عـلـوم محـیـطی سال دهم، شماره اول، پاییز ۱۳۹۱
ENVIRONMENTAL SCIENCES Vol.10, No.1 , Autumn 2013
103-118

# Strategies for Enhancing the Quality of Urban Natural Public Spaces: Tehran's Farahzad River-valley's Landscape

**Shahindokht Barghjelveh,[1*] and Nima Sayad[2]**

*1- Assistant Professor, Department of Planning and Designing the Environment, Environmental Sciences Research Institute, Shahid Beheshti University, Tehran, Iran.*

*2- MA Urban and Regional Designing and Planning, Faculty of Art and Architecture, Islamic Azad University Central Tehran Branch, Tehran, Iran.*

تاریخ دریافت: ۹۰/۹/۲۸ تاریخ پذیرش: ۹۱/۶/۲۹

**Abstract**

The focus of this study has been the application of the concept of eco-hydrology through the rehabilitation of Tehran's Farahzad River-valley's urban landscape. The key element in the implementation of the concept has been the ecological management of the river-valley as the spatial link between geomorphology, vegetation, hydrology and land use. The study follows the proposition that to attain more qualified public spaces resulting from the development of urban river-valleys' natural environments, it is necessary to stop the continuous ecological destruction of landscapes and to take steps to improve their ecological connectivity. Based on the potentials and the limitations of the region, the solutions for enhancing the quality of Tehran's Farahzad River-valley's public space, are derived from different levels of landscape management: *System Ecology, Urban Ecology* and *Human Ecology*. According to principles of landscape ecology, these strategies are provided to manage *landscape's resource allocation (level of construction and use)*, *landscapes' socio-spatial programming (level of ground coverage)*, and *landscapes' bio-socio-spatial network function (level of recreational infrastructure)*. In this study, the analytical framework of the proposed component model is used for examining the quality of Tehran's Farahzad River-valley's Public Space. The information regarding this assessment is collected through observations and statistics gathered from relevant organizations.

**Keywords:** Landscape ecology, urban development, quality assessment.

## راهبردهای ارتقاء کیفیت فضاهای عمومی طبیعی شهری سیمای سرزمین رود- دره فرحزاد تهران

**شهیندخت برق جلوه[1*]، نیما صیاد[2]**

۱- *استادیار گروه برنامه ریزی و طراحی محیط، پژوهشکده علوم محیطی، دانشگاه شهید بهشتی، تهران، ایران*

۲- *کارشناس ارشد برنامه ریزی و طراحی شهری و منطقه ای، دانشکده هنر و معماری، دانشگاه آزاد اسلامی تهران مرکز، تهران، ایران*

**چکیده**

مطالعه حاضر کاربرد مفهوم اکو هیدرولوژی در بازآفرینی سیمای سرزمین رود دره فرحزاد تهران را مورد بررسی قرار می‌دهد. نکته کلیدی کاربرد مفهوم، مدیریت بوم شناختی رودخره شهری در برقراری تمامیتی فضایی از زمین شناسی، آب شناسی، زندگی گیاهی و کاربری زمین می‌باشد. مطالعه تاکید دارد در روند دستیابی به فضاهای عمومی با کیفیت که در جریان توسعه محدوده های طبیعی رودخره‌های درون شهری حاصل می‌آیند، لازم است تخریب اکولوژیکی سیمای سرزمین متوقف شود و در راستای بهبود تعاملات اکولوژیکی قدم برداشته شود. مبتنی بر توانایی‌ها و محدودیت‌های منطقه، راهبردهای ارتقاء کیفیت فضای عمومی رودخره فرحزاد از سطوح مختلف مدیریت سیمای سرزمین، شامل: بوم‌شناسی سیستمی، بوم‌شناسی شهری و بوم‌شناسی انسانی منتج می‌شوند. بر مبنای اصول بوم شناسی سیمای سرزمین، این راهبردها در روند مدیریت "تخصیص منابع سیمای سرزمین (سطح ساخت و استفاده)"، "برنامه فضایی- اجتماعی سیمای سرزمین (سطح پوشش و کاربری)"، و "عملکرد زیستی- فضایی- اجتماعی شبکه سیمای سرزمین‌ها (سطح زیرساخت فراغتی)"، کاربرد می‌یابند. در این مطالعه، چارچوب تحلیلی مدل ارائه شده جهت سنجش کیفیت فضای عمومی رودخره فرحزاد تهران مورد استفاده قرار می‌گیرد. اطلاعات مورد نیاز از مشاهدات و آمارهای بدست آمده از سازمان‌های مربوطه حاصل می‌آیند.

