

Research Article

INSPIRATION OF POTENTIAL ARCHITECTURE IN THE PAST FOR THE FUTURE OF ARCHITECTURE IN SISTAN

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ABSTRACT

Nowadays, in many parts of Iran including Sistan, architecture regardless of culture, climate and users' demand can be seen in a way that climatic paradigm such as wind and sun reflection have been ignored. Sistan architecture is similar to valuable treasure that has been formed during centuries and provides Iran architecture with priceless hints and additionally can respond the current challenges. This article aims that Sistan former architecture can present itself as a proper example for the present and future's architecture. This research is based on descriptive approach and in accordance with library studies and field research.

Keywords: *Sistan, Domed Ceiling, Climatic Design*

INTRODUCTION

Sistan's contemporary's Architecture has been formed without paying attention to climate and culture while studies on its past, prove that these paradigms were fully respected in the architecture of this region. It is expected that present technological progress help architects promote current situation although Iran's architecture lacks identification in comparison with the past.

The main purpose of this research is to discover a sustainable design and architecture which is in accordance with cultural, social and economic circumstances. Moreover, it can provide users' comfort with respect to climatic paradigms specially sun reflection and wind. Certainly, the region's previous experience can be beneficial for responding the cultural and climatic condition (Sistan' vernacular architecture) and the region's present architecture.

Research Questions

1. What are the potentials of Sistan's Architecture?
2. How can architects benefit from the potentials and values of Sistan's former architecture?

Theoretical Framework

With regard to various researches carried out in traditional sustainable architecture, it is worth mentioning that in previous studies, priority was given to climatic points but the value of Iran's traditional architecture as Sistan stems from different factors such as harmony with environment, visual values, proportions, geometry in elevations and plans, structure and proper use of different elements that can be a suitable source of inspiration for the future. Considering what mentioned above, in this article, climatic potential of Sistan's architecture with other values will be presented in order to be applied for the future architecture.

Hypothesis

In former Sistan's architecture, natural resources such as wind and sun reflection have been efficiently used. Sistan vernacular's architecture is in harmony with nature and has the least negative impact on environment. Sistan's traditional architecture emphasized on human and is formed compatibly with users' demands and psychological conditions. Sistan is the name of vast territory in south east of Iran where at present is mainly located in Afghanistan and is called Velayat Nimrooz. Iranian Sistan or west Sistan is situated in the far north of Sistan and Balouchestan. It is roughly flat and main part of that is made by sediments of Hirmand River (Sajjadi, 1997)

Sistan of Iran

Sistan region (It's center is Zabol) is about 15197 kilometers and is located in north east of province in a vast plain at the western point of border and has a rich history and civilization. Sistan has six city centers,

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5 Bakhsh, 17 vill, 1005 hamlet including 855 residential hamlet and none residential ones. The distance between county to city of province is 213 kilometer.

The Climatic Characteristics of the Sistan

According to categorization of Kopan, a French scientist, and reformed proposal of Russels in climatic point of view, Sistan has a very hot and arid climate with long summer. The warmest month is June and the maximum temperature is about 40 to 53. In fall, it has a mild temperature while in winter is cold. The coldest month is January and the minimum temperature is minus 12 (Afshar and Sistani, 88). Wind and sun are the most important factors in Sistan architecture. In Summary, Sistan climatic characteristics are listed as below:

- 120-day winds of Sistan known as Levar
- Low annual rainfall
- Hot days in summer
- The extreme difference temperature in summer and winter
- Stable absolute humidity and unstable relative humidity caused by changing temperature

Sun Radiation: Almost, sun radiates vertically. In Sistan, at everywhere, hot temperature, caused by sun radiation is dominant. Therefore, in order to cope with this severe issue, residents utilize trees shades. Additionally, small openings in yards and growing heat tolerant plants are solutions that are common in region.

120 Day Winds: These winds frequently blow in the summer with 10 to 120 kilometer speed per hour. Although, 120 day of winds cause many problems such as dust and damage to farms, in normal situation and cultivated years, wind with average speed can provide for residents with tolerating extreme heat in the summer.



Figure 1: Kasmaei



Figure 2: 129 day of wind in Sistan

British explorer McMahon in 1283 visited Sistan and noted that if it is supposed to call somewhere as a wind territory, Sistan is the best candidate. This wind is called 120 days of wind and takes place in the summer. It begins blowing from North and North West and its speed is about 70 miles per hour. It has an eccentric sound and comes with dust. It gets on individuals' nerve. On the other hand, blowing wind has some advantages as well as reduction summer heat, killing insects. Without having this wind in April, May, Jun, living is a great tragedy (Historical Geography of Iran).

