Islamic Art

Comparative Principles of Sustainable Architecture of Indigenous Residential Buildings in Arid Climates of Iran

Abstract

The architecture and construction of housing has long been one of the most significant human concerns and at the same time, it has been unswervingly associated with climatic conditions. Studying this architectural model along with its quantitative and qualitative features play a vital role in promoting sustainable architecture. Irreparable damages to the environment have been caused as the result of global warming and city pollution; therefore, it is necessary to pay attention to the use of fossil energy resources and the limitation of fossil fuel resources by emphasizing the principles of sustainable architecture and indigenous buildings and its use in solving this crisis. The present research is accomplished by a descriptive and analytical method in two parts based on a qualitative system and a descriptive method. The study and analysis of selected samples of arid climates is completed based on three criteria of physical fit, spatial organization and criteria related to environmental conditions. Findings indicate that indigenous architecture in hot and dry climates is closely related to climatic conditions and by designing and adopting the most appropriate strategies, sustainable architecture can be achieved in these areas.

Research aims:

1.Detecting the degree of adaptation of indigenous architecture in the climate of arid regions.

2. Developing appropriate instructions based on the indigenous architectural features of cold, hot and dry areas.

Research questions:

1. What is the impact of the architecture of arid areas on the receiving environment?

2. What are the similarities and contrasts between hot and dry climates and cold and dry climates?

Keywords: arid climates, sustainable architecture, indigenous buildings.

Introduction

The need for housing as a shelter is one of the most basic human needs. One of the factors affecting the appearance of the Iranian city is the traditional residential architecture of Iran, which has valuable components and varies in various parts of the country depending on the environment and is formed based on the natural and climatic identity of each region. The purpose of climate design is to maintain or minimize the cost of maintaining optimal conditions and comfort indoors. The present study, focusing on the nature of sustainability in Iranian indigenous architecture in arid regions and also emphasizing the essential role of home spaces in this architecture, intends to investigate the key role of home spaces in creating sustainable indigenous architecture. Therefore, comparative studies of this region will be performed. In order to achieve this goal, according to the coupon climatic zoning method, the climatic zone of the arid region, which includes regions B and D, is determined. The commonality of these houses is obtained from a comparative comparison of samples of these areas.

Regarding the background of the present study, it should be said that no independent work with this title has been written so far. However, studies have examined the issue of climate and architecture. Mahmoud Tavassoli (2012), in his book Urban Construction and Architecture in the Hot and Dry Climate of Iran, examines the effect of historical factors on the one hand and climatic factors on the other hand on the spatial structure of cities and rural complexes as well as architecture of hot and dry areas; in this book, dealing with a number of urban and rural issues is addressed. Masoud Rezaei and Behzad Vasegh (2014), in their book "Analysis of Sustainable Architecture in Indigenous Rural Housing in the Cold and Mountainous Climate of Iran" scrutinize the mountainous architecture of the Zagros region in the three provinces of Ilam, Kermanshah and Kurdistan with a structure that has similarities and differences compared to the architecture of the central and desert regions of Iran. Parisa Ahadi (2014) in her dissertation entitled "Climatic Architecture of the Yard in Indigenous Residential Buildings in the Cold Region of Iran" studied the architectural-climatic patterns of the courtyard in indigenous residential buildings in the cold region of Iran. Shabnam Akbari Namdar (2011) in her dissertation entitled "Recognition of Sustainable Principles in the Architecture of Traditional Iranian Homes in order to Formulate the Basics of Designing a Desirable Contemporary Housing "Tabriz Case Study" has considered a range of macro to practical goals. Javad Abdolhosseini (2011), in an article on "Adapting the Design of Residential Houses in Tabriz and Baku to the Indigenous Culture and Climate" has studied the changes and fluctuations in the structure of residential buildings in the city influenced by indigenous culture and climate in the selected study area. Yousef Gorji Mahlabani, Ali Yaran, Samira Parvardinejad (2011) in their article "Evaluation of Climate Compatible Architecture in Kashan Homes" seek to study how architecture and climate are adapted in Kashan and how to attend to weather conditions in creating houses in Kashan; the purpose of this study was to investigate how the climate is used in the architecture of Kashan to create the desired comfort and reduce energy consumption and use as much as possible the parameters and weather conditions.

