

The Importance of Urban Corridors in Improving the Green Infrastructure in Cities: Case Study Gaziantep-Turkey

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Introduction

Rapid urbanization in parallel with population growth is the phenomenon of our century. Urbanization implies great pressure on natural resources and the environment (Rees, 1997; Sandstrom, 2002). Urban growth, by altering cities and the surrounding countryside, presents numerous challenges in urban environment (Tzoulas et al., 2007). As a result of these rapid alterations in urban land use; loss of natural areas, fragmentation of open spaces and degradation of water resources have been occurred over the years. Furthermore, these changes have been influenced the function of ecological services such as provisioning services (e.g. food, fuel, water) to regulating (e.g. climate/air pollution regulation, waste assimilation, flood and fire regulation) that emerged many environmental problems which influenced the quality of human life. Therefore, concerns about the future of cities and next generations' life in urban area caused the improvement of environmental quality and long-term livability become the main goal of urban planning process.

Based on these objectives, the concept of *Green Infrastructure* gets importance in urban planning and design over the past few decades. Integrating green infrastructure into the land planning process in cities can prevent many environmental problems associated with the human population and protect the natural ecosystem values as well as contribution to the health and quality of life for communities and people. Therefore, the concept of green infrastructure, its benefits and the urban corridors as a tool for improving green infrastructure are focused in this article. Also, Gaziantep city located in Turkey is selected as a case study to clarify these issues.

Background / Literature Review

Cities can be described as an ecosystem having interacting biological and physical complexes. There are different organisms in this ecosystem as well as air, soil, water, light, and physical regulators such as temperature and day length (Cadenasso & Pickett 2008). Today, alteration in land use, consumption and fragmentation of green areas effecting urban ecosystem is taking place faster than ever. As a result, fragmented dysfunctional ecosystems will not provide long-term sustainability nor benefit society and the global environment (Cook, 2007).

Planning the green infrastructure is the key concept improving the function of dynamic urban ecosystem and as a means of spatially organizing urban environments to support a suite of ecological and cultural functions (Ahern 2007). Also, green infrastructure is related to environmental or sustainable goals that cities are trying to achieve through a mix of natural approaches (Foster et al., 2011). The concept of urban green infrastructure is new term in urban planning, but the roots of this idea started more than 100 years ago. As Charles Little indicated in his book; the *Greenways for America*, Frederick Law Olmsted planned green infrastructure in his project 130 years ago.

Today, the concept of green infrastructure is explained in different terms. This concept is defined by Benedict & Macmahon (2002) as “*interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations*”. In other words, green infrastructure (GI) refers to the network of living green spaces that play a fundamental role in helping us address climate change, public health, biodiversity and community cohesion. In short term, it can be defined as nation’s life sustaining system (Comhar 2010). In addition to variations in definition, there are differences in the type of work being undertaken in developing Green Infrastructure in different countries (Comhar 2010). Green infrastructure also can be created in different scales; state, regional, metropolitan area, and local community (McMahon 2000).

For a long time, Communities that planned for open space primarily thought about preserving land for parks and these parks were often viewed as a community amenity, an extra, even a frill (McMahon 2000). Now, Green infrastructure can link the parks and green areas for recreation and benefit of people and link natural areas for improving biodiversity and habitat fragmentation. Likewise, it also can shape urban form and provide a framework for growth.

Briefly, the benefits of Green infrastructure can be categorized as; Environmental benefits (air, soil and water quality, climate change adaptability, landscape amenity, biodiversity, flood alleviation & water management and landscape character), Social & Community Benefits (bringing people together, health and well-being, culture & heritage, education & life-long learning, culture & heritage aesthetics and a sense of place) and Economic Benefits (adds value to land and property increases productivity, provides jobs, decrease public costs). In addition, it can strengthen the landscape identity of city which is defined as the individual identity of a city which clearly distinguishes it from other cities (Xuesong & 2008).

The evaluation of green infrastructure predicts that *Hubs* and *Links* are two major components of green infrastructure plan. Hubs are variety of natural and restored ecosystems and landscape features and links are the connections tying the system together and enabling green infrastructure networks to work (Benedict & Macmahon 2002).

