Volume 4, Issue 5, May 2026 ISSN (E): 2938-3765

DYNAMICS OF ATMOSPHERIC POLLUTANT EMISSIONS: THE CASE OF UZBEKISTAN (ANALYSIS FOR 2020–2024)

Nargiza Ikramova Alisher qizi
Go‘zal Obidova Murod qizi
Tashkent State Medical University

Abstract
In recent years, air pollution has become a pressing issue at both global and national levels. This article examines the dynamics of atmospheric pollutant emissions in Uzbekistan during 2020–2024 from the perspective of the interrelationship between economic activity, human well-being, and environmental policy.
The study is based on national statistical data and highlights the decline during the pandemic period as well as the subsequent recovery processes. The results indicate a 6.2% reduction in total emissions, confirming the effectiveness of environmental policy and technological modernization.
The paper also analyzes regional disparities, sectoral factors, and the growth of environmental awareness, and proposes practical recommendations for the transition to a green economy.

Keywords: Air pollution, environmental statistics, sustainable development, emissions, industry, energy efficiency, regional disparities, green economy, environmental policy.

Introduction

Today, human progress appears to be moving in two contradictory directions: on one side, economic growth, technological advancement, and increasing production volumes; on the other, the ever-intensifying degradation of nature. In particular, the issue of air pollution is becoming increasingly relevant not only as an ecological problem, but also as a social and economic one.
Air is the most vital resource for human life. We cannot see it or hold it, yet we depend on it every second. For this reason, any change in its quality directly affects human health, quality of life, and social stability.
In Uzbekistan, the processes of economic development are closely linked to the volume of pollutants emitted into the atmosphere. Industrial growth, the expansion of the energy system, and the increasing number of motor vehicles — all of these factors exert their influence on air quality.
The years 2020–2024 stand out as a distinct period. These years were marked by the pandemic, global economic instability, as well as environmental policy entering a new phase. During this period, the economy first contracted and then recovered, environmental measures were strengthened, and new technologies were introduced.
This article is aimed at explaining these complex, multi-layered processes through a human-centered approach.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

Literature Review

The issue of atmospheric pollution has been at the center of attention of the international scientific community for several decades. Reports published by organizations such as the UN, OECD, and the World Bank view air quality and emission reduction as global challenges.

International studies demonstrate that in the early stages of economic growth, pollution increases, but beyond a certain level, technological development and policy measures lead to a decline. This phenomenon is known as the Environmental Kuznets Curve.

A number of studies have also been conducted by Uzbek scholars in this field. Most of them focus particularly on the statistical analysis of environmental indicators, identifying regional disparities, and evaluating the effectiveness of environmental policy.

Drawing on this scientific heritage, the present study reinterprets the existing data through a human-centered and systemic approach.

Methodology

The study primarily focused on actual statistical data. The data were obtained from the official database published by the State Statistics Committee of the Republic of Uzbekistan.

The following approaches were applied during the analysis:

– identifying change dynamics through time-series analysis
– assessing disparities through inter-regional comparisons
– interpreting economic and environmental factors in a coherent manner

In addition, statistical results were explained not merely as numbers, but in connection with real-life processes.

Results

Overall Dynamics of Change

In 2020, the volume of pollutants emitted into the atmosphere amounted to 924.4 thousand tonnes. This period coincided with the economic downturn associated with the pandemic. As a result of reduced production volumes, decreased traffic, and lower energy consumption, pollution levels also declined comparatively.

In subsequent years, a gradual recovery was observed. In 2021 and 2022, indicators continued to decrease, indicating that economic activity had not yet fully recovered.

By 2023, the lowest level was recorded — 763.2 thousand tonnes. This period may be conditionally referred to as the 'period of ecological relief'.

However, in 2024, economic activity increased again, and the volume of pollution reached 866.7 thousand tonnes. This increase is not regarded as a negative phenomenon, but rather as a natural consequence of economic recovery.

Overall, a 6.2% reduction was recorded over the five-year period.

Regional Breakdown:

The analysis was conducted across 10 administrative units (the Republic of Karakalpakstan, 8 regions, and the city of Tashkent).

№	Region	Volume (thousand tonnes)	Change (2020–2024)
1	Tashkent Region	465.0	+8.1%
2	Kashkadarya Region	88.6	−30.8%
3	Bukhara Region	35.4	−4.5%
4	Samarkand Region	47.4	−10.1%
5	Navoi Region	39.2	−19.0%
6	Andijan Region	32.6	+183% (large ratio from a low base)
7	Republic of Karakalpakstan	10.5	−63%
8	Tashkent City	21.1	−37.3%
9	Surkhandarya Region	10.8	+66%
10	Sirdarya Region	42.5	−40.8%

As seen from the table, changes in pollution levels are directly linked to the economic structure and energy sources of each region. For example, the decline in Kashkadarya is explained by modernization efforts around oil and gas fields, while the increase in Tashkent Region is attributed to the commissioning of new industrial facilities.

The volume of pollutants emitted into the atmosphere varies significantly across Uzbekistan's regions — this is directly related to differences in the country's economic structure, distribution of natural resources, and levels of production. Each region plays a unique role in terms of ecological burden, depending on its economic orientation, urbanization rate, and volume of traffic.