**کلمات کلیدی:** بوم‌شناسی سیمای سرزمین، توسعه شهری، ارزیابی کیفیت.

* Corresponding author. *E-mail Address*: s-barghjelveh@sbu.ac.ir

## Introduction

With the expansion of cities worldwide, a knowledge of the ecology of cities, integrated with social science approaches to guide the development of sustainable cities is urgently needed (Wu 2008; Grimm et al. 2008). From an ecological perspective, cities are formed from a unique mosaic of sites, which are constructed for residential, commercial, industrial, and infrastructural purposes, interspersed with green spaces. Urban green spaces are diverse and include for instance, parks, gardens and recreational venues. In addition to these formal green spaces, cities include informal green space consisting of remnants of less modified, indigenous vegetation types, as well as specific urban habitats such as derelict industrial sites, and overgrown gardens (Breuste 2003). This mosaic of habitats can be effectively studied and understood using landscape ecology as a framework (Wu 2008).

## TEHRAN'S PLAIN LANDSCAPE – FARAHZAD RIVER-VALLEY'S URBAN LANDSCAPE

Tehran is located in a plain between the Alborz Mountains and the northern border of the Central Desert of Iran. Among the geographical features of Tehran's urban landscapes are the foothill areas at the north, which are of high ecological importance in terms of water resources, plantation and mountain climate. The environmental conditions of these areas directly influence Tehran's urban landscapes, and any ecological damage to these areas has direct consequences for the whole landscape. As a result, any changes in the use of ecological elements or natural environments within these areas is the main concern of the development strategy for Tehran's urban landscapes.

Situated at the foothill areas of the Alborz Mountains, Tehran has five main river-valleys running from north to south (Image 1). There are also a number of canals and seasonal rivers that absorb additional rainfall in these areas. The rivers and streams that run through these mountain valleys and inside urban areas are among the unique features of Tehran's urban landscapes, and their ecological potential creates desirable *patches* within the manmade urban fabric. In addition to providing open spaces, concentrating main views and circulating pure air, these *natural corridors* have become the most important ecological elements for different plans to revive Tehran's environmental sustainability. This study evaluates new considerations related to the proposed component model for Tehran's Farahzad River-valley's public spaces. The study area is the Nahjolbalagheh Graden, which is located at Tehran's northwest foothills and has been created by developing a part of Farahzad River-valley's urban landscape (Images 2 & 3).

## FARAHZAD RIVER-VALLYE'S URBAN LANDSCAPE – NAHJOLBALAGHEH GARDEN

In order to have a continuous and expansive network of natural patches and to assure spatial connectivity between these patches and manmade urban spaces, Tehran's natural corridors are recognized as the main ecological elements for environment sustainability. For the environmental sustainability of Tehran's urban landscapes, these

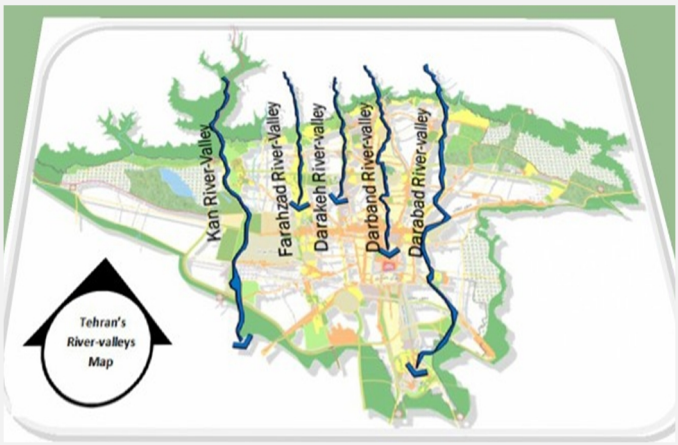



**Image 1:** Tehran's Urban River-valleys *(The Authors)*

**Images 2 & 3:** Tehran's Farahzad River-valley's Urban Landscape, 2006 and 2011

*(Google Earth 2006 & 2011)*

natural corridors, i.e. the river-valleys, have been subject to different development processes and some of their areas have been set aside for creating urban greens and public spaces. These development plans have been confirmed to resolve the landscapes' various environmental problems, such as high pollution, social insecurity, shortage of cultural places, and so on. Our study area is approximately 1200 meters long and 300 meter wide, with a height difference of approximately 40 meter (from the lowest to the highest part). This section of the landscape is an urban public space created by developing a part of the Farahzad River-valley's urban landscape. The result of the development plan has been a multi-functional urban space with various public sections, including cafes, restaurants, playgrounds, bicycle routes, walking passesparking lots and green spaces (Images 4 & 5). In order to examine the quality of urban public spaces, created by developing the urban natural environments, the study has provided a new conceptual model with comprehensive components and criteria, with which the quality of urban natural public spaces can be assessed. Accurate evaluation of urban natural public spaces and the assessment of their current deficiencies will help towards the development of highly qualified urban landscapes. By looking at and