Sistan's Architecture

Sistan residents demonstrate capability to adapting with environmental circumstances. Climatic design is fully respected. Every house has a circulation fan. The vertical duct is appreciatively passing between walls and opens to rooms. Ceilings are dome shaped. (Historical Geography of Iran)

Sistan Current's Architecture and its Disadvantages

Sistan's current's architecture has severe issues, caused by improper studies of Sistan's former architecture, climatic design and users' demands. In the past, the proper orientation, harmonious designing, region's facilities and local materials were given the preference. For an example, local materials such as adobe and brick were compatible with hot and arid climate of the region.

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But unfortunately, nowadays, common materials such as granite and travertine and even glass are used in Zabol and around villages.

As it is clear, due to master plan, land uses are limited and perhaps it is not possible to inhabit in great buildings (Four season house with Tābestān Neshīn and Zemestān Neshīn) but it is manageable to design a house with current situation.

In current situation of Sistan, even planning and placement are not considered wisely. To add more, for heated spaces such as kitchen, it is required to place them away from living spaces and locate in the middle part.

Nowadays, it is rare to see standard doors and openings. And, in modern windows, openings cause heat loss. It is preferable to replace metal windows with wooden types.

Façade designing and landscape are not designed intelligently. Urban and rural textures are not identified and lack harmony and proportions in a way that any kind of material, volumes regardless urban landscape are used.



Figure 3: Comparison between new and old textures shows that in new texture the orientation of building, yards and ceilings form is different with climatic condition of Sistan

Considering Wind Impact in Building

Wind is an important climatic element in the region and it plays a vital role on determining the location of urban elements and building orientation. Not only does wind impact on residents' life, also it can influence the urban textures as well, the dominant wind in Sistan comes from north and north-west and as a result, dust can be seen most of the year.

Most of traditional houses in Zabol are located in Northern-southern orientation and use wind tower and air vents. All ancient buildings in Sistan are following one angle. And, front and back walls are vertical in wind orientation and side walls are parallel with wind.

Site Planning for Cities and Villages

Sistan plain is benefiting from natural resources in different periods of time and ruins of great cities proves the grandeur of its establishments. The height is chosen for construction in Sistan.

There are some reasons for choosing the site:

- More usage of centralized wind can be achieved by constructing on height.
- Low depth of subsurface water and humidity in Sistan Plain can damage foundation.
- Due to flatness of Sistan plain, lower construction than baseline does not seem wise.

Location of Shahre-E-Soukhte, former civilization on natural terrace of Romroud (Mehr and Seyed Sajadi, 2005), Dahan-e Ġolāmān between Zabol, Romroud (ibid. 232) and formation of main castle in Khaje mountain on slope of eastern range (Mosali: 2006) prove that architects were aware of Hirmand river flood and flood in Pahn dasht. To add more, proper usage of Khaje Mountain as a wind shield in Gale Kaferoon shows an appropriate site planning before Islam.

The physical appearance of Sistan houses for environment is an interpretation of the physical appearance of vernacular houses to their neighborhood and environment. As Shoultz mentioned (2010) Land quality is essential and prior to skyline (Shoultz, 2010)

Architectural theme is derived from environment and it is as if nothing added to the nature. Soil is the most important achievement of the nature for people in Sistan. In general, buildings are adapted with

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nature in a way that seems building is inside the nature and it is not dominant. Form and skyline are closely related with landscape and hills.



Figure 4: Harmony with nature

Review of Proportion in Urban and Rural Landscape

Proportion is discussed in Two Ways:

First, physical proportion: architects and artists recognize physical elements such as material, climate, geometry, technical and executive factors in a specific time and use them in architecture. (Nasr, 1996, 63)

Second, spiritual proportion: architects make an effort to create in meaningful space in order to help individual with grow spiritually. This space does not include neglect, illusion and dependence and finally the quantity and formal dimension is interlocked with quality and content. To tell more it is like the relationship between means and goals, farm and plants and body and soul. Spaces in rural houses are not decorative and proportion is completely concerned. Rural houses in Sistan have simple forms, cubic shape, domed ceiling and short wind tower.

Zoning in Former Housing of Sistan

Zoning is tightly related with a specific function. In Sistan houses, there are three zones that result from different functions: inhabit services and livestock.

Sprawling and organization of housing depend on the quantity combination of spaces. In general, rooms and living spaces are included kitchen, bakery, bathroom and store and services, stable and other parts related to animals are livestock zoning. In former architecture of Sistan, these parts were chosen properly. The location of living spaces was in higher level in order to preserve yard and other parts and prevent winds and dust.

