

Review of the Forgotten Role of Spring House in Achieving Sustainable Architecture (Case Study: Mansion of Gardens of the City Yazd)

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ABSTRACT

Architecture is the physical reflection of human life, life with all its dimensions (needs, beliefs, attitudes and etc). In this case, we find out that today and tomorrow's architecture cannot be irrelevant to the past architecture. Water has always had an obvious symbol in desert architecture as the symbol of light, life, purity and motion. The present research has studied the role of spring houses of the mansions of gardens of the desert region of Yazd and its convergence with principles of sustainability. The research method is descriptive – historical with qualitative study which has been compared with the comparative method, principles of sustainable architecture with the spring house of the mansion of the gardens in the purposive sampling. The obtained results indicate that this element is a tool for using natural energies as a small but exquisite sample of sustainable architecture and its coordination with cultural, social and mental needs of the house and also its convergence with structure leads to creating comfort and peace in the mansion of the gardens of this desert area in such a wonderful way that it has been aligned with the principles of sustainability.

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INTRODUCTION

Among other cities of Iran, the city Yazd is among those places in which historical and traditional buildings of all classes of the society have remained with the least changes. Sustainability of many of the traditional buildings of desert, culturally, socially, economically and environmentally, is one of the values that has the capability to be expanded in the today architecture of desert settlements [6]. Each land has a spirit, a thought, a culture and an architecture which is stable and it shall be sustainable [23]. Man gives value and mode to the environment in which he lives and finds himself by designing and building spaces [12]. Today, the serious issue that man faces is, understanding the consequences of the process of human evolutions and civilization and generally, the effect of human activities on climate and environment [9]. Development of science and technology in today's world has apparently led to comfort and welfare of the man. But this development is the cause of new problems such as excessive use of fossil fuels, pollution of environment, wide changes of climate and some other problems for man. Among these buildings has a large role in intensifying environmental crises; therefore, studying sustainable architecture in today's societies is not an option, but an unavoidable necessity. A few decades have passed of the rise of sustainable architecture, and it seems that it can be completed by removing the obstacles through paying attention to the values and features of vernacular architecture; because by paying attention to the effects of vernacular architecture, these buildings is well in accordance with the purposes of sustainability approach in its time and place. In such way that the past architectures and designers, in constructing the environment surrounding them, have presented applicable facades affected by the ideological values to their societies, not only as symbol but also in a live and consuming way. Therefore, even more recognition and identification of the elements of vernacular architecture raises the principles and solutions for new designing, in addition to a more qualified maintenance and resuscitation of spaces.

Definition of issue and purposes of the research:

An overview to Iran's architecture in antiquity illustrates this feature that Iranian architecture has been founded on three principles: strength, comfort and relaxation. Iran's architecture, throughout its long history, has had originality of design and simplicity together with arrangement and decoration. Certainly, we can say that it has introduced architecture as one of the branches of the strong tree of Iran's culture and art. Traditional architecture of the historical cities of Iran contains the used techniques in designing various spaces of desert cities and despite the harsh difficult environmental conditions of these regions, it has provided a safe and comfortable and sustainable life for thousands of years.

But today, aesthetic programs which has been embedded in the architectural sense and understanding and it has marginalized the correlations of sustainability. Among the problems, which are in the way of sustainability and sustainable architecture today, is the inaccurate thought that sustainability can be shown through combined technologies and whereas the façade of building is a reminder of the issues of sustainability, the complex still remains unsustainable [32]. In today's world, the sustainability approach has been mentioned as an approach which suddenly questions what is known as the modern achievements by the Western people throughout the last century [24]. Recognition of environment and architecture is only possible by understanding human activities in his surrounding world. Therefore, if we accept that architecture is the physical reflection of human life, life with all of its dimensions (needs, attitudes, beliefs, values and etc.), In this case, we find out that today and tomorrow's architecture cannot be irrelevant to the past architecture. Given what was said, it is clear that imitating the physic of the past architecture is not considered but understanding the sustainability of building at its time and place and understanding of its values, which can work well today, is considered. The present research has studied the role of spring houses of the mansions of gardens of the desert region of Yazd and its convergence with principles of sustainability. The purpose of writing this article is not encouraging architectures to return and imitate the traditional architecture but its purpose is to celebrating this precious historical treasure and also learning architectural lessons from these values, in such way that in a new design or in developing standards, it would help architectures and programmers.

