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Greenway Planning for Tehran Metropolis

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Introduction

"Greenways are networks of land that are planned, designed and managed for multiple purposes including ecological, recreational, cultural, aesthetic, or other purposes compatible with the concept of sustainable land use." (Ahern, 1996) The term greenway comes from the "green" in greenbelt and the "way" in parkway, implying a recreational or pedestrian use rather than a typical street corridor, as well as an emphasis on introducing or maintaining vegetation. Some greenways tend to have a contiguous pathway, allowing urban commuting via bicycle or foot. Greenways are seen as a critical part of urban green infrastructure and as a positive way to conceptualize green space planning. The aim is to increase the quality of natural capital rather than concentrate solely on the quantity of natural capital. Greenway planning represents the coming together of various interests. It is not seen just as a way of providing an improved green structure for the landscape, but also as a mechanism for more informed decision-making and more 'joined-up' thinking in relation to urban and regional environmental planning.

The history of greenway planning in Iran goes back to year 1600 A.C. Sheikh Bahaie, the architect and the urban planner of Isfahan in the 17th century used the Zayanderud River as the main structure of the greenway system and used the Madies as the greenway network in the city. Madies were manmade streams that they have been set apart from Zayanderud River. This kind of greenway planning in Isfahan was a crucial decision to transform the city from an arid region into a green city. Nowadays the development and planning of the cities are far from the application of greenway planning model. Tehran, the capital city of Iran, is the largest and the most populated city in the Middle East. Today, Tehran has the lack of green open spaces and the greenways could be a great response for this problem. This paper studies the greenway planning for Tehran and considers the greenways as the main green structure of the city. Greenway planning in Tehran is an exceptional opportunity to fulfill both ecological and recreational needs, while enhancing the green open spaces in the city. More specifically the goals are:

- Connectivity in urban green structure with an easy access from different parts of the city
- Penetration of green spaces into the urban context
- Connect green areas to present a strategic whole that is greater than the sum of the parts
- Improve the quality of green areas to better serve local needs

Approach

The study presented here aims for planning greenways in high populated cities as their main green structure. In this process the first step would be a quick review on the existing literature on greenway planning models. In this way, Isfahan greenway system is considered precisely. In the next step Tehran is chosen as a case study of a high populated city which needs the greenway planning. At first Tehran's urban development is reviewed and after that the greenway planning model for this high populated city is considered.

Isfahan's Greenway Model

Isfahan's greenway model was planned in the 17th century. The greenway model of the city transformed Isfahan to a famous garden city at that time. Indeed, the city seemed like a huge, smooth, green stain, crossed by a blue line -the river- in contrast to the rocky background of the desert. Chardin (1666) States that Isfahan with its suburbs was the largest city in the world, resembling a forest from every direction; approaching the town, only the minarets and domes came to the eye. Tavernieh (1633) admits that Isfahan was not smaller than Paris and the entire town structure was enveloped by green foliage. In short, Isfahan was a garden city. The reason for such a miracle in the heart of the desert can be attributed to the Zayandehrud, the largest interior river in the Iranian plateau. An irrigation system (Madies) originating from the river dispersed water to all parts of the town. These Madies were manmade stream that let the water of Zayanderud River flow inside Isfahan's urban context. These Madies were designed by Sheikh Bahaie. This penetration of water in the urban context had a great greenery consequence in Isfahan's landscape. Zayanderud River and the Madies were the main green infrastructure of Isfahan (Figure 1). Sheikh Bahaie also designed green thoroughfares in Isfahan named Chahar Bagh. These green streets were public open spaces and they were used as walking and transport routes in the city. The axis of Chahar Bagh is perpendicular to the Zayanderud River. Isfahan's greenway model is consisted of riparian and thoroughfare greenways.