**Images 4 & 5:** Tehran's Nahjolbalagheh Public Space, 2006 and 2011

**(***Google Earth 2006 and 2011)*

scrutinizing existing conceptual models, this study introduces a comprehensive component model to assess the quality of Tehran's Nahjolbalagheh public space. For this evaluation, the objectives of this study have been: 1) introducing a new conceptual model for assessing the quality of natural public spaces resulting from the development process of urban natural environments, and 2) evaluating the quality of Tehran's Nahjolbalagheh public space, created in the effects of developing a part of Farahzad River-valley's urban landscape.

## Methods

### A COMPONENT MODEL FOR CREATING URBAN NATURAL PUBLIC SPACES

With the ever-increasing expansion of cities, larger areas of natural environments have fallen into urban limits. On the one hand, natural environments located at urban limits are exposed to gradual destruction, due to their structural characteristics, such as spatial suitability for the occurrence of wrongdoing, illegal accommodation, waste discharge, and so on. On the other hand, biotic, environmental and societal sustainability of today's cities needs all natural environments that are capable of supporting ecological processes and can therefore optimize the quality of urban natural public spaces. Maintaining the ecological attributes of urban natural environments and qualifying the ecological processes of urban landscapes, promote both the ecological processes of natural environments and environmental processes of landscape services. This also enhances the citizens' quality of life and promotes social interactions. It is for this reason that natural environments are structured and urban natural public spaces are brought into existence. In order to optimize the spatial quality of urban natural public spaces, it is necessary to pay attention to the semantic, functional and structural attributes of public spaces in different ecological, environmental and societal dimensions. This will ensure that the ecological and environmental characteristics of urban public spaces will also have the necessary qualities for expressing and conditioning human interactions.

In fact, when a development plan is proposed for structuring an urban natural environment and converting it to an urban public space, it is expected that the mechanism of natural processes be thoroughly questioned. In planning for urban sustainability, we need to look at a *multilatera*l management of landscapes and human activities from an urban landscape point of view, referring to a geographical unit characterized by specific patterns of ecosystem types, and formed by interactions of geographical, ecological and human-induced forces (Forman, 1995; Steiner, 2000). It is important to highlight that when reviewing urban space component models, the necessity of valuing the principles of landscape ecology in assessing the quality of interconnections between *natural and social* processes becomes identifiable. Related to this subject, since urban natural environments are the heritage of our cities and their maintenance and protection is necessary for the continuation of urban sustainability, it is important to give special attention to the principles of landscape ecology in a model provided for investigating the quality of urban natural environments. Landscape ecology focuses on structures, functions and transformations of the

environment, attempting to find patterns and interactions between landscape elements, patches, corridors, and the matrix (Forman, 1995; Ingeognoli, 2002). As any urban ecosystem consists of a whole set of landscapes that are more or less sustainable, any planning and design strategy, especially in large scale landscapes, should consider the principles of ecological networking to integrate ecology into sustainable land development (Farina, 2010). These are the reasons that necessitate the need to investigate the bio-human causes and effects of land-use and land-cover dynamics in controlling social programming as well as planning new landscapes. In a promising step towards planning sustainable urban landscapes, the ability of human beings in pursuing the elevation-inquiry of the quality of landscape (the ultimate programming of environment sustainability) is achieved through two dimensions of planning process: (1) the process of programing social interactions in practicing bio-human values in three dimensional synchronous space, and (2) the process of structuring social programs in developing bio-human criteria in time-space dimensions (Barghjelveh, 1998).

It is worthy to emphasize that the most fundamental properties of cities and urban landscapes are their ordering of space into living relational systems embodying social purposes (Hillier, 1989). Such purposive relations elaborate living orders to pursue ultimate spatial *'goals'* and *'ideals'* (Ackoff, 1972). In this context, the principal issue with which the subject is concerned is that of *connecting the notion of human action with structural explanation in eco-spatial landscape analysis*. The making of such a connection, an adequate account of bio-human agency must situate action in *time* and *space* as a continuous flow of conduct (Table 1). Translated into the structural identity of human landscapes, the most fundamental properties of urban landscapes are their ordering of space into programmed 'bio-socio-spatial systems' with shifting relations in time and space for embodying social purposes. The spatial and functional living complexity of landscapes suggests that their spatial form and especially their part/whole structure is programmed itself and can be replaced by a de-spatial network of communications and transactions. Having the component model of

