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AIR POLLUTION IN THE CITY OF FERGANA DURING 1995–2010 AND ITS ANALYSIS

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Abstract: This article provides a scientific-analytical overview of the state of air pollution in the city of Fergana from 1995 to 2010. It analyzes the levels and trends of major air pollutants over time, with a focus on suspended particles, sulfur dioxide, nitrogen oxides, carbon monoxide, ammonia, and other harmful components. The impact of industrial enterprises, transportation, and other anthropogenic factors on air quality is discussed. The study also examines the potential health effects on the population and evaluates environmental risks. Additionally, the article offers recommendations and measures for air protection and pollution reduction.

Keywords: air pollution, industrial emissions, Fergana city, environmental risk, public health, suspended particles, sulfur dioxide, nitrogen oxide, 1995–2010.

Today, among the various environmental issues, air pollution is considered one of the most pressing global problems. In areas with high population density and rapid industrial development, this issue becomes even more acute. The Fergana Valley of Uzbekistan, particularly the city of Fergana, is among the regions where the level of ecological risk continues to rise due to the increase in industrial enterprises, the number of vehicles, and population growth. Especially during the period from 1995 to 2010, the volume of harmful substances emitted into the atmosphere significantly increased as a result of economic reforms, the expansion of industrial production, the growth in the number of automobiles, and the development of infrastructure.

Air pollution negatively affects human health, environmental sustainability, and the natural balance of ecosystems. Based on monitoring data conducted in Fergana city, it has been revealed that the concentrations of suspended particles, sulfur dioxide, nitrogen oxides, carbon monoxide, ammonia, and other chemical substances in the air have exceeded permissible levels, contributing to the spread of various chronic diseases.

This article scientifically and analytically examines the quantity of key pollutants in the atmosphere of Fergana city during the years 1995–2010, their sources, dynamic changes, and their impact on public health. Additionally, the article presents proposals and recommendations aimed at preventing existing issues and reducing ecological risks.

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Air pollution remains one of the most urgent ecological concerns today. In large cities with dense populations, particularly in areas where industrial enterprises operate, the increase in the concentration of harmful substances in the air poses a serious threat to human health. Fergana city—being one of the major industrial and transport hubs of the Fergana Valley—holds significant scientific and practical relevance for studying air pollution levels. Based on monitoring results from 1995 to 2010, this study analyzes the changes in concentrations of major air pollutants—suspended particles, sulfur dioxide, carbon monoxide, nitrogen dioxide, nitrogen oxide, phenol, and ammonia. Using the average annual concentrations recorded during these years, the study evaluates air quality indicators and identifies probable causes of changes observed in specific years.

Table 1
Air Pollution in Fergana City During 1995–2010 (Average Concentrations in mg/m³)

No.	Years	Suspended Particles (mg/m³)	Sulfur Dioxide (mg/m³)	Carbon Monoxide (mg/m³)	Nitrogen Dioxide (mg/m³)	Nitric Oxide (mg/m³)	Phenol (mg/m³)	Ammonia (mg/m³)
1	1995	0.1	0.019	2	0.04	0.03	0.003	0.06
2	1996	0.2	0.013	2	0.05	0.04	0.003	0.06
3	1997	0.2	0.015	1	0.06	0.05	0.003	0.06
4	1998	0.2	0.012	1	0.05	0.03	0.004	0.03
5	1999	0.2	0.012	1	0.05	0.02	0.004	0.03
6	2000	0.2	0.017	1	0.06	0.02	0.004	0.03
7	2001	0.1	0.023	1	0.04	0.01	0.005	0.06
8	2002	0.1	0.018	2	0.04	0.01	0.004	0.06
9	2003	0.1	0.014	1	0.05	0.01	0.003	0.05
10	2004	0.1	0.022	2	0.04	0.01	0.003	0.04
11	2005	0.1	0.022	2	0.04	0.01	0.003	0.05
12	2006	0.1	0.021	2	0.05	0.01	0.003	0.03
13	2007	0.1	0.014	1	0.04	0.01	0.004	0.04
14	2008	0.1	0.018	2	0.04	0.01	0.003	0.05
15	2009	0.1	0.016	1	0.04	0.01	0.003	0.04
16	2010	0.1	0.017	2	0.04	0.01	0.003	0.05

