Nature and design in traditional Persian architecture

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Abstract

Persian architecture has a deep history of designing buildings with respect to nature. This paper will deal with the classification and analysis of various types of traditional buildings in the different climatic zones of Iran. Finally, interesting criteria will be introduced to help with contemporary architecture design. These lessons from the past will not only improve energy conservation but will also result in pleasing architecture in harmony with nature.

1 Introduction

Iran is one of the Asian countries. Its neighbors are Armenia, Azerbaijan, Turkmenistan, the Caspian Sea and Russia in the North; the Oman Sea and the Persian Gulf in the west. Iran has two famous ranges of mountains; the Alborz Mountain Stretches in the north and the Zagros in the west [1].

Climatically, Iran is classified as a dry region with an average rainfall of about 250 mm. The amount of rainfall in some of the northern parts of the country exceeds 1000 mm per year. In most of the central areas, especially in the deserts the figure is less than 50 mm. The north, west and some parts of the southern regions of the country have a moderate climate. In Khoozestan, one of the most famous civilizations, namely Mesopotamia, has emerged. Cities like Shoosh and Babylon with a deep brilliant history were located in this region.

Aryans came to Iran from the north some 10,000 years ago. They resided along the Mountains and formed different dynasties such as the Achaemenids (559-331 BC) the Parthians or Ashkanids (174B.c. – 224 AD) and the Sasanids (224-624 AD) [2].
History reveals that the knowledge of architecture progressed to a good level in the entire country through the ages. Buildings in each region were made with locally available materials and were suited to the climatic condition. This shows that climate plays a significant role in architecture and gives different character to the architectural features in any region.

This paper will try to show the impact of climatic factors as a part of nature and an example of each typical building in each region is shown.

Figure 1: Location of Iran in relation to its neighbors.

2 Various aspects influencing Persian Architecture

There are a number of important aspects influencing traditional Persian Architecture. In most of the residential buildings, the socio-cultural and religious aspects bring about the feeling of privacy and security. In regard to economic aspects, building material was simply affordable through using local material [3]. With respect to climatic aspects, they could achieve not only comfortability but also durability for residential buildings.
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- Arid hot desert climate
- Hot semi-desert climate
- Hot and humid climate
- Caspian moderate climate
- Extra Cold mountainous

Figure 2: Map of Climatic Divisions of Iran [4].

Table 1: Major climatic zones.

<table>
<thead>
<tr>
<th>Z</th>
<th>Type of climate</th>
<th>Temp.</th>
<th>Rani</th>
<th>Hum</th>
<th>Wind</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Arid hot desert climate</td>
<td>18.8-4.5</td>
<td>56.2</td>
<td>32%</td>
<td>NW to SE</td>
</tr>
<tr>
<td>B</td>
<td>Hot semi-desert climate</td>
<td>6.2-28.4</td>
<td>222.1</td>
<td>41.7</td>
<td>NW</td>
</tr>
<tr>
<td>C</td>
<td>Hot and humid climate</td>
<td>10.2-32.8</td>
<td>225.1</td>
<td>71</td>
<td>NE to SW</td>
</tr>
<tr>
<td>D</td>
<td>Caspian moderate climate</td>
<td>6.9-24.3</td>
<td>1277.3</td>
<td>83.5</td>
<td>E to SW</td>
</tr>
<tr>
<td>E</td>
<td>Extra cold mountainous</td>
<td>-1.9-25.1</td>
<td>328.8</td>
<td>54.6</td>
<td>NW</td>
</tr>
</tbody>
</table>
Table 2: Building properties.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Location</th>
<th>In ward</th>
<th>Out ward</th>
<th>Type of plan</th>
<th>Orientation</th>
<th>Connected with ground</th>
<th>No. of stores</th>
<th>O.S</th>
<th>T-S</th>
<th>T-S</th>
<th>Built form</th>
<th>Type of verandah</th>
<th>Outside color</th>
<th>Courtyard</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Yazd</td>
<td>×</td>
<td>π</td>
<td>k</td>
<td>U.G</td>
<td>a</td>
<td>f</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>At.</td>
<td>×</td>
</tr>
<tr>
<td>B</td>
<td>Shiraz</td>
<td>×</td>
<td>g</td>
<td>l</td>
<td>O.G</td>
<td>b</td>
<td>g</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>S-AT</td>
<td>×</td>
</tr>
<tr>
<td>C</td>
<td>Boushehr</td>
<td>×</td>
<td>m</td>
<td>n</td>
<td>O.G</td>
<td>d</td>
<td>i</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>DF</td>
<td>×</td>
</tr>
<tr>
<td>D</td>
<td>Rasht</td>
<td>×</td>
<td>n</td>
<td>O.G</td>
<td>e</td>
<td>j</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>At.</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>×</td>
</tr>
</tbody>
</table>