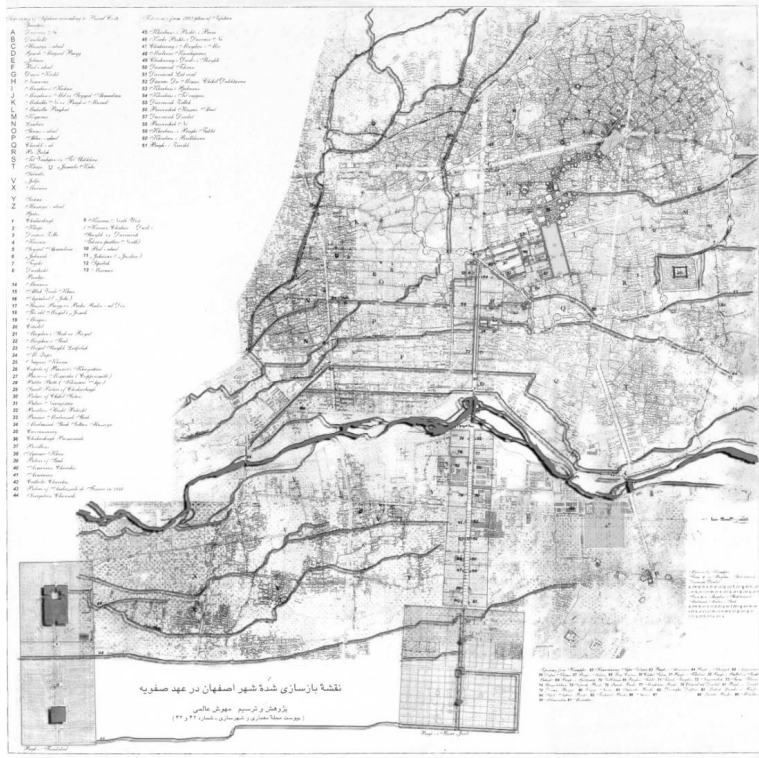


Figure 1. Madies in Isfahan (The main structure of Isfahan's Greenway Model)

Tehran's Urban Development

Tehran, Iran's capital, ranks among the world's fast-growing cities. In the early 1940s, Tehran's population was about 700,000. By 1966, it had risen to 3 million, and by 1986—during the Iran-Iraq war—migrants brought the population to 6 million. Today, the metropolitan area has more than 10 million residents, more than the sum of the country's next five major metropolitan areas combined. This explosive growth has environmental and public health consequences, including air and water pollution and the loss of arable land. Today, Tehran has confronted with the lack of green open spaces more than ever before.

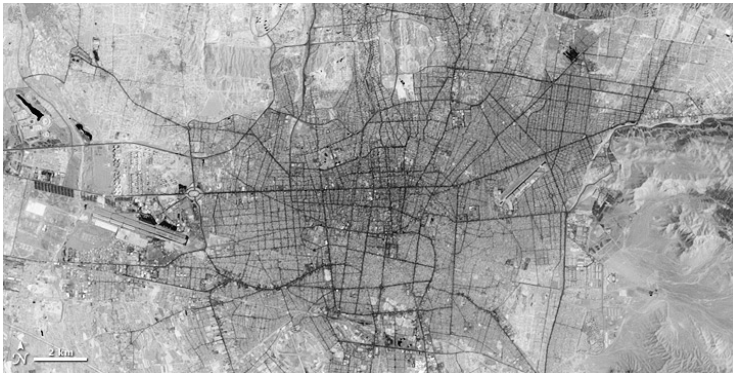


Figure 2. False-color images of Tehran on August 2, 1985 (NASA, Landsat 5)



Figure 3. False-color images of Tehran on July 19, 2009 (NASA, Landsat 5)

The Thematic Mapper sensor on NASA's Landsat 5 satellite acquired false-color images of Tehran on August 2, 1985 (Figure 2), and July 19, 2009 (Figure 3). In both images, vegetation appears bright green, urban areas range in color from gray to black, and barren areas appear brown. Whereas non-urbanized areas fringe the earlier image, urbanization fills almost the entire frame of the later image. Major roadways crisscrossing the city in 1985 remain visible in 2009, but many additional roadways have been added, particularly in the north. With a comparison between the Figures 2 and 3, we could conclude that Tehran has had a rapid urban development in the last two decades. The green areas in the images show the green bodies of the city. As it is obvious, very low amount of green spaces is available in the city and there is no main green structure in the city. Due to this point and the present environmental problems that Tehran has faced with, it is crucial to devise a comprehensive urban planning focusing on the city's green structure. Tehran is a dense constructed city with low percent of green open space. The question is how

could we plan Tehran's main green structure? One of the models that could respond to this question is planning a greenway system for the city. In the following section Tehran's greenway system is considered.

