

## The effect of sustainable urban infrastructures on the process of formation of historic cities in Iran

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### Abstract

Many purposes in urban growth and sustainable development are gained through conservation of the urban valuable heritage. Paying attention to the all city components causes sustainable conservation of the city to occur. Unfortunately, in modern cities disharmonious growth is seen. While the city is emptied inside and it has lost many qualifications, surrounding areas are grown greatly and major areas as well as the main components are not developed. Conserving the urban valuable infrastructure is one of the significant categories and plays an important role in formation of urban tissues in growing and developing of the city.

In this paper the historic and worthwhile tissues of cities in Iran are dealt and various infrastructures from environmental, continental, economical and social aspects are evaluated. The effect of infrastructures on formation of urban areas regarding environmental –regional constraints and their influence on the form of urban areas in addition to adoption of urban areas in urban extension, urban streets, social-economical cooperation in urban areas as well as the effect of city identification on its body are studied. In this research, specifically the effect of urban infrastructures likes aqueducts and *Vaqf* system in formation of passages, urban streets and urban open spaces as well as their progress is investigated. Obtained results show that sustainable urban policies can be applied. By knowing these infrastructures thoroughly and the way they have an effect on city formation and their interactions with urban tissue formation, urban restoration projects can be presented.

**Key words:** Infrastructures, Urban, City formation, Conservation, Sustainability.

### 1. Introduction

Among human constructions, the most complicated and important thing that human efforts can be manifested is city. The effective factors in formation of city and urban spaces are climate-environmental, religious-social, and economic factors that each one has diverse subdivisions. The role of these factors along with time and different climates in varied environments has various influences in the formation of cities (Saeidi, 1987, 6).

Architecture and historic urban planning in Iran have values as well as cultural, religious, social, economic, and physical concepts. Exploring the architectural concepts and traditional urban planning in addition to the conservation of these values and honoring the principles and elements of urban planning not only help the new urban infrastructures greatly, but also cause the principles of urban sustainable development in the historic contexts to be reinforced. Since many purposes of new urban planning growth and sustainable development are obtained through heritage conservation and valuable urban contexts, it assures that having these religious, environmental, social, and economic values cause the city to approach sustainable principles and sustainable future would be obtained. Because sustainable urban conservation is a universal approach as well as regional-vernacular activity, it can be used for urban sustainable infrastructures in each region and conservation of the values would be obtained in the best possible way. Unfortunately, in many modern urban developing designs, the continuity of sustainable principles of historic cores of cities has not been observed and sustainable development has been considered with no attention to the city originality for the present and future urban designs. In urban planning system in Iran for sustainable urban conserving designs, it has been paid less attention to the qualitative dimensions of urban environment. Considering this issue, qualitative concepts in sustainable urban conserving designs are required.

## **2. Research Methodology**

This article deals with the recognition of urban sustainable infrastructures and their influences on the cities formation and their interactions. This recognition is based on the effect of religious beliefs of people (e.g. dedication system or *Vagf*) and water supply (e.g. aqueducts) on the formation of city as well as studying this effect on the urban sustainable development and conservation. This article uses literature reviews, discretional method, and observation technique as well as environmental understanding.

## **3. Theories of Islamic cities formation**

Many western and eastern historians have been considered the progress in agricultural economy as the major factor in the formation of initial cities. Focal theory of city formation is the agriculture priority theory, as well as additional production in excess of need that has been lead to the city market formation (Tavassoli, 2000, 34-36). Some believe that the first step in cities formation is to choose its location and this can be achieved by water access and the ways to other urban centers (Etezadi, 1367, 78). Sometimes strongholds have been developed and have changed to the cities that had military usages, for example, Rabat, capital of Marrakesh. There were other cities that were constructed around the tomb of religious people. The most important ones are Karbala, Meshed, Quom (Ashraf, 1963, 8-50). It can be said that the reasons and purposes of city formation in Islamic countries are different. Some theories are related to the formation factors, urban infrastructures and some natural factors such as water access (Hydraulic theory) as well as the formation of agricultural centers, and some other theories consider effective human factors in cities formation like political, economic, cultural,

religious, social factors. But based on Amus Rapaport's theory, the cultural factor especially religious beliefs is the base of human settlement creation (Rapaport, 1987, 19).

