Journal of Applied Science and Agriculture, 9(2) February 2014, Pages: 605-610

AENSI Journals

Journal of Applied Science and Agriculture

ISSN 1816-9112

Journal home page: www.aensiweb.com/jasa/index.html

Iranian Vernacular Houses as Sustainable Spaces Case Study: TIZNO House in Hot and Semi Humid Climate -DEZFUL-IRAN

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ARTICLE INFO

Article history:
Received 17 November 2013
Received in revised form 19 February 2014
Accepted 26 February 2014
Available online 20 March 2014

Keywords:
Climatic Design,
Sustainable Architecture,
SHAWADAN, DEZFUL, IRAN

ABSTRACT

Iranian traditional architects had many innovations with the aim to adapt with the nature and climate of every region like Hot-dry, cold and humid climates. Wind catcher, water reservoir and ice-houses are the samples of these geniuses. Many of these sustainable designs would provide stable conditions for human comfort in simple ways and the great heritages of Iranian architecture are still not known. The aim is to investigate the sustainability in the living spaces like entrance, yard, stairs, the room and SHAWADAN. SHAWADAN is one of the underground special spaces in DEZFUL of Iran with hot and semi humid weather. The methodology is descriptive – analytical and collection of information is from library research and author's observation from the TIZNO house. The concept of sustainable architecture and set it as the act of creating humanitarian space between human and physical environment as well as the production process is always mixed with a stable environment. This heritage that is remained for us, should be identified, transmitted and reused.

To Cite This Article: Naser Jahangir and Negar Isa Kakroodi., Iranian Vernacular Houses as Sustainable Spaces Case Study: TIZNO House in Hot and Semi Humid Climate -DEZFUL-IRAN ***J. Appl. Sci. & Agric.,*** *9(2): 605-610, 2014*

INTRODUCTION

Many ways, tools and concepts have been developed to determine performance indicators and criteria for healthy and comfortable buildings, focusing in general on the prevention of health and comfort problems. Perhaps the most important observation in these ways, tools and concepts is the fact that because dose-response relations in general are incomplete, most indicators do not seem to be useful (Bluyssen, P.M., 2010). One of the human's characteristic is overcoming the surrounding hardships. Iranian architects as creative persons could change the hardships to suitable potentialities with using the scientific and experimental sources. There are various ways for adjusting the environmental conditions like high humid and hot weather in cities, SHAWADAN as a cool and enjoyable space is one of them.

Sustainable architecture is a revision of the principles and approaches of modern architecture based on a system of environmental ethics that was propounded in the second half of the twentieth century in order to respond to the many problems come from the wrong decisions of the environment. The concept of sustainable architecture and set it as the act of creating humanitarian space between human and physical environment as well as the production process is always mixed with a stable environment. In other words Sustainable architecture is a general framework that can be interpreted to mean the man-made environment stable.Climatic design is a technique for multilateral decreasing the cost of energy in building (Watson, D., 1983). designing based on nature current of energy have many benefits for buildings. This method decrease the necessity or mechanical heating and cooling at least and use the natural energies around the building. Because of uneven surface of mountain next to flat surface of KHUZESTAN plain, There are special climatic conditions in the Southwest of ZAGROS mountain of Iran, The humidity of Persian Gulf reaches to this region very easy, but for much distance (about 250 km), the humidity are decreased in DEZFUL. The relative humidity in 6.30 A.M is 59% (Ghobadian, V., 2006).

We can find the examples as sustainable architecture between Iranian architects that this shows their creativity and ingenuity. The following examples prove their creativity:

- Wind catcher, specially for hot-dry climate (for vertical ventilation of inside spaces of buildings)
- Water reservoir in many regions of Iran (for having the cool water in the summer)
- Ice-house in the depth of ground (for keeping ice to use in the summer)

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Data And Material:

The methodology was descriptive - analytical and preparation of information and documents had been performed with documentary and field Methods. In documentary part necessary information has been collected through books, maps, and internet base and field studies, photographs and videos has been performed in field of paper subject by the author. Sustainability of the spaces has been investigated in the various parts of house in the table. In the end several ways been suggested for designing the sustainable spaces with climatic benefits in IRAN.