Tehran's Greenway System

To achieve a suitable greenway system in Tehran, we should have a revision on the main factors of Isfahan's greenway succession. In Isfahan, the main body of the greenway structure was formed by the Zayanderud River. And the greenway system was made by manmade streams called Madies. Here in Tehran we don't have any major rivers like the Zayanderud in Isfahan, but there are seven seasonal rivers that flow from north to south of the city. These rivers could play the role of the main greenway structure of the city. According to north to south riparian greenway, the city needs a greenway structure in the east-west direction, so that it could connect the north to south riparian greenways to each other and make a greenway network in the city. In this way, east-west direction thoroughfares could be used as the secondary greenway system (Figure 4).

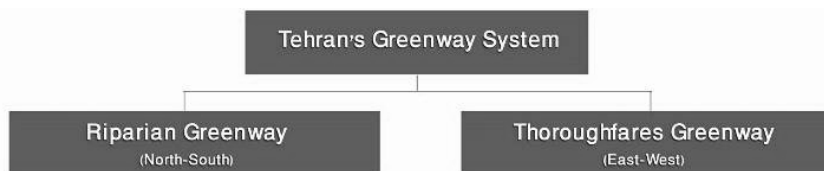


Figure 4. Tehran's Greenway System

Riparian Greenway System in Tehran

Tehran has seven seasonal rivers, flowing from the northern parts of the city to the southern parts. The northern part of Tehran is laid on the hillsides of Alborz Mountains and the rivers flow from the valleys of these mountains and enter the Tehran's plain. Regarding to this geomorphologic situation of these river's basins, they are called as river-valleys. These seven north-south river-valleys are characteristic of natural corridors of Tehran's landscape structure. In Figure 5 Tehran's hydrological map is illustrated. The seven river-valleys are: Kan, Farahzad, Darake, Darband, Golabdare, Jamshidie and Darabad. They are fertile habitats that support a variety of flora and fauna and play significant roles as catchments and as places for energy and wind flows to remove air pollutions from the city environment, providing opportunity for connection with the natural upland-lowland context. Upland areas benefit from much better conditions than lowlands due to less environmental destruction caused by urban development. The natural hydrological corridors along the river-

valleys face more destructive factors and have less ecological functions from north to south because of their structural modifications. Natural corridors connect many natural and built patches scattered along them. These corridors are mostly oriented in a north–south direction. The east–west ecological connections are restricted due to the morphological structure of the city.

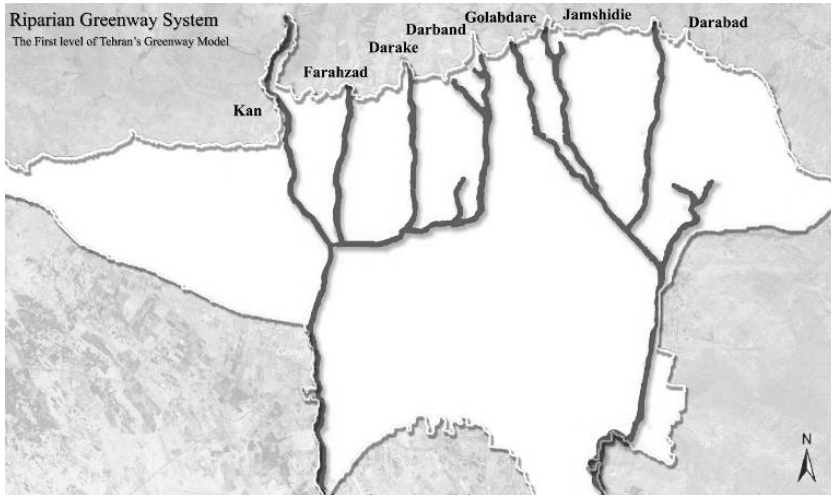


Figure 5. Riparian Greenway System in Tehran

These seven river-valleys in Tehran have always had a significant role in offering valuable bio-environmental services to the city. Little by little, green corridors in the northern part of Tehran were built near river-valleys, which formed the axes of the development of the city at the time Pahlavi dynasty (1922-1979). In the last three decades the development of the city increased towards the hillsides regardless to these natural structures. Today the destruction of these urban natural spaces has posed serious environmental problems. Due to this fact, it is crucial to rehabilitate and preserve these river-valleys as a greenway and make the optimum use of them in the urban context of Tehran. According to the greenway model of the Isfahan and the proposed greenway system, Tehran's main greenway structure is based on its river-valleys. In Figure 5, the riparian greenway system is illustrated. Riparian greenway system is the first level of Tehran's greenway model.

