



## The Accordance of Vernacular Earth Architecture with IEPs and the Natural Image of Sustainability: Investigation of Earth Architecture of Kavir

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**Abstract:** Making an investigation into the traditional architecture found in Iran's Kavir, one can see an architecture that has emerged by merely changing the form of the face of the earth; this [complex] architecture is nothing but an intellectual use of simple land and water which simultaneously accords with the Islamic environmental principles [IEPs]. In this article, following a descriptive analysis of this architecture and its natural environment and making a comparative analysis of its values with the Islamic Environmental Principles [IEPs], we are going to demonstrate how Kavir's vernacular architect, as the steward of the earth, has achieved utilization, development and maintenance of natural environment in the light of IEPs and a tacit sustainable building approach. Eventually, a model related to overlapping values of this earth architecture with the IEPs and the natural image of sustainability has been introduced.

**Keywords:** Vernacular Earth Architecture, Islamic Environmental Principles, Natural Image of Sustainability, Kavir.

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### INTRODUCTION

It has been thought that many environmental problems are the result of pollutions and damages to the nature as the result of irrational use of natural resources and neglecting the outcomes of the present economic and industrial activities. These problems probably originate from a lack of special attention to the meaning of nature and its elements, which are defined in different cultures. Today's world, which assumes architecture and cities as machines, also assumes the whole nature as a machine whose purpose is to give us the most economic exploitation. Nature, as an ecosystem, consists of physical components, both inorganic and organic. What human beings are doing is making the environment of the world more and more inorganic, and more artificial. By building roads, bridges and buildings, human beings are making the biospheres more and more concrete, artificial

and inorganic.

But Muslims, inspired from their ideology and culture, have, throughout history, created a living environment in which not only one can see their attitude towards the environment and the universe but also something more than what we today call sustainable development exists (Naghizadeh, 2002). In Iran, vernacular architecture in all three climatic zones, namely mountainous, forestry and hot-arid, with completely different environmental conditions, has common features of which is the adaptation to the environment to provide a better place for living. It seems that in this adaptation, the selection of forms and materials plays an important role.

As political boundaries differ from climatic boundaries, and the climatic conditions which are usually the same for all people living in similar climatic and environmental conditions, the solutions that human beings in hot-arid parts of the world have found to come over the severe climatic problems, may be different in shape but they are the same in meaning (Tavassoli, 1979, p. 67). One of these solutions, to overcome the problems

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caused by water deficiency is found in the central part of Iran. This article focuses on the architecture of this zone and compares its environmental features with those of IEPs and one of the present images of sustainability.

## THE NATURAL AND ARCHITECTURAL FEATURES OF KAVIR

### *Definitions of “Kavir” and “Biaban”*

Desert is a translation of the word Biaban. The word Biaban consists of three parts Bi-ab-an. “Bi” as the first part is a prefix meaning “without; lacking”, “ab” is the exact word for “water” and the last part, “an”, is a suffix of place. As explained, the main feature of Biaban, is

deficiency of water (Tehrani, 1998, p. 4); Besides this feature, the word also refers to lack of plants of any kind (Dehkhoda Persian Encyclopedia).

Kavir is by definition, as translated to saline desert or brackish ground, has characteristics making it different from Biaban; That is, in Kavir, the earth’s over salinity and richness in minerals like Nacl is as much as it makes the life of any potential living thing almost impossible and planning for exploitation and vitalization would to a great probability be in vain. So we conclude that most of the areas of the world are falsely named Kaviri areas, while in fact they are Biaban, which is to some extent habitable and exploitable (Tehrani, 1998, p. 5).