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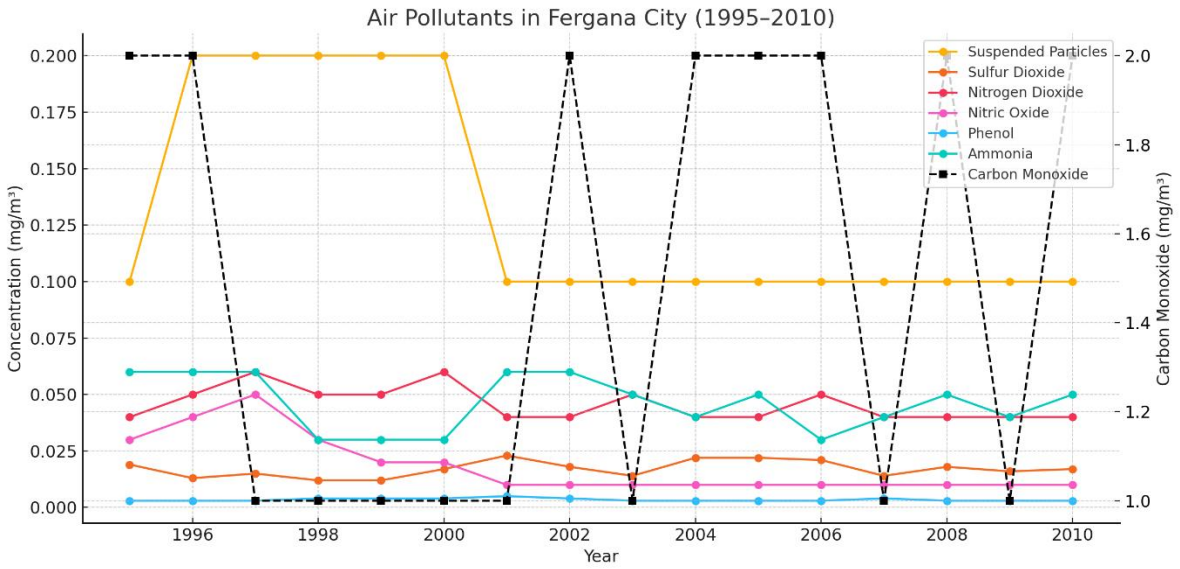

The results of the analysis show that during the years 1995–2010, the level of air pollution in Fergana city remained relatively stable, although some fluctuations in the concentration of certain pollutants were observed in specific years.

The concentration of suspended particles was 0.1 mg/m³ in 1995 and increased to 0.2 mg/m³ in 1996. This indicator remained relatively high until 2001 but then stabilized at around 0.1 mg/m³ in the following years. This may indicate a reduction in dust sources within the city.

Sulfur dioxide (SO_2) levels varied significantly between 1995 and 2000, ranging from 0.012 to 0.023 mg/m³. Although it peaked in 2001 at 0.023 mg/m³, a slight decline followed in subsequent years. The high concentration of this pollutant could be linked to the poor quality of fuel products or increased industrial activity.

Carbon monoxide (CO) levels fluctuated between 1 and 2 mg/m³ from 1995 to 2010. In some years (e.g., 1995, 1996, 2002, 2004, 2005, 2006, 2008, and 2010), the concentration reached 2 mg/m³, likely due to the rising number of vehicles and increased fuel combustion.

Nitrogen dioxide (NO_2) concentrations did not change significantly over the years, generally ranging between 0.04 and 0.06 mg/m³. This compound mainly originates from motor vehicles and industrial fuel combustion systems.

Nitric oxide (NO) was recorded at 0.03 mg/m³ in 1995 and increased to 0.05 mg/m³ in 1997, but in the following years, it gradually stabilized at around 0.01 mg/m³. The decrease may be attributed to enhanced environmental regulations or technological upgrades in industrial processes.

Phenol concentrations remained low (0.003–0.005 mg/m³) over the years, which is directly associated with the operations of industrial enterprises and proper waste management practices.

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Ammonia (NH_3) was measured at 0.06 mg/m³ in 1995–1997 and ranged between 0.03 and 0.06 mg/m³ during 1998–2010. This suggests the influence of agricultural activities, fertilizer use, or the chemical industry.

In conclusion, the data analysis for 1995–2010 indicates that the concentrations of key harmful substances—suspended particles, sulfur dioxide, carbon monoxide, nitrogen dioxide, nitric oxide, phenol, and ammonia—remained relatively stable in the air of Fergana city. Occasional increases or decreases were observed in certain years. Notably, carbon monoxide and nitric oxide concentrations were higher in some years, which can be explained by vehicle emissions and fuel combustion. Additionally, phenol and ammonia levels, though within permissible limits, were affected by the operations of industrial and chemical enterprises.

These findings highlight the necessity of continuous air quality monitoring in Fergana city, reduction of harmful emissions from vehicles, and the implementation of purification technologies in industrial sectors. Furthermore, improving public environmental awareness, expanding green spaces, and adopting sustainable environmental policies are essential to reduce air pollution levels.

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