



## Review of Climatic Strategies in Local Houses through Achieving Sustainable Architecture (Case Study: Yazd Historical Texture)

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**Abstract.** Considering the area climate in a way that the optimum condition is provided in the building by the minimum required energy and maximum use of the natural energies is of today life requirements. Today, buildings have essential roles in intensification of environmental crises, therefore review of the sustainable architecture is not only a choice, but also it is an undeniable necessity. Summer heat, winter cold, lack of comfortable access to fossil energy sources and the thought predictions by the past architects motivated us to review the climatic strategies of the local houses in order to achieve the sustainable architecture. The climatic strategies of the local houses have been studied by the use of historical-descriptive method and qualitative studies in historical texture of Yazd. Moreover, they have been compared by comparative method by the use of the sustainable architectural principles whose result has been harmony with such principles. Absolutely, copying the past architecture physical attributes hasn't been considered, but understating the building sustainability in its time and location is considered along understating of today efficient values.

**Keywords:** Climate, climatic strategies, local houses, sustainable architecture, principles of sustainability

### 1. INTRODUCTION

Significance of climate effect on architecture calls studies implementation and comprehensive researches in this matter, especially in our country where variations of the climatic conditions are evident. It is undeniable to implement broad researches in this matter. Human being is the main factor in architecture. Since the climate is related to human's comfort, it is the mutual result of certain factors such as sunlight, temperature and humidity, wind and rainfall (Kasmaei, 16, 2009).

Technology and science development in today's world has apparently led to human's welfare and comfort but this development has turned to the reason of occurring new problems including excessive use of fossil fuels for humans being. Application of fossil fuels has caused environmental pollution, widespread water and air changes and some problems for human being. Thus, developed countries have considered the available energies in the nature and specially renewable energies (Ghobadian, 2005, 29). One of the main architectural principles is that features and climatic conditions must be regarded in designing. Observing the climatic conditions in architecture brings energy saving.

On the other hand, the sustainable architecture describes architectural design which is aware of the environment. Buildings have significant role in intensification of the environmental crises; therefore it is undeniable to consider the sustainable architecture in today's societies not only as a choice, but also as a necessity. Several decades have passed of the time when the sustainable architecture has been raised and abundance of strategies has been submitted by it in order to solve the contemporary crises. But there are still certain problems on the way of the sustainable architecture. It seems that it is possible to complete it by removing obstacles through considering values and features of the local architecture. That's why by considering the local architecture

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works, these constructions in their own time and location used to adapt the objectives of the sustainable strategies.

Today, necessity of considering the climatic conditions in building designing and constructing (specifically, those that are directly used by human and living creatures) has been significant for two reasons. The buildings which are compatible with the climate (with the buildings with the climatic design) have better quality in terms of human thermal comfort. The environmental conditions of such buildings is better and daily and seasonal variation and changes of light, heat and air flow of these buildings create various and desirable spaces. Another reason is that the creation of harmony between the building and the climatic conditions has led to the required energy saving to control the environmental conditions in such buildings. Accordingly, the settlements located in hot and dry and desert-like areas are real samples which are in compatible with the climatic conditions. The local architecture in these areas has unique features in both residential and non-residential sections. In certain climates, we could adjust interior conditions of the buildings which are compatible with the climate naturally through the year without needing to thermal mechanical systems according to human's welfare.

In order to gain the human welfare, application of climatic principles and criteria have been the most significant factors in the buildings. Therefore, it is necessary to study the relationship between climate and architecture in each region.

Application of the local architecture experiences in this matter is highly helpful (Sharafi et al., 2013:12). Sustainability requires to be seen in the relation with the process (Armaghan and Gorji Mahlabani, 2009:20). The actual research considers lack of attention to the local architecture as one of the main factors in separation of the contemporary architecture from environmental considerations as well as the lost ring in creation of the sustainable architecture and the sustainable development. The today's societies naturally must probe in recognition of their unknown and forgotten values following discovery and use of the past values.