The map below (Fig. 1) shows the location of Kaviri<sup>1</sup> and Biabani<sup>2</sup> zones in the central Iran plateau:

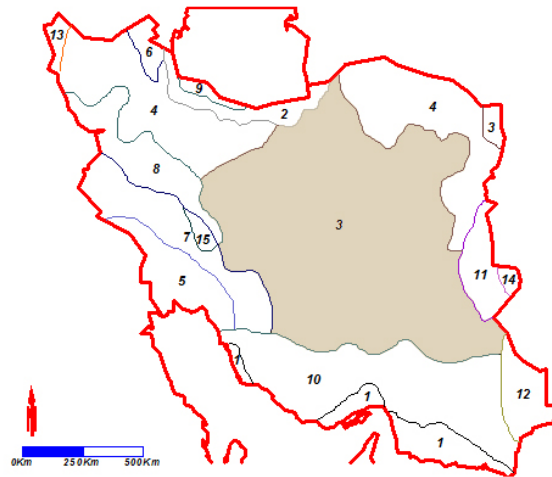


Fig. 1. The Area Studied, is the Third Area of the Fifteen Climatic Zones Proposed by Masoodian, S.A.

### *Natural Features*

#### *Water and Earth*

Iran plateau, with its dry and semi-dry climate, has different kinds of earth (Fig. 2). Except for sedimentary earth, most others lie in the range of desert earth, which can be categorized into two major groups: red and gray. These two kinds of earth, which are mostly saline and without organic substances are found near Na’ain, Yazd, Kerman, Zahedan and some other cities. But as there is almost no rain [water from sky] in Kavir, the Kaviri man, in search for [the precious] water, achieves strategies to extract water from deep in the earth and probably qanat is the

most important of these strategies which roots in Iranian culture (Ziari, 2000, p. 86). The purpose of digging qanat is to contribute to the formation of sustainable settlements and communities and development of agriculture.

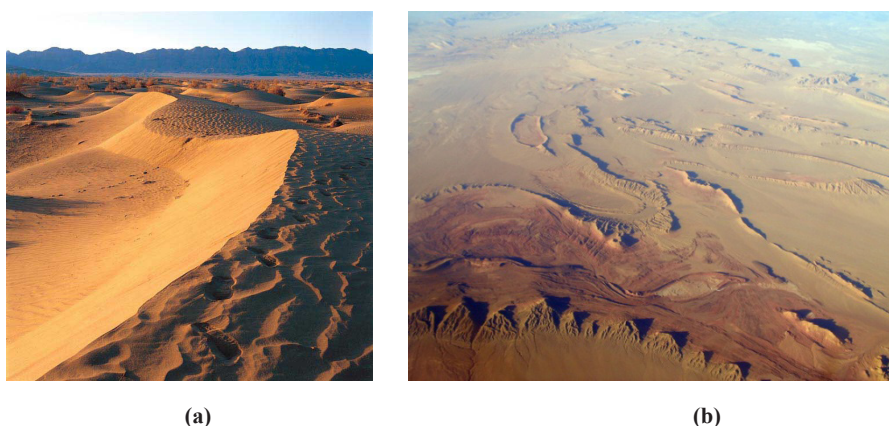


Fig. 2. (a) and (b). The Natural Texture of Kavir

The distribution of the early settlements inside the central part of Iran plateau (in Kaviri and Biabani zones) has a close relationship with the pattern of qanats'

distribution (Fig. 3); and the historical process of the settlements' physical development has been dependent on these water resources (Ziari, 2000, p. 88).



Fig. 3. (a) Qanat Path (b). A Village Shaped by Qanat Water and Simple Earth

### *Climatic Features*

Iran climate is divided into four major groups (Kasmaei, 1993, p.14):

- The coast of Khazar sea (temperate and wet climates),
- The coast of Persian Gulf and Oman Sea (hot and wet climates)

- Mountainous areas (cold climates)
- Plateau desserts (hot and dry Kavir)

Considering that the average raining in Iran is much lower than other parts of the world, the weather in most parts of the country is hot and dry (Ghobadian, 1996).