#### 4. Effective factors in the formation of urban spaces

Generally, the infrastructures in the formation of urban spaces in Iran can be divided to the following factors:

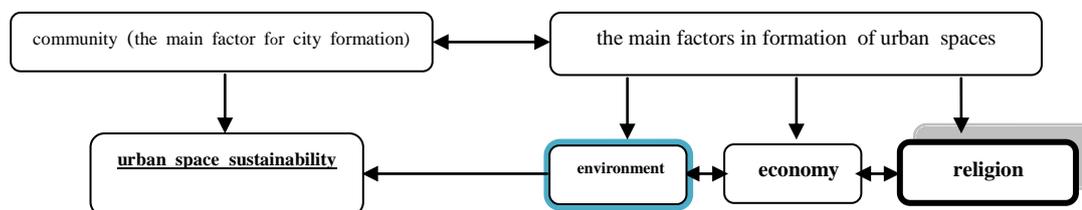


Diagram 1. Drawing of author

##### 4.1. World viewing factor (religion)

World viewing has a great effect on the life and activities of human. It can be seen in every structure and human behavior. Religious values are very determinant in the formation of urban spaces in Islamic periods. Therefore, in Iran despite the varied climate and natural environment, it can be seen similar spatial system in many cities. This case shows the great effect of culture and Islamic beliefs on the formation of Islamic cities.

##### 4.2. Economic factor

Certainly, economic factor has a huge effect on the formation of urban spaces and a variety of economic ways in various periods are the factors for formation of varied spaces (Shahabi, number 72, 137).

##### 4.3. Climate-environmental factor

This factor as a restricting one would form the habitat and the city. The compatibility between urban constructed spaces and environmental conditions is an important principle in the formation of urban spaces (Habibi, 2006,40-48). Iranian traditional urban spaces are homogenous spaces (Tavassoli, 2000,36). These three mentioned factors have an effect on each other and have not been separated from each other.

Among these factors, the effect of religious values and environmental factors on the urban spaces especially in Islamic periods is the most significant one. One of the points of view in Islamic culture that manifests Islam is the spatial-physical effect of dedication. *Vagf* effects present the best Islamic aspects that are beneficial for both the individuals and the society, In addition to one of the most important environmental factors is urban water supply network that has a great effect on the city formation.

#### 5. Order in the historic cities structure

In the case of spatial organizing of buildings and passages it should be mentioned that historic-Islamic cities of Iran are not lack of order but they have biologic order. Having urban infrastructure, geology and city order would be determined step by step during its

growth (Afshar, 1996, 4-53). Some believe that the complex and tangled context is the characteristics of Islamic cities, but this context would produce some kind of proximity and social solidarity and cause most people to have this solidarity. In Iranian historic cities besides apparent disorder, a kind of organic order has been established.

It should be noted that in the initial core of Iranian cities mostly surrounded by the fence, the passage network have been formed in terms of defense factors, ways, *bazaars*, irrigation canals, religion, etc. and had a complex context with an organic order.

Man and Freidman, as an example, have presented a particular rational system in traffic network for their discussion around Iranian traditional cities. This traffic network consists of the main street as well as its branches. From their point of view, the rational system is based on the combination of geology, facts that are related to the land possessions and topography. In their study on city Kerman, they (1971-1975) have investigated the factors that have an effect on the orientation of streets and houses. They have shown that topography and water supply have formed the first cultural concepts of Iranian settlements. Later, this attitude has been certified and applied by Bonine (1979). He was one of the few geographers had a spatial approach. In his article with the title of genetically morphology in Iranian cities (1979), he has investigated other factors except religion that have effect on the city formation and spatial patterns. Topography and water are not the only determinant factors in the physical contexts of traditional cities in Iran. Among the effective factors in the formation of streets, climate, wind, business, and defense, considerations can be mentioned (Kheirabadi, 1997, 17, 50). It is impossible to recognize a factor as the only determinant factor in Morphology of Iranian traditional city. This factor may be religion, natural environment, or economy (Kheirabadi, 1997, 114). The formation and development of Iranian traditional cities are the combination of many various factors that are obtained over several thousand years in urban life in Iran.

## **6. Purposes of development as well as urban sustainable conservation**

The purposes of sustainable development in each city would be determined according to the requirements of social development, desired usage of environment, and considering the economic status of the city. Therefore, the purposes of development and sustainable conservation are as follows: economic, social, and environmental sustainable purposes. All the mentioned purposes have subdivisions, e.g. in cities in Iran the religious factor accounts for the social purposes.

