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INNOVATIVE ECO-SPACES IN DENSELY POPULATED CITIES IN THE CONTEXT OF UKRAINE'S SUSTAINABLE DEVELOPMENT STRATEGY²⁰

Global urbanization processes, rapid population growth in cities, and environmental challenges demand new approaches to urban spatial development [1]. In Ukraine, where the expansion of megacities is intensifying, the creation of innovative eco-spaces is becoming critically important for ensuring sustainable development [2].

Eco-spaces are a key element of "green cities", improving air quality, reducing noise pollution, optimizing the urban microclimate, and enhancing citizens' well-being. Their integration into the urban structure allows for a balance between urbanization and ecological stability [3].

International experience (Sweden, Germany, Singapore) demonstrates that "green" urban development strategies incorporate innovative solutions such as vertical greening, "smart" parks, energy-efficient public spaces, ecological transportation, and integrated urban resource management systems [4]. The implementation of similar solutions in

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Ukraine aligns with the goals of sustainable development outlined in the Ukraine 2030 Sustainable Development Strategy and the European Green Deal [5].

This paper examines modern approaches to forming innovative eco-spaces in densely populated cities, their impact on ecology, energy efficiency, and the social development of urban areas [6].

Key Aspects of Innovative Eco-Spaces

- Green roofs and vertical gardens – using buildings as additional green zones (example: Bosco Verticale, Italy).
- Regeneration of industrial zones – transforming abandoned areas into modern energy-efficient spaces (example: HafenCity in Hamburg).
- Implementation of "smart parks" – integrating sensor technology, solar-powered lighting, and rainwater collection systems.
- Expansion of pedestrian zones and green corridors – reducing transport congestion and promoting ecological mobility.

Eco-Spaces as a Key to Climate Change Adaptation includes reducing the urban heat island effect through the integration of natural materials, water features, and green areas. Urban stormwater management – using drainage systems and permeable surfaces to minimize flood risks; enhancing biodiversity – creating green zones suitable for wildlife within urban environments [7].

- ✓ “Smart” greening – automated plant care systems to optimize urban greenery maintenance.
- ✓ Interactive public spaces – parks and plazas that engage with visitors through digital technologies (e.g., LED lighting adapting to noise or air pollution levels).
- ✓ Renewable energy sources – utilizing solar panels, wind turbines, and kinetic energy to power urban spaces [8].

Socio-Economic Benefits of Innovative Eco-Spaces consist of improved public health – reducing stress levels and enhancing the microclimate of urban areas and attracting investments – the development of green zones increases real estate value and urban tourism attractiveness.



Figure 1. Urban Eco-Trends and Their Adaptation in town



Figure 2. Innovative Technologies in Eco-Space Development

That is also fostering ecological awareness – integrating environmental initiatives into urban planning and educational programs [6].

The development of innovative eco-spaces in densely populated Ukrainian cities is a crucial step toward sustainable urban transformation. The integration of modern ecological and digital technologies will create a comfortable, healthy, and energy-efficient environment for urban residents, facilitate climate adaptation, and stimulate economic growth [3].

Future for eco-space development in Ukraine include launching a National Program for Urban Ecological Modernization, supported by international grants and investments, incorporating European urban planning practices, and adopting "15-minute city" models. It also involves promoting the growth of green businesses by supporting startups in urban development and eco-tech solutions, and fostering public engagement in urban space design through platforms for discussions and eco-projects [4].

Ukraine has great potential to implement green urban strategies that align with European standards, improving the quality of life for city dwellers while ensuring environmental sustainability [4-5].

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