#### **Assumptions and Research Objectives:**

In today's world, the sustainable attitude has been raised as an attitude which suddenly questions all what is known as new achievements by the western human during the past century. These achievements are highly dependent on land sources, so that losing such sources in the near future along with menacing life and possibility of human life. We come from any part of this planet, from any religion and belief along with any cultural support; we have all something in common which form our entire destiny: the Earth (Monshizadeh, 2004:63). Sustainable attitude in the late century was interpreted by appearance of the environmental movements as a concept to submit the environmental politics. In spite of all various interpretations that it faced based on the landscape of each specialty, this new concept had a general purpose which was human ability to survive and maintain his life through a long term. In fact, the sustainability attitude brings a message for today's consumer-oriented human; a human who is hopeful to the power of science and increase of his ability against the existence system and what used to confine him in meeting his needs and the thing which is considerable today is passing three decades of the advent of sustainability issue as the mere solution for the societies' today problems and conditions that have been advertised by the world developed countries by raising certain words such as sustainable development, sustainable economy, sustainable society and so on in broad dimensions. The author of "Small is beautiful" book introduces peace and comforting the field of the sustainability creation and a human is called to reduce necessity, greediness and envy to maintain his planet. What is the thing that the countries which assert having such attitudes push toward unsustainability of other's world? We may be able to look at the work through Gandhi's point of view who says: the Earth is enough blessed which meets each human's need, not his greediness (Monshizadeh, 2004; 64). The aesthetic programs placed in understanding and architectural sense that sent the sustainable dependence to the margins and a wrong imagination which could be

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shown through combined technologies whereas the building façade reminds the sustainability issue and the complex will be reminded unsustainable. They were are examples of certain problems existing on the way of the sustainable architecture (Willis, 2000: 263).

Most today buildings of Iran have been constructed with no attention to the climatic conditions and correct use of the natural energy sources and they are unaware cope of the western architecture. The interior conditions of such buildings are intolerable in most cold and hot seasons of the year and there is no way but using mechanical tools which adjust the interior conditions of the buildings (Ghiabkeloo, 2000; 93). Although modernity had brought technological developments along with valuable scientific findings, its second layer has dark colour (Fort Mier, 2008;56). The development of science and technology in today's world has resulted in the welfare and comfort of human life. The use of fossil fuels has caused environmental pollution, widespread climate changes and some other problems to human being. (Qobadian, 2005: 38). But this development has led to a source of new problems, such as excessive use of fossil fuels for him. Lack of attention by human to the nature and being away from his environmental spaces, from the natural potentials and gifts have created a number of problems. Moreover, the human habitats have been less satisfactory for him and even in most cases, it disturbs his comfort as a man-made construction.

In spite of certain problems such as environmental pollutions, undesirable mental and psychological side-effects from being away from the nature, destruction of fossil energy sources and so on and finally health deprivation and human comfort. Therefore, facing such crises has invited the actual human to search new approaches of having harmony with the climate, green projects and natural forces. The research objective is to adapt the climatic strategies of the local houses with the sustainable architecture in order to prove that if the climatic strategies are observed, it will assist us in achieving the sustainable architecture.

## **2. METHODOLOGY**

The research method is historical-descriptive by qualitative studies. The research population includes local architecture of desert and hot and dry climate of Yazd which is limited to study textures of Yazd historical houses in Gajar and Pahlavi era. Here, five houses including the Semasar's House, the Lariha's House, the Arabha's House, the Mehraban Goudarz's House and the Olumi's House are presented. The research sampling method is targeted and data collection tools are library studies, written sources, documents, maps, objective attitudes and observations. Data analysis method has been content analysis. In order to review the local house climatic strategies to achieve the sustainable architecture in the process of the research, first of all climate of the historic texture of Yazd, climatic strategies of Yazd local houses and then the sustainable architecture along with its principles have been studies. Thus, climatic strategies of the local houses of historical textures in Yazd have been compared while sampling with the sustainable architectural principles by the use of a comparative method.

### **Concepts and Review of Literature:**

#### **Climate of Yazd Historical Texture:**

Yazd is located in geographical latitude of 32° North, near the central desert of Iran and the weather is hot and dry in summer and cold in winters. The maximum temperature in summers is 45°C by 12 % of relative humidity and the minimum temperature in summers is 16°C by 73 % of relative humidity.

Yearly temperature difference is 61°C (maximum 40°C and 12% of relative humidity in summer and minimum average is -6°C in July (11°C, yearly average). Average of relative humidity is 32

percent (maximum average of 73 % in July and minimum average of 12 % in June, July, August and September). The Yazd sky is averagely sunny 3188 hours a year (maximum 185 hours in December and minimum 345 hours in July). The prevailing direction of wind blow is along with some humidity in summer from North-West by 5.6 meters per second speed. In winter, this angle changes toward the South-East and the West by 8.4 meters per second speed. The wind along with the dust mostly blows in spring from the North-East and certain problems are caused (Ayatollahi, 2006:72). The analysis of the statistical information through a day, research and comparison of meteorological vector statistics demonstrate that the difference between outside dry temperatures is 2-4°C. namely, the measured dry temperature of the air outside the house which is 2-4°C more than the claimed temperature by the meteorological station has been studied through the summer.

