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# ECOLOGICAL PROBLEMS EMERGING IN CITIES DUE TO GLOBAL CLIMATE CHANGE (THE CASE OF TASHKENT)

***Jasur Mukhammadiev Mardon ugli***
*Uzbekistan State World Languages University,*
*Department of Ecology and Green Resources, Lecturer*
*Email: jasurmarqayev24@gmail.com*

***Mudarisova Raykhon Khodjayevna***
*Uzbekistan State World Languages University,*
*Department of Ecology and Green Resources, Associate Professor*
*Email: xodjayevna@mail.ru*

***Fotima G'ofurova Erkin kizi***
*Uzbekistan State World Languages University,*
*Faculty of Foreign Languages and Literature, Student*
*Email: fatimagafurova574@gmail.com*

**ANNOTATION:** Global climate change is causing environmental problems around the world, with cities particularly affected the most. For example, Tashkent, the capital of Uzbekistan, is experiencing serious environmental pressures due to rising temperatures, increased air pollution, water shortages, and the urban heat island effect. This article examines the environmental challenges posed by climate change in Tashkent, analyzes current data and municipal responses, and proposes mitigation and adaptation strategies. The results show that although some initiatives are being implemented, comprehensive urban planning is important for protecting the environment and public health of Tashkent in the context of ongoing climate changes.

**Key words:** Tashkent, climate change, urban heat island, air pollution, water scarcity, adaptation strategies

## INTRODUCTION

Climate change presents one of the most pressing issues of the 21st century, especially in urban environments where high population density and human activity amplify ecological stress factors. Tashkent, the largest city in Central Asia, serves as an important economic and cultural hub for Uzbekistan. However, in recent years, it has increasingly experienced the negative impacts of global climate change. Rising temperatures, irregular precipitation, water shortages, and deteriorating air quality have become commonplace in Tashkent, directly affecting the health and well-being of its 3.1 million residents. Although the country's arid continental climate has historically faced climatic extremes, climate change is further intensifying these conditions. The expansion of Tashkent is worsening ecological problems, making it a vital case for understanding the broader implications of climate change in Central Asian cities. This article aims to explore the specific environmental problems caused by global climate change in Tashkent, investigate their root causes, and propose sustainable solutions.

## METHODS

This article uses a qualitative approach based on analysis of recent scientific publications, government reports, meteorological data, and expert interviews on the impacts of climate change in Uzbekistan. Key data sources include the Center of the Hydrometeorological Service of Uzbekistan (Uzhydromet), the World Bank Climate Change Knowledge Portal [1], and policy documents from the Ministry of Ecology, Environmental Protection and Climate Change of Uzbekistan [2].

The methodology includes:

Literature Review: Academic articles, government publications, and international organization reports.

Data Analysis: Temperature trends, precipitation changes, air quality indices, and water resource reports for Tashkent.

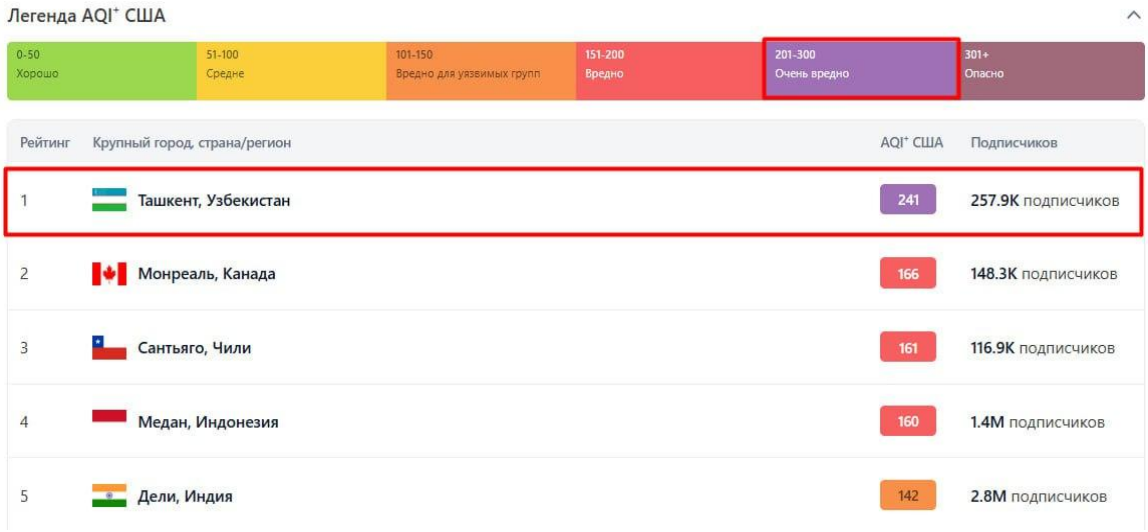
Policy Review: Evaluation of climate resilience strategies and initiatives implemented by local authorities.

