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***Analysis of Ecological Structure of Tehran Landscape to Develop
Restoration and Enhanced Environmental Quality Strategies***

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Extended Abstract

Tehran is one of the most polluted metropolises in the world. Sink capacity for absorption and assimilation of pollution is reduced generally in Tehran due to failure in incorporation of ecological aspects in the regional land use development plans. The present condition of air and water related issues in Tehran are largely affected by landscape structural alterations at urban level.

In this research, the focus is to understand the relationships between land use patterns and ecological processes particularly those air and water related processes, which are affecting the urban environmental quality. We propose measures to harmonize urban growth patterns based on the existing opportunities for increasing the sink capacity for air pollution and waste water.

Using Land sat satellite images (dated 1988 & 2002) maps for three classes of green, open and built land cover types were created. A series of landscape metrics, NP (Number of Patch), MPS (Mean Patch Size), MNND (Minimum Nearest Neighbor Distance), and CAP (Class Area Proportion) were used for the analysis of landscape structure (both configuration and composition) at two different scales. Based on Variations in environmental conditions and spatial configuration and composition of Tehran landscape, three distinct homogeneous zones and six subzones with different environmental conditions and ecosystem capabilities for urban development are distinguished within the delimited urban region considered (Figure 1 and Table 1).

The following characteristics have been associated to each zone:

Zone A: in this zone, the remnant patch mosaic network with the highest MPS value and most appropriate connectedness is found. Conservation and restoration of remnant patch mosaic network will be most cost effective results in landscape type A because of its proximity to mountainous area as the source of valuable services that may be transferred into the city by means of several river valleys which are still remained less altered.

Zone B: in this zone despite low class area proportion of urban green space, it has a high class area proportion of open (agricultural land, hills and river valleys) patch type with good connectedness. If treated waste water and urban runoff is appropriately allocated to these patches, an important green patch mosaic as urban forest is expected to be created that function as sink for air and water pollution and will serve as a source of environmental services in addition to improvement of urban regions' remnant patch network connectedness.

Zone C: The present urban remnant patch mosaic network has both a low connectedness and a low class area proportion. It is essential to develop urban green spaces to obtain regional connectedness despite the fact that no particular advantageous potential resources are available in this respect.

Fig.1: Map of homogeneous landscapes identified in association with patch type and natural characteristics of Tehran Urban Region

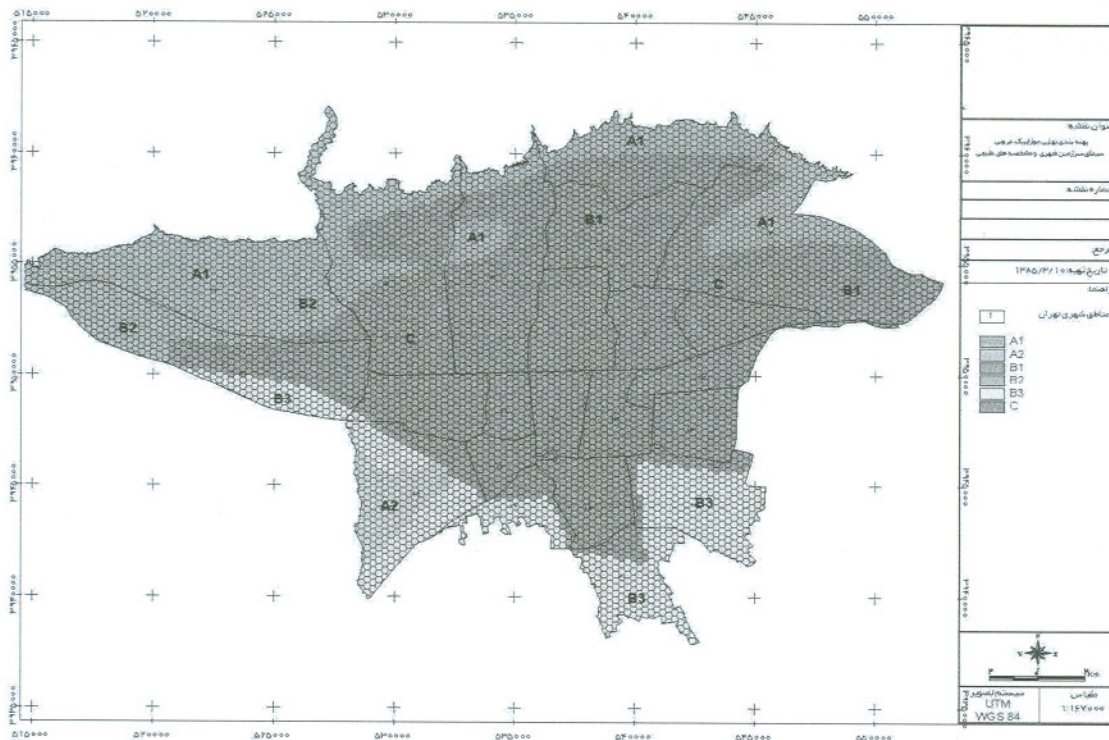


Table 1: Metrics computed for built, green and open patches in different homogeneous parts of urban landscapes

Built up area			Open Spaces			Green Spaces				zone	Sub zone	Zone
MNND Meter	MPS Hectar	CAP %	MNND Meter	MPS Hectar	CAP %	NP	MNND Meter	MPS Hectar	CAP %			
<214	<4	<12	<37	>12	>50	<180	11>	>1	>50	A ₁	A	
<214	<4	<12	<37	>12	>50	<180	11>	>1	>50	A ₂		
<59	4-14	13-50	37-45	>12	22-50	<350	34>	.42-1	11-50	B ₁	B	
<59	4-14	13-50	37-45	>12	22-50	<350	34>	.42-1	11-50	B ₂		
<59	4-14	13-50	37-45	>12	22-50	<350	34>	.42-1	11-50	B ₃		
<59	>14	>50	>45	>12	<21	<68	281>	.42>	10>	C	C	

Final results demonstrate that despite ecological alteration, the remnant patch mosaic network of Tehran may still be restorable. The river valley network provides the basis for development of a conceptual framework referred to in this research as “Refuge Network” in order to integrate all corrective measures at different scales. Natural layouts of river valley networks along with the core open patches of hills may be the basis for implementation of a comprehensive restoration plan based upon the “Aggregate with outlier” model as a spatial design framework at urban level.

Key words

Landscape Ecological Metrics, Landscape Structural Restoration, Aggregate with Outlier Model, Refuge Network, Urban Environmental Quality, Tehran