Research Method:

The research method is descriptive – historical with qualitative study. The population of research is the spring house of the mansion of the gardens of the city Yazd and among them, to case samples are introduced, Dolat Abad and Moshirolmamalek garden. The method of sampling is purposive and the tools of gathering information are library studies, written sources, documents, maps, and objective observations and approaches. The method of data analysis is analysis of content. In the path of research, in order to explain the role of spring houses in the sustainability of architecture, initially we have mentioned sustainability, sustainable architecture and principles of sustainability and then with a comparative method, the principles of sustainable architecture and spring house selected in sampling were compared.

*Concept and literature of the research:**Sustainability:*

Today, the word sustainability is used widely as the global description in which the human and natural systems would be able to live together till a far future. "John Aherne" says: I define sustainability as the permanent prosperity of man and other live creatures on this planet. Sustainability is a specification which belongs to the systems. Sustainability is the system which is most like the whole world and the architectures have always been the thinkers of the systems. The definition of sustainability might be like a philosophical game, but its realization is an absolute matter [14]. The word sustainability is used for self-retained and self-compensated ecosystems which have a certain extent of tolerance. Naturally, sustainability has been described as the power of a system against while dealing with an external harshness. Thus, the system maintains its structural status throughout a long time [25]. The word sustainability has been defined like this in concept: sustainable means stable, durable, it means something which remains fixed. In sustainability between conservation and development, there is a natural tension between stability (for coherence) and changeability (for growth) and sustainability belongs to the phenomena which can balance and use this bilateral relation. This relation is circular and upward [3].

Sustainable architecture:

Architecture in modern terms, led to the loss of the pure essence of Iranian architecture which had obtained the ideals of time and place with centuries of practice. How to deal with nature and architecture in it, is a reaction that any human has showed or will show in various places on earth and the valuable architecture remained from the past shows that man has, completely or partially, overcome factors such as climatic issues, weather and etc. [5]. Sustainable architecture considers environmental considerations and adaptation with climate and it is designed and built based on the effective exploitation of natural sources. In sustainable architecture, it is attempted to reduce the negative impacts of architecture on the environment. With this

purpose, building artificial environments shall be done by considering the available natural resources and being careful while consuming non-renewable sources such as fossil fuels and saving it for the future generations.

Sustainable architecture is a method in designing and leads to the reduction of the consumption of non-renewable sources and indicates this issue that we can achieve what we need for survival from the environment [1]. The challenge of sustainable architecture is associated with a comprehensive solution for environmental considerations and at the same time, it is in order to obtain the level of life quality and cultural, economic, social and comfort values [20]. Sustainable architecture is a field feature, a combination of sustainable architecture cannot be transferred from one place to another as a built and prepared product, because the policy of sustainable architecture includes environmental, social, economic, cultural sustainability and etc, which are basically content features and are associated with the available situational and local sources or with the rights, needs and traditions of the local people. The purposes of the sustainable architecture can be outlined as follows: caring about the human life and maintaining and keeping it now and in the future, using materials which are homogenous and compatible with their environment at the time of production or usage and even destruction, minimum use of fuel energies, maximum use of natural energy, minimizing environmental degradation, physical and mental improvement of people and all living creatures and being in harmony with the natural environment.

Buildings that are in the category of sustainable buildings are known with the features and principles that shall be considered in them. These principles are: first principle: reducing the buildings need of fossil fuels. Second principles: coordination with climate. Third principle: reducing the usage of sources and materials. Fourth principle: meeting the needs of residents including mental and physical needs. Fifth principle: coordination with site. Sixth principle: reduction of losses. Seventh principle: Holism: all of the principles of sustainable architecture must be embodied in a complete process which leads to the formation of a healthy environment [11].