Such difference could be considered as a result of certain phenomena such as “heat Island” which is increasing in the centre of the populated cities. Annual meteorological statistics of Yazd indicate the Yazd inhabitants experience cold nights through winter months, so that necessity of thinking over proper heating systems will be as significant as necessity of thinking over proper cooling systems (Ayatollahi, 2006:72).

### **Climatic Strategies of Local Houses:**

Adaptation of the life styles with the climatic conditions is regarded as the features of dry and hot areas. The local houses have been designed in a way that they are suitable for all seasons. Rooms around the yard of this building are used based on each certain season. The way of application of these houses are in a way that northern part of the yard facing the sunlight and has more heat is considered as “Winter Area” and it is known as “Sanctuary”. Most routine activities of the house residents are done in this part. In summary, the contrary is implemented and all the southern rooms of the yard which are located in shadow and are cooler are considered as residential part of the family members.

This part is called “Nesar” meaning “shadow catcher” and “cold”. In hot seasons, cellar temperature due to being located in the basement is less than other parts temperature. When the temperature is really high, the house residents go to the cellar in order to use cooler air. In certain houses where canal is passed underneath, there is a direction from the cellar toward the canal for having access to it and sometimes the canal water is entered from one part to a small basin along with being existed from another part. Water basin increases humidity and cold in the space. Sometimed, the yard depth was less than normal in order to have access to the canal water underneath the yard for irrigation of garden. These yards are called Pit Garden (Sharafi et al., 2013:61). The localized experiences of the architecture and engineering throughout Iran plateau have been formed during thousand of years in material and energy poverty. Artistic and smart architects of Iran have succeeded in invention of the outlines and methods in relation with the climatic features, especially in desert areas of Iran that are called today “traditional architectural pattern of Iran” to which all the Iranians and Iran Experts are proud of. Which are these characteristics? First of all, an Iranian architect is humble and introvert. Our local architecture modules are similar to closed cubic boxes which are repeated in small and large sizes and they are arranged next, against or back to each other depending on the situation. This arrangement has a sense. Each box is like a box which maintains its interior material against exterior environment and in the view of any passer-by. The external layers of this main box or back to back are linked to the back of the other houses. In case they are located in the last row or next to the passage, they are fully maintained and impenetrable. This impenetrability is not due to insecurity (although insecurity has been an issue in the cities and it has been intensified today), but it is because of maintenance against climate such as extreme heat and cold as well as sand storm.

Secondly, all rooms are independent and separate box each contrary to the common architecture of 50 years ago, although there was no wooden door among them in order to show the space

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temporarily larger in case of need. These boxes are well maintained comparing to the main box, namely the house. Their arrangement is based on the nature of the year seasons. The main living room is located facing the south and the terrace is placed in front of it. In addition of being a place to gather for people, the terrace is a tool to control sunlight which is translated as “Air Conditioning” in architectural terms. The terrace roof resists against direct sunlight in summers whereas it shines to everywhere in winters when the sunlight is very weak (Azimi Bolourian, 2008:66). Third, windows were built small with the minimum glass layer contrary of today because the glass is not a proper conductor unless it is built double-glazed. This measure was not possible due to the material poverty. A basin was built in the middle of the yard or interior open area that it was responsible for air inteneration by absorbing dust from the desert storms along with washing and irrigation of the gardens. Fourth, in desert cities like Yazd, Kasha, Tabas and Kerman, application of windcatcher guarantees blowing desirable air into the building. The basement basin has its own specific place. Fifth, there was no enough energy to heat all rooms and the rooms separation was helping the energy saving. Leafy fruit and decorative trees were built among the basins and rommswhose branches were the same as an obstacle against direct sunlight into the rooms in summer whereas the direct sunlight was facilitated in winters. On the other hand, by creation of a mini space or miniator space named as Korsi, all family members, specifically children were able to keep the heat in the collest winters by a couple of coals without heating the whole house or room. Compare it with negligence of today’s architects who integrate all spaces of a residential unit. Sixth, outside the house, building narrow streets with tall walls and windcatcher could maintain people’s path against sust storms. Seventh, although using mud, thatch and clay have been symbols of lack of material and energy of Iranian people, the mud is one of the best, most sustainable and renewable building materials (Azimi Bolourian, 2008:68).

