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The Role of Nature as the Infrastructure of Public Landscapes on Sustainable Development of Kerman City*

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Abstract

Sustainable development is one of the main challenges of human being in recent years. Sustainability science has been introduced as an approach to modify the interactive relationship between man and nature. This approach has provided three components for sustainability of cities: society, the environment and the economy. In one of the latest presented models, the environment has been considered as an infrastructure for two other factors. It seems to be possible to retrieve this pattern in cities that have been able to stay sustainable over the years. The city of Kerman is a good example of the sustainability pattern in which the city (community and economy factor) is based on the nature infrastructures (environment). The main natural infrastructures of Kerman city can be described as desert, water and mountain. Kerman's public landscape, which are the products of people's beliefs and the interactions between the society and the environment, are influenced by these three natural elements of Kerman, so that at least one of these three is influential on the so-called landscapes. The aim of this paper is to recognize the natural infrastructures of the Kerman city, and to answer the question "how it is related to the urban perspective?" Afterward, the given content has been discussed through analyzing the qualitative data of the case study, Kerman city, and concluding from it. This paper first introduces the patterns of sustainable development and natural infrastructures. Afterward, the natural landscape and public landscape was defined in order to study the role of the natural landscape infrastructures on the public landscape of the city. At the end, a classification of natural infrastructures was defined in order to classify the public landscape in Kerman based on their relationship with the natural infrastructures.

Keywords: *Sustainability, Natural Infrastructure, Natural Landscape, Popular Landscape, Kerman.*

Introduction

Today, one of the main challenges facing mankind is to achieve patterns that will lead to its survival and sustainability. Cities, as one of the physical aspects of human's "presence" in nature, need strategies that ensure the continuity of their lives. Sustainability can be regarded as a kind of interactive relationship between human and the environment that help the continuity of both human beings and the environment survival (Hemmati, 2016). Today, due to the crises that arid cities are facing to survive under difficult natural conditions, the question of "How to get connected to the natural context?" has become significantly important. One of the methods for acquiring the required cognition is the analysis of case studies that addresses the achievements in this regard. The city of Kerman, located in a low water area and deserted region, is a typical example of the sustainability of a human being. In spite of the tough climate, this city is one of the oldest cities in Iran, which has remained stable throughout the history, and today, it continues its dynamic life. The survival of the city shows that its inhabitants were able to achieve a proper pattern during the historical periods has developed sustained interaction with nature. This research seeks to answer the question "What is the relationship between the city of Kerman and its natural context, which has ultimately led to the sustainability of the city in such a nature?" For this purpose, this essay first outlined the concepts of sustainability and natural Infrastructures, and then by introducing the city of Kerman as a sustainable example, provided analytical explanations and examples on how the city connects with its natural infrastructures.

Sustainability and nature

One of the issues that attract so much attention in the contemporary landscapes is the concept of sustainability. Sustainability and survival of the public landscapes, which are the material and spiritual reserves of societies, are among the first priorities of its inhabitants. So far, many scholars have focused on sustainability issue and ways to achieve it, but most of experts believe that in order to achieve sustainable development, three essential elements must work in connection with each other: society, economy, and the environment. Also, one of the topics discussed by the scholars is the relation between these components. Previously, in models that were used to connect these components, these factors have been considered separately and with equivalent weight (Fig. 1a). However, after a while and by raising the environmental issues, new attitudes have emerged for explaining their relationship. One of them is a model that describes the environment or nature as an infrastructure for the other two factors to achieve sustainable development (Wu, 2013); (Fig. 1b). Understanding nature as a platform that includes human interaction with the society has a huge impact on our understanding of the biological systems sustainability of the cities.