Water in desert architecture:

Water, in man's thoughts, has a close relationship with the sky and it is one of the very important natural elements and in many ancient lands, especially in hot and arid ones in which people face shortage of water, has a special significance in people's lives and that is why it is considered holy and some places were established to worship it. Water has various concepts including light, life, purity and fluidity [10]. Water has always had an obvious symbol in various climates and cultures. An overall geographical review of Iran's cities shows the dependence of the urban living and accessing water resources. Water, with its different capabilities, have brought different emotions to man's soul and spirit and that is why it has found its place in places built by the man in various ways such as reservoirs, glaciers, coastal, spring houses and etc. [29].

Other than the vital role of water in life, water has always had an important role in architecture as a holy element. Before Islam, the role of water was more a abstract role and temples and houses of worship were formed besides water and with the full respect to its existence. In the Islamic period, the role of water has become applicable in architecture. The architects of this period, with total awareness, tried to dominate the nature and give it order. Architects, by knowing the physical rules of water's behavior and understanding of the role and allegory and association with man, brought water into architecture. Therefore, water entered construction and formation of buildings in such way that practically, we cannot consider it as a separate thing from the built form. Our architects bring water into their complex and use a treasure of physical and spiritual specifications so that their architecture would be richer. One of these physical elements which has been formed by using the water element in the desert city of Yazd is the spring house [17]. Fountain can be considered as dynamic waters which are very stimulating and full of energy and grab the viewer's attention quickly and have a sound while moving which has crucial mental impacts as well as visual attraction. If artificial buildings and spaces lead to our separation from nature, on one hand, they protect us against some of the natural factors and on the other hand, at their turn they indicate a more human realm and if these features turn our physic into an unfamiliar shape, although it has been desirable for us, but it also has a cold and artificial quality. Then, we see a need of a kind of link between architecture and nature and this issue has been obtained in the Iranian architecture and gardening arts through the water element which is somehow holy, valuable and the rarest natural element. This usage has happened in such way that the link between architecture and the surrounding site has been obtained through this mutual factor and the space of spring house has been formed with this intention, somehow it is a medium and half-open space between the open and closed spaces or inside and outside.

Garden:

Thousand years ago, when the Aryans came from Caucasus Mountains to the Persian plateau, they started cultivating to provide for their needs and after a while, building gardens and establishing amusement gardens flourished. Water is the most basic tool for creating gardens in Iran. Iranian people used canals aqueduct to meet their own needs, also pools and fountains have and have had significant importance in Iranian gardens. They often established pond or pool in one of the basic axes of the space of the house or garden.

Iranian garden has been composed of four basic elements and it is formed consequently in proportion with these elements in an intellectual system. The basic elements are: land, water, plants and space. Without considering each of the mentioned factors, the garden won't be created or it will have defects. The principles of designing Iranian gardens are: 1- hierarchy, 2- symmetry, 3- centrality, 4- rhythm, 5- independence, 6- naturalism [4].

Spring House:

In the mansion of Iranian gardens, through the establishment of a pond under the dome of the house, features such as coolness, moisture and reflection of various images are created and this complex is called spring house [8]. Spring house has been built with a relatively simple design as a summer residence for usage in the hot seasons. Inventing and establishing spring houses is caused by the area's need associated with the atmospheric situation and geographical conditions of Yazd and the intensity of warmth in summer and it is obtained by the innovation of skilled local architects. The spring houses usually have these features: 1- they are built in the location that the water of an aqueduct flows there permanently, 2 – around it has trees and it is at least agricultural lands, 3- its floor plan is usually square or sometimes a square _rectangle, 4- there is a pond in the middle of them without exception, 5- its front faces the yard and the courtyard of the spring houses is always opened to an entrance, 6- depending on the owner's affluence, the spring house has 2 or 4 rooms which are on the two sides of the pond.

The functional system of the spring house is usually like this, water enters the spring house from one side and exits it by passing the water pond. In addition to the fact that flow of water makes the environment cool, in some spring houses, by building two long ventilator in the back of the buildings, cool air enters the inside of the spring house. Usually, one side of the spring house is the yard and courtyard of the garden and its ceiling is higher than the spaces adjacent to it in order to respect the spatial hierarchy. Placement of the pond in the center of the building's center of gravity and considering the platform and the seating stool and watching water and the scenery and having a close relation with landscape features (water, light, air and etc) is one of the other features of the spring house. The most important used pattern in the spring houses is "ripped belly". Spring house, due to the ponds and water creeks around it, water flowing canals around its rooms, linked canals to the ventilator and specific architectural issues, has a desirable air and the coolness of the air is totally tangible compared to other parts of the building. The central patio of the spring house provides the light for it and there are some special rooms around it. The water of the aqueduct enters the spring house at first and then it is conducted in one of the side rooms. The careful insulation of these canals is very interesting and given the fact that any kind of leakage leads to the destruction of the bases and upper floors, carefulness and courage of the architect is admirable. The spring house is the symbol of peaceful coexistence of man with the arid nature of desert.