**Table 1: Levels of Living System Order** *(derived from Barghjelveh, 1998)*

| | System Order | Function | Structure |
|---|---|---|---|
| **LANDSCAPE** | Ultimate-elevate | Excellence | Open-ended Bio-socio-spatial Relations |
| **SOCIETY** | Self-ideal | Purposive | Open-ended Socio-spatial Relations |
| **MAN** | Self-consciousness | Self-reflexive | Open-ended Symbolic Images |
| **ANIMAL** | Self-awareness | Teleological | Fixed Knowledge |
| **ORGANISM** | Self-maintenance | Pre-programmed | Fixed Genetic |

*"Sustainable Place"* (Golkar, 2000), in order to identify a component model for creating *urban natural public spaces:*

(1) At the level of '*System Ecology',* components of *'Thought Structure', 'Biological Structure', 'Ecological Equilibrium'* and *'Ecological Function',* are definable in respect to mutual interactions of interrelated aspects (Fig. 1). *Environment Equilibrium* is achievable by either *allocating landscape's natural resources* or *preserving landscape's structural elements*;

(2) At the level of '*Urban Ecology'*, components of *'Mold Structure', 'Spatial Structure', 'Environmental Sustainability', and 'Environmental Function'* are definable with respect to mutual interactions of interrelated aspects (Fig. 1). *Environment Sustainability* is achievable by either the *landscape's socio-spatial programing* or *sustaining landscape's ecological networks*;

(3) And finally, at the level of '*Human Ecology'*, components of '*Meaning Structure', 'Social Structure'*, '*Societal Excellence'* and *'Societal Function'* are definable with respect to mutual interactions of interrelated aspects (Fig. 1). *Environment Excellence* is achievable by either the *landscapes' bio-space-societal network management* or *promoting landscapes' ecological-anthropological functionality*.

**The Study**

Among Tehran's considerable features are its natural and manmade patches, which give Tehran its unique character and residential and touristic value. One of the most important natural patches is its northern foothills which endow the city with a special natural characteristic. Today, Tehran has lost many of its natural patches due to rapid growth. The development of manmade natural patches shows that even though the number of parks and greens has increased, these new natural spaces have not been built in sustainable way. They have shown little efficiency due to their small size and a lack of ecological integration. These patches have been made without paying attention to the landscape's capabilities and water and soil resources. In addition, urban constructions have caused the gradual destruction of natural patches, which were situated along geological corridors, near to local water resources. Most of the newly established green spaces have also been built on uncultivated hills and lands without suitable water and soil resources. There have always been a shortage of water in Tehran's urban landscapes, and because this water has often been taken from other areas, the result has been the eventual destruction of more natural landscapes. Therefore newly established green spaces have not been able to perform as good ecological substitutions either (Images 6, 7 & 8).

Hence, with the increase of urban constructions and the continuous destruction of the landscape's natural resources, there are no more valuable areas in Tehran that can be considered as natural patches. Except for large patches dispersed in the northern foothills and the margins of the city, which are ecologically disconnected, there are only small natural patches within the landscape. It is worth noting that patches near the natural corridors are ecologically historic and are also valuable in terms of size. These areas are not only considered

