent cold wind from entering. (Molanayi and Soleymani, 1395:62)



Image 9: Kulak and its function

Kharkhaneh

In Sistan, they use houses called Kharkhaneh or Kharkhaneh in the local language in order to convert the hot air into humid and mild air. In terms of performance, this element works like a water cooler. (Heydari and Davtalab, 1398: 58) Kharkhaneh is not only for Sistan, but also it's for all desert areas, and only it has different names. In Sistan, thorn bushes are put behind the vents that are built in the back of the houses facing North, and people sprinkle water on the thorns once in a while. When hot air passes through these thorns and absorbs moisture, turns into moist and cools the air. In another example of Kharkhanehs, a room is built with walls of compressed thorns, and by installing containers on the roof and filling them with water, water flows down the walls of the thorns through netted pipes. When local hot winds pass through, they meet moist and lose dust, so a large amount of heat is reduced and relatively cool air blows into the barn. As a result, there is a significant temperature difference between the inside and outside of the Kharkhaneh. (Molanayi and Soleymani, 1395:63)

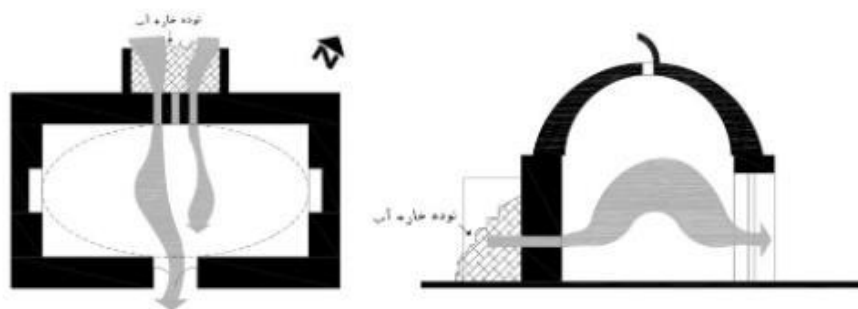


Image 10: Local Kharkhaneh from Sistan region

Mahtabi

It is an enclosed and roofless space that is located between the rooms and it's usually used in types of rural housing in Sistan, where the living space is located on the upper floor and the livestock space is located on the lower floor. Moonlight is surrounded by a wall with small openings in special shape, and the height of this wall is about one

meter. The use of this space is usually for family members to sit in the afternoon and sleep at night and when the heat absorbed during the day is lost by clay materials, and closed spaces become unbearable. (Davtalab, 1394:20)

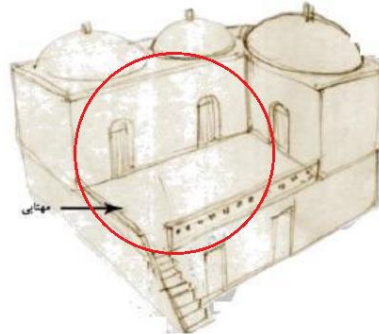


Image 11: Mahtabi

Dokancheh (small shop)

In some forms of rural housing where the livestock space and the living space are located on two different sides, the open area in front of the living spaces surrounded by these spaces and usually separated from the main yard by a wall with a diameter of 60 cm is called Dokancheh. Due to the fact that this space is located on the South side and facing the wind, it is used for relaxing in the evenings and nights due to the favorite weather and calmness of the wind speed in this area. (Oveysi Kikha et al, 1399)



Image 12: Mahtabi of locating Dokancheh in Sistan's residential architecture

The large diameter of the walls

Architecture in Sistan is based on the climatic conditions of this region, in a way that most of its houses are made of local materials including clay and mud that keep cold and heat in themselves. The dimensions of each brick are 22 x 22 cm, the thickness of the walls is three bricks, which is 66 cm. Due to the large thickness of the wall and the low heat transfer coefficient of clay, the outside heat is not transferred to inside during the day. Therefore, the interior remains cool. (Chabok et al, 1400)

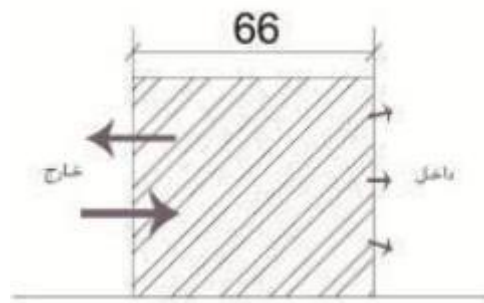


Image 13: Wall's thickness

Netted shelter on the roof

One of the features about forms of the native architecture of the region is the presence of netted shelters on the roofs of the houses. These shelters provide protection on the roof of the house by creating air flow and coolness in the roofs, in addition to creating a beautiful view, they provide a suitable place to sleep at night. (Tavasoli, 1381: 118) The harmonious repetition of full and empty surfaces that brings the sky into the building is one of the remarkable beauties of the native architecture of Sistan.