Case samples:

Dolat Abad Garden:

Dolat Abad garden is among the great samples of Iran which has been built in the year 1160 AH (Zandiyeh period). Its high and beautiful ventilator is the highest ventilator known so far and its octagon mansion has beautiful sash and Karbandy. The mansion of the garden includes: an outside mansion which is located on the east side and has a high ventilator and a spring house, the mansion located in the west of the courtyard and the entrance mansion of the porch of the house. The octagon mansion and ventilator are considered as the most important parts of the complex in which the air and water current have been combined in the most beautiful way. The superfine Karbandies of the vestibule ceiling has been done with floral wire has been done very subtly. The lattice sash has added to the beauty of the building with colorful glasses.



Image (1): outside mansion of Dolat Abad.



Image (2): Sash of the outside mansion of Dolat Abad.



Image (3): Karbandy of the ceiling of the spring house of Dolat Abad.

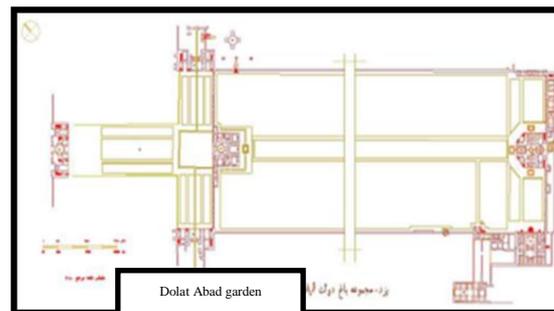


Image (4): Plan of Dolat Abad garden.



Image (5): existence of pond in the center of the spring house of Dolat Abad garden.

By taking a look at the map and plans of the garden, we can deduce that ponds and trees of the garden and the empty spaces form the dominant space and the buildings which are special for summer and winter or etc, have occupied only 10 to 15 percent of the space of the garden. Generally, due to the arid and desert weather and role of trees in purifying the weather and making it more desirable, we can refer to the high percentage of the open space in the building. Development of the DolatAbadi garden in its own scale is longitudinal. The rectangular geometry of the land and the fact that this geometry has a ratio of one to two emphasizes the linear development of the garden. This geometry hasn't been without effects on the buildings of the garden either. By taking a deeper look at the spaces of the garden, we can easily find out that the building of the garden is divided into two categories: 1- a space for living, 2- a space for governance and work. Locating the governance space of

Dolat Abad garden reaches a cross form in a linear and central relationship together. The lines of this axe determine the main associative accessibility of these spaces. The vestibule mansion is the most basic building of the courtyard of the garden. This mansion has been attached to the southern wall and it has been established at the end of the main axe of the garden. This mansion is famous as the ventilator mansion as well, because it has been the main palace of the Dolat Abad garden and there is a long ventilator in it. Below the ventilator of the vestibule mansion, there is a pond which is completely made out of marble. First, the water runs from this pond and goes up and there is another pond in the middle of the vestibule mansion. The water enters the middle pond of the vestibule mansion (pool house) from the pond which is below the ventilator of the vestibule mansion. Then, the water enters the three rectangular ponds which are in the Shah Neshin. The formal section used in the central section of the building of the pool house is new and belongs to the repairing periods of the garden which has been formed after the destruction of the patio of the vestibule on the ceiling and reconstructing it in the shape of pergola; but generally, in other ceilings of the building of the garden, we can see simple Karbandies with the combination of altar forms and structural principles.

