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BUFFER ZONES IN ECOLOGICAL FRAMEWORK PLANNING: ROLE, CHALLENGES, AND PROSPECTS

Annotation. In the context of increasing environmental challenges associated with climate change, land degradation, and biodiversity loss, the formation and maintenance of ecological frameworks is one of the most pressing issues for sustainable development. An ecological framework represents a spatially organized system of natural and anthropogenic elements that ensure environmental stability, the preservation of ecosystem services, and the maintenance of biodiversity. Within this structure, buffer zones play a crucial role as transitional areas between biodiversity cores and territories of intensive economic use. Their function is not limited to shielding protected areas from anthropogenic pressure, but also includes regulating flows of energy, matter, and species between ecosystems.

Keywords: UNESCO, ecological network, sustainable development, territorial planning, landscape management, buffer zones.

Introduction. Buffer zones in ecological framework planning serve multiple functions. First, they reduce anthropogenic pressure on protected areas by spatially separating natural cores from intensive land use. Around reserves, national parks, and biosphere territories, buffer zones act as filters: they restrict agricultural expansion, regulate recreational loads, and mitigate the spread of pollutants and erosion. At the same time, they provide additional habitats for

species sensitive to direct human contact and create ecological corridors for migration.

One of the central aspects of buffer zone planning is the determination of their optimal width and regime of use. International experience demonstrates several approaches: from strictly regulated zones with minimal human activity to multifunctional areas that allow sustainable agriculture, forestry, and eco-tourism. For instance, in the UNESCO *Man and Biosphere (MAB)* concept, buffer zones hold an intermediate status: limited resource use is permitted, provided that ecological functions are preserved. In Central Asia, this approach is especially relevant given the high population density, water scarcity, and agrarian dependence of regional economies.

However, the effectiveness of buffer zones largely depends on legal frameworks and institutional mechanisms. Research shows that the mere designation of a territory as a buffer zone does not guarantee its ecological function. In some cases, lack of enforcement, weak environmental awareness among local populations, and economic pressure lead to degradation of these areas. Therefore, buffer zone planning must be accompanied by comprehensive ecological assessments, monitoring systems, and the active participation of local communities. Case studies indicate that involving residents in eco-tourism, environmental education, and sustainable farming practices increases compliance with conservation regimes and enhances socio-ecological benefits.

A review of the literature reveals several key findings. Lezhnina (2018) emphasizes the role of buffer zones as spatial mechanisms balancing biodiversity cores with surrounding landscapes. Sokolov (2020) argues that buffer zones are essential for ecological connectivity in fragmented landscapes. Schmidt et al. (2021) highlight the multifunctional potential of buffer zones, showing that they can mitigate social conflict between conservation and economic interests. However, these authors stress the importance of strict regulation to avoid the substitution of conservation goals by commercial

exploitation. Reports from Uzbekistan's Ministry of Ecology (2022) underline that in arid regions, buffer zones are also crucial in combating desertification, conserving scarce water resources, and maintaining ecological resilience.

Thus, buffer zones should be viewed as a strategic tool of ecological framework planning. Their role extends beyond local protection: they establish ecological connectivity, mitigate anthropogenic pressures, and support ecosystem adaptation to climate change. Yet, their effectiveness depends on integrated approaches that combine legal regulation, inter-agency cooperation, scientific monitoring, and community involvement. Adaptive management models, based on continuous evaluation of ecological and social outcomes, appear to be the most promising pathway. Through such an approach, buffer zones can evolve from a formal designation into a functional mechanism for sustainable development.

Preservation and restoration of ecological connections between natural ecosystems has become an important direction of global environmental policy. The concept of an ecological framework (or ecological network) plays an important role in this. International experience shows that through proper planning of an ecological network, it is possible to preserve biodiversity, increase resilience to natural disasters, and reduce anthropogenic pressure.

The concept of ecological framework and its international appearance is very multifaceted. Ecological framework (English: ecological network, green infrastructure) is a territorial structure that connects natural areas, corridors, buffer zones and other ecosystem elements, maintaining ecological continuity. Its main purpose is: protecting biodiversity, ensuring ecological sustainability, restoring balance at the landscape level.

This concept first emerged in Europe in the 1990s and later became widely used in the United States, Canada, Australia, and other countries.

- Analysis of natural geographical zones,
- Taking into account animal migration routes,

- Taking into account the interests of local communities

Conclusion. International experience shows that for the successful organization of ecological frameworks, not only natural resources are needed, but also political will, institutional stability and technological readiness. The experience of Europe, the USA and Canada sees ecological networks as an integral part of territorial and strategic planning. Uzbekistan, due to its unique natural and geographical features and important ecosystems, should use foreign approaches to the formation of ecological networks and create its own national model. This will be an important factor not only in preserving biodiversity, but also in ensuring sustainable economic development and environmental security**.**

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