Due to the definition of Green infrastructure components, urban corridors can have significant role as linkage between natural and green areas improving the green infrastructure. Urban corridors can tie different areas with diverse function. Also, if these corridors are planned or designed according to ecological and cultural values, they can be an attraction point in the urban circulation spaces. Roads, waterways, railways, pedestrians zones are some examples of urban corridors. In this research for emphasizing the impacts of urban corridors for improving the urban green infrastructure, Gaziantep city is chosen as case study.

Gaziantep is located in south-central part of Turkey. Geomorphologic structure of the city is mountainous and rugged. Geographically, being located on the historical Silk Way and founded near to the first civilizations of Mesopotamia and the Mediterranean caused that the city became the settlement of human populations since prehistoric times. Over the years, the population growth and expanding the industrial areas around the city caused rapid urbanization in the city.

Historically, residential areas developed around the Alleben River the most significant corridor of Gaziantep landscape in central part of the city. The first regular apartment-style housing area is zoned and developed in the west part of the city for high income group. In addition, around

these areas sub region with different functions are located that meet the needs of urban residents. During the years, development of industrial areas in the southwest and northwest parts of city and the need for workers caused the migration of low-income groups to the city. As a result, for residing these low-income immigrants illegal and unplanned constructions occurred in the south and north part of the city. Therefore, over the past century the main purposes of development plans of Gaziantep were planning residential and industrial areas. In other words, urbanization in Gaziantep has occurred in a demographically. Likewise Gaziantep, there are evidences to suggest that in many ‘advanced’ industrialized countries there has been a reversal in the rural-to-urban shift of populations (Sandstrom 2002)

Urbanization with rapid and uncontrolled manner caused socio-economic context and the internal migration. Therefore, it is difficult to describe these alterations as the process of urbanization. As a result; natural areas and corridors usually were ignored during the urbanization planning. Therefore, over the years constructional areas are expanded and natural landscape and green areas of the city have been disappeared. Also, the land use of the farms and forests inside the city borders were changed and most of these areas were fragmented. In addition, most of the productive farmland are isolated and lose their ecological function.

Today the only natural green areas are located in north and west part of the city as urban forest. In addition, in urban scale there is a park in parallel with Alleben River which does not have design accordance with ecological goals. Also, there are small scales parks that are separated inside city (Figure 1).



Fig 1. The distribution of green areas inside Gaziantep

Goals and objectives

Green infrastructure has a significant role in improving the urban ecosystem and quality of life. Urban corridors are important tool for promoting green infrastructure in urban areas. Therefore, the quantitative, qualitative, distribution and connection of these elements are determinant factor affecting the quality of urban Green infrastructure. In this research, identification and detection of corridors of Gaziantep are the basic concepts that will be covered to demonstrate the importance of urban green infrastructure and its tools in the urban planning process.

Methods

In this research, books and electronic journals database that are related to the concept of green infrastructure, its benefits and planning methods were first reviewed. Consequently, the Gaziantep city is chosen as case study. After the site survey and evaluation of the Gaziantep recent maps, the map of green areas of Gaziantep had drawn.

Furthermore, the corridors of the Gaziantep including Alleben River and roads are evaluated in city plan using GIS. In this stage, the city is separated to sub-regions and corridors. Consequently, the relations of these regions and city corridors are discussed. Additionally, the potential of these corridors for improving the urban green infrastructure in sub-regions and in city as whole are determined. Finally, the methods of integrating the open and green areas of city by using the urban corridors are assessed.

Results

Gaziantep plan does not have an integrated system of open green space. Also, the distribution of green areas inside the city is not equal. Therefore, the city separated to sub regions to overcome the deficiency of open and green space system and to ensure the distribution of green areas in city. The intervention and improvement of green areas and corridors in sub regions will improve the green infrastructure in city as whole. As it presented, in figure (2) city contains different size of open and green areas. But, these areas are not integrated to structural areas. There are also problems of accessibility as well as security in these places. On the other hand, these areas have potential to contribute the quality of life in urban area. Forest and parks of Gaziantep have an important role in meeting the need for recreation of residents, especially on the weekends. Integrating the urban forests and green areas to urban open spaces, squares and commercial zones can create a circulation in the city. Integrating urban corridors to this circulation can promote the green infrastructure and transform these areas into attraction areas for recreation.