At: attached
S-AT: semi-attached
DF: defacted
S-DF: semi-defatched
PI: pinch
Va: vast
OS: one sided
TS: two sided
U.G: under ground
OG: on the ground
VG: over ground
SUN: sun-dried brick

Table 3: Building material.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Location</th>
<th>Foundation</th>
<th>Wall and ...</th>
<th>roof</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>stone</td>
<td>wood</td>
<td>earthware</td>
</tr>
<tr>
<td>A</td>
<td>Yazd</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Shiraz</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>C</td>
<td>Boushehr</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>D</td>
<td>Rasht</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>E</td>
<td>Tabriz</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>

A: average  M: max.  m: min.
The architectural characteristics of buildings in the north (Caspian moderate climate) of Iran can be described as follows:

1- Most of The Buildings are outward oriented and are open to the surroundings.
2- They do not have a central courtyard.
3- Their plan is East-West oriented.
4- They are built above the ground level and usually have an open plint (Pilot) for air circulation.
5- All roofs have enough slope to dispose of rain water quickly.
6- Wood is the basic material used [8].

Figure 4: Traditional buildings in the central and east area of Iran (City of Yazd).

The architectural characteristics of buildings in the center and east areas of Iran, with dry and hot climate are as follows:
1- Using four sided wind catcher [9]
2- Using basement and garden to get rid of heat and the sand storms of the desert [10].
3- Using compact built forms and plans.
4- Using brick and clay (sun-dried brick) [11].
Figure 5: Traditional buildings in semi-arid region (City of Shiraz).

Some of the architectural features of the region are:
1. Courtyard housing. [12]
2. One story buildings with basements.
3. South-west and south-east oriented buildings.
4. Hierarchy of spaces for connection to the outside (street).
5. Semi-open plans.
6. Brick is the most common building material used [13].
Some of the architectural features of the region are:
1- The built form is oriented inward as well as outward.
2- Two-sided visual relation with outside spaces.
3- Aiwan (Verandah) and opening toward the outside connecting to courtyard for air circulation.
4- Two to three stories for better air circulation [14].
5- No basement.
6- Using coral stone for walls and timbers for roofs.

Figure 6: Traditional buildings in the south semi-arid region (City of Buoshehr).
3 Conclusion

The study of architectural design of various traditional buildings in different climatic zones of Iran shows that the impact of climatic aspects has been given more significant identity to the buildings of each zone than to other aspects such as social, cultural, economical etc. On this basis one can say that nature has played a very important role in forming Persian Architecture. What one would see in the north of Iran is entirely different from those in the desert and semi-desert parts (in the center as well in the east).

The form of roofs, connection of buildings to the ground, the site plan and layout, numbers of openings, building materials and color of the buildings along the Caspian Sea are different from those of Yazd, Kerman and Kashan near the desert and that of along the Persian Gulf regarding climatic diversities.

Although the central courtyard and inward plan with several openings around it is mostly rooted from social and religious aspects, because of the climatic effect of the north of Iran (along the Caspian Sea) they do not have any central courtyard in their residential buildings. In spite of the availability of good quality stones nearby the zones, they have preferred to use sun-dried bricks instead of stone to avoid heat penetration inside their living spaces.
This study, by revealing the architectural features of various zones of Iran influenced by climatic aspects, points out interesting design criteria that can be helpful to achieve more economical design in our contemporary architecture. This would also help to achieve a better design in harmony with the nature of each zone and also conserve energy through criteria derived from vernacular architecture ‘badgir’ or wind catcher is a good example in this regard.

References


[6] ibid pp. 334-400


[12] ibid, Memariyan, G. H. pp. 72-73

