РЕГИОНАЛЬНЫЕ ОСОБЕННОСТИ ЗАГРЯЗНЕНИЯ ОКРУЖАЮЩЕЙ СРЕДЫ В УЗБЕКИСТАНЕ

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Аннотация

В статье анализируются региональные особенности загрязнения окружающей среды в Узбекистане. Рассмотрены экологические проблемы промышленных центров, сельскохозяйственных районов и региона Приаралья. Показано, что уровень загрязнения зависит от природно-климатических условий, промышленной активности и степени использования природных ресурсов.

Ключевые слова: окружающая среда, загрязнение, региональные особенности, экология, Приаралье, качество воздуха, водные ресурсы.

REGIONAL FEATURES OF ENVIRONMENTAL POLLUTION IN UZBEKISTAN

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Abstract

This article analyzes the regional features of environmental pollution in Uzbekistan. It examines the ecological problems of industrial zones, agricultural areas, and the Aral Sea region. The findings show that pollution levels vary across regions depending on climatic conditions, industrial activities, and the use of natural resources. The study highlights the need for region-specific environmental management strategies to ensure ecological stability.

Keywords: environment, pollution, regional characteristics, ecology, Aral Sea, air quality, water resources.

1. Introduction

Environmental pollution in Uzbekistan has become a pressing issue, influenced by regional disparities in geography, economy, and resource utilization. The country's territory encompasses diverse natural zones — from desert regions in Karakalpakstan and Navoi to fertile valleys in Fergana and Samarkand — each facing unique environmental challenges.

Industrialization, intensive agriculture, and unsustainable water management have led to various forms of pollution, including air, water, and soil contamination. In the **Fergana Valley**, industrial emissions and vehicle exhausts contribute significantly to air pollution. In **Kashkadarya** and **Bukhara** regions, oil and gas extraction have caused soil and groundwater contamination. Meanwhile, the **Aral Sea region** suffers from catastrophic ecological degradation due to the desiccation of the sea, affecting both the environment and public health.

According to the **State Committee for Ecology and Environmental Protection of Uzbekistan (2024)**, annual atmospheric emissions in the country exceed **1 million tons**, with **Tashkent, Navoi, Fergana, and Angren** being the most polluted areas.

Purpose of the Study

The main objective of this study is to analyze the regional characteristics of environmental pollution in Uzbekistan, identify the main sources and types of pollutants in each region, and propose region-specific strategies for mitigating environmental degradation and ensuring sustainable development.

2. Methods

The research used a **comparative and analytical approach**, relying on:

1. **Statistical data** from the State Committee for Ecology, WHO, and the Ministry of Water Resources (2020–2024).
2. **Geographical information system (GIS)** analysis to visualize pollution distribution by region.
3. **Field surveys** and local monitoring reports on air and water quality.
4. **Correlation analysis** to compare industrial density, agricultural activity, and pollution levels.
5. **Literature review** of national and international environmental studies on Uzbekistan's ecology.

3. Results

- **Tashkent and Navoi regions** show the highest air pollution due to industrial enterprises and automobile density. PM2.5 and SO_2 levels often exceed recommended limits.
- **Fergana Valley** (Fergana, Andijan, Namangan) faces high pollution from chemical and textile industries, as well as agricultural runoff containing nitrates and pesticides.
- **Karakalpakstan (Aral Sea region)** remains the most ecologically vulnerable area. Frequent dust storms carry salt and toxic residues, contributing to respiratory diseases and land degradation.
- **Kashkadarya and Bukhara regions** experience soil and groundwater contamination due to oil and gas extraction and outdated waste disposal practices.
- **Surkhandarya and Jizzakh** show moderate pollution levels, mostly from agricultural chemicals and irrigation inefficiencies.
- Correlation analysis revealed that regions with higher industrial output have a direct increase in air pollution levels (**r = 0.78**), while agricultural zones show a correlation between fertilizer use and nitrate pollution in water (**r = 0.69**).

4. Discussion

The study reveals that environmental pollution in Uzbekistan is not uniformly distributed. It strongly depends on **regional economic specialization** and **natural geography**. Industrial areas face air pollution, while agricultural regions suffer mainly from soil and water contamination.

The **Aral Sea disaster** represents a unique regional case of ecological crisis. Over 6 million hectares of land have been affected by salinization, and dust-salt aerosols spread over 300–500 km annually, worsening air quality in surrounding regions. These environmental shifts have led to increased respiratory illnesses, reduced agricultural productivity, and migration from the most affected zones.

Addressing regional pollution requires **differentiated policies**. For instance:

- In industrial areas — strict emission control and cleaner production technologies;

- In agricultural regions — efficient irrigation systems and organic farming methods;
- In the Aral region — large-scale afforestation and desert reclamation projects.

Moreover, public participation and environmental education play a crucial role in preventing further degradation.

5. Conclusion

The analysis confirms that environmental pollution in Uzbekistan has distinct regional features shaped by industrial, agricultural, and climatic factors. The highest pollution levels are observed in the Tashkent, Navoi, and Fergana regions, while the Aral Sea zone remains the most ecologically endangered area.

A comprehensive, region-specific environmental policy — combining industrial modernization, green technologies, and community-based initiatives — is essential to ensure sustainable ecological balance and improve the health of the population.

Uzbekistan's experience demonstrates that ecological stability can only be achieved through a balanced relationship between economic growth and environmental protection.

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