Table (1) illustrates a general look to the Kavir climatic features (Abaft Yeganeh, 2007):



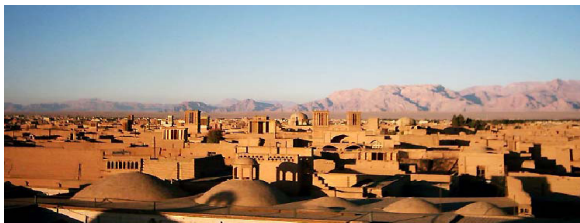
**Table1. Climatic Features of Kavir**

Feature	Amount, Kinds or Quality
Total Area	85 Million Acres (61% Desert Land, 24% Sand Lands, 15% Sand Hills)
Precipitation	Less than 250 mm per year
Temperature	Maximum of +60 Degrees and a Minimum of -30 Degrees Centigrade
Relative Humidity	Less than 50-60% (due to high temperature and evaporation)
Winds	Continuous and Severe Winds (because of lack of plants and the severe temperature difference of the earth and the air above it)

***The Architectural Features***

The first of the necessary conditions in this region to continue living is to adapt to the conditions as much as possible. Moving closer to the central part of Kavir, living conditions become more and more severe and unbearable. A common point in the formation of human communities in these places is to rely on the power of intellect and to use the environmental potentials as much as possible. This adaptation was by itself a beginning for the creation of techniques.

In an investigation of urban structures of the cities and the villages in the hot-arid region, we come to the point that the natural and climatic factors have a major role in the formation of them (Tavassoli, 1979). These factors have always brought through problems to challenge. The response of the architecture to the severe climatic conditions in this region can be seen in the selection of materials, to provide as much shade as possible in private and public spaces and the use of badgirs, dome-shaped roofs, etc. (Fig. 4).

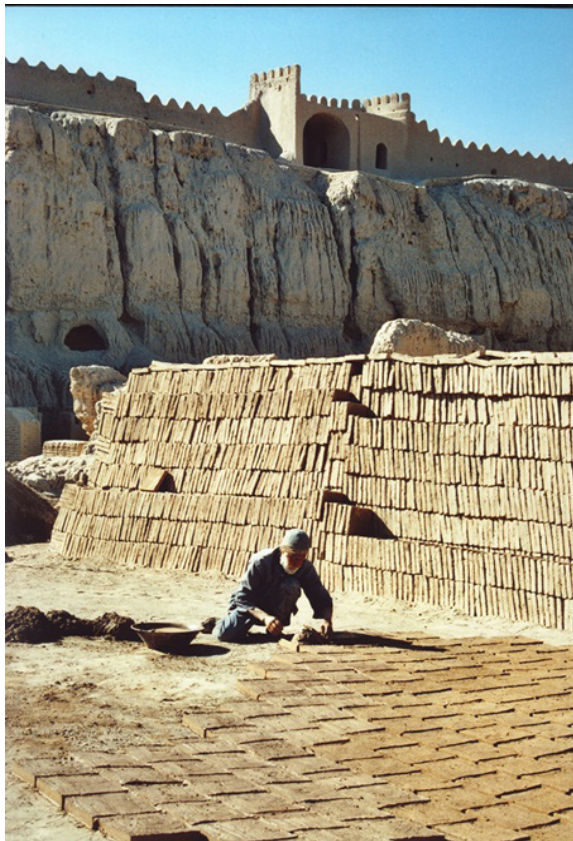


**Fig. 4. Yazd, The Earth Architectural Features (Simplicity of Materials, Complexity of Forms, Harmony with the Environment)**

Throughout history, four major earth technologies have evolved and diffused in the vernacular architecture of the world namely wattle and daub, cob, adobe, and rammed-earth from which other earth technologies might

have been derived (Elizabeth et al., 2005, p. 56). The earth architecture in central plateau of Iran that has emerged by slightly changing the form of the face of the earth has been formed with the simple use of earth and water. The Kaviri vernacular architect, in search for water, achieves different strategies and as he brings the water up to the surface of the earth, he finds nothing but earth to create his architecture with (Fig. 5). The architecture of Kavir includes such a simple building in a village to more complicated and majestic architectural structures (i.e., the whole city structure) is made up of this simple material; earth. In this process, earth passes through two filters: Man’s intellect and IEPs; That is, despite the simplicity of materials, one can observe complexity and diversity of architectural forms and meanings. Here, the extraction of materials [earth] for the purpose of architecture would not impose any kinds of damages to the nature; after the architecture reaches its death point, the waste material is nothing but a part of the same nature and would dissolve in the natural environment again. In its lifetime, the material has proper interaction with other climatic elements such as the sun, water and so on. These features, exactly accord with the eco-aesthetic logic in the natural image of sustainability [which comes later in the article]. Another characteristic of earth is its accessibility in every point of Iran’s Kavir. This enables the architect to easily find the necessary material to make his architecture with; thus, the architecture of earth is being localized regarding to each point and its characters change slightly from point to point; That is, the architecture is in complete harmony with the environment (i.e., in landscape, form, material, color, etc.).