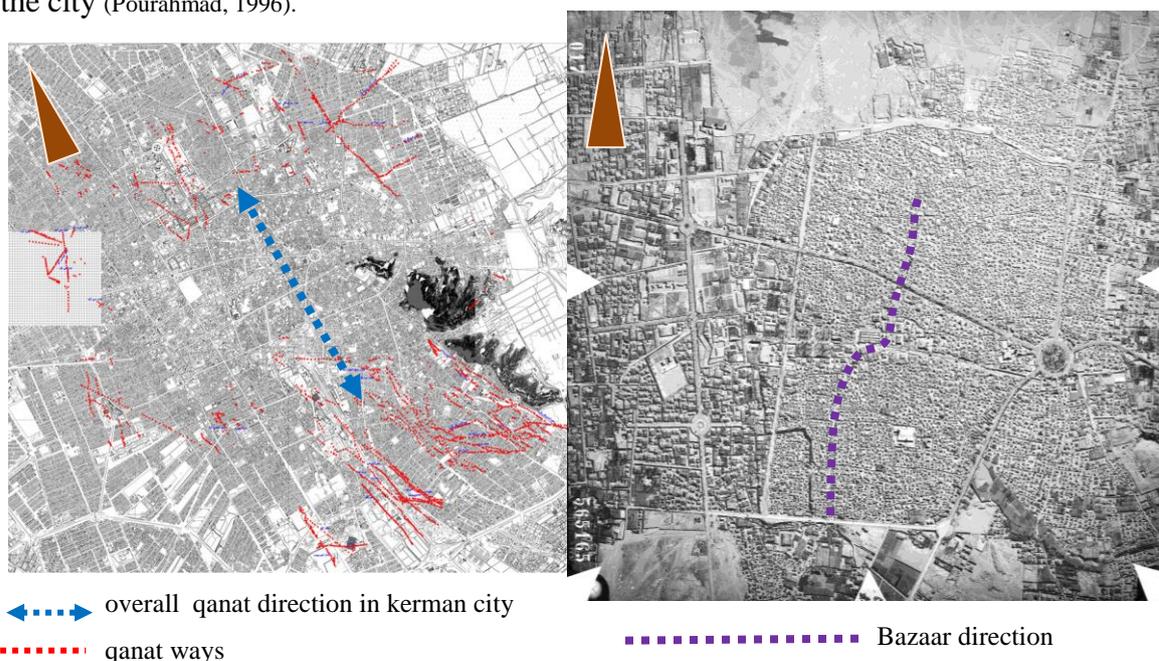
## **7. Infrastructures in formation of city Kerman**

As it is obvious, the old place of Kerman (before Islam) was next to the Ardshir and Dokhtar castle. This city was extended from the east to the west and had a limited extension. Therefore, the formation of city Kerman was based on a military-economic requirement. The requirement was Silk Road, Indian spice road as well as Oman sea coast that they passed the deserts of Kerman and Baluchistan and lead to the main Silk road. Spice road was the most important branches of Silk road and passed another passage. This road caused Silk road to thrive. There was a tendency to the west for the city development in Islamic period and the reason was that Hormoz road in Khorasan that passed from the west of Kerman had a business importance. In addition to the mentioned economic-business infrastructure, Kerman had religious-social as well as environmental

infrastructures and no attention is paid to it in the modern urban designs. This can damage these infrastructures.

### 6.1. Studying the effect of aqueducts in the formation of Islamic city Kerman

*Qanats* is a hydraulic structure which transfers the underground water to the surface of ground using gravity and ground slope. The form and the orientation of street drawing system in Kerman are justified according to the natural considerations and regional topography. Its topography is based on the region slope. The irrigation canals of *qanats* as well as the streams of water distribution operate based on the same topography and underpin the pattern of passage ways, bazaar and water storages with the south-north orientation. Factors such as appropriateness of winter sun, wind blow, and the slope reinforce this pattern. The slope of Kerman desert is not rough and reaches the maximum amount of 3 degrees from south to north. Since the southern mountains of this province are the highest altitudes of Kerman desert, waters enter the desert with a better slope. Desert Kerman has been extended between two mountains in its northeast and southwest sides. These mountains are effective on the formation of urban passages and prevent the city from the urban growth and development in this part. As a result, the future development of Kerman would be from other directions especially the west and south of the city (Pourahmad, 1996).