This research is fundamental and applied. Research on the foundations of the theory of sustainable architecture, indigenous architecture and climatic divisions of the arid region of Iran is fundamental. The part of the research that uses the results of basic research to provide solutions, suggestions and physical models of the dry climate environment is of the applied methodology hence the research method will be qualitative. The method of data collection is based on field studies, study of similar researches, scientific research articles, books in the field of sustainability, doctoral dissertations and peer-reviewed articles, and moreover, the study of buildings, drawing plans and drawing maps and related case studies. Since the subject of this research is discussed in the field of sustainable architecture, the description and inference of each category needs to be interpreted and analyzed.

Conclusion

The results showed that these two have similarities and differences between climates. 1) In terms of physical characteristics, it seems that in cold climates, the courtyard form is square with an average length-to-width ratio of 1.11, but in warm climates the courtyard form is rectangular with an average of 1.31. In cold climates, building masses are formed on 3 sides of the yard, but in hot climates, they are formed on 4 sides. 2) The direction of the yard was different in cold climates in the houses and seemed to be a function of the texture of the region, but in the warm north-south climate and this may be a function of climatic conditions in the middle of the climate. 3) The average ratio of open space to closed space in cold climate is 37% and in warm climate is 29%, which reveals the need to allocate more open spaces in cold and dry climate than hot and dry climate. 4) Also, in terms of physical and spatial characteristics, it can be said that both climates are similar; Thus, the highest area of the facade and opening belongs to the southern facade and the lowest level and opening belongs to the western facade. 5) The highest level of space belongs to the yard and then to residential and then to service and communication spaces. The only difference is that in cold climate design, more space is allocated to outdoor space and in hot climate to service space than the compared climate. 6) The inputs of both inter-climates are formed in such a way that the connection from outside to inside is formed through the intermediate space; Nonetheless the location of the entrance is different in the two climates. In such a way that in cold climate, the entrance is different from house to house, while in hot climate, the entrance is installed in the northern part in most of the samples. This can be a function of the form of the yard, because in cold climates, which are square-shaped and do not have a special orientation, the location of the entrances is different, but in warm climates, where the yard is stretched in a north-south direction, the entrance is located on the north front. Is. 7) In the analysis of cold and dry climate houses, it was found that the number of spaces such as 5-door and royal rooms are located on the north and south fronts, but 3-door, 2-door and 1-door rooms are located more on the north, east and west fronts and fewer on the southern front. It can also be seen in these samples that the majority of the halls are not only located on the north or south front, but are scattered on different fronts of the houses, which indicates the difference in lighting in both hot and cold climates; As observed, in cold climates, none of the fronts has priority over each other in lighting. This is due to the fact that in the houses studied in hot climates, the halls are mostly located in the northern and southern parts of the house, which confirms the need for lighting on the north and south fronts for important residential spaces of warm climate houses. Another significant point is that in most examples of cold and dry climates, the royal atmosphere is not observed, which may be due to the different type of use of these houses, which has not had a ceremonial aspect in the past. However, in the analysis of warm climate houses, it was found that the highest number of residential rooms, unlike the cold climate, is allocated to 3-door and 5-door rooms, and there are fewer one-door and two-room rooms. In hot climates, unlike cold climates, the halls are located on the southern and northern fronts, and the royal halls are located on the southern fronts. But in the cold climate, the halls were often located on all fronts, and the emperor was mostly located in the northern part of the house. 8) In terms of environmental conditions, both climates are very similar to each other, so that the average ratio of shade to yard area in the surveyed houses in warm climates in July, October and January are 37, 57 and 85%, respectively, and for cold climates, respectively. It is equal to 30, 51 and 85%. The proportions of the shadows in both cold, hot and dry climates are higher on the first of January than in October and more than in July. The average amount of shading on the south wall in hot climates is about 90% and in cold climates is about 95%. In both climates, the south wall of the courtyard is always shaded. The northern wall is about 22% in the warm climate before noon and about 51% in the afternoon, and in the cold climate it is about 16% and 25%, respectively. The amount of shading of the northern wall in the warm climate is almost twice that of the cold climate. The western wall is about 41% in the warm climate before noon and 100% in the afternoon, and 22% in the cold climate before noon and 100% in the afternoon. The eastern wall is about 75% in the warm climate before noon and about 25% in the afternoon, and 89% in the cold climate before noon and 15% in the afternoon. Therefore, the pattern of shadow in the western wall and the eastern wall in both hot, dry, cold and dry

climates is similar, and the amount of shadow in the western and eastern walls for before noon and afternoon are shifted in both climates. Therefore, it can be said that the patterns of environmental conditions that can be used for cold, hot and dry climates are similar.

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