**Fig. 5. Bam; the Kaviri Man and His Management of Earth; and the Process of Architecture Formation**

As a conclusion, the whole city, and all its elements find their forms, sizes, proportions, orientations, etc. based on the natural and climatic opportunities and the threats existing in the natural environment around.

### **ACCORDANCE OF KAVIR ARCHITECTURE WITH IEPS AND THE NATURAL IMAGE OF SUSTAINABILITY**

#### ***The Islamic Principles of the Relation of Human and Nature***

##### ***The Relation of Man and Nature***

The effect of human activities on the environment can be mentioned as the following (Radmand, 1999, p. 71): (a) The change in the quality of air, water and earth, (b) Influencing the natural resources, (c) vital currents and

natural landscapes.

In the aim of human being to have a proper relationship with the nature, Islam has set up a responsibility for man toward the natural environment. This responsibility evolves from the role of man as God's Khalifa on earth. In this regard, the Qur'an says: "He is that has made you inheritors on earth: if then any who rejects Allah, their rejection works against themselves" (Qur'an, su.35:39). The interpretation of this verse is that man is only a manager of the earth and not a proprietor (Mortada, 2003); and that man may realize the following objectives: (a) contemplation and worship, (b) inhabitation and construction, (c) utilization and (d) enjoyment and appreciation of beauty." So man's responsibility toward the natural environment can be framed within the two principles of utilization of natural resources and preservation of natural balance (Mortada, 2003, p. 43).

#### ***Islamic Principles of Utilization of Natural Resources***

According to shari'ah, the utilization and sustainable use of natural resources and elements are the right and privilege of all people. This right is to a certain degree considered by Islam as an obligation (i.e., to restore derelict lands and act as good stewards of nature). In fact, Qur'an makes it clear that the relation between man and nature is a relationship of utilization and development (Mortada, 2003); meanwhile, it disapproves of any selfishness associated with this utilization. Natural resources have been provided by God for the welfare of all people as it says:

*God has blessed the earth to all (of the creatures and people)*

There are also many verses and hadiths, which emphasize on surveying the nature and its mysteries to properly exploit its resources. For example in a verse it says:

*And God has let the possession of the heavens and whatever is in the earth to you and in that, there are clear and numerous signs of God's blessing, of course for those who use their mind and intellect.*

What discussed above, would lead to the following principles of proper exploitation of nature (Shafiei Mazandarani, 1999, p. 139):

1. The nature and all natural elements are all in the possession of humankind to be exploited (humankind's mastery of the environment),
2. All dimensions of nature are possible to be mastered by human being, and man can master any dimension he wants by implementing his mental and practical power,
3. By implementing his mental and practical power,



- man can know and exploit nature in a better and more proper way,
4. Mastering the nature and exploiting it, is in relation with the provision of life necessities in this world while regarding afterlife,
  5. Regarding the fact that nature is exploitable, man has a crucial responsibility; that is the responsibility of discovering and knowing dimensions of nature and exploiting it properly.

### ***Islamic Principles of Preserving the Natural Balance***

Although Islam asks people to benefit from the natural environment for their living necessities, it encourages and makes require them to maintain it. Many Qur'an's verses and Prophetic hadith command Muslims not to abuse or damage plants or animals [and probably the natural landscape of nature]. From a number of verses we can come to the fact that natural creatures and elements are co-inhabitants of this universe and should be treated as communities in the same way as humans and should not be harmed (Mortada, 2003).