Nature as an Infrastructure

Landscape ecosystem thought can potentially play important roles in the planning and designing of "urban infrastructures". Landscape architecture can serve as a driving force for the practical application of ecological principles in urban issues (Khansefid, 2016). Infrastructure can be described as elements of a set of related systems that shape the activities of societies and provides the necessary services for development and sustainability of the society (Da Silva & Wheeler, 2017). In some definitions, the emphasis was on this concept that these infrastructures are made by humans. For example, Al-Hashimi considered the infrastructures as a network of handmade independent systems. He believed that by operating this network it is possible to produce different goods and services and helps the distribution of these goods and services to have a continuous circulation. Accorsing to him, without these infrastructures the contemporary societies, especially urban societies, cannot survive (Alehashemi, Mansouri & Barati, 2016). However, in the definitions given in the late 1980s, ecosystems were identified as infrastructures due to its environmental services and benefits for human
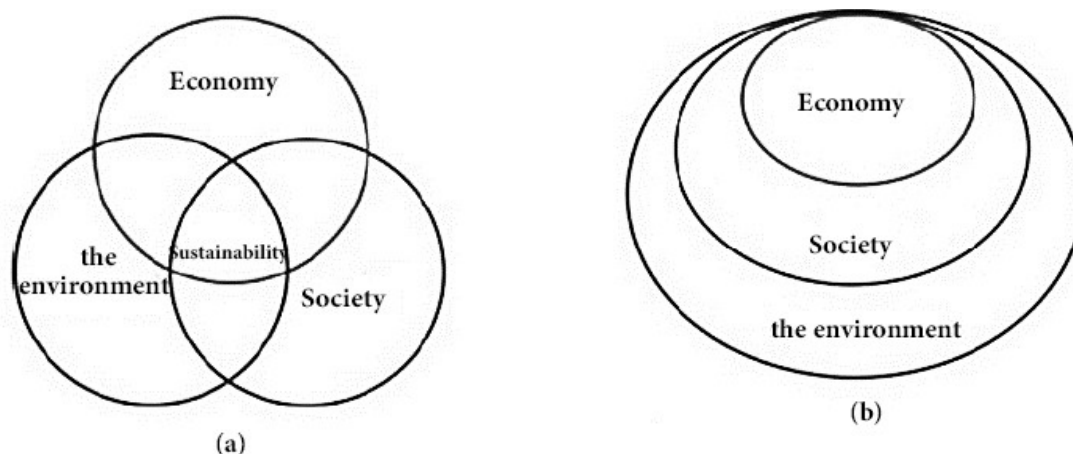
Fig. 1.Two models presented for the relationship between sustainable development components, in the (a) (former) model, the contribution of the three components is identical, and in the (b) (new), the environment includes society and the economy. Source: Wu, 2013.

societies (Da Silva & Wheeler, 2017). Therefore, the success of a city in providing the means for economic-social and health development, well-being and security of citizens depends on factors such as its location, its neighborhoods, and its natural resources. In other words, it depends on its environment (Masnavi, 2011). The term "natural infrastructure" was first used by Sajaloli in 1996 to emphasize the importance of wetlands in water management activities (Sajaloli, 1996). Afterward, this term was widely used by scholars. As a social settlement, the city itself has a system that accepted structural developments and changes and manage it. The adaptation of these two systems with each other is inevitable for the city's stability. In this regard, a city system requires more adaptation with its natural or environmental system and needs to adapt itself to natural infrastructures as well (Masnavi, 2011). Also, Mojatehdi believes that understanding and mapping the natural infrastructures of the city, gives it a sustainable feature. But, the emergence of this trait requires a holistic approach for dealing with the city, so that considers the city and nature altogether and as a system (Mojtahedi, 2010).

Development of Kerman city in terms of natural infrastructures

Kerman is the product of combining three natural elements: mountain, desert and water. Kerman is located on the edge of the desert and is near the high and scattered mountains. The area of the city was created at the foothills of the Saheb Al-Zaman Mountain, which forms the city watershed (Mansouri, 2007). The first development of this city was from the East-West side and was started from the foothills of the mountain, which was extended along the water way of these heights and ends on the edge of the desert. The main structure of the city includes all the main functions such as markets, fields and buildings (social and economic factors) have been located on this natural axis. However, over the years, the water flow was decreased, and now the formation of Qanat chains that passes from north-south direction of the city's former development axis, has happened, but the basis of the city's space organization is still these three elements.