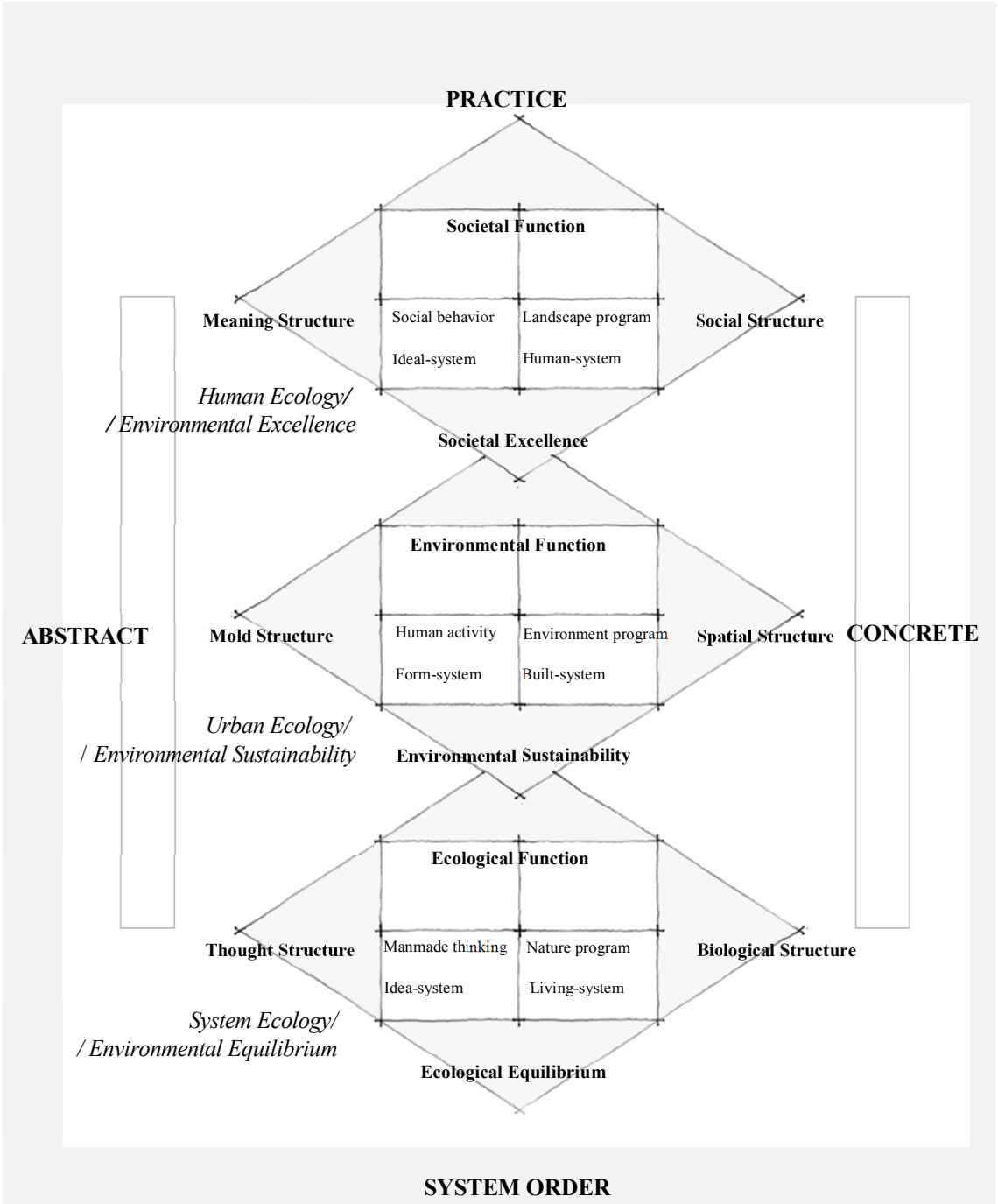
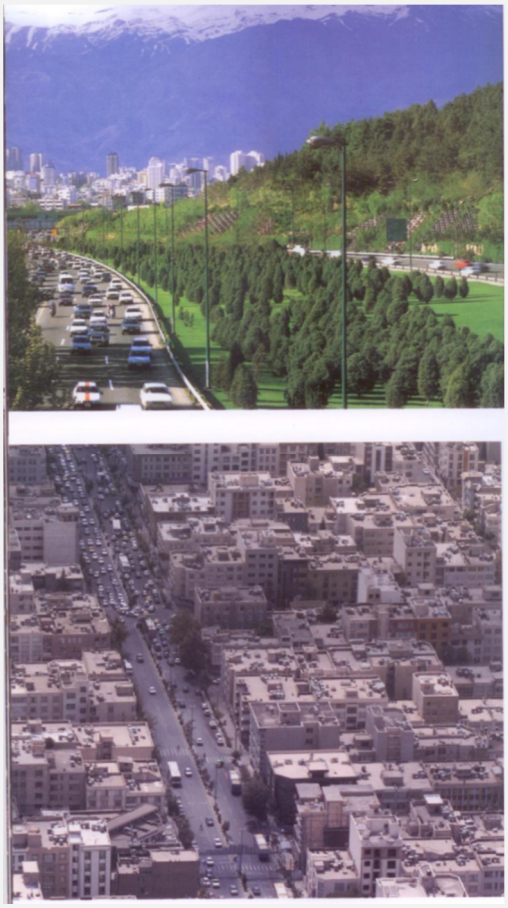
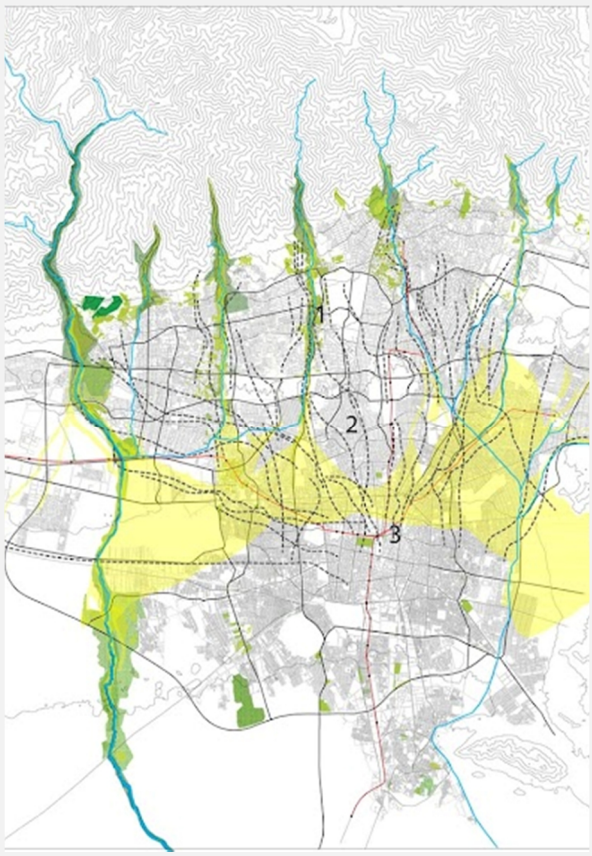