The Islamic principles of preventing the destruction or abuse of any natural elements that provide benefits for others aims also to protect people's rights (i.e., utilization) to the natural environment. Therefore, man should not distort natural elements; they should remain permanently suitable for human life and settlement. Nor should he use natural resources irrationally or in such a way as to destroy other resources or spoil their habitats. For instance, water as a basic natural element is, according to the Qur'an (i.e., Sus. 21:30, 2:64, 6:99, etc), created as the source and origin of life. So, this element should be preserved from any actions or elements that may spoil it. Similarly, air is created for the perpetuation and preservation of life. It is also clear evidence for God's omnipotence, bounty, provision and perfection (i.e., Qur'an, Su.21:164), thus, it should be pure and unpolluted. Chemical materials and biological products- that could directly or indirectly-cause damage the natural elements have been forbidden by Islam. This is also applied to noise, wastes, exhaust gases, radioactive substances, insecticides and other pesticides and intoxicants.

The intention of this law is to preserve the harmony that is provided in the natural environment (Mortada, 2003, p. 93). Indeed, Qur'an emphasizes on the preservation of this harmony and says that whatever God has created in this universe was created in due proportion and measure both quantitatively and qualitatively. It says, "Every single thing is before His sight, in due proportion" (Qur'an, su.13:8).

The harmony God has provided in nature symbolizes

His greatness, and hence guides man to mediate upon and contemplate God. Therefore, it is the responsibility of man to preserve this ecological order (Mortada, 2003).

As a result, Islam's viewpoint towards preservation of nature, which is one of its main objectives, can be put into the following principles (Shafiei Mazandarani, 1999, p. 146):

1. Revitalization of nature and the environment,
2. Preservation of nature, the environment and its generosity,
3. Respecting the nature.

### ***Special Attention to Earth and Water***

There is a special attention to water and earth in Islam and especially in the Qur'an verses. Earth and water are the two [usually] interlinked natural elements, which have been mentioned many times in Qur'an. Water is introduced as the source of life and developing and enhancing the earth (Naghizadeh, 2003); A survey on Qur'an shows that earth is one of the most important elements whose revival by water is explicitly mentioned many times (Naghizadeh, 2003, p. 82); besides that, there are many verses that show the role of water in developing and enhancing them. In other parts of holy Qur'an, there are other verses that list multiple roles of water as a factor of growth, development, and the contribution to the growth of many kinds of different plants and reviving the dead land (Fig. 6).



**Fig. 6. Water Reservoir Earth Architecture Shaped in Harmony with Nature**

### ***The Cultural Fundamentals of Iranian-Islamic Architecture***

Iranian culture which has Qur'an's instructions as one of its bases, introduces the methods of implementing natural resources as values for life. These values define how to use nature and natural resources. Values like



perfectness, avoiding extravagance, maintaining balance, earth promotion, avoiding uselessness, contentment, etc., tell us that any activity regarding nature should lead to a degree of perfection and promotion and be empty of uselessness (Naghizadeh, 2002). Meanwhile, the use of resources must be based on specific and definite measures. As a result, the use of indigenous materials, the selection of proper forms and colors, attention to the kind and method of exploitation of natural resources, tendency towards perfectness and the perfection of materials are the main features of Iranian-Islamic culture. These values affect the attitude of man toward natural environment to act as the following (Naghizadeh, 2002, p. 38):

1. Promotion of land and avoiding uselessness,
2. Trying to develop the land,
3. Indigenosity of architecture,
4. Special attention to the human values,
5. Unity and inter-relativity of all environmental elements,
6. Tendency towards perfectness,
7. Providence,
8. Contentment

### ***The Natural Image of Sustainability***

#### ***Sustainability***

Sustainability stems from the word sustain. Some meanings of sustain that are important to this paper include: to keep in existence, i.e., to maintain a statuesque, to maintain a static state or maintain a rate of growth. Sustain also means to keep alive. Sustainability is the ability to sustain (Cambridge dictionary, 1995, p. 1472). In the context of this paper, the word sustainability is used as it relates to the concept of sustainable development. Something is said to be sustainable when it can be maintained. Development is a noun that stems from the word develop. To develop means to grow or change into a more advanced form (Cambridge dictionary, 1995, p. 377). This growth can be quantitative or qualitative or a mix of both. According to Coetzee, development is "a concept carrying with it the connotation of favorable change: moving from worse to better; evolving from simple to complex; advancing away from the inferior" (Coetzee, 2001, p. 20). Sustainable development is a development that can be maintained forever. Sustainable development is defined quantitatively and qualitatively in relationship to man whereby development should provide for his needs today while taking into account the needs of future generations: The main motivation behind sustainable development is to sustain the species homo sapiens. Sustainability is thus the condition or state that

