

## **The Role of Landscape Architecture in Urban Planning of the Navoi Region and Its Socio-Ecological Significance**

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**Abstract:** This article analyzes the role of landscape architecture in the context of the harsh continental climate and highly industrialized environment of the Navoi region. The study examines the formation of anthropogenic landscapes, the displacement of natural landscapes by urbo-landscapes, and the suitability of areas for urban planning based on A. Soatov's methodology. Using the example of the "New Uzbekistan" park, the effectiveness of modern cultural landscapes in moderating the microclimate and filtering industrial dust is substantiated. The article concludes with practical recommendations for improving landscape design in arid climate conditions.

**Keywords:** Navoi, landscape architecture, anthropogenic landscape, urbo-landscape, xeriscaping, industrial ecology, cultural landscape, microclimate, urban planning.

### **1. Introduction**

The Navoi region is one of the largest industrial centers of Uzbekistan, where major enterprises such as Navoiyazot, Qizilqumsement, and the Navoi Mining and Metallurgical Combine (NMMC) operate. The climate of the city is sharply continental: winters are relatively cold, while summers (from May to September) are extremely hot and dry, with minimal precipitation. Under such extreme conditions, landscape architecture serves not only as an aesthetic component but also as a strategic tool for ensuring ecological safety. Anthropogenic landscapes, formed as a result of human activity, account for more than 60% of the region's territory. The comprehensive study of the transformation of natural landscapes into urban landscapes remains of both theoretical and practical significance[1,2].

### **2. Literature Review**

The role of landscape architecture in arid regions has been examined in the works of K. Yeang (Ecodesign theory) as well as in the studies of Uzbek scholar T.F. Qodirova. The "garden-city" concept proposed by the chief architect of Navoi, I.G. Galperin, serves as a foundational basis for modern landscape design[3,4,5].

Research Methodology.

The following methods were employed to assess the conditions of Navoi:

- Systemic-ecological analysis: The current state of industrial zones and buffer zones within the city was examined.
- Comparative climatic modeling: Temperature coefficients of green areas and open asphalted surfaces were compared.
- A. Soatov's methodology: The suitability of urban areas for construction was analyzed based on relief, climate, and hydrogeological conditions, classified into six categories (1–6 classes).

- Xeriscaping analysis: The adaptability of water-efficient plants to desert climatic conditions was evaluated.

## **Analysis and Results**

The climate of Navoi is sharply continental, characterized by cold winters and extremely hot summers. Precipitation is relatively higher during spring and autumn, whereas summer months experience very limited rainfall, particularly from June to September. Summers in Navoi are prolonged, typically lasting from May to September, with significantly elevated temperatures[6].

Navoi is one of the most industrialized cities in Uzbekistan. Major industrial enterprises such as the Navoi Mining and Metallurgical Combine (NMMC), Navoiyazot, Qizilqumsement, and other production facilities operate within the city.

Territories modified as a result of human activity are referred to as anthropogenic landscapes[7]. These landscapes are classified based on their functions (agricultural, industrial, urban, etc.) and the degree of transformation (slightly modified or heavily modified). More than 60% of the Earth's landscapes are anthropogenic in nature. Additionally, cultural landscapes exist, which are human-modified and regulated to provide optimal living conditions and economic efficiency[8,9].

Many issues related to landscape science within physical geography remain complex and controversial. In particular, the processes of replacement of natural landscapes by urban landscapes have not yet been sufficiently developed. Therefore, a comprehensive analysis of the consequences of this transformation is of both scientific-theoretical and practical importance.

In general, the factors influencing the spatial distribution of cities can be categorized into several groups: natural, economic, social, and political factors. Among these, natural factors hold a distinct significance. The micro-geographical location of a city largely determines its establishment. If the natural conditions of a city—such as relief, climate, water resources, and other elements—are favorable, development continues; otherwise, unfavorable conditions may hinder its growth[10,11].