In general, the inhabitants of dry and hot regions have considered the following measures to come over the weather problems:

- 1- The buildings have been built in these regions by thatch and mud which has high thermal capacity. In certain areas with sever weather conditions, building houses in the heart of the hills or basemnets, delay time has been reached to the extreme and balanced thermal conditions of land depth have been used accordingly.
- 2- The buildings plans must be dense and compact as much as possible and it has been attempted that the exterior level of the buildings must be low comparing to its volume. This density and compact of the houses plan minimizes the heat exchange through external walls of the buildings in summers or winters. As a result, the heat penetration in summers highly prevented into the building as well as its waste in winters.
- 3- The buildings are usually built in dense and compact textures, therefore it has been attempted to create the most possible shadow on the exterior surfaces. The total mass of building materials have increased and the delay time has been desirable due to the complex density and compact.
- 4- In most areas of these regions, the buildings roofs are built doom like without any structure containing mud and raw thatch due to lack of rainfall and wood. Therefore, in semi-desert areas, most roofs have been constructed mostly by wood and flat due to relative balance of air along with adequate wood.
- 5- In order to reduce the wall heat resulting from the sunlight as mush as possible, the exterinal surfaces were whitewashed.
- 6- In such regions, number and areas of the building windows have been reduced to the least level and the windows have been palced in the upper parts of the walls to preventg the reflected beams from the surrounding land layers.
- 7- In dry and hot regions unlike the humid and temperate areas, it has been attempted to prevent curran and entry of the outside air into the building through windows or open

- areas, especially in hot weathers whereas other measures including windcatcher creation are highly essential to cool naturally the inside air.
- 8- Using interior yards with trees as well as focusing on the life spaces on these yards is the main architectural features in dry and hor areas. The internal yards include trees, basins and planted areas are the most effective factors of creating humidity (which is highly important in dry areas).  
The rooms which are opened to these yards are maintained against wind, storms and sand blowing from the desert areas as well as winter cold winds.
  - 9- The buildings direction in these regions is from the south to the southeast. These directions are considered the most proper ones in order to maximize penetration of the heat from sunlight into the building in the afternoon (Kasmaei, 2003:82).

### **Sustainable Architecture and its Principles:**

Sustainability is widely used today for a global description in which human and natural systems could survive up to a distant future. John Ohrenfield states: I define sustainability as possibility of permanent human boom and other living creatures on this planet. The sustainability is a characteristic which is belonged to the systems. The architecture is the most similar system t the whole world and the architects have been always thinkers of such systems (Fort Mier, 2008:63). The sustainability definition may be the same as a philosophical game, but it is impossible to fulfill it (Tabibian, 2011:87). The sustainability is applied in self-retained and self-compensated ecosystems which have specific patience. Sustainability is naturally described as power of a system in dealing with retrieval against an exterior harshness that a system could maintain its building sttaus through a long term (Miller, 1987:64). The sustainability is defined in the concept: the sustainability means constant, stable or anything which remains stable. In sustainability, there is an inherent tension among susrvival and development, stability (for consistency) and changing ability (for growth) and the sustainability belongs to certain phenomena which could balance and use this mutual relationship. This relation is distant and ascending (Pakzad, 2002:23). So-called modern architecture caused destruction of pure essence of Iranian architecture which has been achieved ideals time and location as a result of several centuries of attempts. The method of dealing with the nature and its architecture is a reaction that anyone will have in varous areas of the Earth and the architecture with the remained value from the passed times indicate completely or incompletely overcoming certain factors such as climatic, weather and ... issues (Pirnia, 1992:44). The sustainable architecture considers environmental considerations which are in compatible with the climate which are built and designed based on the effective exploitation of the natural sources.

The sustainable architecture has attempted to reduce negative effects of the architecture of the environment. Construction of artificial environments must be implemented based on the available natural sources and saving in consumption of inrenewable sources such as fossil fuels and maintain it for the future. The sustaoinable architecture is a designing method which studies reduction of non-renewable sources cncumption. Therefore, it suggests that what we need for survival is gained from the environment (Azarbaijani and Mofidi, 2003:38). The sustainable architecture challenge is in relation with a thorough solution for environmental consideration as well as reaching life quality level and cultural, economic, social and welfare values (Wgsc, 2004:361). The sustainable architecture is a basic feature: a sustainable architectural combination couldn't be transferred as a built product from one place to another. That's why the approach of the sustainable architecture includes the environmental, social, economic, cultural and ... sustainability which are basically certain conceptual characteristics which are related to the available local sources or rights, traditions and needs of the local people. Norton considers the terms and criteria which could be base of the sustainable architecture as follow: 1- to use available materials and local transportation vehicle, 2- to use certain sources which are adequately available in order to meet the vital needs without destructing the environment, 3- lack of dependence on certain equipment which are not easily available, 4- to create valuable results, 5- to be created

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based on social-economic field of the local area, 6- to meet the local climatic effects, 7- to have flexibility to be adapted with needs and local habits (Norton, 1999:624).