Climatic Design And Sustainability:

In most of religions , light is symbol of divine sense and source of all purities and goodness and deliverance of human from ignorance and spread of insight in his/her existence is always ultimate purpose. Thought of light nobility like material appear three times during evolution world view in Iran. Two times in religious form

Sustainable building has the least inconsistence and incompatibility with the surrounding natural environment and Regional Features**.**Sustainable Construction is the healthy and clean environment managing by effective utilization from natural resources and ecological principles that Reduces environmental damage on energy and natural resources, pollution and increases comply with environmental and natural resource utilization and energy**.** Traditional architecture of Iran was regarded as the kind of architecture with identity before the advent of technology and has new materials and Technical methods for construction in all parts of the country. This type of construction was based on indigenous principles and sublime concepts. It was timely and extremely valuable and sometimes very glorious architecture**.**

Despite the diversity and complexity of the structures, principles and concepts of patterns it still has the same value and credibility as a noble architecture for human. According to these definitions Shawadan space had been designed to accommodate the climate with its natural substrate so is sustainable space. It had been formed without any damage and harm to the environment and the rise of cultural and social identity in residents**.** We can begin the Principles, concepts and models of vernacular architecture with return to traditional values and techniques traditional. It can be made during the development of a creative activity, and to advance in modern methods.

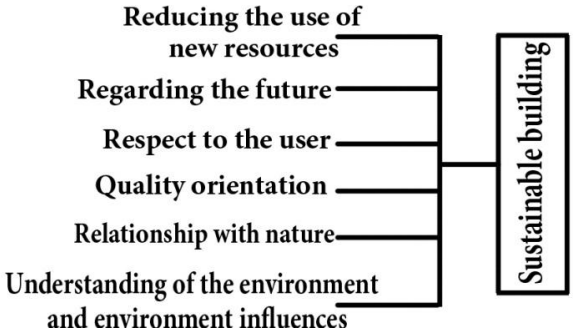

Fig. 1: The Features of Sustainable building

The Case Study:

Dezful is located in the province of Khuzestan, in south-west of Iran in +32º, 25´ latitude and+48º, 25´ eastward longitude according to Greenwich meant (Safaee, M., 2000). Tizno historic house located in the Ghal-e District and it have been made with the mix of architectural styles in all of the old houses of Dezful. The house has eight entrances, central patio, the porch room, passageway, the nave and Shwadan space. This house, like many traditional houses in Iran is introverted and has a central patio on the ground floor and the first floor has two side porches. The building was constructed in two floors and the ground floor is separated by the 4 stairs from the yard. The architectural style of the house is Esfahani and from rich identity of Dezful.

After passing the entrance there is a large and beautiful roofed space called the "vestibule". It acted as a room divider, so in the left there is the reception of guests and in the right is Private space. The underground connections of neighboring Shawadans and the access to the river side for coping with the danger of enemies and keeping the heat away in the hot summer time caused the formation of underground gathering in the old Dezful period. Most of the many factors influence on depth, size and dimension of Shawadan like:

- Wide of house
- Quality of ground and reach to strong layers of ground
- Financial ability of family
- Connections and family adjacency

The temperature inside the Shawadan is 25 degrees whereas in the surrounding streets is 54 degrees. Shawadans have various sizes, depth and coolness, deeper and more voluminous have lower temperature and

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they are cooler (Bina, M., 2008). Many of Shawadans have underground roads to each other, thus will be formed neighborhood connection in the depth of ground. These twisting labirent structures connect many old buildings of the city together through underground tunnels in the end, through Shawadans neighboring buildings it is connected to Dezz river bed (Saremi, A., 1997).