**Fig. 1:** A Component Model for Creating Urban Natural Public Spaces *(The Authors)*

as landscape's micro-scale ecological patches, but due to their expanse and the presence of hydro-corridors, they are also able to act on the landscape's macro-scale ecological activities. These patches are also important in terms of having access to the city's recreational sites and other urban land uses and functions. Thus, these characteristics and capabilities add further value to the ecological importance of these patches.

Tehran's natural corridors (including Farahzad River-valley) do not have ecological boundaries and as a result their ecological potential as connecting routes have no use. Constructed natural corridors (including river-valleys, riverside-corridors and greenways) also possess urban functions due to being connected to urban public areas. All these corridors have special characteristics in terms of having important ecological and societal advantages in different landscape scales. The recreational potentials of these landscapes are also considerable. They are remarkable areas not only because they are rich ecological resources providing large green patches, but also because they are important cultural sites






**Images 6, 7 & 8:** Tehran's Natural and Manmade Patch-Corridor Network

*(Tehran's Comprehensive Plan 2006 and 2012)*

that provide the landscape's historic identity. Sometimes these areas, along with their manmade urban elements benefit from the landscape's natural characteristics and become historic urban elements that define cultural functions. However, other times they remain poor in terms of plantation, and though they have the spatial capability to benefit from the landscape's natural patches and corridors, nonetheless, they remain in need of good ecological connectivity.

## Results

In this study, the analytical framework of the proposed component model is used for assessing the quality of Nahjolbalagheh public space, born out of Tehran's Farahzad River-valley's development process. The analytical framework is used for examining the quality of the public space, based on landscape's *content composition* and *spatial configuration* principles. According to the principles of landscape ecology, the quality assessment of the nature-made public spaces needs to consider the importance of the constituent elements of landscape structure (natural and manmade corridors and patches) and the consistent need of their organization in the form of different alternatives and plans. The importance of landscape planning alternatives in creating and preserving natural corridors lies in their capability for maximum ecological protection of potential resources of landscape: 1) integration of spatial elements, capable of circulating matter and energy; 2) integration of natural patches and corridors, capable of developing ecological functions; 3) integration of natural patches, capable of division into manmade units; 4) integration of natural corridors, capable of developing infrastructure networks; 5) integration of urban activities, capable of developing multipurpose ecological networks, and so on. In the following, the new proposed component model is used for assessing the quality of Farahzad River-valley's public space (Images 10, 11 & 12).

**Image 10:** Farahzad River-valley's Public Space: landscape's overall view, *2006 (The Authors)*

**Image 11:** Farahzad River-valley's Public Space: landscape's overall view, *2011 (The Authors)*

**Image 12:** Farahzad River-valley's Public Space: landscape's overall view, *2011 (The Authors)*

Although ecological principles have been observed in the construction of Farahzad River-valley's public space and efforts have been made in using compatible materials and environmental standards for repairs and waste disposal, there are nevertheless some weaknesses in the intra- and extra-habitat structural equilibrium for preserving species diversity, and intra- and extra-habitat connectivity equilibrium for preserving patch heterogeneity. For example, grass has no ecological relation to other plant species belonging to this region. The need of grass for large quantities of water has made it difficult to maintain this decorative species efficiently, and therefore,

