

Environmental sustainable Iranian traditional architecture in hot-humid regions

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ABSTRACT

This paper concentrates on the results of sustainability caused by climatic elements in Iranian traditional architecture in Hot-Humid regions. In a vast country such as Iran, with different climatic zone, traditional builders have presented a series of logical solutions for human comfort.

The aim of this research is to demonstrate traditional architecture in Mild-Humid climate of Iran as a sample of sustainable architecture.

Sustainability in architecture means conserving constructions for the future, in terms of physical durability planet protect conserving on energy resources. In this case, it seems that sustainability would be based on the introduction productive models in which available materials and resources are used more efficiently, rather than being ignored. Nowadays, the knowledge of building ecology focuses on its capacity to integrate environmental and climatic parameters into design and thus enhances space qualities such as comfortability.

Traditional architecture of Iran is perceived sustainable for having sustainable features. It is able to response to environmental problems from a long period. Its features are based on climatic factors as well as local construction materials of Hot-Humid regions.

This research uses library documents and Internet sites as well as analyzing building plans. At first, it describes meaning of sustainable development, sustainable architecture and its principles. The principles of sustainable architecture will be explained according to characteristics of traditional architecture in Hot-Humid regions. Then, it is necessary to investigate

building's elements such as roof, wall, window and wind catcher, building materials and colors are also considered important interrelation to sustainability.

This paper concludes that according to some factors, it is possible to address Iranian traditional architecture sustainable.

1. SUSTAINABLE ARCHITECTURE

Sustainable development is to be seen practical solutions given against traditional patterns of social and economic development that prevents annihilation of natural resources destroy of ecosystems, increase of pollution, irregular increase of population and decrease quality of human life.

Another definition of sustainable development is "sustainable development is a kind of development that is able to protect human health and improve ecological orders for along period".

Sustainable development has a comprehensive sense and is related to all aspects of human life. In practically, using sustainable development models needs basic changes in international politics. "The Green approach to architecture is not a new approach. It has existed since people first selected a south – facing cave rather than one facing north to achieve comfort in a temperate climate. What is new the realization that a green approach to the design of buildings, by their materials, fuels or the contribution of the users, need to be considered if a sustainable architecture is to be produced. Many building embody at least one of the various identifiable green characteristics. Few as yet embrace the holistic approach.

Rather than suggesting ideal of imaginary so-

lutions to the problems of green architecture, a series of building will be examined which all embody some green characteristics, considered in relation to a set of green principle. However, the green principles purposed are not intended as a set recipe that must be followed, but are put forward as a reminder of the issues that many designers ignore. Nevertheless, the headings that follow for a green architecture to emerge.

Principle 1: Principle 2: Working with climate: Buildings should be designed to work with climate and natural energy sources.

Principle 3: Minimizing new resources: A building should be designed so as to minimize the use of new resources and at the end of its useful life, to form the resources for other architecture.

Principle 4: Respect for users: green architecture recognizes the importance of all the people involved with it.

Principle 5: Respect for site: A building will "touch – this – earth – lightly"

Principle 6: Holism: All the green principles need to be embodied in a holistic approach to the built environment" .

2. THE EFFECT OF ENVIRONMENTAL FACTORS ON IRANIAN VERNACULAR ARCHITECTURE&URBAN PLANNING IN HOT-HUMID REGIONS

2.1 Warm - humid climates in Iran:

This region lies along a narrow and relatively lengthy littoral strip of the Persian Gulf coast the length of which exceeds more than two thousand (2000) kilometers. In terms of climate, the different zones of this strip are considered as those with hot and humid climates. They have rather long summers and winters with short days. In fact, there is normally rather cold weather only during two months, Jan. and Feb. (as under the rubrics of train months): in this area, there are very high levels of evaporation and air humidity because of its approximate to the sea and vertical solar radiation in both spring and summer on the one hand and because of the existence of typical soil of this area which is physically calcareous and because of very hot weather, the grass and plant covering is very meager on the other hand. Too much humidity of air across the sea coast and much. Heat of air

in hot seasons create a sweltering weather that develops a very troublesome living condition. In general, this region has the following climatic conditions

1. Scanty level of annual Rainfall with the most rainfall occurring during autumn (fall) and particularly winter.
2. Overwhelmingly high humidity in air in all seasons of year.
3. It has a, very hot and humid weather in summer and moderate one in winter.
4. Low level of difference in temperature both day and night.
5. Salty or briny ground water in most areas.
6. Scanty level of grass and plant covering.