Materials Used in Vernacular Buildings of Sistan

Walls are made by adobe and their thickness is 60 to 90 centimeter. In some cases, wall base course reach the beneath of brick floor. Elevations are covered by brick and cob material and the interior surface is plastered, the exterior surface of ceiling is covered by light color cob material in order to prevent solar radiation and results reduction of heat in interior spaces.

In large part of Iran, after formation, adobe and in more advanced way bricks are made by soil (Memarian, 1987). This tradition is seen in Sistan but it has to be noticed that this region lacks materials except adobe and it can be perceived by geological characteristics and physical appearance.

Different Types of Ceiling

One of the major potentials of Sistan's architecture is domed ceiling that has various characteristics such as climatic function, wind and earthquake resistant, technical execution and load transfer.

Domed ceiling is executed similar to squinch system but it has one main advantage. It can be developed in square and rectangular ceiling while squinch is just executed in square plans regarding earthquake behavior and its impact on vernacular architecture, barrel vault can transfer loads to one side and they fully are earthquake resistance. During earthquake, barrel vault will be destroyed easily whereas in Sistan domed ceilings that can transfer loads to both sides and earthquake loading are divided in all walls and the intensity of earthquake is reduced considerably. Form of Sitan ceiling and wind tower are the best method for ventilation during hot days.

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Advantages of domed ceiling in Sistan

- Sistan ceilings are domed shape. Choosing this form has structural and climatic reasons.
- Ceiling form causes wind passes in a desired amount and it can lead to the interior spaces.
- This ceiling can resist bilateral forces and transfer loads to all walls.

Considering this point that local material come in handy and their executions are not complicated, imported material and labor force out of province are not needed.



Figure 5: Process of making adobe, construction, and covering domed ceiling

Entrance: Not only entrances do provide aesthetic aspect in building, but also they have special function as well. These building elements in Sistan architecture are wisely located and can prevent bad weather and dust.

Natural Ventilation (Kharkhona): In the past, architects applied some solutions that are adapted with climate and prove that people were aware of their environment. Kharkhona has a system similar to water chiller and it increases the humidity and reduces the temperature and often is located in north part of building. By Flowing water and humidify the straw-bale in water chiller, hot wind of desert became favorable and comes to the house. This device has an efficient function to moderate the temperature inside the house. In the winter, it was common to block the wicket in order to prevent cold weather (Saadtian, 2012)

Windrower: Wind tower is a simple structure that mainly is located on top of domed ceiling and its maximum height is about 1.5 meter. These structures have one opening toward prevailing wind that blows from north. Their plans are square shaped 1*1 meter and their ceiling has a slope with angle of 30 degrees



Figure 6: One side Koolak

Windmill: Regarding the potential of wind in the region this source of energy is important. Majority of historian and researchers believe that windmill originated in Sistan

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Figure 7: Picture and map of windmill

Tandor(oven): Knowing the intensity and quality of unfavorable wind in the region, tandoor lid design in a way that prevent hot sun and unfavorable wind with the minimum usage of material and high efficiency.



Figure 8: Tandor

Stable and Livestock: The placement of livestock and stable in south of plan prevent bad odours in living space although it is not respected nowadays.

Heat Producer Heat Elements (Fireplace): Winter in the desert can cause difficult condition as well as summer. This season in Sistan is accompanied with cold and dry wind. Because of it, architects provide for people with proper condition in the plan by putting rooms in north to benefit from sun. Additionally, building different fireplaces with simple structure in the wall recession can supply heat for interior spaces (Saatian, 2012)

CONCLUSION

To be inspired by positive points, Sistan former's architecture can be influential because this kind of architecture is made during centuries. The main purpose of this research is to achieve climatic design and with respect to social, cultural and economic conditions.

Studying the former architecture of Sistan can identify the residents' demands and is used for its updating.

- Proper sit planning of urban and rural texture with respect to climatic and environmental condition such as flood, hurricane and river flood
- Respecting proportion in elevations and plans in order to prevent space loss
- Paying attention to neighborhoods, skyline and choosing colors based on climatic and cultural condition in designing urban or rural elevation.
- Surrounding building with consistent and relatively high walls or considering court yard and opening interior spaces toward yard
- Usage of compact textures
- Usage of small and manageable windows in wind direction

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- Usage of various windbreak such as trees, walls
- Filling seams in doors, windows and openings
- Proper placement of interior spaces such as putting less important spaces such as store as insulation in cold parts
- Considering Iwan or exterior spaces that benefits from sun prevent wind
- Considering proper for windows
- Usage the maximum of direct sun in east and south face
- 20% of south facing assigns to openings
- Less than 10% of facing assign to opening
- 10% of eastern facing assigns to opening
- It is better to avoid opening in western elevation.

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