Moshirolmamalek garden:

Moshirolmamalek garden, with a 18000 meters width, is one of the lush gardens located in the northwest of Yazd and it is from the middle of Qajarieh period. This garden has reservoir, stable, dock, storage room, flower and vegetable gardens, bathroom, palace, courtyard, outside, orangery, parking and so on. The most prominent material used in the building is adobe and the drinking water of the garden was supplied by the garden's canal in the past. Transparency, connection of spaces, organization of spaces, cohesion of spaces, geometry and proportions used in this garden are all indicative of the intellectuality and thoughtfulness in the style of building Iranian gardens which is knowingly seeking mental and physical human peace and comfort with awareness [26].

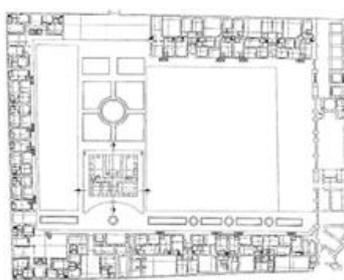


Image (7): plan of Moshirolmamalek garden.



Image (8): a view of the palace of Moshirolmamalek garden.



Image (9): pool house of Moshirolmamalek garden.

In this garden, there is also a tangible difference between the ratio of open and closed spaces just like other gardens of the hot and arid gardens. In Moshir garden, given the environmental sort of the building in a distant

and making the central palace of the garden prominent, the percentage of using natural conditioning and light and therefore the percentage of the ratio of open to close space of the building is large. In the middle section of the pool house, there is an octagonal stone pond whose internal surface has been covered with turquoise blue tiles. Water runs from the provided stone fountain in the middle of the pond and after filling the pond completely, the additional water is poured to the "pashooyeh" which has been built around the pond. Then, in the only stream located in the west section of the pond which is located in the vicinity of the main entrance – departure towards the main area of the garden, water is current. This current water flows below the vestibule and after passing through the stairs placed in front of the main entrance to the area, it enters the "Pashooyeh" of another stone pond in the yard and finally, it enters a water stream which has been extended in the eastern – western sections of the garden.

Role Of Spring House In The Emergence Of Sustainable Architecture (In Accordance With The Case Samples): Spring house and saving energy:

By taking a look at the way the residents have been established and located in various geographical regions, we can find out that we can reduce the loss of energy to a large extent by understanding the climatic conditions. Vernacular architecture in Iran's desert regions has been formed without depending on the fossil fuels and by consuming energy carefully and on the basic considerations in designing settlements and mansion of the gardens of Yazd has been the spring house. Spring houses have been a determinative element in saving energy with their own focus, certain shapes and dimensions and purposive orientation and location. Spring house provides cool and desirable air for the inside space of the building by creating moisture through the water pond and air flow through openings which has been considered as a renewable energy itself. Water pond in the middle of spring houses for making the air more desirable, creating a proper visual view and creating water sound by using fountains and instilling a sense of peace are all samples of traditional architects' concentration in designing the mansion of garden.

Spring house and materials:

Building materials are practical in some way in climatic conditions, in such way that in the hot and arid weather which is being studied, the type of the used materials largely affects the rate of residents' comfort. In the cities of arid desert regions, materials are prominent as a symbol of paying attention to the environment. Producing construction materials in traditional buildings has been done with the minimum destruction and damage brought to the environment and with the least consumption of fossil fuels, not creating hard and non-absorbable building wastes in nature. The type of construction materials used in the reviewed buildings is mainly adobe, mud and brick which have usually been obtained from excavation of the product itself and digging the location of the building and it has been used combined with other materials in construction. In other words, providing all materials is from local resources and they are considered as local materials. Recycling and reusing the buildings can be considered as another one of the traditions of Iran's architecture and urbanization and especially the desert. In vernacular architecture, materials are selected by considering the natural resources, existing materials in the environment, climatic and environmental features.

Building materials of the pond is like other sections of the building, but for keeping and sealing, other resistant and impenetrable materials such as natural tar were used as the mortar between the bricks, lime paste and wood ashes and also the mortar was often used as the interior concrete of the ponds' covers due to being resistant against coldness and keeping the water cool. This issue is one of the most important indexes in sustainable architecture. In this method, the building is built quicker and it becomes more compatible with its environment and at the time of repair and reconstruction, it have always been accessible.