2.2 The effect of warm- humid climate on Iranian Vernacular architecture and urban planning

Urban texture has taken a semi- consolidated form and is bound to south and south east, urban spaces are half-Circled, cities develop towards the coast line and have seaward directions. The more the cities are away from the sea coast, the more the space are closed and encircled. A semi- consolidated urban texture allows the air current flow easily across the city surface and gets much benefit from the shadows cast by neighboring buildings in urban space and possibly from the available plant interspersed across the said space to reduce the surrounding high temperature. According to what was said we can conclude that the creation of shadow and use of air current are construed through extremely important contribution to an improved urban texture and structural form for a more comfortable living.

The urban texture is dense and the lanes and alleys will have narrow widths such that they would be around 1-1/5 Meters wide. The proportion of wells height to the width of a lane or alley is about 10/1 So that they may create shadow in hot seasons and acts to decrease the surrounding temperature.

Other important characteristics owned by littoral cities located in southern parts of Iran are the existence of long flood channels that are worthy here. Since the soil in this territory is of calcareous type and the earth is unwrapped of glass covering, rain water does not penetrate into the earth and so even the little rain that falls

brings about a flood. For that reason, it is very imperative to construct and dig up long channels to conduct away the rain water in such cities. These flood channels are, however, dry almost all days of year except a few days.

2.3 The influence of hot-humid climate on the Iranian vernacular architectural elements.

2.3.1 Central courtyard

In this area, nearly all building is semi-introverted and rooms look upon the surrounding central yard. The difference between the central yard in this climate and that in hot and dry climate is that there is no entirely closed. Connection between internal spaces of building and those of external. Windows are made high and long with broad verandas looking on the lanes spaces or with squares in second floors and especially in third floors. They all account for bilateral ventilation in heat if one leaves the windows looking on the yard and those on the lanes, he will make it possible for the natural bilateral air current to flow freely. This will slump down the intensely high temperature in interior spaces. Another difference is that in hot and humid regions, the central courtyard is designed as more compact and of less size. One reason for it is facilitated way of trees irrigation and permanent predominance of shadow in hot season.

In houses where rich people live there are two central courtyard yards. One is private quarters where private members of family such as wives, daughters and kinsfolk people live and the other is an external one where a private people commute. In larger house, there is another courtyard which is called service and facilities room.

This is simpler and smaller in size than private quarters and special to the living of servants and breeding the chicken, and domestic animals.

2.3.2 Roof

In this region the construction of arched roofs not commonly used and conversely most buildings have flat roofs. In hot seasons, when right comes people are used to sleeping on roofs because of the cool of weather. The shelters on and around the roofs are often made in the form of a grid so that the occupiers would be kept safe from the looking of outsiders and at the same time a use may be made of air current on

roof.

Flat clay plastered arch is used to cover the roof. To important it, first lengthy wood beams are laid on to the opposite wall within 30 centimeters away from each other and then mats are paid on these beams and finally the surface on these beams and finally the surface of roof is covered with one layer of clay plaster. In most cases *Chandel*, an Indian wood or lumber, is used as hat for roof. This lumber is smooth, long and is kept safe against pests such as termite as well as humidity. One disadvantage of such roofs is that there is no rigid link between beams and walls and are, thus, affected by earthquake.

2.3.3 Materials

In hot and humid regions some materials have been used (are used) that each has a lower thermal mass and has the capability to store and keep as reserved the volume of heat neither. For this reason, wood, as an example, is considered to serve as a good material. However, since in these regions, there is little grass covering, wood was merely used for roof framing and windows or doors woodworking. And in making other parts of building uses are made of native and local materials existing in any region there such adobe, baked brick, brick and alluvial rocks, marine coral stone and reed. As these kinds of stones (rocks) are porous and they can be used as good thermal and acoustic insulators.

2.3.4 Color

Colors painted on walls and roofs of a building in a hot and humid climate where the sun radiates in a rather intense ray will play the best part in absorbing sun's rays and radiation. A typical color also plays a very important and controlling part in controlling the solar radiation on walls and particularly on roof with its maximum potentiality in absorbing solar energy depending on different orientations of a building. The temperature difference between a white-colored roof and a black-colored one is 40 K. Of course, the amount of heat the internal space of a building takes in depends largely on thermo physical features of layers. At any rate, however, a typical color plays a very important part in this regard.

