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WATER ECOLOGY AND HYGIENE IN THE SAMARKAND REGION: PROBLEMS AND PROSPECTS

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Abstract
The article addresses the pressing issue of the environmental state of water resources in the city of Samarkand. It analyzes the main causes of water scarcity and pollution, such as the irrational use of water resources, insufficient development of water supply and sewage infrastructure, as well as the impact of climate change. Special attention is given to the problems of soil salinization and the deterioration of drinking water quality. The article suggests possible solutions to these problems, including the optimization of water usage, modernization of wastewater treatment facilities, reclamation of saline soils, and raising public environmental awareness.

Keywords: Samarkand region, ecology, water hygiene, water scarcity, water pollution, reclamation, water supply, sewage, sustainable development.

Introduction

The Samarkand region, with its rich history and culture, faces serious challenges related to water ecology and hygiene. The issues of water ecology and hygiene play a crucial role in ensuring the health of the population of the Samarkand region. Depletion of water resources, pollution of water bodies, and soil degradation all have negative impacts on the health of the population, agriculture, and the region's economy. Effective water resource management and control of drinking water quality have a direct impact on public health and the well-being of the region's inhabitants.

One of the key aspects of ensuring ecological safety is monitoring the water quality in natural sources, water bodies, and water supply systems. The presence of contaminants, as well as the bacteriological and chemical parameters of water, requires constant monitoring and analysis to ensure its safety for consumption.

Additionally, providing access to clean drinking water for all segments of the population is no less important. This involves the development of infrastructure for water purification and distribution, as well as public awareness campaigns on hygiene practices and the rational use of water resources. The supply of clean drinking water to the population of the Samarkand region is managed through groundwater resources by water management facilities of the "Samarkand Suvtaminoti" enterprise. Currently, the groundwater level (flow) has decreased due to a lack of precipitation and low water flow in the Zarafshan River. As a result, due to the lack of groundwater reserves during normal operation of pumping equipment at facilities, the supply of clean drinking water to the populations

of Samarkand, Kattakurgan, Pastdargom, Nurabad, Ishtikhon, Pakhtachi, Narpay, Payarik, and Akdarya has faced shortages in recent times.

To successfully address the problems of water ecology and hygiene, close cooperation is needed between government agencies, scientific institutions, public organizations, and enterprises working in the field of water resources. Only joint efforts from all interested parties can create a sustainable system for monitoring water quality and ensuring its safe use.

Main Problems

1. Water resource scarcity: The irrational use of water in agriculture, industry, and households has led to the depletion of groundwater and a reduction in river flow.

Residents of the Samarkand region, living near the Zeravshan River and its tributaries, viewed drought and desertification as distant issues just 10 years ago. But in recent years, when tens of thousands of hectares in various districts of the region began to receive insufficient irrigation water, and when the water levels in wells in coastal villages dropped by 5-7 meters, these problems became more apparent. Unfortunately, human activities, particularly the irrational exploitation of natural resources, have been the cause. Specifically, the extraction of sand and gravel from riverbeds or coastal areas.

The extraction of sand and gravel from the Zeravshan River bed has deepened it in some areas by 5-7 meters, causing the groundwater level to drop by 12, and in some places 15 meters. Until the end of last year, there was a moratorium on gravel extraction along the Zeravshan National Natural Park, but gravel continues to be extracted in other areas.

2. Pollution of surface and groundwater: The discharge of untreated wastewater, industrial waste, and agricultural fertilizers leads to the pollution of rivers, lakes, and groundwater.

The condition of groundwater in the Samarkand region is a cause for serious concern. Intensive use of water resources in agriculture, industry, and households, as well as climate change, have led to significant depletion of groundwater reserves.

Most surface water bodies are classified as moderately polluted according to Uzbekistan's water pollution index.

In 2018, the most polluted water bodies were the Siab collector in Samarkand and the Salar canal downstream of Tashkent and Yangiyul. Groundwater quality is generally considered satisfactory. The average percentage of non-compliant samples over the period from 2012–2017 was 5–10% per year based on microbiological analysis and 10–15% based on chemical analysis.

3. Soil salinity: Intensive irrigation leads to soil salinization, which degrades soil fertility and reduces crop yields.

4. Deterioration of drinking water quality: Many settlements experience a shortage of quality drinking water, which increases the risk of infectious diseases.

Consequences:

1. Water scarcity: Limited access to water for the population, agriculture, and industry.
2. Deterioration of the environmental situation: Soil degradation and reduction in biodiversity.
3. Threat to public health: Consumption of contaminated water can lead to various diseases.

Causes of the Problems

- Rapid population growth: Population growth leads to increased water consumption and waste production.
- Inadequate water supply and sewage systems: Many settlements lack centralized water supply and sewage systems, resulting in untreated wastewater being discharged into the environment.
- Insufficient funding for environmental protection measures: A lack of sufficient financial resources hinders the implementation of large-scale environmental protection projects.
- Lack of environmental awareness among the population: The low level of environmental consciousness among the population leads to careless attitudes toward water resources.

Today, the coastline of the Zeravshan River near the village of Farhad and further downstream presents a grim picture. More than 30 enterprises processing gravel and producing concrete building materials are operating here, in violation of regulatory documents regarding water protection areas. Understandably, raw materials for production are often sourced from the nearby shore and riverbed. The full consequences of exploiting the river will become apparent to all of us in the coming years. In addition to the drop in water levels, the cutting of riparian tugai vegetation is being observed everywhere in the region. This destabilizes the banks, leading to changes in water flow patterns, soil erosion, the influx of excess sediment and pollutants, and, as a result, the silting of water sources, loss of biodiversity, and changes in the microclimate.

Solutions:

- Optimization of water resource use: Implementing water-saving technologies in agriculture and industry, and adopting water recycling systems.
- Construction and modernization of wastewater treatment facilities: Building new and upgrading existing wastewater treatment plants to clean wastewater before discharging it into the soil.
- Reclamation of saline soils: Conducting land reclamation activities to restore soil fertility.
- Monitoring groundwater conditions: Regular monitoring of groundwater levels and quality.
- Development of water supply and sewage systems: Expanding and upgrading water supply and sewage systems in rural areas.
- Raising environmental awareness among the population: Carrying out large-scale public information and education campaigns.
- Development and implementation of water-saving technologies: Using drip irrigation, mulching, and other methods to reduce water loss through evaporation.
- Optimization of water resource use: Introducing water-saving technologies in agriculture and industry.
- Construction and modernization of wastewater treatment facilities: Restoring soil fertility.
- Reclamation of saline soils.

For a deeper analysis of the problem and the development of specific recommendations, additional research is necessary, including:

- Assessment of water quality in various sources.
- Analysis of existing water supply and sewage systems.
- Assessment of economic damage from water pollution.
- Development of a regional water resource protection program.

Conclusion

The environmental situation in the Samarkand region requires urgent action. Solving problems related to water ecology and hygiene requires a comprehensive approach that brings together the efforts of the government, businesses, and civil society. Only through joint efforts can the region's sustainable development be ensured, and its natural resources preserved for future generations. Therefore, addressing the problems of water ecology and hygiene in the Samarkand region requires a systematic approach, continuous monitoring, and effective measures to provide clean drinking water for all the region's residents.

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