The architectural objectives could be considered as below: considering the human life and maintaining them now and in the future, application of certain materials at the time of producing or using or even destruction which is compatible with its environment, the least use of fuel energies, the most application of the natural energy, the least environmental destruction, physical and mental human and all living creatures' development as well as harmony with the natural environment. Certain buildings which are located in the category of the sustainable buildings are identified by certain features and principles that should be observed in them. Such principles are as follow: first principle: energy maintenance: reduction of the building need to fossil fuels. Second principle: harmony with climate. Third principle: reduction in use of materials and sources. Fourth principle: meeting the residents' needs including mental and physical needs. Fifth principle: Coordination with the site, Sixth principle: loss reduction. Seventh principle: holism: all sustainable architectural principles must be imagined in a complete process leading to forming a healthy environment (Sofalaei, 2003:43).

**Sample Studies**

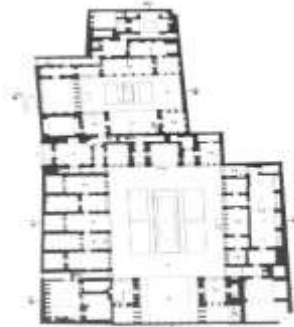
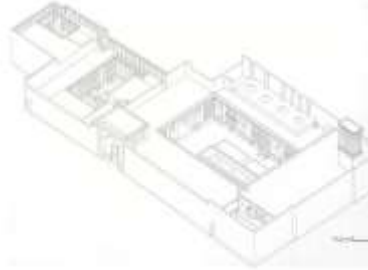
By study structure and function of several samples from the local houses of Yazd historical texture, their consistency with the regional climate and the mentioned climatic strategies have been considered in the architectural design.

**Table 1.** Features of the Semsar's House.

<p><b>The Semsar's House:</b> it is a construction related to Qajar era. The main part of this house areas have been gathered around the yard. The outline base is triangular and its stretch is from the North to the South. Most house spaces are located in two Northern and Southern fronts of the yard. Therefore, the southern front of the yard is more profound along with having wider spaces. The eastern and western fronts of the yard are mostly dedicated to semi-open spaces such as terrace and small terraces. The most significant spaces of the house which are semi-open spaces are located in the center of the southern front and a high and beautiful windcatcher is shown on the top of this front. The windcatcher is located behind the summer room (Shekam darideh) which leads to the ground floor. But it has relationship with basement by a limited entry. Due to the fact that this windcatcher is related to the hall and basement both, it has relationship with the closed and semi-open space. Among small, large and various spaces in the house basement, a wide cross-like basin is seen under the main terrace that the air humidity increases through the windcatcher by entry of air flow.</p>		
		 <p>First floor plan</p>

**Table 2.** Features of the Laris' House.

**The Laris' House:** this building was founded in the Qajar era. The key components of this house are two small and large yards with a set of terraces, halls, rooms as well as an entrance and porch. The main yard is huge and vast and the terraces, halls and rooms are located around it. The main yard is triangle-shaped and it is somehow along with North-East and South-West. The South-West front of the yard is higher and most significant than other fronts. There is also a high and tall terrace in the mid of the front which is the most significant and hugest space of the house. There is a high windcatcher behind the terrace which is seen very well from inside. Unlike the usual situation, this windcatcher is not only the main axis of the yard, but also it is located in the side of the terrace. These windcatcher continue up to the basement. Therefore, this windcatcher is related to the closed space and semi-open space of the hall.



First floor plan

**Table 3.** Features of the Arabha's House.

**The Arabha's House:** This complex consists of two houses related to the Qajar era. It is a set of several yards among closed and semi-open aspects. Apart from relational or service open spaces; there are only six central yards that each centre is considered as an independent part. One terrace, one hall and a panjdari are middle elements of mid-fronts of the arabs' house. The house holds two windcatchers. The main one is placed in the southern front and behind the main hall which continues up to the ground-floor. This windcatcher is related to the porches with its adjacent space. Another windcatcher is located behind a three-door room and it doesn't continue up to more than the ground-floor. These windcatchers are in relation with semi-open space.