even underground water resources of other regions are being used for its irrigation. Another example is the concrete structure of the riverbed, which has impaired the relation-isolation balance of the ecosystem for establishing the intra- and extra-habitat heterogeneity of the region. The spatial arrangement of the environment also indicates the excessive interference of humans in nature. The river valley, as a natural corridor, cannot adequately preserve the area's heterogeneity by balancing the need for socio-economic functions on the one hand and the connections between habitat patches and the possibility of access to environmental opportunities on the other. Moreover, considering the water shortage in the region, the vast cultivation of plants that need ample irrigation, the use of underground water resources, and the use of electrical energy for underground water-pumps all indicate that almost no attention has been paid to the optimal use of matter and energy and their cycle. The foul smell of urban sewage coming from upper lands into the river-valley (especially in summer time) also adds to the discomfort of the users. Though there are adequate public transportation vehicles, users prefer their own vehicles due to shortcomings in accessibility. Additionally, although the space is used by almost all age groups, the activities are not nature-related. And since land dispersion and spatial connectivity of species and ecological and spatial connectivity of habitat patches are ill-suited, there are also disorders in the region's biological and spatial connectivity of natural and manmade patches. And although the place is within a natural environment, there are no usable activities to enable people to interact with nature. The resultant natural space is like a painting that only allows the users to view decorative natural sceneries. Therefore, the development plan of the river-valley has not been successful in achieving its multiple eco-socio ambitions: from ecological goals to environmental, recreational, cultural or aesthetic.

## Discussion

According to the principles of the proposed component model, some strategies are provided to prevent more ecological destruction of Tehran's Farahzad River-valley's landscape. Based on levels of *System Ecology, Urban Ecology* and *Human Ecology management,* hierarchical strategies for enhancing the quality of Farahzad River-valley's urban landscape, are derived according to:

(1) *Landscape's resource allocation (level of construction and use)*,

(2) *Landscape's socio-spatial programming (level of ground coverage)*, and

(3) *Landscapes' bio-socio-spatial network management (level of recreational infrastructure)* (Table 2).

## Acknowledgment

This work is based on the findings of a research project (Reference Number: 600/1815–1390/10/25) carried out at the Department of Planning and Designing the Environment, Environmental Sciences Research Institute, Shahid Beheshti University, with the financial support of the Vice-Chancellor for research.

**Table 2:** Hierarchical Strategies for Enhancing the Quality of Farahzad River-valleys' Urban Landscape: 'Content Composition' and 'Spatial Configuration' *(The Authors)*

| | | | Content Composition | Spatial Configuration |
|---|---|---|---|---|
| | | | ***Landscapes' bio-socio-spatial network management*** | |
| **Human Ecology** | **Level of Recreational Infrastructure** | **12)** Societal Excellence | - preserving genuine natural resources<br>- preserving genuine cultural-historic elements<br>- preserving genuine human behaviors | - preserving genuine natural environment<br>- preserving genuine cultural-historic relations<br>- preserving genuine human functions |
| | | **11)** Societal Function | - preserving the multi-functional network of corridor, benefiting both humans and nature (Jongman & Pungetti, 2004; Walmsley, 1995);<br>- preserving the multi-functional network of corridor, integrating both social and ecological objectives (water quality protection, erosion/flood control, recreational-aesthetic facilities, etc.) (Erickson and Louisse, 1997) | - preserving multiple eco-socio spatial purposes (environmental, recreational, cultural, aesthetic, etc.) (Ahern, 1995);<br>- preserving spatial network of species diversity, tourism opportunities, regional characteristics, etc. (Linehan et al., 1995) |
| | | **10)** Meaning Structure | - preserving urban landscape's views in proportion with climate and land;<br>- preserving human aesthetic needs using landscape's natural features and local materials | - introducing spatial sequences of natural sceneries with ease of urban interactions ... |
| | | **9)** Social Structure | - preserving natural and manmade patch heterogeneousness, natural patch abundance, and socio-economic functions (Ahern, 1991) | - preserving connections of habitat patches and accessibility of environmental positions (Schwarz, 1993) |
| | | | ***Landscape's socio-spatial programming*** | |
| **Urban Ecology** | **Level of Structure and Type of Ground Cover** | **8)** Environmental Sustainability | - preserving hierarchy of bio steps within natural and manmade patches, urban and geographical patches, and different geographical phenomenon | - preserving sequences of living spaces within natural and manmade patches, urban and geographical patches, and different geographical phenomenon |
| | | **7)** Environmental Function | - preserving ecological connectivity of habitat patches<br>- introducing ecological connectivity of natural & manmade systems | - preserving spatial connectivity of habitat patches<br>- introducing spatial connectivity of natural & manmade systems |
| | | **6)** Mold Structure | - preserving eco-socio boundary of urban corridor;<br>- introducing eco-touristic activities, preserving the possibility of creating different socio-economic activities (multipurpose greenways) | - preserving infrastructural connection of roads, rivers, canals, and sewage networks<br>- introducing ecological network of recreational walking roads, bicycle routes, local traffic, etc. |
| | | **5)** Spatial Structure | - preserving intra- and extra habitat species diversity<br>- introducing intra- and extra-habitat structural equilibrium | - preserving intra- and extra habitat patch heterogeneousness<br>- introducing intra- and extra-habitat relation-isolation equilibrium |