## RESULTS

Rising Temperatures and the Urban Heat Island Effect
According to Uzhydromet, the average temperature in Tashkent has increased by 1.5°C over the past three decades [3]. Summers have become longer and hotter, with temperatures frequently exceeding 40°C. This warming trend exacerbates the urban heat island effect, where cities become significantly hotter than surrounding rural areas due to concrete structures, asphalt roads, and limited vegetation. The urban heat island effect increases energy demand for cooling, raises heat-related illness rates, and reduces overall livability [4]. Vulnerable populations such as the elderly and low-income groups are disproportionately affected by extreme heat events.

Air Pollution
Air quality in Tashkent has deteriorated significantly. Vehicle emissions, industrial activity, and construction dust contribute to high levels of particulate matter (PM2.5 and PM10). During summer heatwaves, stagnant air traps pollutants, creating hazardous conditions. According to the World Health Organization, air pollution levels in Tashkent often exceed recommended limits [5], leading to respiratory and cardiovascular diseases and decreased life expectancy.

As of June 6, 2025, at 19:20, IQAir reported the concentration of PM10 particles in Tashkent's air was 383 μg/m³.



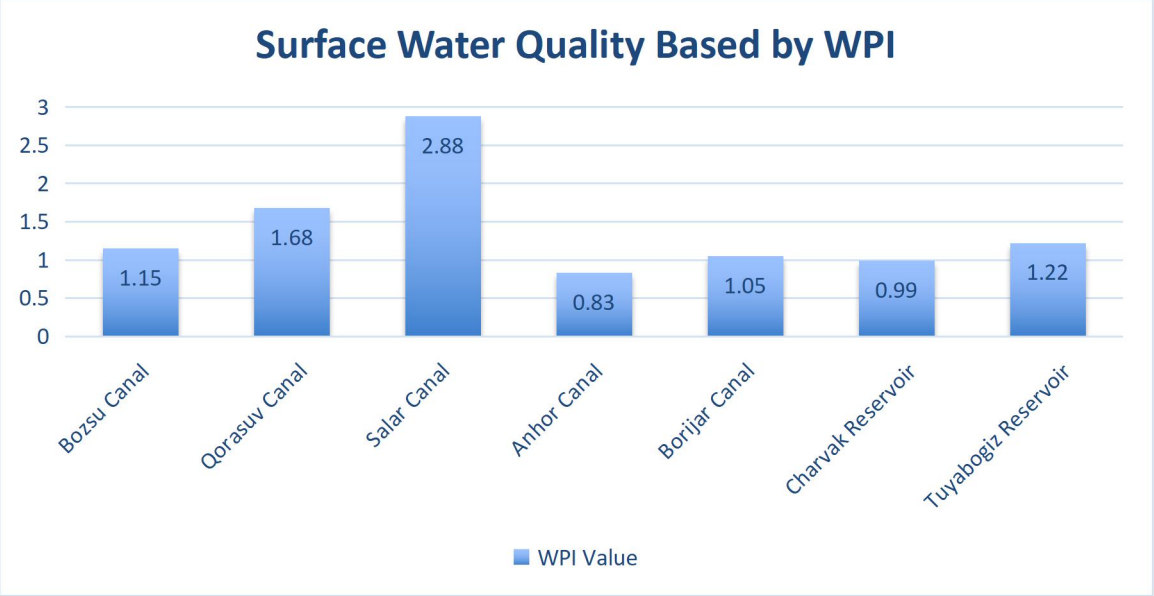

1-picture. IQAir

Water Scarcity and Pollution

Tashkent is experiencing severe water shortages. Changing precipitation patterns and retreating glaciers that feed the Chirchik River, the city's main water source, threaten water supply [6]. Additionally, aging infrastructure leads to significant water losses during distribution. Water scarcity affects not only households but also green spaces and agriculture on the city's outskirts, leading to ecosystem degradation and food security risks.