Spring house and climatic considerations:

One of the bases of the formation of Iranian architecture is climate. We shall think about understanding our architecture in compliance with the geographical climate. Hot and arid climate in summer and cold and arid in winter, very low rainfall and moisture, very low vegetative cover and large temperature difference between night and day are the general features of the climatic conditions of Yazd. In these regions, the form of the mansion of the garden can develop along the east – west axis by considering the winter conditions of this region (Kasmayi, M. 2008). Presence of spring houses in the mansion of the garden leads to creation of a relatively proper space in the mansion by evaporating water. In fact, with the flow of air from the top of the water pond, the temperature of the environment reduces. Mansions with spring houses have the best possible form and composition between the components to balance the climatic conditions. In the mansion of the gardens, all of the composing components come together and provide a habitable microclimate. They act like an intelligent element and like a natural oasis gathers light, wind and water together so that it would provide comfort for the residents in undesirable environmental conditions.

- *Spring house and responding to the needs of the residents:*

Sustainability in architecture is not possible without taking the physical, mental and spiritual needs of man into consideration. Fulfilling the needs of man is one of the necessities of the sustainable architecture as his mental and physical efficiency increases, in the environmental substrate which has been created for his growth and perfection. The type of meeting these needs will face several changes throughout time [24]. Recently, before many methods of environmental technologies become successful, they lose. And it is because their designers have not been able to understand the needs and expectations of those who intend to use them. This issue truly affects the success and failure of a project. Although the passage of time is unavoidable in the change of needs and concepts, but some of the human needs, which depend on his mental and personal characteristics more than others, have theme of sustainability and as the time passes, they only might change in terms of form. Spring house is also an evidence of vernacular architecture of hot and arid regions which indicates the customs, spirit and emotions, thoughts and ideas, taste and art of the people. Functional and spatial diversity, such as spring house, three-door and etc, were created in various times and in proportion with the daily needs of the family and using any space. Spring house, in addition to creating a delicate environment in summer, has had the role of spatial division of the house in summer and all of the spaces used in the summer which had access to it. By considering the need of the users given the need of personal privacy and safety, paying attention to human scales and human's sizes and dimensions in designing the formation of the spaces based on cultural and social features and behavioral patterns of the people of desert, flexibility in designing the building in order to increase its age and to reduce the need to create new spaces, paying attention to the semantic features of nature in designing in order to make the built environment meaningful, optimizing the energy consumption and maximum use of various types of renewable energies in order to balance the temperature and to increase the desirability of the environmental conditions are among items that the architects of the desert area have tried to respond to this type of need of the residents by creating local elements such as spring house.

Spring house and coordination with the site:

What is meant by coordination with the site is that we must focus on the building's capability for combining environmental and atmospheric factors and converting them to spatial qualities and comfort and form. An architectural work blends with the land since the birth and since the moment that it shall take the first step towards being physical. It receives water from the ground, and after changing its appearance and physical and chemical content, it returns the water to different extents. It faces the breeze and turns its back to the winds that bother it. Mixture with nature comes with both following the nature and also exploiting it. Establishment is the natural environment, whether due to following it or respecting it or whether in association with the series of beliefs which have been born from the ancient culture and eventful history of the land, is done with grace and elegance. The important cultural and geographical features of Iran are the reason why there is so much diversity in its architecture. If we wanted to briefly review the architecture of various regions by complying with the existing geographical divisions, we will see that even a limited geographical region offers varieties in the architecture of its various areas, but generally, just like the desert is not separate from Yazd, there is a very tight link between their architectures. In Yazd and areas around it, whatever has been built is made of mud and its derivatives. Given the geographical situation and how the cities are located and also the needs of the citizens, Yazd's architecture has built mansions that would enable its residents to live easily (compared to the time conditions) in the heart of warmth and current sand and also severe coldness of the winter. As the city's walls provide its safety against human invasions and forces of nature, the walls of the mansion also play the same role in a different way. Existence of water in the environment is the visualization and crystallization of beliefs and the when the creatures of space approach it, which is crystallized in centered forms, forming, formable, inviter, linker, separator, landscape – presenting. Water's location in the central core and focus of the spring house is the reason why various organs of a building have been gathered around it and the geometry of man's presence in the space is also all around the central spot of the spring house which is the pond. Spaces such as spring house, spaces used in summer, balcony and roof tops make the accordance of the house with various conditions of living possible. Spring house has been formed as a component of the whole mansion of the garden in coordination with its structure. Materials, the method of organizing the space, proportions, paying attention to climatic conditions, method of meeting the needs and etc, have become evident in proportion with the conditions of the desert area.