The aforementioned content suggests that urban development is based on natural infrastructures and residents of the area have experienced things similar to the model presented today as a sustainable development model. In other words, the correspondence of the urban system with the natural infrastructures of the city has led the city to be formed based on the natural infrastructures and remain stable over the years (Fig. 2).

Nature Infrastructures for the public landscape

One of the most commonly used landscape categories is the classification based on the "human" presence in

the process of landscape development. Accordingly, the landscape can be divided into two general categories of "natural landscape" that human beings are not involved in its development and the "cultural landscape" created by human influences. Therefore, natural landscapes are landscapes that existed before human interventions, and sometimes referred to as the existed nature (Cousteur, 2015). public landscape are one of the cultural landscape subcategories, since it is created by the influence of humans. The main theme of the "public landscape" is the landscape that was formed by the social and economic interactions of the people in a community. The people landscapes are collections of people's deeds and beliefs that have been accumulated throughout the history in the collective memory of peoples and are transmitted from generation to another generation. The historical development of the city indicates that the city has begun its development from the mountain and extended up to the desert (Mansouri, 2007). It should be noted that the combination of nature and the biological processes has been directly exposed to the human audiences in

order to perceive, that is to say, human society was in convergence and symmetry with the nature and its developmental progress (S. Berenji & Barati, 2011). This approach will lead to a proper perception of the natural infrastructures of the city and maintaining them for the survival of the city. This holistic view toward the city landscape, which is viewed as a coherent system whose elements is interconnected, and contrary to the traditional methods of economics-oriented planning, pays more attention to the ecological network of the city in order to optimize the ecological functions of urban spaces (Sadeghi Benis, 2015). By studying the urban structure of Kerman city, it can be deduced that urban organizing is formed based on a special natural body that is a combination of mountain, water and desert elements and was shown in Jianguo Wu[1] model. Infrastructures environment is considered to be sustainable for the other two factors. Therefore, if both societies and economies are considered as a dimension of people landscape, then, the natural landscape of mountains, water and desert can be considered as sustainable infrastructures

The direction of waterway in the city
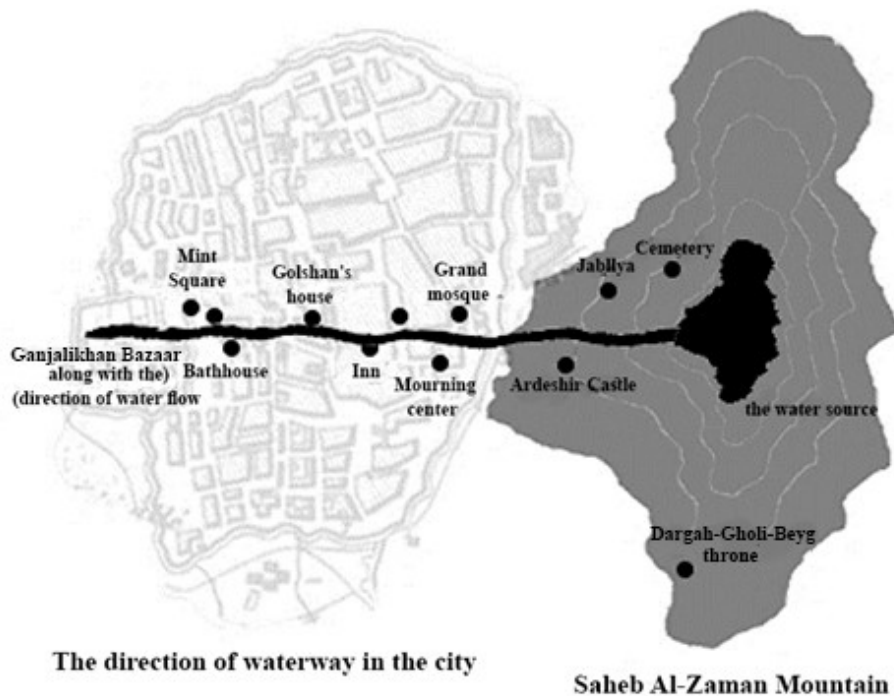
Saheb Al-Zaman Mountain

