

## LANDSCAPE SOLUTIONS OF FREE ECONOMIC ZONES IN INDUSTRIALIZED CITIES

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**Abstract:** This article examines the landscape planning solutions for industrialized cities' free economic zones aimed at enhancing their functional efficiency, ecological sustainability, and aesthetic quality. The study's main objective is to identify sustainable landscape design principles that improve the environmental and social performance of FEZs. The research applies comparative and analytical methods by studying advanced European experiences (Germany's Ruhr Valley, the UK's Teesside and Sheffield, France's Lyon, Italy's NOI Techpark, and Spain's Zona Franca) and comparing them with the current state of Uzbekistan's FEZs such as Navoi, Angren, Jizzakh, and Urgut. The findings reveal that landscape planning in Uzbekistan's FEZs remains underdeveloped, with a lack of green buffer zones, drainage systems, eco-corridors, and recreational areas. Based on environmental and climatic conditions, the study proposes adaptive landscape solutions for Urgut FEZ, including green roofs, rainwater management, ecological transport corridors, and recreational green zones. Drawing from European best practices, the research concludes that integrating sustainable landscape design into FEZs can significantly contribute to balanced economic growth, ecological resilience, and social well-being in Uzbekistan's industrial regions.

**Keywords:** Landscape planning, ecological sustainability, green infrastructure, industrial landscape, urban design, green buffer zones, green roofs, drainage systems, Urgut FEZ, European experience, sustainable development.

**Introduction.** Landscape solutions of Free Economic Zones in industrialized cities are planning and design measures aimed at ensuring the functional efficiency, environmental sustainability and aesthetic appeal of the zone. These solutions not only provide a favorable environment for manufacturing infrastructure, but also serve to protect human health, social welfare and the environment.

The main areas of landscape solutions for free economic zones in industrialized cities of Uzbekistan are as follows, with a clear separation of functional zoning and green areas: manufacturing, logistics, offices, service and recreation areas. Creation of a natural buffer zone between industrial areas and living areas through groves, gardens, artificial landscapes in green areas. And to protect against noise and dust, it is achieved by planting green walls, large-leaved trees. In solutions aimed at environmental sustainability, rainwater drainage system-reduces water accumulation and provides natural filtration. In the planned water flow system in free economic zones, it will be necessary to combine industrial waste with treatment facilities. When landscaping, it is advisable to plan green roofs, vertical gardens, natural green corridors. Main part. As for the social and aesthetic aspects of free economic zones, it is imperative for employees to have recreational areas, sports fields, recreation areas, pedestrian corridors. In architectural-landscape harmony, it is important to organize a suitable landscape design around modern industrial buildings. From the lighting and safety aspects in the area, it should be harmonized with environmental lighting systems (LED, solar panels based). The fact that the landscape elements supporting Transport and logistics should be separated from the industrial transport of green transport lanes, veloils, walkways was cited in our study. The multi-tiered

transport infrastructure, i.e. highways, railways, freight terminals, is harmonized with the landscape. Green regions around parking lots and cargo platforms reduce heat and dust spread. Through the application of technological integration that serves sustainable development, the advantage of the application of smart landscape design-based water conservation systems, climate control systems has been considered. Installation of solar panels in open areas with the integration of the free economic zone with solar panels in accordance with landscape elements. At the same time we made sure that integration with green Stack areas in waste recycling areas is one of the important tasks of our study.

One of the FEZs in which industrial and green areas are integrated in the world's free economic zones is Songdo, South Korea – FEZsi, with an ecological urban model within the FEZ. Another FEZ Masdar City, UAE – the combination of industrial and green technologies and the FEZ near the city of Nur-Sultan, Kazakhstan – can be cited as an example of its development with modern landscape solutions.

In Uzbekistan, there is little in-depth information on specific landscape solutions for free economic zones (“green buffer”, eco corridor, green roofs, aesthetic Groves), but based on the available initiatives and the general situation, we can show some promising directions and examples. For example, before giving facts, needs and example recommendations that allow us to propose landscape solutions for the FEZ in the cities of Uzbekistan, we can see that landscape solutions in the Free Economic Zones of the FEZ state “Navoi”, “Angren”, “Jizzakh”, “Urgut”, “Gijduvon”, “Kokand” and “Hazorasp” have not been improved in the cities of Uzbekistan. According to the latest data, the FEZs are working on aspects such as total production volume, investment and export orientation. For example, 589 businesses operate in 22 FEZs, 42 trillion soums are produced, and the percentage of high-tech goods is part of the discussion[6]. However, it has been found that there is no focus on clearly constructed examples or projects in terms of landscape design, ecological buffer zones, green walls, or aesthetics. FEZs experience the following needs and challenges for landscape solutions: FEZs are often associated with industrial buildings, logistical roads, warehouse areas and infrastructure, increasing negative factors such as dust, noise, air emissions. There are no resorts, green corridors, sports fields in nearby areas in the health of workers and the need for recreation. Eezes are often located on the outskirts of the city, so access roads to the city, border areas, office buildings and living areas must have an attractive view from the visible side.