Light colors painted on external surfaces of a building also plays an effective role to decrease

the daily level of temperature caused by reflected sun's radiations, increase the thermal stability, capacity and finally provide the community with comfort at night. It, however, *Gatch* plastering (white plastering) is not repeated time after time, it is natural that the building should take in and absorb solar energy the most due to its exterior surfaces.

2.3.5 Ornaments

As the coastline (seaside) cities on Persian Gulf are located in hot and humid climate, there are business and commercial relationships between such cities and those lying in Arab nations and India. This, in turn brought as the same formal ornaments such as arches and semi-circular arches on the openers of building as popular in architectures of those countries.

2.3.6 Spaces

In cities and towns lying along Persian Gulf coastline with their hot and humid climates, spaces are organized around central courtyards and within the limits of at least two stories of building. No basement has been designed for houses in this region for their proximity to the sea, higher levels of ground water and immense humidity of air. Ground floors, were used as facility spaces such as kitchen, foodstuff room and probably rooms to store provisions. First and second floors feature living spaces such as living room, bedroom, drawing room and etc. Developing living spaces in upper stories was to both create much better air current to cool the internal spaces and augment privacy by installing top window in upper stories.

Rooms rise to 4 meters and sometimes more. The reason for it is that convection ascends writhing internal spaces to decrease eventually the air temperature at lower height. Furthermore, air in the room is ventilated by windows on both sides of room.

Ivan is one important space in houses in a hot and humid region. Broad and high verandas (*Ivan*) around central court yard are used as living spaced during half period of year. The reason is that it has both air current with good ventilation and good shadow. The existing problems of health hazards.

2.3.7 Wind catcher (*Badgir*)

Wind catchers are other elements due to the hot

climate which were used to ventilate the buildings. Wind-catchers are structures built onto the roofs of buildings with open units at their head facing in the direction of the cooler prevailing winds. Air caught in the vent is channeled down through a shaft in the building into the rooms below which are cooled and ventilation.

2.3.8 Water disposal- sewer system

These settlement lack of organized sewer system as a result of which the settlement are poor and unsatisfactory from the public health point of view.

3. THE EFFECT OF WATER ON IRANIAN

The effect of water on Iranian vernacular architecture and urban planning of hot -humid climates:

Because of the location of the Persian Gulf the water in the form ocean plays an important role in the emergence of settlements in the area. The impact of water over these settlements can be brought out as under.

1. Water forms a major element of landscape in this area and emergence out as an outstanding characteristic.
2. Water forms an independent mode of transportations and activities thereby the city circulations best concentrated towards the water from inner cities. Thus the shape of the settlement gets decided by the basic presence of water as a focal point. Hence the growth is generally parallel to the water line.
3. Large number of jaalies, balconies, and jetties stand as unique features along water edge which give a distinct to the city appearance.
4. In order to get a better view and the cooler breeze of the water, most of buildings unites of the settlements are generally two storied in high.
5. Coral stone which is the product of the sea has been used extensively in the construction of the buildings and structures giving a unique character to the settlements.

4. CONCLUSION

Iranian vernacular version of architecture and urban planning in hot and humid climate is a representation of logical planning version for

providing all living comforts there.

Use of semi-consolidate urban texture in urban planning, planning narrowly binding or spiral-shaped lanes with high walls to provide shade in hot seasons and in houses with central court yard, the existing typical features such as thick walls in the central court yard, broad verandas (*Ivan*) with high canopies, wind catchers (*Badgir*) to remove humidity and provide cooling in internal spaces, planning upper windows to increase a passing ventilation and use of locally-made materials such coral slates and stones, sedimentary rocks, bake bricks, mud plastering, wood, lumber, reed, adobe and etc... indicates how the architects who planned such buildings good understood the environmental conditions. Seasonal use of spaces, focusing on how to plan the central court yard and appropriate use of roofs at night, though appears so simple, are efficient solutions to planning in hot and humid climate.

Furthermore, Iranian traditional building, architectural or structural aspects, have all taken shape based on natural sources of energies. These building have been designed in such a fashion to take in maximum sunlight in winter and maximum shade in summer, for better natural ventilation and good comfort.

The idea to provide central courtyard within these buildings has been formed based on climate factors. It is, therefore, necessary to study traditional and conventional version of architecture in these regions in order to conduct any climatic planning and create sustainable architecture in hot and humid climate.

In conclusion let us say that the Iranian traditional architecture in a hot and humid climate is considered a sustainable version of it and can be, thus, used as a good model for designing in Contemporary architecture.

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