Fig.2. The city has been developed in the east-west direction along the water that originates from Saheb Al-Zaman Mountain. This schematic picture shows that the most important commercial, religious, service and social functions of the Kerman city have been created along the water infrastructures. Source: Author.

required for shaping the city's public landscape. Thus, the public landscape can be categorized based on these three elements:

1. Mountain as an Infrastructure

Saheb Al-Zaman Mountain[2] is located on the eastern side of Kerman city. This mountain has served as an infrastructure for the formation of "Ritual Landscapes" of Kerman residents from past to present. Ghaleh-Dokhtar Castle and Ardeshir Castle are signs of pre-Islamic settlement in Kerman city that are located on the highlands of this city (Fig. 3). The oldest works in this section represent the facilities that are related to the sacred places of the city and the Mehr and Anahita worship rituals (Mansouri, 2007). Like other pre-Islamic cities, the government sector and the sacred area of the Kerman was placed on the high altitude places dominated and ruled lower areas. In addition to pre-Islamic castles, the Saheb Al-Zaman Mount has different ritual landscapes such as the main cemetery of the city and the Dargah-Gholi-Beyg throne (Fig. 4). The cemeteries have been built in the contemporary era, which includes mosque and pilgrimage functions, located in a short distance from the Takht Dargah of Qoli Beig. Dargah-Gholi-Beyg throne is an edifice located on the southern corner of the Ghaleh Dokhtar. This mansion is a brick-based Chahartaqi[3] built on a number of graves. The location of the ritual landscapes of Kerman city in this place from the ancient times to the contemporary time (Mehr and Anahita facilities, the main cemetery of the city and the building of Dargah-Gholi-Beyg) indicates the continuity of the ritual interactions of the inhabitants of the city with the sacred meaning of the mountain, which has created a unique public landscape.

2. Water as an infrastructure

In the past, cities needed water for two main purposes: 1) drinking and healthcare, 2) for agricultural use. However, as time passed, the need for water has exceeded from the two main needs in daily life of the people, which has led to the emergence of the role of water as a landscape in the city and made it a memorable and lasting element in the People's mind (Sheibani & Farahanifard, 2013). The watershed at the bottom of the mountain, after Islam, was constructed along the waterway structures of the city. The main route of Bazaar, which is the main part of this bazaar, has been created along this rout and shaped the structure of Kerman. Although water is not that much visible in the Kerman market, placing the Bazaar axis along the flow of waterway coming from the mountains was carried out with the goal of placing the water facilities, which attracts population, near each other. The Bazaar landscape is not only a place for economic exchanges, but also ritual interactions (such as mosques and temporary mourning centers) and social interactions (such as squares and Chahaar-Soogh) and a place for political consolidation (e.g., the existence of the main mint of the city in his place) are also considered in this bazaar and its multi-functional axis. In other words, water can be considered as the basis of "urban landscape" formation in Kerman city.

For example, Ganjalikhan bath is one of the functions conducted in line with the water infrastructures that are located on the southern side of the Bazaar Square. Due to the emphasis on bathing in Islam, it is possible to imagine that this bathhouse was one of the thriving and popular spaces of the Bazaar. Sarbineh architecture of this Bathhouse is a representation of social classes during its lifetime, which suggests that the bathroom space is not only considered as a service space, but also serves as a space for the forming a landscape for public interactions (Fig. 5). Also, the grand mosque of Kerman is also located along the Bazaar, and water has a meaningful presence in its vast pond in front of its eastern entrance, which has made it a unique urban environment. In this building, the water has become the interactive tool between the city and the mosque (Fig. 6). The above examples demonstrate the conscious adaptation of the city's artifact infrastructures to the water structure of Kerman city and indicate its compliance with the Jianguo Wu sustainability model.