The effects of *Qanats* in city construction as well as the context of residential areas are completely obvious. Generally, the scarcity of surface water resources in Kerman desert result in the concentrated form of human settlements near the underground water resources such as *qanats*. Unfortunately, no *qanats* in Kerman is active and most of them are being damaged. The main passage of the historic city and the first passage of city bazaar (Mahmud castle bazaar, Castel square bazaar, and Aziz bazaar) have been completely compatible with the passages of city aqueducts and had a north-south direction. But after street drawing in Pahlavi period, these infrastructures have been forgotten gradually and the directions of city growth as well as the main passages have a west-east direction. The direction is not compatible with the urban sustainable principles. Because of the local

wind blow from west and the direction of sunshine in summer, the east-west passages have a great deal of problems.

One of the most significant damaging factors to the aqueducts is earthquake, drought, inharmonious development of cities, construction of deep wells, and lack of knowledge in citizens and urban planners.

## **6.2. Investigation on the effect of *Vaqf* (devotion) in the formation of Islamic city Kerman**

*Vaqf* is one of the economic infrastructures in Islamic world. Beside the social-economic consideration, it has many functions in daily life and urban activities. Physically, it has an effective role on the formation of spatial construction of Islamic cities especially Iranian cities. Having a look at to the physical context of Kerman city, it can be observed that many elements as well as city components have a great role in the operation and urban life. The dedication system is of a great importance in their formation. This influence is in such a way that if the public spaces as well as the endowment ones are neglected in Kerman, a sporadic collection of houses and private spaces will be remained.

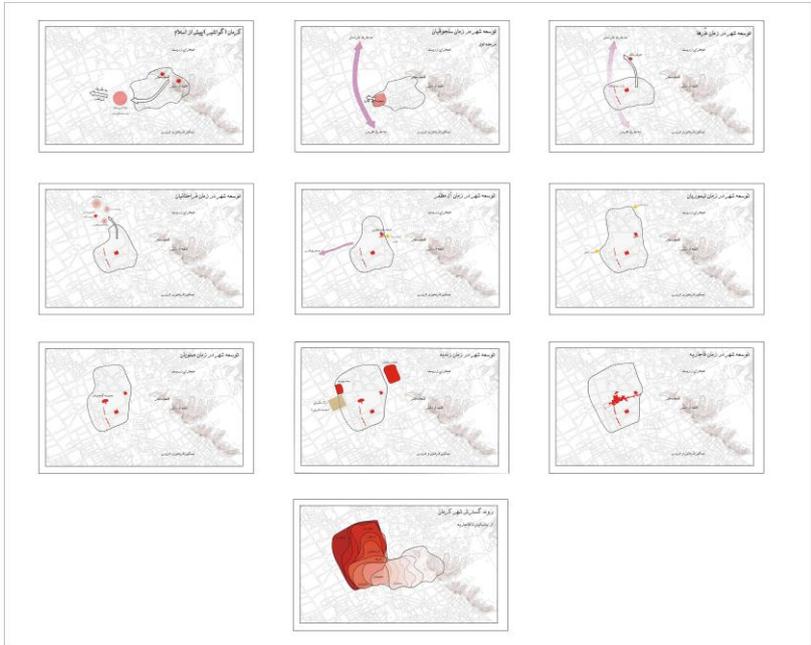
Actually, many public spaces in traditional cities of Iran which are the main connection of urban elements are *Moqufe*. Physically, the role of *vaqf* can be observed and investigated on the formation of the smallest physical elements such as mosques, schools, bathrooms, water storages, the lighting of passages, in addition to the production of the biggest urban spaces like bazaars, *Moqufe* collections. In recent conditions, Kerman has a lot of problems and dedication is obvious there. The available experiences that are used to meet the public requirements, is very effective and cause these problems to be resolved. Disability and weakness of urban management system in providing public services and urban spaces as well as houses, has required the attention to be paid to the *Vaqf* and each pattern that is effective in reinforcement of urban management operation. Therefore, in a city like Kerman with an average population and many problems, it is required to have such approach.