Image 14: Netted shelter

Conclusion

Studies show that the architecture in Sistan was derived from the climatic conditions of this region, and according to the conditions and climate of this region which is consistent with the conditions of desert and semi-desert regions, the use of climatic architectural elements specific to this region (Kulak, Surak, Kharkhaneh, moonlight, netted shelter, etc.) is a suitable solution that have been defined for many centuries as components of the architectural principles of this region in order to confront the harsh climate and facilitate living conditions. Therefore, native housing in the Sistan region, like other parts of our country, has been built with an emphasis on the weather conditions and the facilities that the environment provides to the native architect.

Paying close attention to the climate-architecture of Sistan shows that in the past renewable energies (such as wind) have been used prominently in the architecture of this region, so that at regulating the environmental conditions inside the buildings, choosing the forms and shapes and materials and architectural details have played an essential role. In the following, some points are written about the residential architecture of Sistan region.

- The plans of the buildings are as dense and compact as possible, and efforts have been made to keep the external surface as small as possible compared to its volume. This compactness of the house plan minimizes the amount of heat exchange through the external walls of the building, both in summer and in winter, and as a result, it significantly prevents the penetration of heat into the building in summer and its loss in winter.

- The correct use of the prevailing wind in the region and its use at ventilating and cooling the spaces used in summer by orientation and rotation according to the appropriate winds and natural air conditioning using elements such as Kulak, Surak, kharkhaneh and Dorcheh.
- Using the thickness of the walls for suitable heat exchange for the climate of the region and insulation against heat entering the interior in summer and leaving it in winter.
- The number and area of the windows of the buildings in similar areas are reduced to the minimum possible, and in order to prevent the penetration of the rays reflected from the ground, windows are installed in the upper part of the walls and where there is a niche inside the house, and the material of the windows is wooden (wood of willow tree, nettle tree or mulberry tree).
- In order to reduce the heat generated in the walls due to the sun's radiation on them as much as possible, the external surfaces are usually covered with thatch.
- The buildings are usually built in dense textures and very compact collections, and efforts have been made to create as much shade as possible on the outer surface in this way. As a result, the density of the whole mass of building materials has increased and the delay time has reached the optimal level.
- Using materials with suitable heat capacity, organic and available in the surrounding nature, with low transportation cost, compatible with the climate, renewable and flexible against environmental factors and climatic actions and reactions.
- Using materials with suitable heat capacity, organic and available in the surrounding nature, with low transportation cost, compatible with the climate, renewable and flexible against environmental factors and climatic actions and reactions.

References

- Ibrahimzadeh 2001; rural migrations and the causes of its consequences, the example of Sistan and Baluchistan Province, Geographical Research Quarterly, No.60
- Afshar Sistani, 1383 A Look at Sistan and Baluchistan, Tehran, Mehtab Publications. Owaisi Kikha, Z., Kavesh, H., Jaidari, A., Toder, J. 2019. Typology of the spatial organization of native housing in Sistan in terms of the formation of open and closed space. Housing and Village Environment Quarterly, No. 17
 - Tavasli, M. 2002, City construction and architecture in the hot and dry climate of Iran, 4th edition, Tehran: Payam Phandeh New Publications
 - Heydari, A., volunteer, J. 2018. The role of Kharkhaneh in adjusting the spatial temperature of life in rural housing effective in promoting the sustainability of architecture, Quarterly Journal of Architecture and Urbanism, Year 7, Number 2.
 - Chabek, R., Fathi, S., Sharif Khaje Pasha, S., 1400, survey of climatic architectural components of Sistan region, 6th National Conference on Architecture and Sustainable City, Tehran.
 - Volunteer, J. 2014. Sustainability patterns in the native architecture of Sistan. National Conference of Native Architecture and Urban Planning of Iran. Sargazi, M. 2013. Semiotics of native architecture of Sistan region. Two visual arts quarterly, second year, number 3
 - Gul Mohammadi, F. 2018. Investigating methods of teaching and promoting local knowledge of rural architecture (case example: Sistan and Baluchistan province). Housing and Village Environment Quarterly, No. 136.

- Oshki, N., Ahmadzadeh, M. (2016), typology of rural housing in Sawad Koh city in terms of architecture and structure. *Housing and Village Environment Quarterly*, No.160.

- Malekzadeh, M. 2001. A brief look at the history and archeology of Sistan, quarterly works number 2.
- Molanai, S., - Soleimani, S. 2015. Valuable elements of native architecture of Sistan region based on climatic components of sustainable architecture, *Bagh Nazar Quarterly*, 13th year, number 41.

- Vali Beg, N., Rostkar Jhaleh, S. 2017. A comparative study of native rural Sistani and Baloch housing from the perspective of physical identification with the approach of cultural anthropology. *Housing and Village Environment Quarterly*, No. 163