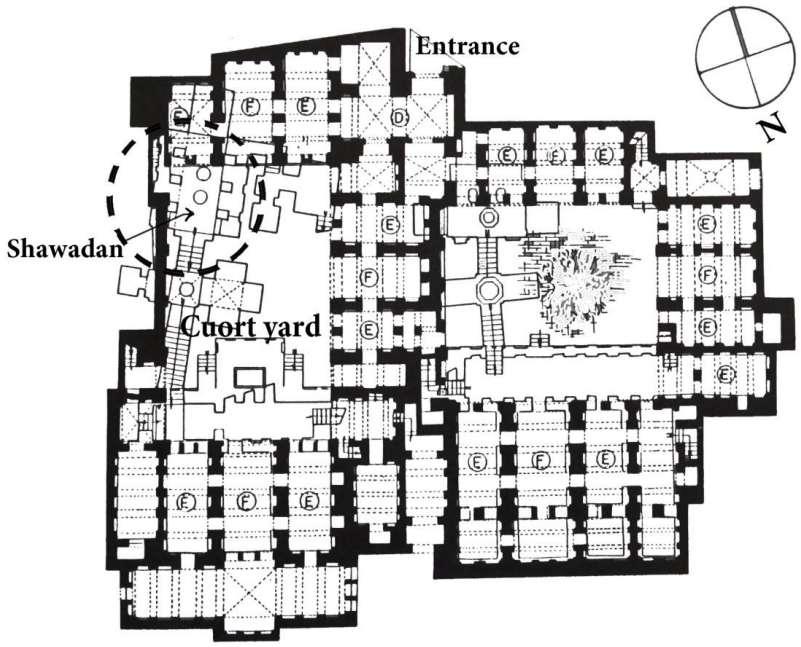

Fig. 2: The Ground floor plan of TIZNO house in Dezful

Conglomerated soils and conditions of position of Shawadan in the depth of earth helped them remain until now. This sample of sustainable architecture has been forgotten in the modern time of technology and air conditioning system. Today all the houses in the city are equipped with electrical cooling and heating systems with high consumption too (Safaee, M., 2000).

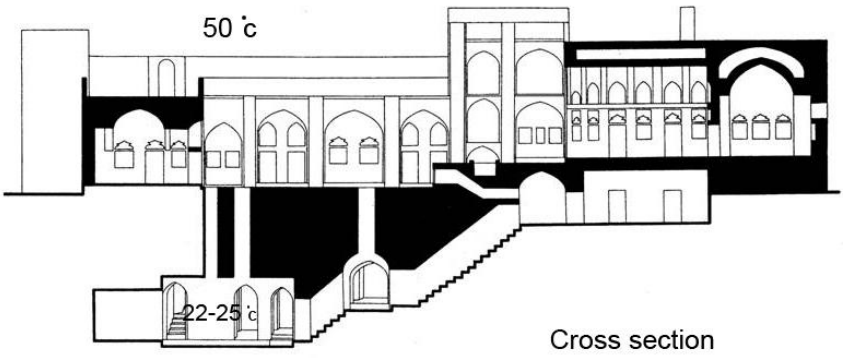

Fig. 3: Typical of Shawadan

Parts Of Shawadan:

Entrance: Shawadan has a wide entrance (1.2 – 1.8 m). it's in the side of yard and doesn't have any door. A short wall was constructed around the entrance.

TAAL: Taals are the low-wide horizontal canals that provide underground connections between Shawadans. These tunnels circulate the weather and provide the accesses. In some cases, these Taals establish the connection between a few neighboring Shawadans. These Taals lead to river side through the nearest Shawadans (Bina, M., 2008).

DERIZE (Vertical passage of air): Derize is a vertical canal with dimension of 1m for providing the light and vertical ventilation of Shawadan. These canals join the home spaces to Shawadan and move the cool and pleasant weather to inside the home, also there were Derizes in the yard for providing the soil in the construction time. Designing ventilation systems for buildings requires a suitable tool to assess the system performance. This

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investigation assessed seven types of models (analytical, empirical, small-scale experimental, full-scale experimental, multizone network, zonal, and CFD) for predicting ventilation performance in buildings, which can be different in details according to the model type (Chen, Q., *et al*., 2010).

For ventilating the spaces under the ground, these air ducts were formed based on physical principles of fluids to conduct the pleasant air from Shawadan to inside the main building (Sadughi, A., 2006).

