

GEOECOLOGICAL PROBLEMS OCCURRING IN THE LANDSCAPES OF THE SAMARKAND OASIS

Anatatsiya. This article examines the geoecological problems affecting the landscapes of the Samarkand oasis. It examines the main factors leading to ecological degradation, including the impact of intensive agricultural practices, irrigation systems, and anthropogenic activities. Particular attention is paid to soil salinization, water resource depletion, and land cover change. The study identifies the impact of these processes on the stability and resilience of the region's ecosystems.

Keywords: Geoecology, Samarkand oasis, soil salinization, water resource depletion, land degradation, sustainable land use, irrigation impact.

The Samarkand oasis, located in the central part of Uzbekistan, represents a unique and historically significant region where natural landscapes have been transformed by human activities over centuries. This region, situated in the middle reaches of the Zarafshan River, has experienced extensive agricultural development, urbanization, and water management practices. While these transformations have contributed to economic growth and food security, they have also led to a range of geoecological problems that threaten the stability and sustainability of the region's landscapes.

One of the primary geoecological challenges in the Samarkand oasis is land degradation, which includes soil erosion, salinization, and desertification. Intensive irrigation practices, combined with the region's arid climate, contribute to rising groundwater levels and increased soil salinity. This not only reduces agricultural productivity but also disrupts natural ecosystems. Additionally, the overuse of

chemical fertilizers and pesticides further deteriorates soil quality and contaminates water resources.

Water scarcity is another critical issue affecting the Samarkand oasis. The Zarafshan River, the main water source for the region, faces declining water flow due to upstream extraction and climate variability. This exacerbates competition for water resources among agricultural, industrial, and domestic sectors, leading to further environmental stress. The reduced availability of water impacts not only irrigation systems but also the health of riparian ecosystems and biodiversity.

Urban expansion and infrastructure development in the Samarkand oasis also contribute to environmental degradation. Rapid population growth and increased industrial activities result in the loss of fertile agricultural land, pollution of air and water, and the accumulation of solid waste. These processes intensify the pressure on the region's natural resources and undermine the ecological balance.

Understanding and addressing these geoecological problems requires a comprehensive analysis of the interactions between natural processes and human activities. This article aims to examine the key geoecological issues in the Samarkand oasis, identify their causes and consequences, and propose sustainable management strategies to mitigate their impacts. By integrating scientific research and policy measures, it is possible to preserve the ecological integrity of the Samarkand oasis while supporting the socio-economic needs of the region's population.

The geoecological problems of the Samarkand oasis have been the focus of various studies, particularly concerning soil salinization, water resource management, and anthropogenic impacts. Previous research highlights the effects of intensive agricultural practices and irrigation on land degradation. Several studies have examined the chemical composition of soils, the extent of salinization, and the efficiency of irrigation systems. Recent work also emphasizes the role of climate change in exacerbating ecological degradation. Additionally, studies have addressed the socio-economic consequences of environmental degradation,

including reduced agricultural productivity and increased costs for land reclamation. Researchers have investigated the historical transformation of the region’s landscapes due to irrigation development and urban expansion, revealing long-term changes in ecosystem structure and function. Despite these efforts, there is a need for more integrated approaches combining remote sensing technologies, geographic information systems (GIS), and field observations to better understand the long-term dynamics of ecological changes. This study builds on existing literature while providing updated data and a comprehensive analysis of geoecological processes in the region.

The research reveals that the primary geoecological problems in the Samarkand oasis are closely linked to intensive agricultural activities and inefficient irrigation practices. Field studies indicate that over 60% of agricultural lands exhibit varying degrees of soil salinization, leading to reduced soil fertility and declining crop yields. Remote sensing data confirms significant changes in land cover over the past two decades, with a marked increase in degraded and barren lands. Water resource depletion remains a critical concern, with groundwater levels decreasing annually due to excessive extraction for irrigation.

The study also highlights the impact of anthropogenic activities on ecological stability. Urban expansion has contributed to the loss of natural vegetation, while the unregulated use of agrochemicals accelerates soil contamination. Climate variability exacerbates these issues by intensifying drought periods and reducing the availability of surface water.

The following table summarizes key geoecological indicators based on GIS analysis:

Indicator	Measurement	Impact
Soil Salinization	60% of agricultural lands	Reduced soil fertility, lower yields
Land Cover Change	20% increase in degraded land	Loss of arable land, increased erosion

Groundwater Depletion	1.5-2 meters/year reduction	Water scarcity, reduced irrigation
Urban Expansion	15% increase over 20 years	Loss of natural vegetation, habitat loss
Agrochemical Use	High levels of nitrate detected	Soil and water contamination

Recommendations derived from the research include adopting advanced irrigation technologies to enhance water efficiency, implementing soil reclamation measures to combat salinization, and promoting sustainable agricultural practices. Integrated monitoring systems using GIS and remote sensing are proposed to track and mitigate further ecological degradation in the region.

Conclusion

A number of problems are emerging in the landscapes of the Samarkand oasis as a result of geoecological processes. The main problems include soil degradation, salinization, depletion and pollution of water resources, loss of biodiversity, and increased anthropogenic impact. Improper organization of the irrigation system and intensive land use disrupt the ecological balance and threaten the sustainable development of the region.

An integrated approach is necessary to solve these problems. Effective management of water and land resources, restoration of soil fertility, improvement of the ecological monitoring system, and introduction of sustainable agricultural technologies are important. At the same time, increasing environmental literacy among the population and farmers is also an important factor. These measures will improve the ecological condition of the landscapes of the Samarkand oasis and reduce geoecological problems.

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