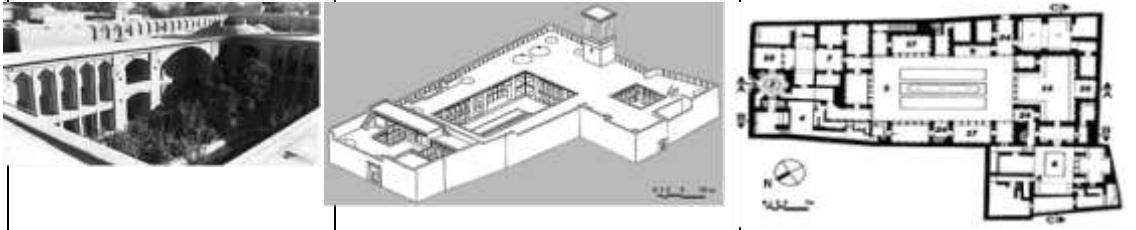


First floor plan



**Table 4.** Features of the Mehraban Goudarz's House.

**The Mehraban Goudarz's House:** It is a construction related to Qajar era. The building base is a stretched triangle in the North and the South where a small part is attached to its South-west angle. The building has covered all base levels. The house has two main yards. The large one is located in the middle of the main part and the small one in the concrete part. Frame of the main yard is shaped as a long and stretched triangle following the building base shape. All spaces are in the South and North fronts along with the East and West shallow fronts. Most surrounding areas of the main yard are one-floored whereas the small yard is surrounded by a two-floored building without considering the pit garden. Apart from these two yards, there are two small yards in the North part of the complex.

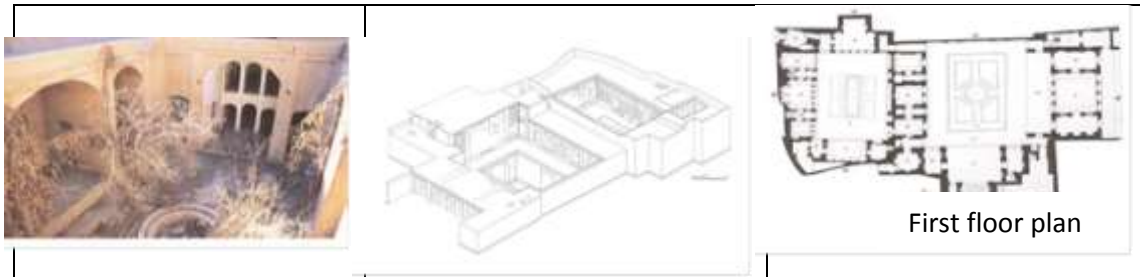


**Table 5.** Features of the Olumi's House.

**The Olumi's House:** It includes two houses which have 150 and 120 years old, respectively. Generally, we could mention that different spaces of this complex has been arranged in three various parts:

- 1- The Northwest part which is a triangular yard and there are several spaces in its three NorthWest, North East and SouthEast fronts.
- 2- The middle part of the yard is large and there is a ptr garden in the centre of it where there are various spaces around it.
- 3- There is a lot in the southeast part which seems it was a garden in the past and this garden has created a beautiful landscape for the house and it has been linked to the mid part of the house.

An obvious point of the project is pit garden in the centre of the large yard. This pit garden creates a centre for the yard which is the central element of the house itself; therefore it concentrates on the central discipline of the house outline once more along with indication of the yard space more profoundly. Due to breaking of the yard floor and creation of sunken yard, they yard volume is more open step by step from the bottom to the top and it has been more spirit catching and more desirable. What must be considered in pit garden of the house is its high depth comparing to the height of the yard facades. Its depth has been more than three another fronts and it is high in size of two floors. Such features have led to separation and dismissal of both levels and the pit garden is shown at the sunken bottom of the yard which is a dependent yard in the heart of the main yard.