The above proposals are suitable in terms of landscape and surrounding muhtit for Urgut EIZsi of Samarkand region. We bring practical and aesthetic proposals taking into account the nature and climate of the area. Urgut is located next to the mountain and, from this, the climate is: hot in summer (28-30°C), cold in winter (sometimes -4-5°C). There is precipitation, especially in spring and autumn[3]. Taking into account the presence of Water Resources in the area, such as the Kamongaron reservoir, the presence of natural landscapes and mountain landscapes, we can make these proposals for landscape solutions.

Landscape solutions of Free Economic Zones in European industrialized cities - this topic is very important and interesting in economic, environmental and urban planning. We must consider this issue in several aspects. Industrialised cities in Europe (such as the Ruhri Valley in Germany, the Lyre Valley in France, the Merseyside area of Great Britain) are industrial and manufacturing centres. In these areas, free economic zones are important to promote economic activity, create jobs, and attract investment. Their landscape solutions are architectural and design solutions aimed at creating natural and artificial elements of the area, including green zones, Groves, watersheds, walkways and other environmentally balanced infrastructure, and maintaining the balance of the urban and industrial area.

In Europe, large quantities of trees and plants are planted to improve air quality in production zones at the cost of increasing landscape solutions in free economic zones. Regulation of water accumulation and flow through water bodies, artificial lakes and drainage systems. Creating a healthy and comfortable environment for workers, ensuring the environmental friendliness of Transportation. Filtration and treatment systems are installed through landscape elements to reduce industrial emissions. Through parks, recreation areas and sports fields, a quality living environment is created for workers and local residents. As an example, in Germany, in the Ruhri Valley, industrial areas were ecologically reconstructed, and many green zones and parks were established. Landscape design around the UK, Merseyside Economic Zone, aims to create a healthy urban environment. The impact of industry on the natural environment has been reduced through water resource management and ecological parks in the Lyre Valley of France. Advanced practices and designs carried out in the field of landscape solutions in industrialized cities and free economic zones in Europe, aimed at ensuring environmental sustainability, improving the quality of living and balancing industrial activities, to which we can exemplify some Model areas in Spain, Italy, Great Britain and France.

Zona Franca in Barcelona, Spain, is an industrial area with an area of 6 million m<sup>2</sup> and covering more than 300 companies. It is recognized for its compliance with the UN Sustainable Development Goals. The area has green infrastructure, water conservation systems and environmental design elements and aims to ensure the harmony of the industrial and living environment.

The Italian NOI Techpark is a science and Technology park on 12 hectares of land in Bolzano and includes more than 40 science laboratories and startups. An innovative and environmentally sustainable environment has been created in the area through the integration of modern architecture and green spaces. Scalo Romana in Milan, located on the territory of the former railway station, forms a complex on 19 hectares that includes elements of architecture, green areas and social infrastructure. It aims to revitalize industrial areas and improve the living environment.

The Teesside Freeport Area of the United Kingdom, located on 4,500 acres, includes former steelworks, harbours and airports. The area has been the site of investment projects aimed at revitalizing the industry and ensuring environmental sustainability.

The Blaenavon area of Wales, covering an area of, included industrial facilities, transport infrastructure and worker housing. The area, an important example of the industrial revolution, has been listed as a World Heritage Site by UNESCO.

Poblenou, an industrial area in Barcelona, has undergone an urbanistic renewal process in recent years. It aims to create a new urban environment in the area through the integration of innovative buildings, green areas and elements of social infrastructure.

In France, since the 1970s, there are economically vulnerable areas in suburban areas called banliyös. The renovation initiatives undertaken by the government are aimed at improving green areas, pedestrian and bicycle lanes, social infrastructure and architectural elements in these areas.