Spring house and reduction of losses:

The lesser application of artificial materials and more use of natural materials pave the way to reduce the consumption and loss of energy and materials. Paying attention to the spring house in the mansion of the gardens as the symbols of the traditional architects' concentration on the facilities and constraints for the maximum compliance with the environmental conditions and providing comfort and welfare of the residents are significant.

In contrast with the contemporary architecture, traditional and local buildings age more than people and their age is considered as a capital itself. It is obvious that their low quality forces a public cost on the future generations. These buildings save energy with their age [2]. This kind of production means that a rotational sequent of consumption would be in compliance with the economic pattern of traditional societies and it shows the deep associations between the human location and creations [9]. In the traditional consumption system, there is not waste in nature and the cycle of life constantly continue without an element exiting this cycle. Islamic culture, by recommending moderation and using divine blessings properly, has cleared its followers from doing useless works and also creating entertainment objects that have no proper application and are good enough for man. Retrospection and avoiding unnecessary things for increasing efficiency, using materials that can be returned to the natural cycle, making the local materials of the region proper, in proportion with the new methods of living in order to reduce the costs and make the building homogenous with the surrounding environment, designing and building with a lone useful life, standardization in constructions, stability and strength of the building against environmental incidents, the minimum need of the building to be kept and repaired, paying attention to reusing and recycling at the time of constructing and maintaining the building and facilitating it for the residents are items that provide the field for designing which is homogenous with sustainability in desert residences.

Spring house and holism:

In vernacular architecture, components of programming and designing act as an integrated system. Each aspect of the physical texture of the building (how elements are placed, thickness of the walls, and size and location of the windows, and etc) are linked together with the natural processes that exist in their own substrate (sun, wind and rainfall) and with the economic, social, cultural and historical needs and specifications of the society. Gestalt psychology considers an understood whole as the result of the sum of them or even more than the sum. The role of mud and muddy materials is significant whether inside the mansions or outside of them. In fact, application of muddy materials in desert areas and especially Yazd has had climatic, applicative and technical reasons. Perhaps, we could dare to say that presence of the spring house inside the garden of the reviewed mansions has been formed given the climate, materials, reduction of energy consumption, responding the needs of the residents and its site.

Conclusion:

Sustainable architecture is among those issues that have largely improved internationally. Going back to the past and using local and natural technologies of the residents of hot and arid regions in association with supplying water clearly indicates that the people of these areas have been able to be independent in fulfilling their own needs in a harsh living area. Features such as aesthetics, protecting the environment in order to meet the climatic needs are seen in Iran's sustainable architecture and we can refer to water and its role in the sustainability of the architecture of tropics and its positive impact [13]. Architects of this land, subtly and cleverly, have used some specific techniques in creating various architectural elements which are unique in some cases, so that they would make the lives of the people of the desert easier and more comfortable. At their time, these buildings met the environmental, cultural and economic needs of the residents in the best way and therefore, the principles governing them can be indicative of the principles of sustainable architecture [6]. By understanding that the values extracted from this type of sustainable architecture are applicable, we can achieve a kind of architecture that would work well just like the past architecture and it would fulfill the human needs. By considering the fact that natural air conditioning and cooling system have always been important in Iran's traditional architecture especially in hot and arid areas, the presence of spring house in the mansion of the gardens have become significant as an element which is coordinated with the environment and structure in order to balance the hard climatic conditions and making the environment of the inside of the mansion more desirable. Spring house is a toll to use the natural energies, its coordination with cultural, social and mental needs of the residents and also its compliance with Yazd's desert and local architecture and site have led to creation of comfort and peace in the settlements of this desert area and therefore, an intelligent balance has been formed between human biology and nature. This prominent element is a small but exquisite sample of sustainable architecture of this area which has been created based on coordination with the particular quality of natural substrate and man's respect to nature and it is wonderfully homogenous with the principles of sustainability.

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