### **Adaptation of Climatic Strategies with Sustainable Architectural Principles (According to Case Studies)**

#### **Climatic Strategies and Energy Maintenance:**

Energy has specific place in human's life and all living creatures' life generally depends on it (Swang, 1991:17). The energy is highly significant in terms of economic and social development as well as enhancing quality of life. The local architecture in Iran desert areas has been formed without focusing on the fossil fuels as well as saving energy consumption. One of the main principles of spatial organization in desert (local) houses is to use natural sources and energies such as wind and sun. For instance, the climatic element of windcatcher provides air conditioning by the use of renewable energy of the wind as a static cooling system. The building harmony with the climatic conditions leads to energy saving which is required to control the environmental conditions of such buildings. Accordingly, the studied samples in Yazd historical texture are the real samples which are compatible with the climatic conditions, the local architecture has unique features in this area because the interior conditions could be naturally adjusted due to the thought climatic strategies throughout the year without any need to thermal technical systems according to human's comfort level. In fact, application of principles, strategies and climatic criteria has been the key factors in the building in order to achieve human's welfare.

#### **Climatic Strategies and Material:**

The building materials act differently at any various climate, so that type of the used materials in dry and hot climate highly affect comfort degree of the building residents. The building materials must be selected in this climate in a way that they are resistant against the heat along with having high thermal capacity. Examples of such materials applied by the building constructors are mud and its derivatives. It is noteworthy to mention that the given mud is gained of the soil of the very location after land excavation that it leads to reduce energy consumption by the use of the local materials. Additionally, constructing upon production of materials, applying and throwing it away has no side effect on the surrounding areas. Another most significant point is thickness of the used materials. The wall thickness must be resistant enough against long sunlight and the color of the used materials must be light in order to reflect high amount of the sunlight. Light color of the soil is the best color to be chosen for materials of dry and hot regions (Shaterian, 2013:69). Not only such element including recyclable contents, accessibility with long longitude, replaceable at place and in consistent with the climate has created any interruption in natural cycle of the environment, but also it has enabled construction with the least environmental destruction as well as lack of creating building wastes. Wasting and throwing away has no meaning in the architectural school of the desert (Ghahremani, 1996:23). This region architects have high degree of understanding over the natural process and they are aware that there is no waste in the nature (Soflaei, 2003:95). All the local houses which have been studied have used these materials which are regarded as climatic strategies.

### **Climatic Strategies and Regional Climate:**

One of the bases of shaping Iranian architecture is climate that we must think over understanding architecture in compatible with climate and geographical conditions. Hot and dry climate in summer and dry and cold in winter, rainfall and extremely low humidity, very low vegetation cover and high difference in heat degree between day and night are considered as examples for general features of Yazd climatic conditions. In case criteria of compatibility with the climate are observed in building projects, certain results such as optimum consumption of materials and energy, costs reduction and economic and environmental damages and generally human's welfare are supplied. Climatologists could offer proper guidances in the field of computability with architecture and climatic conditions by having precise and comprehensive recognition over the climatic conditions which are ruling ecosystems (Sharafi et al., 2013:13).

For creation of architectural profitable projects, the following advices are stated:

- 1- Appropriate considerations must be implemented in consistence with the location, cuktore and available local sources as wella s the architects' and designers' specialty to supply the main functions of the building.
- 2- It is advised to the designers and architects to gain basic information about the climate from mteorological stations which are close to the suggested site as well as analyzing its data for the climatic project.
- 3- It is better that the climatic analysis is implemented to supply principles of designing instructions for the exit, building orientation, space building, proper ventilation and creation of spaces between buildings, trees sjadow, landscapes, building shape and height as well as the building form. The site climate is dealing with land cover and the region topography along with the information gained by the meterological stations (Agboola O.P ,2011,268). Thde applied climatic elements in the cases such as pit garden, windcatcher, the central yard and so on indicate harmony and adaptation of thde climatic strategies with the climate of the hot and dry region.

### **Climatic Strategies and Meeting Residents' Needs:**

A building indicates interference of complexed and numerous factors along with their actions and mutual reaction (Rapaport, 2003:4). Sustainability in architecture is not possible without consideration of physical, mental and spiritual needs of the human being. Supply of the human's needs in environmental field which has been created for his perfection and growth by increase in his mental and physical efficiency is an example of the sustainable architecture. The way of meeting such needs will come across a number of changes throughout the time and the architecture is an outfit for a human who looks for his vital and environmental needs in it. By considering the environment, we do not have to ignore the outline efficiency principle which is compatible with the human needs. Increasing quality of the working and residential areas will cause an incarese in efficiency and reduction of mental, health and welfare pressures of the people. In fact, the sustainable architecture has attempted to meet human's needs and increasing his life quality throughout perfection by the least amount of damage to the surround are (Monshizadeh, 2004:39). Most technological environmental methods have been recently nothing but a failure before being successful. Due to disability of its designers who couldn't comprehend needs and expectations of the ones who use them. It really affects success and failure of a project ( Cole and Richard, 2004:30).