In 2023, Tashkent saw reduced rainfall due to climate change. This decreased river, canal, and reservoir levels. Lower water volumes concentrate pollutants, making contamination more noticeable.

On July 12, 2023, Uzhydromet collected surface water samples from Tashkent's canals and nearby reservoirs. Water pollution was assessed using the Water Pollution Index (WPI).




2-picture. Screen Uzhydromet

Water Quality Results (WPI):

Bozsu Canal (Teleminora area): Class III – Moderately polluted, WPI = 1.15

Qorasuv Canal (Furqat Park): Class III – Moderately polluted, WPI = 1.68

Salar Canal (Below Ecopark): Class IV – Polluted, WPI = 2.88

Anhor Canal (Below Ring Road): Class II – Clean water, WPI = 0.83

Borijar Canal (Magic City Park): Class III – Moderately polluted, WPI = 1.05

Charvak Reservoir: Class II – Clean water, WPI = 0.99

Tuyabogiz Reservoir: Class III – Moderately polluted, WPI = 1.22

WPI allows for comprehensive assessment of surface water quality, enabling both spatial and temporal comparisons [7].

Impact on Green Spaces and Biodiversity
Urbanization and worsening climate conditions are reducing Tashkent's green areas. Parks and tree-lined streets play a crucial role in cooling the city and improving air quality. However, prolonged drought and insufficient irrigation are reducing urban flora, negatively affecting local biodiversity.

## DISCUSSION

The ecological problems facing Tashkent highlight cities' vulnerability to global climate change. The results stress the need for integrated urban planning prioritizing sustainability and climate resilience.

Urban Planning and Green Infrastructure
Expanding green infrastructure—urban forests, green roofs, and shaded streets—can mitigate urban heat islands and improve air quality. Programs encouraging park creation and tree planting help lower ambient temperatures and absorb pollutants. The city administration has launched initiatives like "Green City" and partnered with international organizations for urban greening. Expanding these initiatives is critical for meaningful impact.

Renewable Energy and Sustainable Transport
Transitioning to renewable energy and promoting sustainable transport are vital. Expanding Tashkent's metro system, encouraging electric vehicles, and improving bicycle infrastructure can reduce greenhouse gas emissions and air pollution. Improving building energy efficiency also reduces cooling needs during hotter summers and cuts reliance on fossil fuels.

Water Resource Management
Investing in modern water management technologies like smart irrigation systems and wastewater recycling can alleviate water shortages. Public awareness campaigns on water conservation are equally important. Considering the transboundary nature of Central Asia's rivers, cooperation with regional neighbors is essential for efficient shared water management.

Policy and Public Engagement
Successful adaptation requires strengthening climate policy and encouraging public participation. Educational programs and community-driven initiatives can raise awareness of climate risks and promote environmentally responsible behavior. Uzbekistan's adoption of the "Strategy for Transition to a Green Economy by 2030" is a positive step toward aligning national development with climate resilience goals.

## CONCLUSION

Tashkent's experience underscores the real vulnerability of cities to climate change. Rising temperatures, air pollution, water shortages, and declining green spaces pose serious threats to urban sustainability. While local authorities have taken initial steps to address these challenges, a more robust approach is essential. Through investment in green infrastructure, sustainable transport, efficient water management, and strong climate policies, Tashkent can become a resilient city capable of withstanding the impacts of global climate change. The lessons from Tashkent can also serve as a valuable model for other Central Asian cities facing similar ecological threats.

## REFERENCES

World Bank. (2024). Climate Change Knowledge Portal: Uzbekistan. Retrieved from https://climateknowledgeportal.worldbank.org

Ministry of Ecology, Environmental Protection and Climate Change of Uzbekistan. (2023). National Strategy for Transition to a Green Economy. Tashkent: Government Press.

Uzhydromet (Center of Hydrometeorological Service of Uzbekistan). (2024). Climate data for Tashkent Region. Tashkent: Uzhydromet Publications.

Karimov, B. & Yusupov, N. (2023). "Urban Heat Island Effects in Central Asian Cities". Central Asian Environmental Journal, 12(2), 45–60.

World Health Organization. (2023). Air Quality Database 2023. Geneva: WHO.

UNDP Uzbekistan. (2023). Urban Resilience and Climate Adaptation in Uzbekistan. Tashkent: UNDP Report.

Uzhydromet Press Service. (2023).