would allow the continued existence of homo sapiens; Thus, Sustainability is the goal, while sustainable development is the process of attaining the goal (Plessis, 2002, pp. 5-6). Green architecture is also a term entitled to the architectures which dedicate great importance to the environment, is one of the characteristics of the sustainable design in which environmental sustainability is more important (Burnett, 2007). The Earth architecture which has been analyzed in this paper would be categorized into a green sustainable group of architectural building technologies.

#### ***The Natural Image***

In the book *Design with nature*, published in 1969, Ian McHarg argues that:

*"If one accepts the simple proposition that nature is the arena of life and that a modicum of knowledge of her processes is indispensable for survival and rather more for existence, health and delight, it is apparent how many apparently difficult problems present ready solution"*.

In the natural image, the key to sustainability is to work with, not against nature; to understand, sensitively exploit and simultaneously avoid damaging natural systems (Williamson, Radford and Bennets, 2003). "Design with nature", at the building level, is a code for recognizing natural elements to work with in order to make somewhere for people to inhabit, while protecting specific natural features. In this attitude, natural features are used instead of mechanical ones, and the building has a co-existence with the natural element. Thus, both the building and the "other" elements of nature are sustainable. This image of architectural sustainability, then, mirrors a view that it is necessary to treat human activities as a non-damaging part of the ongoing ecological landscape, with a brief that "nature knows best" (Williamson, Radford and Bennets, 2003, p. 37). The eco-centric logic (that is identified by Guy and Farmer) embraces this image of sustainability, linking it strongly with a rhetoric of a fragile, delicately balanced earth where straying far from this path will lead to environmental catastrophe.

As Williamson et al. (2003) quote:

*"The natural image naturally assumes purity in the environment, because pristine nature is unblemished by the act of building. Moreover, the calming and stress-free attributes attributed to nature are also encompassed in this image so that mental health accompanies physical health: a healthy mind in a healthy body in a healthy building, in which humans and other creatures live in a happy harmony."*(Fig. 7).





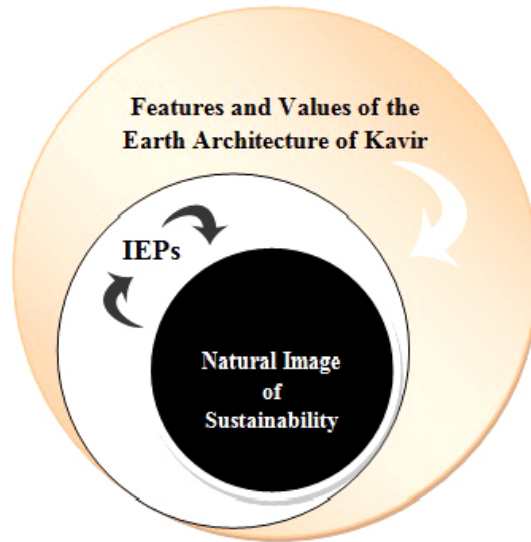
**Fig. 7. Earth Architecture Decaying Back to the Mother Nature**

Within this image, materials which are used are those of nature; straw bale, rammed earth and pressed mud brick, or rough-hewn stone, and natural timber rather than manufactured timber particle boards, all with natural finishes. Soft, organic curves may be favored over hard mechanical angles and earth colors over fighting brighter ones. Thus not only the building doesn't dominate its natural setting, but also it expresses a complete harmony

with nature. In this image, an impression of shelter is provided, but it is constructed of local materials with least impact on the context environment and will decay back into the same environment. In order to bring about a mutual benefit to ourselves and to the nature, we should be prepared to live as close to the nature. Designing regarding to the nature can provide both physical and spiritual comfort and would let the building live in happy harmony with its context (Williamson, Radford and Bennets, 2003).