An assessment of Gaziantep corridors indicate that Alleben River in central part of the city is the main corridor that can connect natural green areas and parks and improve the green infrastructure of the city. Evolution of the road inside city represents that a large part of the historic center of Gaziantep in the south-west, and south-east of the castle have organic and narrow road system. On the other hand, the roads of urban fabric in low income group zones and slums in contrast to other cities slums areas have wide and smooth roads. The majority of residential zones in western and eastern areas of urban structure developing after 1970 have suitable and wide roads. Besides the vehicle roads, there are a large amount of pedestrian corridors inside the city. The reason is that most of the urban residents are low-income groups that use these pedestrian for

transportation. Weather conditions, topographic structure and inadequate public transport systems are the other reasons for the large amount of pedestrian areas.

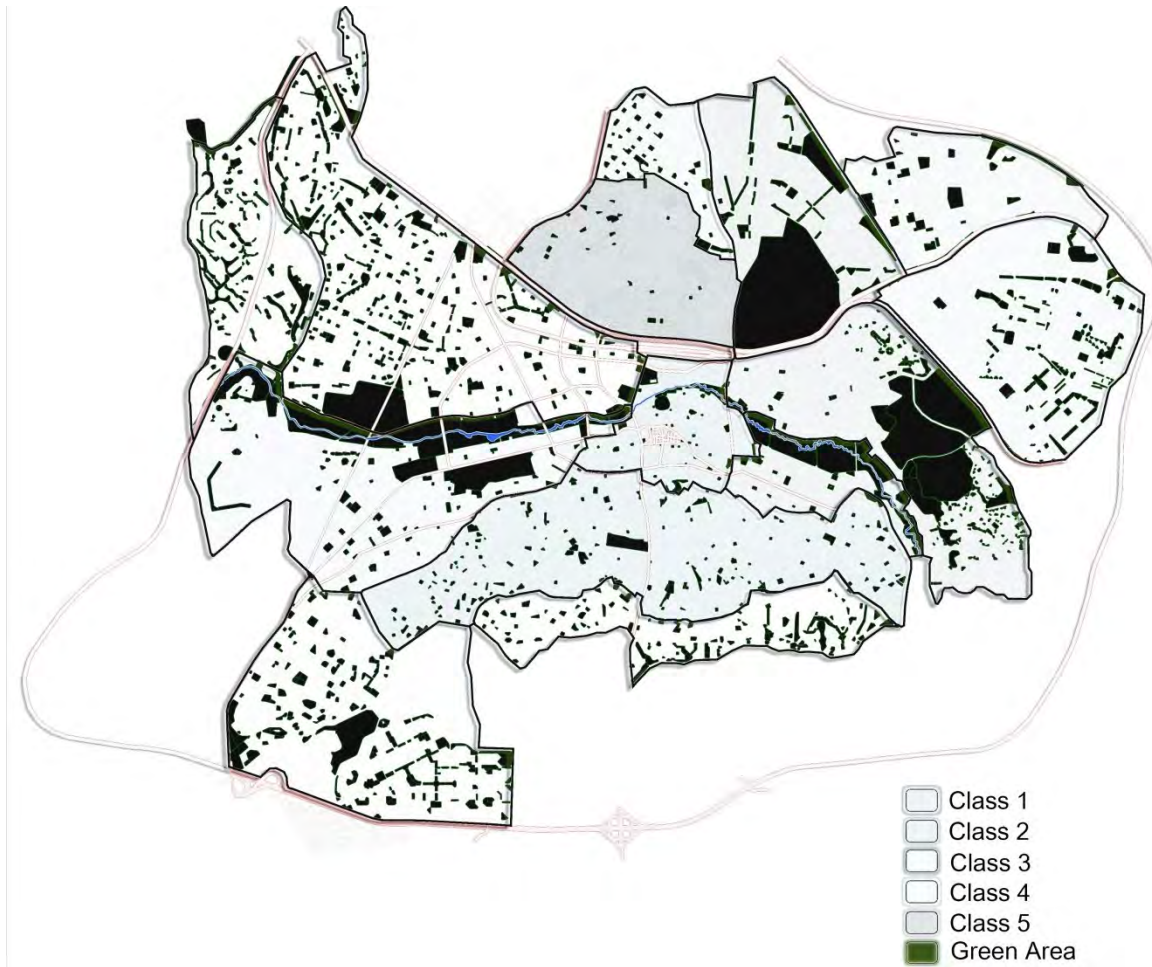


Fig 2. Gaziantep is separated to 14 sub regions in this plan and sub regions are classified to 5 classes according the quantity of open and green areas. Class 1 indicates the maximum and 5 in the minimum amount of green areas.

Determination of potential urban corridors in sub-regions and urban overall

Alleben River is the main corridor that can play as a hub as well. If the areas around the Alleben River are planned, designed and planted well, it can be the main hub connecting the other green areas using urban roads. Therefore, roads those are perpendicular and parallel with Alleben River have potential to be used as green corridors linking urban green areas. Also, the main corridors of Gaziantep green infrastructure are investigated in each sub region. In addition linkage corridors between the Alleben River and main corridors are determined (Figure 3).

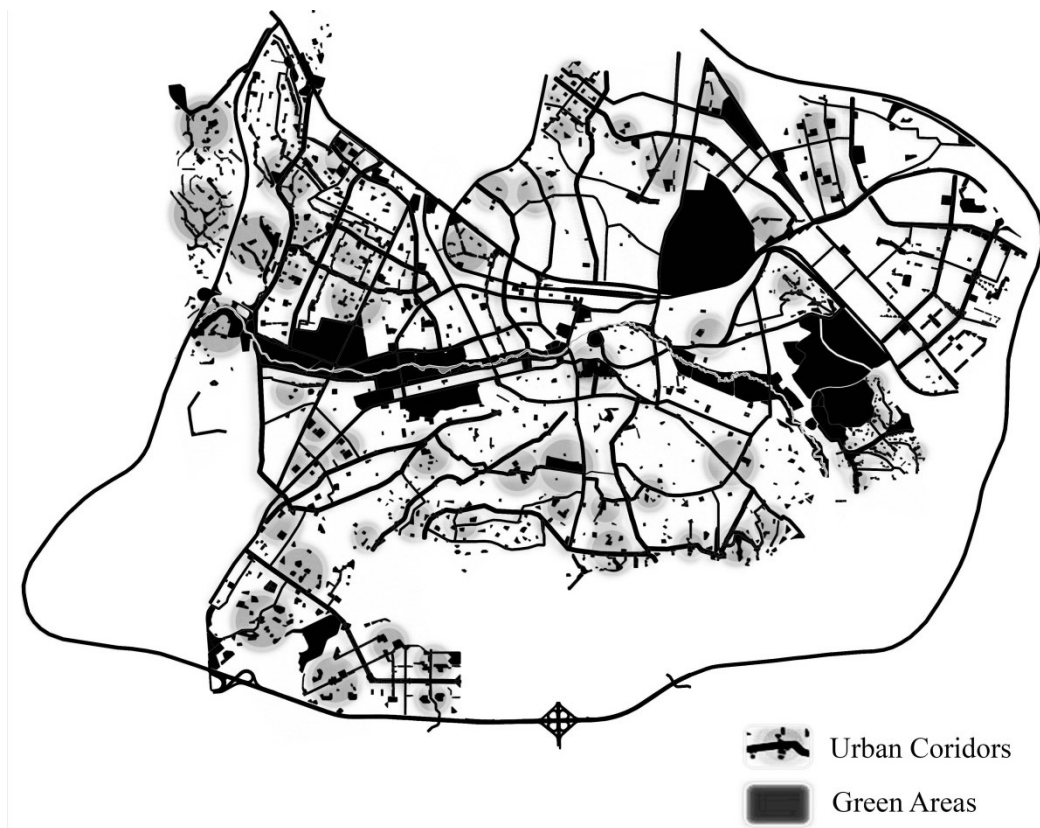


Fig 3. Gaziantep green infrastructure plan.