**Table 2**

| | | | Content Composition | Spatial Configuration |
|---|---|---|---|---|
| | | | ***Landscapes' bio-socio-spatial network management*** | |
| | | | **Landscape's resource allocation** | |
| **System Ecology** | **Level of Construction and Use** | **4)** Ecological Equilibrium | - preserving the corridor's content compatibility, respecting requirements of fulfilling the process of *transcendental social programming* (= respecting both living systems and human needs) (Barghjelveh, 2011);<br>- introducing landscape's new specie, patch and ecosystem prioritizations | - preserving the corridor's spatial compatibility, respecting the requirements of fulfilling the process of *transcendental ecological networking* (= integrated networks of ecosystems and urban developments) (Barghjelveh, 2011);<br>- introducing a comprehensive spatial system respecting both biological processes and urban built infrastructures |
| | | **3)** Ecological Function | - preserving temporal-spatial perspective;<br>- introducing unified system of ecosystem & place, and interconnected system of climate & territory (Forman, 1995; Zonneveld, 1995) | - preserving spatial connectivity/integrity of corridor;<br>- introducing balanced function of ecological-anthropological processes (Jongman and Pungetti, 2004; Forman, 1995) |
| | | **2)** Thought Structure | - preserving natural attractions;<br>- introducing eco tourism opportunities | - preserving nature reserves and cultural features (Little, 1990);<br>- introducing ecological connections between natural patches, urban spaces and residential areas |
| | | **1)** Biological Structure | - preserving species' living conditions (Noss and Harris, 1986) | - preserving species' ecological connections |

## References


Ackoff, R.L. and F.E. Emery (1972). On Purposeful Systems. Tavistock Publications.

Ahern, J. (1991). Planning for an extensive open space system: Linking landscape structure and function. Landscape and Urban Planning, 131-45.

Barghjelveh, S. (1998). Centrality in the Structure of Built Environment, A Study in the Structural Transformation of Society and Space, Ph.D thesis, Scotland, UK.

Barghjelveh, S. (2011). Using the C0mponent Model of Sustainable landscape for the Quality Assessment of urban natural Public Spaces: A case Study from tehran's River-vallyes. International Journal of Architecture and urban Development, 2: 5-24.

Breuste, J. J. Niemela and R. Snep (2008). Applying landscape Ecological Principles in Urban Environments. Landscape Ecol, 23: 1139-1142.

Erickson, D. and A. Louisse (1997). Greenway implementation in metropolitan regions: A comparative case study of North America examples. School of Natural Resources and Environment, University of Michigan.

Farina, A. (2010). Ecology, Cognition and Landscape. Linking Natural and Social

Systems. Springer.

Forman, R.T.T. (1995). Land mosaics: the ecology of landscapes and regions. UK: Cambridge University press.

Golkar K. (2000). Components of creation of urban design quality. *Journal of Soffe*, Shahid Beheshti University, 32: 38-65.

Grimm, N.B. S.H. Faeth, N.E. Golubiewski, C.L. Redma, J. Wu and X. Bai (2008). Global Change and the ecology of cities. Science, 319: 756-760.

Hillier, B. (1989). Space Syntax. Ekistics 334, January/February 1989.

Ingeognoli, V. (2002). Landscape ecology: A widening foundation, Springer, Berlin.

Jongman, R. and G. Pungetti (2004). Ecological networks and greenways concept, design, implementation. UK: Cambridge University Press.

Linehan, J.R., M. Gross and J. Finn (1995). Greenway planning: developing a Landscape ecological network approach. Landscape and Urban Planning, 33: 179-93.

Noss, R.F. and L.D. Harris (1986). Nodes, networks and MUMs: preserving diversity at all scales. Environmental Management, 10: 299-309.

Schwarz, L.L. (eds.) (1993). Greenways: a guide to planning, design and development. Washington, DC: Island Press.

Steiner, F. (2000). The living landscape, in An Ecological Approach to Landscape Planning. New York, USA: McGraw hill.

Tehran's Comprehensive Plan 2006 and 2012.

Walmsley, A. (1995). Greenways and the making of urban form. Landscape and Urban Planning, 33: 81-127.

Wu, J. (2008). Making the case for landscape ecology – an effective approach to urban sustainability. Landscape, J 27: 41-50.

Zonneveld, I.S. (1995). Landscape ecology. Amsterdam: SPB Academic Publishers.