The local architecture meets a society needs in relation with the natural factors and spiritual demands of the human being. Considering the climate and forming the climatic elemnets such as

pit garden, windcatcher, central yard and so on have been for meeting the local house residents' needs.

### **Climatic Strategies and Coordination with the Site:**

Recognition of the environment and architecture is merely possibly by understanding of all human activities in the world surrounding him. Therefore, in case we accept that the architecture is a physical reflection of the human life, the life with its all aspects (needs, beliefs, thoughts, values and...), we will find that our today and future architecture couldn't be unrelated to the past architecture. Given what mentioned, it is obvious that copying the physical attributes of the past architecture haven't been considered, but a sustainable understanding over the building in its time and location along with comprehending its values which work very well today is considered.

In order to comprehend the architectural relationship with the environment, we must first have an idea over human's attitude about the environment and the nature (Shaterian, 2013:38). On the other hand, the sustainable architecture is in charge of constructing buildings which are tolerable in the nature. Moreover, it is responsible of maintaining identity and adapting objectivity with mental images through historical layers of today and the future (Panahi, 2007:69). Mixing with the nature is along with following the nature as well as using it. Establishing in the natural environment whether due to adherence or respecting it or in relation with a set of beliefs born of old culture and adventurous history of the land is implemented precisely (Fort Mier, 2007:64). In the local architecture, planning and designing components act as an integrated system. Each aspect of the building physical texture (elements arrangement, wall weight and thickness, location and size of the windows and so on) by the available natural processes in its bed (sun, wind, atmosphere pressure and rainfall) along with needs and economic, social, cultural and historical features of the society is linked to each other. Additionally, its materials have been gained of the nature. Its outline is in consistence with the location climate as well as creation of the least assignment and destruction for the environment or the building itself.

### **Climatic Strategies and Loss Reduction:**

In contrary of the contemporary architecture, these buildings have longer life comparing to people's life. Longitude is regarded as an asset per se. It is obvious that their low quality assigns a general cost to the future generation. These buildings save the energy by their own longitude (Edward, 2010:52). In under study local houses, each man-made construction used to be applied several times until its exhaustion and even after recycling of all its components. Such production means sequence rotation consumption and production was in consistent with economic pattern of traditional societies and it demonstrated profound relationships between location and human-mades (Rudofsky, 1964:66). Given the case studies, the climatic strategies of the local houses have led to reduce the fossilized energies use along with guaranteeing the environmental sustainability.

### **Climatic Strategies and Holism:**

All the sustainable principles require participating in a holistic process to construct artificial environment. It is not easy to find certain buildings which have all sustainable architecture principles. A sustainable architecture must include more than one single building and a sustainable figure of the urban environment (Ghobadian, 2005; 65). Gestalt psychology considers a under conception total the result of the sum or even more than their sum. In under study sample the local houses and the submitted climatic strategies are small components of the surrounding nature, a member consistent with ecology and an element in accordance with its bed.

### 3. CONCLUSION

Although modernity had brought technological advances and valuable scientific findings, its second face has dark colour. By advent of the industrial revolution and changes of human life styles, the technology acted in opposition with the nature and it turned to an environment disaster. Sustainability requires a continuous progressive effort. We must accept that we are consumers and we damage and we have to minimize the damage level (Fort Mier, 2008:67). All sustainable principles have been practically used by our ancestors in the past. Time passing and inappropriate use of technological advances led to forgetting those techniques and unlimited use of unrenewable fossil energiew (Mehdi Nejad and Refalian, 2011; 62). The past architectures had no choice of focusing on the natural sources and clean energies which are indefinite. Considering Iranian principles, any works leading to the environment damage is banned itself along with its components. For the projects to be accepted and worked, it is required for them to be in a line with needs and people's culture and knowledge.

Given the fact that by increase of the welfare, need to energy is quickly increasing, energy sources are limited. In the process of the residents' attempt in achieving and maintaining thermal comfort in certain buildings which ave weak design in terms of the climate, it has been identified that abundant volume of the sources are constantly wasted to reach the mechanical controlling measures. However, as we have seen the climatic strategies of the local houses are in consistant and harmony with the sustainable architectural principles along with assisting us in achieving the sustainable architecture. Application of the natural energies such as sun, wind and water, in addition of reduction of fuel assumption will be environmental maintenance and sustainable development project. Today, we hope that the actual architecture has an admirable way afterward as we appreciate the past architectural works due to their sustainable nature.

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