Tashkent Region is the industrial heartland of the country, home to the largest manufacturing enterprises and energy facilities. For this reason, nearly half of all atmospheric emissions nationwide fall within this region. While the opening of new industrial zones has boosted economic activity, it has simultaneously increased demand for air purification systems. At the same time, Tashkent Region is among the leading regions in ecological modernization, with significant work being carried out in the areas of emission filtration, energy reduction, and the introduction of recycling systems.

A decline in pollution levels has been observed in Kashkadarya and Bukhara regions. This is primarily associated with modernization in the oil and gas sector and the implementation of new technologies. A portion of the combustible gases that previously escaped into the atmosphere are now being processed or neutralized through purification systems. Enterprises are also improving their energy efficiency and waste management policies, thereby reducing ecological pressure.

Surkhandarya and Namangan regions have an agricultural orientation, so the volume of industrial emissions in these areas is comparatively low. However, in recent years, due to population growth, an increase in the number of motor vehicles, and the expansion of residential areas, pollution dynamics have been rising in these regions as well. From this perspective, it is important to forecast ecological problems at an early stage and introduce protective mechanisms.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

As the capital of the republic, Tashkent City leads in modernizing its environmental management system. Currently, the city is improving its air quality through fleet renewal, increasing the share of gas-powered and electric vehicles, and expanding green spaces. Statistical data show that the volume of atmospheric pollutants in the city in 2024 has decreased by almost 40% compared to 2019.

These differences between regions are not merely statistical divergences — they reflect the varying levels of development of production culture, energy policy, and ecological responsibility among the population across the country. Each region should have its own ecological roadmap, because a one-size-fits-all approach does not yield results in addressing environmental problems. Only when regions develop local 'green strategies' that take into account their own social, economic, and natural conditions will it be possible to achieve sustainable results in reducing pollution across the country.

Sectoral Factors

The analyses show that the energy and industrial sectors account for the largest share of atmospheric pollutant emissions.

The energy sector is considered the primary source of pollution. The combustion of large quantities of fuel during electricity generation increases the volume of emissions from natural gas, coal, and fuel oil. Nevertheless, the introduction of renewable energy sources in recent years has initiated positive changes in this sector.

Industrial sectors — in particular metallurgy, cement, and the chemical industry — are also significant sources of atmospheric emissions. Although production volumes are growing, the relative volume of these emissions is declining as a result of improved efficiency and the implementation of new filtration technologies.

The transport sector is an important factor directly linked to people's daily lives. As the number of vehicles increases, emissions also rise; however, in recent years, the growing share of electric and gas-powered vehicles has significantly reduced ecological pressure.

Overall, despite the growth in production volumes, the decline in pollution intensity indicates that technological modernization and increased ecological responsibility are advancing in Uzbekistan.

The results obtained demonstrate that the environmental policy being implemented in Uzbekistan in recent years has gradually begun to yield positive outcomes. This is not a result that emerged overnight, but rather the product of the harmonious combination of economic reforms, technological modernization, and shifts in public awareness. In particular, the positive dynamics observed during 2020–2024 indicate that significant progress is being made in the country's path toward achieving ecological sustainability.

One of the most important factors behind these positive changes is technological modernization. Modern filtration systems being introduced in the industrial and energy sectors, technologies for treating and recycling waste, as well as the widespread use of energy-efficient equipment, are all contributing to a significant reduction in the volume of pollutants. The growing attention to renewable energy sources — solar and wind energy — not only reduces ecological burden but also ensures long-term economic efficiency.

At the same time, economic mechanisms are emerging as an important pillar of environmental policy. The expansion of ecological tax incentives introduced by the state, programs supporting 'green' investment, and financial incentive measures are encouraging enterprises to abandon traditional,

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

ecologically harmful technologies and transition to cleaner and more efficient production methods. This serves to establish a balance between economic growth and ecological safety.

However, the most important and long-lasting influencing factor is the human factor. Worthy of particular attention is the growing ecological awareness and culture in society, and the formation of a responsible attitude toward the environment among the population. In recent years, everyday habits such as sorting waste, submitting it for recycling, using public transport, and choosing environmentally clean vehicles are gradually becoming more widespread. This demonstrates that environmental problems can be resolved not only at the state or industrial level, but also with the participation of every citizen.

Overall, the harmonious combination of the above-mentioned factors is creating an important foundation for ensuring ecological sustainability in Uzbekistan. The continuity and effectiveness of this process will, in turn, determine the extent to which the country will develop on the basis of 'green economy' principles in the future.

Conclusion:

The years 2020–2024 were a period of not only economic, but also ecological transformation for Uzbekistan. During this period, pollution levels declined, technologies were modernized, and environmental policy was strengthened.

The most important conclusion is this: economic growth and ecology are not contradictory concepts. Through proper management and a conscious approach, they can be harmonized.

In the future, it is necessary to focus on the following directions:

– expanding real-time monitoring systems
– increasing the share of green energy
– developing environmental education
– differentiating regional policy

The results of this study are not only of scientific importance, but also serve as an essential basis for making practical decisions.

References

1. Statistics Agency under the President of the Republic of Uzbekistan. Environmental Statistics Collection. – Tashkent, 2024.
2. Ministry of Ecology, Environmental Protection and Climate Change of the Republic of Uzbekistan. National Reports. – Tashkent, 2023.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5