For improving the green infrastructure of Gaziantep, the function of the roads that are the linkage corridors between Alleben River Park and other green areas must be converted to pedestrian zones or semi pedestrian. Furthermore, like the method for Green Tokyo project (Tokyo Metropolitan Government, 2007) for enhancing “green road network” connecting large scale plots of greenery, the number of roadside trees must be doubled or in some cases roadside trees must be planted (Figure 4). Some factors should be determined in the selection of the trees and plants. First, selecting the areas native trees and plants has advantages of easily adaption as well as improving the urban biodiversity. Considering the air pollution in Gaziantep, the trees species must be resistant to air pollution. Also using the indigenous species will contribute the identity of the region.

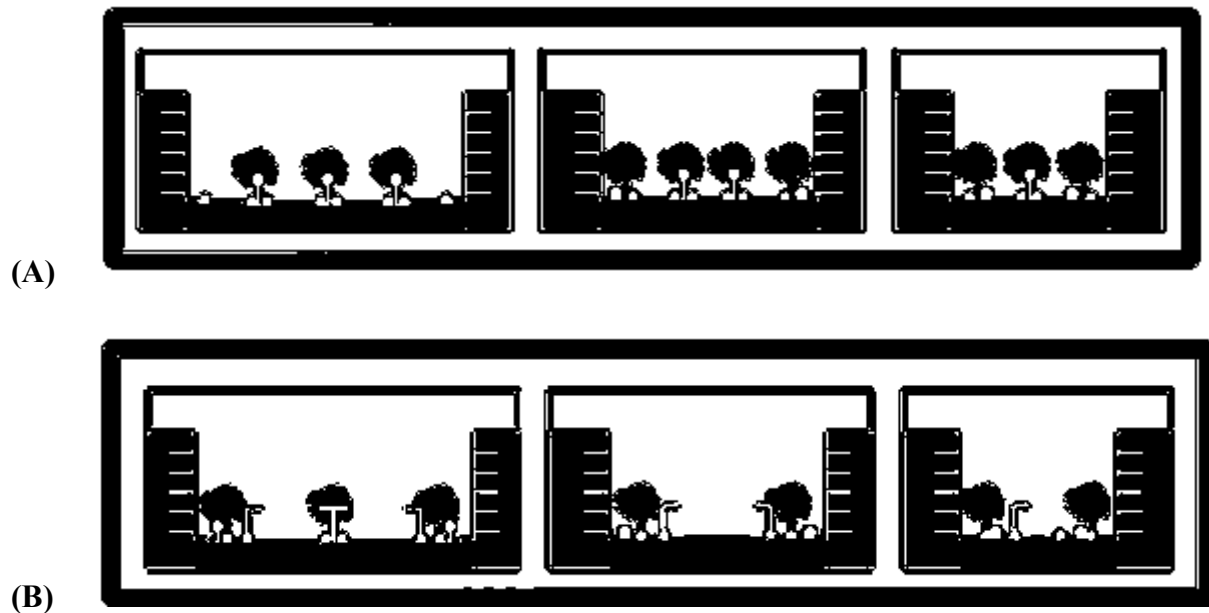


Fig 4. Sections of the urban corridors for improving green infrastructure (A) Roads that are converted into a pedestrian zone (B) Roads that are converted to semi-pedestrian area

Discussion and conclusion

Although a modern ecological framework exists, unfortunately inappropriate or outdated concepts continue to be used in the context of land-use and planning decision making in many cities of developing countries (Flores et al., 1998). Emphasizing the new approaches of urban planning such as planning green infrastructure, their application tools and benefits in different research can contribute the local government to be aware about these concepts.

Green infrastructure planning must be the first step in developing land-use plans as communities grow, and should be coordinated with planning and design of other essential gray infrastructure in effective, economic and sustainable manner. Also, it must be noted that the green infrastructure should plan comprehensively, implemented publicly, practice of diverse professions and manage in long-term period with realistic perspective to gain the successful result. In this research Gaziantep city was investigated not only to emphasize the importance of urban corridors in improving the green infrastructure but also as an example for many developing city with the same planning problems and circumstances in enhancing green infrastructure.

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