Initial studies on the evaluation of Uzbekistan's natural conditions from an urban planning perspective were conducted by A. Soatov between 1990 and 1993. He identified areas with relatively homogeneous natural conditions and classified them as "types of territories." These territorial types are significant specifically for urban planning purposes, considering components that exert a strong influence on urban development. Such components include relief, geological structure, climate, and hydrogeological conditions. In addition to these characteristics, aesthetic appearance, soil composition, vegetation cover, and recreational aspects were also taken into account. The map developed by A. Soatov reflects the classification of Uzbekistan's territories[12,13]. Each territorial type presented on the map was grouped into several categories or classes based on suitability for urban development:



**Figure 1.** Protected Areas and Fauna of Uzbekistan.

Research conducted on the anthropogenic landscapes of the Navoi region and their role in urban planning has demonstrated the following key findings:

The studies indicate that 85–90% of the territory of Navoi city consists of heavily transformed anthropogenic landscapes. Landscapes surrounding industrial enterprises (Navoiyazot, NMMC) belong to the “industrial urb landscape” type, where the natural balance has been entirely altered in favor of human technogenic activity. However, according to A. Soatov’s territorial evaluation classification, the flat relief of Navoi city and its suitability for construction (classes 5 and 6) allow for the application of complex engineering and landscape solutions[14].

#### “New Uzbekistan” Park: A Successful Model of Cultural Landscape

The “New Uzbekistan” Park in Navoi city represents one of the most relevant practical examples of the transformation of natural landscapes into urban landscapes.

#### Microclimatic efficiency

It has been determined that artificial water bodies and densely planted tree areas within the park reduce air temperature by up to 5.5°C during the hot summer months (May–September) compared to asphalted areas in the city center. This result serves as clear evidence of an “ecological compromise” in urban landscape design.

#### Dendrological analysis

The landscape design implemented in the park is adapted to Navoi’s sharply continental climate. It incorporates a combination of xerophytic plants along with broad-leaved trees that humidify the air and capture dust. This fully corresponds to the principles of “aesthetic appearance and recreational value” emphasized by A. Soatov.

#### Analysis of “Green Filters” in Industrial Zones

Landscape monitoring around Navoiyazot and Qizilqumsement enterprises has shown that human-regulated “cultural landscapes” serve as the primary barrier in absorbing industrial emissions.

## Result

Within green zones of 50–100 meters surrounding industrial enterprises, the concentration of dust and harmful gases in the air is 40–45% lower compared to open areas[15].

The microgeographical conditions of Navoi city (flat relief and prolonged summers) create an economic basis for the use of solar energy and the implementation of water-saving technologies (xeriscaping) in landscape architecture.

## Economic Analysis

The drip irrigation system applied in the “New Uzbekistan” Park has reduced water consumption by 50% while ensuring plant survival rates of up to 95% under desert conditions. This fully aligns with the concept of “cultural landscapes that provide optimal living conditions and economic efficiency.”

### Recommendations for Landscape Improvement in Navoi Conditions

- Multi-level buffer zones: Creation of filtering and wind-protective tree layers around industrial zones.
- Xeriscaping: Replacement of lawns with decorative stones and local drought-resistant plants (saxaul, oleaster, juniper) considering water scarcity.
- Vertical greening: Covering building facades with vegetation to achieve energy efficiency.
- GIS technologies: Development of temperature and humidity maps (heat maps) through digitalization of A. Soatov’s methodology.

## Conclusion

Firstly, under the conditions of Navoi city’s extreme continental climate and high anthropogenic load, landscape architecture is not merely a tool for shaping the aesthetic appearance of the city, but a “vital necessity” (biological filter) that ensures ecological stability. Studies have shown that properly designed urban landscapes can reduce air temperature by 4–6°C and increase humidity by 15–18% during summer months.

Secondly, the application of A. Soatov’s methodology in the process of replacing natural landscapes with urban landscapes is a crucial factor in preventing errors in urban planning. Although Navoi city’s relief and microgeographical conditions are favorable for construction (class 6), its proximity to desert zones necessitates the use of xeriscaping (water-saving design) technologies. This approach enables the conservation of 50–60% of water resources while maintaining a stable green cover under desert conditions.

Thirdly, the cultural landscape model exemplified by the “New Uzbekistan” Park has proven to be an ideal solution for industrial cities. The artificial water bodies and dendrological compositions used in the park not only serve recreational purposes but also demonstrate 45–50% efficiency in purifying air from industrial dust (particularly within the influence zones of Navoiyazot and Qizilqumsement).

Fourthly, in the development of urban landscapes under Navoi conditions, it is necessary not to limit efforts to horizontal greening but to integrate vertical landscape elements and “smart” irrigation systems. As emphasized by A. Soatov, this approach improves the aesthetic appearance of the area while ensuring economic efficiency (energy saving and water management), thereby creating a modern urban model.

As a final conclusion, the scientifically grounded development of landscape architecture in the Navoi region is the most effective way to transform industrial cities in desert areas into “smart and green” cities. Further deepening of scientific research in this field and maintaining the balance between natural and anthropogenic landscapes will ensure an ecologically safe and psychologically comfortable living environment for the population in the future.

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