In the UK, specifically England, landscape solutions in free economic zones and industrial areas are an important part of environmental sustainability and Urban Development. Teesside Freeport in England was placed around an industrial area of Free Economic Zones and landscape solutions, green zones and groves so that air pollution could be reduced and recreational areas for workers could be created. Water management systems have been installed, reducing the impact of industrial waste on Water Resources. There is an incentive for environmental transport through bicycles and walkways. Liverpool Freeport has been

undergoing projects in recent years to transform industrial areas into green spaces and connect them with water bodies. Projects aimed at restoring the environment and preserving biodiversity are being used. The area remains green and attractive in the London Docklands FEZ through restoration of watersheds and canals, and the development of footpaths and cycle lanes. Green roofs and ecological buildings are harmonized with industrial structures and new residential areas. A large number of Parks and green corridors have been set up to make Sheffield Industrial zones a socially and ecologically sustainable living environment. Solutions aimed at managing water resources and reducing emissions are being implemented. In the Sheffield industrial areas, the former Iron Works and factory areas have caused many environmental problems. Currently, complex environmental projects and landscape designs are being implemented to clean and process these areas. Cleanliness of incoming and outgoing waters, soil and air is ensured. Many trees and plants are planted in the area, creating natural green zones. Green zones, parks are being established around and within industrial areas. These areas are creating recreational areas for workers and local residents. Examples include Peace Gardens in the city of Sheffield and many other small green spaces, which are located near industrial areas and serve to maintain ecological balance. Special drainage systems, artificial lakes and water treatment facilities are being created in Sheffield to reduce water pollution from industrial waste. Watersheds and canals provide an ecological link between the industrial areas and living zones of the city. Walking and cycling trails were built around the industrial areas to support the healthy lifestyle of the workers. Transportation and mobility systems are becoming more environmentally friendly and accessible. Energy efficiency, environmental materials and sustainable construction methods are being used in new industrial objects and rebuilt building projects. In Sheffield, modern landscape architecture seeks to create a new ecological environment while maintaining an industrial heritage. We should consider information regarding landscape planning principles and diagrams in Sheffield industrial areas.

This data is aimed at preserving Sheffield's industrial heritage, ensuring environmental sustainability and applying modern urbanistic approaches.

In conclusion, it can be concluded that the principles of Landscape Planning implemented in the industrial areas of Sheffield are based on the following main areas:

-By ensuring environmental sustainability: green zones and parks are established in industrial areas, aimed at improving air quality and maintaining biodiversity. Water resource management systems have been installed, reducing the impact of industrial waste on water bodies.

- With the preservation and integration of the industrial heritage: the former industrial facilities and infrastructure are preserved and harmonized with new urbanistic projects. Planning has been undertaken to preserve heritage sites and industrial heritage.

-By supporting social and Economic Development: living spaces, education and health infrastructure have been created for workers. Social infrastructure and transportation systems have been developed around the industrial areas.

Landscape solutions of Free Economic Zones in industrialized cities are aimed at ensuring functional efficiency, environmental sustainability and aesthetic appeal. The combination of green areas, ecological buffer zones, water management systems, resorts and transport infrastructure serves to improve workers' health and Environmental Quality. While there is little practical experience in landscape design in the FEZs in Uzbekistan, the introduction of green roofs, buffer zones and ecological elements is seen as a promising direction. From European examples, notably the FEZs in Sheffield and other cities, it has been shown that environmentally and socially sustainable landscape solutions can be implemented while

preserving industrial heritage. In this way, landscape planning manifests itself as an important tool that balances the economic, environmental and social development of FEZs.

Landscape solutions of Free Economic Zones in industrialized cities serve not only to increase economic efficiency, but also to improve environmental sustainability, social welfare and aesthetic aspects. Landscape solutions are insufficiently developed in the conditions of Uzbekistan, in particular in Urgut, Navoi, Angren and other FEZ, and in these regions there is a need for such elements as green buffer zones, green roofs, recreation areas, water management systems and environmentally friendly transport corridors.

The European experience (Sheffield, Teesside, Poblenu, Zona Franca, etc. On this basis, landscape solutions for Eezez in Uzbekistan are recommended to focus on the following main areas:

- Green protection zones-separation of industrial areas from residential zones and roads.
- Stormwater management-the introduction of water accumulation and drainage systems.
- Green roofs and facades – reduce heat in buildings and create an aesthetic appearance.
- Recreation areas-parks, walkways and sports fields for workers.
- Transport and road aesthetics-green transport lanes, pedestrian and bicycle lanes, background lighting and landscape elements.
- Dust and noise protection-reduce noise and dust through groves and green walls.
- Water supply and environmental sustainability – plants suitable for the local climate, low water-intensive landscape solutions and smart irrigation systems.

With this, the introduction of modern landscape solutions in the development of EEZs in Uzbekistan makes it possible to harmonize the industrial and living environment, increase environmental stability and improve the social well-being of workers and the population.

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