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Sustainable Landscape Solutions For Sports And Recreational Spaces In Hot Climates: The Case Of Tashkent

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Abstract: The article examines the principles of sustainable landscape design for sports and recreational spaces in hot-arid climates, using the city of Tashkent as a case study. The research analyzes climatic factors and urban conditions affecting the formation of a comfortable urban environment. Key strategies and technologies are identified, including water-saving systems, shading structures, the use of local drought-resistant plant species, and low-heat-absorption materials. The study formulates ecological, social, and economic sustainability principles that underpin the design of sports and recreational areas in Central Asia.

Keywords: Sustainable design; landscape architecture; sports and recreational spaces; hot climate; Tashkent; water conservation; microclimate; urban ecology.

INTRODUCTION:

Modern cities of Central Asia face numerous climatic and urban challenges, including rising temperatures, changing precipitation patterns, water scarcity, and intensive urban development. Under these conditions, the creation of high-quality sports and recreational areas becomes an essential element of the urban environment, both in terms of public health and ecological sustainability.

Tashkent is characterized by a hot, dry summer climate, with an average annual precipitation of 400–450 mm and summer temperatures often exceeding +40 °C. These climatic conditions necessitate the application of specific landscape and architectural solutions when designing sports facilities.

The aim of this article is to identify and systematize the principles of sustainable landscape design for sports and recreational spaces adapted to hot-arid climates, using Tashkent as an example. The research objectives include:

1. Analyzing the climatic and urban characteristics of Tashkent that influence landscape design.
2. Identifying and systematizing sustainable landscape design techniques suitable for sports and recreational environments.
3. Developing recommendations for designing such spaces with consideration of local conditions.

Theoretical Foundations of Sustainable Landscape Design

Sustainable landscape design integrates three dimensions of sustainability: ecological, social, and economic. From an ecological perspective, it is essential to minimize resource consumption (water, energy), support biodiversity, and improve the microclimate. From a social perspective, it is

important to ensure accessibility, comfort, and safety for diverse user groups. Economically, sustainable solutions must reduce maintenance costs and ensure long-term durability.

In hot climates, particular importance is given to the use of native drought-resistant flora, the reduction of heat accumulation through material selection, shading systems, and water- and energy-efficient technologies. Additionally, the creation of "green islands" and landscape-based wind-flow correction play significant roles.

Climatic Features of Tashkent and Their Influence on Design

Tashkent is located in a sharply continental climatic zone, characterized by hot summers and minimal summer precipitation. With an annual average rainfall of 400–450 mm and prolonged periods of heat and dryness during summer, the urban microclimate experiences significant stress, especially in open sports areas.

These conditions shape the design of sports and recreational spaces through the following needs:

- Creation of shaded and cooled zones, such as canopies, pergolas, and green walls.
- Use of water elements (streams, fountains, ponds) not only for aesthetics but also to enhance microclimatic comfort by increasing humidity and reducing temperature.
- Selection of drought-resistant vegetation and low-heat-absorption surfaces (light-colored concrete, gravel, grass pavers).
- Implementation of rainwater harvesting and recirculation systems to support irrigation and water features.

Examples of Landscape Solutions in Sports and Recreational Spaces of Tashkent

1. City Park (Tashkent City)

The project includes a large green area with water channels and shading structures, which contributes to comfortable microclimate conditions during summer. Water surfaces and tensile structures function as cooling elements.

2. Lokomotiv Park

A combination of natural and planted vegetation, along with mini-sports grounds and recreational spaces, demonstrates the integration of sports and leisure functions.

3. "Yangi Hayot Sport Majmuasi" Sports Complex

The project incorporates local tree species (such as plane tree, acacia, and gleditsia), shading structures, and drip irrigation systems. It represents a successful adaptation of planting strategies and technical solutions to hot-arid conditions.

Based on these examples, several common principles can be highlighted:

- Creation of green buffers around active sports areas.
- Combining sports grounds with rest zones and shaded green areas.
- Use of water features and low-water-consumption irrigation systems.

Techniques and Technologies of Sustainable Design

The following practical methods and technologies are recommended for sports and recreational spaces in hot climates:

1. Shading structures — pergolas, canopies, tensile umbrellas, climbing plants; these reduce direct solar radiation and lower heat stress.
2. Water-saving and recirculation systems — rainwater harvesting, filtration, and reuse for irrigation and water features.
3. Vegetation selection — prioritizing native and drought-resistant species; reducing high-water-demand lawns; creating "green ventilation corridors."
4. Low-heat-emission surfaces — light grass pavers, gravel, permeable concrete, reducing heat accumulation and increasing comfort.
5. Microclimate-oriented routing — jogging and cycling tracks placed through shaded and green areas with water features and natural ventilation.
6. Integration of multifunctionality — sports grounds designed for flexible seasonal use and for both recreation and public gatherings.

Socio-Ecological Effects and Practical Significance

Implementation of the above solutions produces several key benefits:

- Microclimate improvement: reduced air and surface temperatures, increased user comfort, and lower heat stress.
- Water savings: efficient irrigation systems and drought-resistant vegetation significantly reduce water consumption.
- Increased attractiveness of sports and recreational zones, encouraging greater public participation in physical activity.
- Development of a sustainable urban environment: projects become more durable, require less maintenance, and support higher levels of ecological responsibility.

These effects are particularly relevant for hot, highly urbanized cities such as Tashkent.

CONCLUSION

Sustainable landscape design for sports and recreational spaces in hot-arid climates is a complex task involving architectural-landscape, engineering, and social considerations. The example of Tashkent demonstrates that the integration of natural and technical solutions can create a comfortable, energy-efficient, and aesthetically appealing urban environment.

Further research is recommended to include quantitative analysis of the microclimatic performance of individual elements (e.g., shading structures, water features) and to develop methodologies for evaluating the economic efficiency of sustainable landscape solutions.

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