Thoroughfare Greenway System in Tehran

Due to Tehran's urban development and its population exponential growth in the last decades, most of the urban planning programs were concentrated on solving the traffic and the transport problems. Today, Tehran has more than 20

highways which connect different parts of the city together and they are linked to each other as a transport network. There are also macro scale streets in Tehran, connecting north of the city to the south and east to the west. These thoroughfares have a great potential towards greenway planning. They could make a greenway network in the city and citizens from different part of the city would have an easy access to them. In Figure 6 the main thoroughfares that could be used in greenway system planning are illustrated.

The thoroughfare greenway planning is based on increasing the tree canopy and the greenspace of the city. Designing pedestrian greenways beside the thoroughfares request is own standards. Due to the high traffic flow and its negative environmental impacts, a greenway for pedestrian purposes should have acoustic and air freshener barriers and it should be in accordance to other human comfort standards. The main goal is to make possibilities of human flow through the urban green context. In this way any of these thoroughfares which comply with the standards could be designed as pedestrian greenways and others are used as urban greenspaces.

Most of these thoroughfares are east-west direction, except no. 11 and no.10. These thoroughfares could help to make the greenway system of Tehran in east-west direction and complete the north to south riparian greenway. At the moment, some parts of these thoroughfares are planned as greenways. But it's only a partial design and they don't have a comprehensive planning on the city's greenway system.

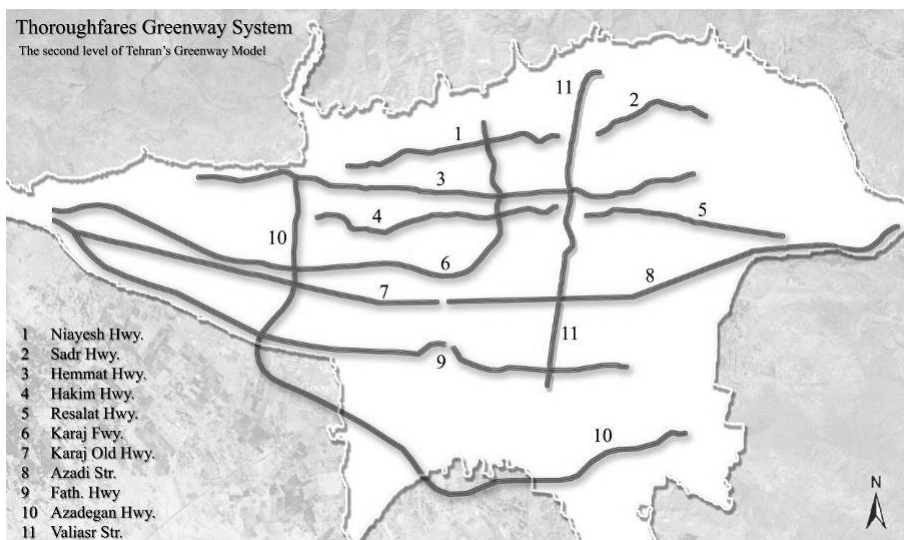


Figure 6. Thoroughfares Greenway System in Tehran

Conclusion

Most of the high populated cities have a dense constructed urban context and most of them have lack of green open spaces. Due to this fact, their green structure planning should be based on strategies that could match with their dense constructed context. Greenway systems are one of the best responses that could be compatible with the existing landscape of these cities. The planning of greenway systems are considered in different level. At the first level the natural features of the city such as rivers or river-valleys are considered as greenway system. At the second level the main thoroughfares of the city could play the role of greenway system. At the third level, local streets and roads could be used as small greenways. Actually, the third level is not the cities greenway structure but it could help to expand the greenway system to the local communities. The process used for planning for Tehran's greenway system could be generalized as a model to the similar cities around the world.

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