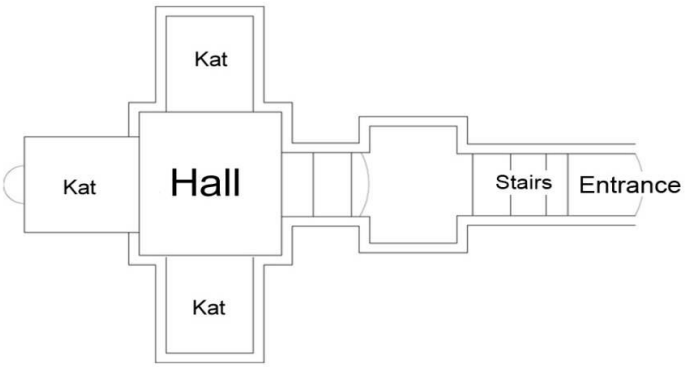

Fig. 4: Plan of Shavadan

SAHN: The main part of Shawadan is a Hall that has square plan, sometimes it was build in the form of polygon plan. Hall is a space for living main activities and other spaces are connected with it. There is possibility of excavation the ground without constructing the arch, Therefore construction the ducts and halls were very easy. In some of Halls there are social connections between neighbors.

KAT: There are some small rooms attached to the main hall (SAHN) which are called "KATs". These are considered more private parts in Shawadan. Each Shawadan consists of more "KATS" depending on its largeness. "KATs" in some cases are elevated from the main hall, about 30-40 centimeters (Safaee, M., 2000).

Results:

Climatic characteristics of this area are as follows:

- Annual rainfall levels are very low and most of the rainfall is in autumn and especially in winter.
- The humidity is very high in all seasons.
- The weather is very hot and humid in the summer and mild in winter.
- Temperature difference between night and day is low.
- Groundwater is salty in the most areas.
- The vegetation is very low.
- Spring and summer sunshine is vertical.
- The rate of evaporation is very high in the region.

Sustainable architecture is a revision of the principles and approaches of modern architecture based on a system of environmental ethics that was propounded in the second half of the twentieth century in order to respond to the many problems come from the wrong decisions of the environment.so The concept of sustainable architecture and set it as the act of creating humanitarian space between human and physical environment as well as the production process is always mixed with a stable environment. In other words Sustainable architecture is a general framework that can be interpreted to mean the man-made environment stable.

Conclutions:

Ground as a best thermal source for human had an important role between Iranian Architects and, we can use lower energy with creating the main spaces of life in the ground. One important point in analyzing the Shawadan space is type of land in the region and its ability to store the energy. Stability of soil as a thermal insulator will be more with increasing in thickness. Stability against heat and cold is one feature of muddy buildings. Mud walls of Shawadan have good performance to balance the temperature of inside the building. Hard ground and position of Shawadan are main reasons for its durability. Performance of Shawadan is based on hot-humid climate. Bilateral ventilation in the spaces is necessary for confrontation with heat and much humid of this region. Walls of Shawadan store the coldness of wind and leak it to warm inside spaces in the summer. The Heating and cooling the spaces done with renewable sources as wind, sun and thermal charge In Shawadan and they play important role in thriftiness of energy. Using the terminable sources of energy like electricity has much cost for human. With analyzing and reusing these valuable spaces and reintroducing them to people and tourists that visit this region we can present culture and ability of Iranian traditional architects more than past.

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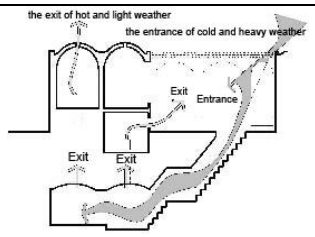
Table1: The Sprit of Time and Light in the Mosque

Analytical spaces	Description of space	Picture of space
Court yard	Despite of the semi- Introverted courtyard Communication with the outside is not completely closed. There are Tall and high windows and large patio facing the street or in the field, especially in the second and third floors of the building.	
Stairs	Stair is an element that connects the building to Shawadan. The stairs connect the entrance to the enclosure, slope of stairs is more than new stairs. Shawadan has 40 stairs and they have various models like Straight, spiral and two-way.	
The room	Rooms are located around a central courtyard and elevations are higher in this region than the other regions of Iran Climate, usually more than 3 meters.The Heat rises in the atmosphere, and the air temperature decreases in a lower part of the room. Despite of ceiling windows on two sides of the room, the warm air is being used as conditioner.	
Shawadan	The most important reasons for building the Shawadan were the suitable ground for excavation and underground waters in the depth. The condition of activities in Shawadans and air circulation such as its harmony with hot and humid climate of the region contributed to form a sustainable architecture.	

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