3. Desert as an Infrastructure

Despite the low water barriers, the desert region has

Fig. 3. Ardeshir castle, pre-Islamic sacred area that is located on the Peak of Saheb Al-Zaman Mountain. Source: www.mehrnews.com.

Fig.4. The body of Dargah-Gholi-Beyg that is located at the southern corner of Ghaleh Dokhtar Mountain. Brick is the main material used in construction of this chahartaqi. Furthermore the chahartaqi was built on a number of graves. Source: www.mehrnews.com.

provided plenty livelihood opportunities for the inhabitants of this area. such as the Shazdeh Mahan and the Fath Abad Gardens and oasis such as Shahdad, Sekanj, Kahnuj and also waterless landscapes such as the Shahdad desert landscape created a special natural and economic infrastructures for Kerman. Desert gardens such as Shazdeh Mahan and Fath Abad edifice garden are examples of the knowledge and skills of residents of this region for developing the microclimates within a desert, which is indication of fundamental role of nature in the formation of popular "recreational landscapes" (Fig. 7). This concept has led to development and exploitation of the desert landscape in the form of projects such as Haftabagh Alavi, which was created with the goal of creating a green axis between Kerman and Mahan, or the creation of tourism infrastructures in the Shahdad Desert, that accommodation places and recreational services are some examples of it[4] (Fig.8 & 9).

Conclusion

One of the challenges facing sustainable development is to achieve patterns of sustainable interaction between man-made environments and the surrounding environment. What is nowadays presented as a sustainable landscape is emphasizing on the interaction of three factors: the environment, society, and economics. Recent patterns of sustainable urban development emphasize that the survival of a city depends on the social and economic aspects of natural infrastructures. Kerman is an example of the historic cities of Iran that has been able to survive in a difficult environment and remain stable throughout the history. This study showed that the sustainability of the city over time was dependent on compliance of public landscapes and its natural infrastructures. As it was indicated, the public landscapes are the result of social interactions that the inhabitants of this city had made. The nature has an infrastructure role and can be classified according to the natural infrastructures (mountain, water and desert), in which at least one of these three elements is considered as the main infrastructures. It seems that among all sorts of public landscape, the mountain has been seen as a "ritualistic" platform, water as an "urban landscape" and desert as a "recreational landscape". The study of Kerman's past and present experiences suggests that the correct interaction of human infrastructures with natural infrastructures will sustain the city and its accurate understanding can lead to a model for the sustainability of new developments.

Fig. 5. A vast pond facing the eastern entrance of the mosque is a shared space between the city and the mosque and a place for citizens' interactions. Source: www.yjc.ir.

Fig. 6. The presence of water in the Ganjalikhan bathhouse was considered as a structure for development of an interactive landscape in the bath. Photo: Mohammad Sadegh Tavakoli.

Fig. 7. Prince Mahan Garden, an example of a garden within the desert. In fact, the beauty of these gardens is more dependent on the external places and its contradicting relationship with the desert rather than the internal part of the garden. Source: www.shahdadbastan.blogfa.com.

Fig.8. The tourism infrastructures in the Shahdad Desert, which is presented as recreational services, does not fit the natural context of the desert. Source: khaandaniha.ir

Fig. 9. Haft Bagh Alavi. The purpose of this project was the physical development through water transferring and using the limits groundwater resources, without paying any attention to natural infrastructures. This kind of development, which is in contradiction with the conceptual model of Wu's sustainable development, creates an unsustainable landscape that is disturbed by the passage of time and destroys the water resources. Source: haftbagh.ir.

Endnote

1. Jianguo Wu.
2. The name of the mountain, titled "Saheb Al-Zaman" also shows the holy and metaphysical attitude of the people of Kerman toward this mountain.
3. Citizens named this place as "lake", which probably refers to the existence of water in front of the eastern porch.
4. In projects like Haft Bagh Alavi, it seems that because of the disparity of the structure of the artifact on the natural infrastructure, the taken actions dose not reach to the desirable result. To the point that in Haft Bagh Alavi, the lack of attention to the local water infrastructure has caused the instability and failure of this project.

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