**CONCLUSION; THE OVERLAPPING AND INTER-RELATED VALUES**

Comparing the features and the values lying in the earth architecture of Kavir, which is the physical formation of the fundamental values of Iranian-Islamic culture, with the IEPs and also the different logics related to the natural image of sustainability, it can be concluded that this architecture has in it the values and the characters mentioned in IEPs and the natural image of sustainability and that these two bases, are inter-connected. We may possibly say that the Qur'an instructions on both exploitation and preservation of nature cover the sustainable development principles (Fig. 5).



**Fig. 5. Diagram Showing the Relation of Kavir Architecture with the IEPs and the Natural Image of Sustainability**





## ENDNOTES

1. *Kaviri* is the adjective for “Kavir” meaning “of or related to Kavir”
2. *Biabani* is the adjective for “Biaban” meaning “of or related to Biaban”

## REFERENCES

Abaft Yegane, M. (2007). *Designing the Center for Kavir Studies*, TarbiatModares University M.A. Thesis in architecture, Tehran, Iran.

Burnett J. (2007). City Building-echo-labels and Shades of Green, *Landscape and Urban Planning*, 81-93.

Cambridge International Dictionary of English, (1995). Cambridge, Cambridge University Press.

Coetzee, Jan K. et al. (eds.). (2001). *Development Theory, Policy and Practice Cape Town*, Oxford University Press Southern Africa.

Dehkhoda Persian Encyclopedia.

Elizabeth, L. & Adams, C. (Eds) (2005). *Alternative Construction: Contemporary Natural Building Methods*, Published By John Wiley & Sons Inc, London & NY.

Ghobadian V. (1996). *Analyzing Iran's Traditional Structures from a Climatic Perspective*, Tehran University Press, Tehran, Iran.

Hashemian, L. (2004). *Designing Kaviri Garden (With Emphasis on Natural-Environmental Factors)*, Tarbiat Modares University M.A thesis, Tehran,Iran.

Kasmae M. (1993). *Climate Zoning in Iran, Housing and Residential Environments*, Building and Housing Research Centre, Tehran, Iran.

Mortada, H. (2003). *Traditional Islamic Principles of Built Environment*, New York: Rutledge Curzon.

Naghizadeh, M. (2002). Cultural Fundamentals of Iranian Sustainable Architecture, *Journal of Maskan-o-Enghelab (Housing & Islamic Revolution)*, Vol.100, 32-49.

Naghizadeh, M. (2003). Characteristics of Water in Iranian Culture and Its Effect on Shaping the Living Environment, *Journal of Environmental Studies* 32 (4), University of Tehran, 71-92.

Plessis Chrisna du (ed.). (2002). *Agenda 21 for Sustainable Construction in Developing Countries*, Pretoria, CSIR Building and Construction Technology.

Radmand, D. (1999). *Islamic Thought in the Studies of Sustainable Development Preserving the Environment*, The First Conference of “Islam And The Environment”, Tehran, Iran, 65-77.

Shafiei Mazandarani, M. (1999). *The Effect of the Environment on Human Bing from Islam Viewpoint*, The first conference of “Islam and the Environment”, Tehran, Iran, 137-141.

Tavassoli, M. (1979). *Urban Structure and Architecture in the Hot-Arid Zone of Iran*, Roshdieh Publishing, Third Edition, Tehran, Iran.

Tehrani, F. (1998). *The Role of Earth in the Vernacular Architecture of Central Iran Plateau*, Traditional Structures Series of Papers, Center for National Architectural Documents, ShahidBeheshti University, Tehran, Iran.

The Holy *QUR'AN*.

Williamson, T., Radford, & A. Bennetts, H. (2003). *Understanding Sustainable Architecture*, London, England, 27-29.

Ziari, K. (2000). *Qanat Technique In Iran And Its Role In The Initial Shaping Of Iran Settlements*, SID Documentation Center, *Journal of Technical Sciences*, Vol. 28, 81-90.