### **6.2.1 Development of Kerman city based on the *Moqufe* monuments**

Islamic city of Kerman has received its reclamation from the forth decade AH and with the entrance of Mohammad Ben Elias and city capturing. The main period of dedication in Kerman is referred to Saljughhi period. The largest part of it is related to the formation of Shah Adel region and construction of profitable monuments that had varied dedications. The most of *Moqufes* in Saljughhi period is the construction of Shah Adel service collection. With Ghos attack and their governing, the signs of dedication(*vaqf*) have been disappeared. There was a recession period in Kerman during Kharazmshahian governing. In Moguls attacking period, Kerman had one of the boom periods. In this period, Kerman is well-known to Gharakhtaeyan and a collection which named Green Dom, has been constructed. The next period in Kerman is related to Al Mozaffar period. Although, Mozaffari collection obtained physical concept through mosque and bazaar construction, but there is not complete information from that period. Safavie period is one of the urban as well as *vaqf* dedication developing periods. In valuable *Moqufe* of Ganjalikhan, varied monuments, and buildings have been dedicated. The collection of Ganjalikhan, city *qanat*, bazaar, square, etc. are some of them. Therefore, Ganjalikhan made a lot of effort to create many physical works, and formed a service collection that assured their self-sufficiency.

Afghan attacking caused *vaqf* periods and construction to be recessed and this situation continued till Agha Mohammad Khan attack. In Ghajar period, dedicated works and collections were created from which Ebrahim Khan collection, Vakil, Haj Agha Ali can be mentioned. In that period, bussiness was great and new works have been produced. Many

works stores, have and before *shamsi* , form of and been poor, works.



such as inns, bathrooms been constructed dedicated. Therefore, 1300 *hijri-vaqf* was common and occurred in the building, land, farm. The revenues have used for scholars, clergymen, the and restoring In all periods

that there was reclamation in Kerman, dedication *vaqf* has been also developed. As it is mentioned, *moqufe* monuments in various periods had an effect on the city formation and the skeleton of city is created based on these monuments.

Figure1

## 8. Conclusion

The valuable historic contexts of cities are sustainable because of the continuity and experiences. The diverse sustainable dimensions have been considered in their designs and are compatible with environment, climate, society, and economy. Most of urban valuable contexts that are available today are suffering from serious damaging and have lost some

values. To conserve the available values, and investments in the urban contexts and similar places, sustainable urban conservation policy should be considered. Therefore, it can conserve physical, environmental, cultural, historic, social qualities, sustainable urban principles as well as urban identity and promote these qualities to help urban sustainable development greatly and produce appropriate quality in the environment.

Urban sustainable conservation can be formed in each region through benchmarking from sustainable principles of traditional urban planning. The principles that are based on the religious beliefs and follow climate and environment, are considered as sustainable principles and investment for their revival is of great importance. One of the sustainable principles is dedication that is a great investment for sustainable urban conservation and the other principle is urban water supply. *Vaqf* is one of the sustainable religious-social as well as economic patterns, but aqueducts are sustainable environmental patterns. Since many cultural heritage monuments are dedicated, the initial cores of cities, architectural patterns as well as urban planning can be conserved just by reusing this system. Urban aqueducts are parts of the most important factors in the cultural heritage of each city and the most efforts should be made to conserve them. Therefore, to revive the historic regions, before dealing with the physical landscape as well as apparent appearance it is required to know the main urban infrastructures. Attention should be paid to the present and future urban planning. More conservation and development in the present situation can cause the available imbalances in city to decrease.

#### **- Strategies and presented solutions**

- Improvement and increase in the people and private investors' trust to dedication (*vaqf*) and its operation.
- Determining the activity areas in which dedication can have a great role and extending this area to many other ones.
- Optimizing the available management structure and using expert as well as committed agents in the related affairs.
- Studying and investigating in productivity development from available dedications.
- Establishing economic balance and justice using all the sustainable systems.
- Making better dedications as well as studying on changes for some especial usages in dedications to have optimized usage and lead to the real needs of society.
- Using abilities of *vaqf* system as the enforcement guarantee of conserving designs and urban restoration.
- Registering the *qanats* and valuable *moqufe* monuments in the list of cultural heritage.
- Preventing from deep wells constructing around the *qanats*.
- Reinforcement and restoration of *qanats* and their revival.
- Paying attention to the urban sustainable systems in the modern urban planning.

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