



## THE IMPACT OF AIR POLLUTION ON LABOR PRODUCTIVITY AND THE RESULTING ECONOMIC CONSEQUENCES FOR ENTERPRISES (CASE OF UZBEKISTAN)

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**Annotatsiya:** Ushbu ilmiy maqolada havo ifloslanishining mehnat unumdorligiga ta'siri va ushbu ta'sir natijasida korxonalar darajasida yuzaga keladigan iqtisodiy oqibatlar ilmiy-nazariy hamda amaliy jihatdan tahlil qilinadi. O'zbekiston sharoitida sanoatlashtirish, urbanizatsiya va transport yuklamasining ortib borishi fonida atmosfera havosining sifati mehnat resurslari salomatligi va ishlab chiqarish samaradorligiga sezilarli ta'sir ko'rsatmoqda. Tadqiqotda ekologik omillar, sog'liq ko'rsatkichlari va iqtisodiy samaradorlik o'rtasidagi bog'liqlik yoritilib, innovatsion yondashuvlar asosida muammoni yumshatish bo'yicha takliflar ilgari suriladi.

**Kalit so'zlar:** havo ifloslanishi, mehnat unumdorligi, iqtisodiy zarar, inson kapitali, ekologik risklar, O'zbekiston.

**Annotation:** This scientific article provides a theoretical and practical analysis of the impact of air pollution on labor productivity and the resulting economic consequences at the enterprise level.

In the context of Uzbekistan, against the backdrop of accelerating industrialization, urbanization, and increasing transport loads, the quality of atmospheric air is exerting a significant influence on the health of labor resources and overall production efficiency. The study examines the interrelationship between environmental factors, health indicators, and economic performance, and puts forward proposals for mitigating the problem based on innovative approaches.

**Keywords:** air pollution, labor productivity, economic losses, human capital, environmental risks, Uzbekistan

### Introduction

Uzbekistan is one of the most important countries in Central Asia and possesses a territory rich in natural resources. However, historical heritage and the current processes of economic development are significantly exacerbating environmental problems. One of the most prominent global-scale environmental issues associated with the country is the desiccation of the Aral Sea. In addition, such problems as water scarcity, air pollution, soil salinization and degradation, dust storms, and others are exerting a serious negative impact on the health of the population and the national economy.

The declaration of 2025 as the "Year of Environmental Protection and Green Economy" in Uzbekistan clearly demonstrates the high relevance and priority of addressing these challenges.

In recent years, the issue of ecological sustainability has been increasingly recognized on a global scale as one of the key factors of economic development. Air pollution affects not only the environment, but also has a direct negative impact on human health, working capacity, and the efficiency of production processes.

In the Republic of Uzbekistan, the growing share of large industrial centers, energy facilities, and motor vehicle transport is making air quality problems even more pressing and relevant.

In this regard, the Resolution of the President of the Republic of Uzbekistan dated May 31, 2023, No. PP-171 “On Measures to Ensure the Effective Organization of the Activities of the Ministry of Ecology, Environmental Protection and Climate Change” defines the main and priority tasks<sup>1</sup>.

In these circumstances, the assessment of the impact of air pollution on labor productivity and the identification of economic losses arising at the enterprise level acquire significant scientific and practical importance.

In the context of rapidly developing modern industry, the aspiration to increase labor productivity at enterprises has become one of the most fundamental goals set by companies themselves.

Under market economy conditions, as enterprises strive to enhance their competitiveness and improve liquidity, they pay special attention to optimizing the use of labor force.

Industrial enterprises face a wide range of challenges and opportunities in raising labor productivity — ranging from the adoption of technological advancements to the development of human capital.

By developing effective and innovative strategies, investing in physical capital, mastering new technologies, and developing human capital — utilizing these key factors — industrial enterprises can achieve sustainable development and discover significant opportunities for long-term success.

### **Main Body**

#### **The Relationship Between Air Pollution and Labor Productivity**

We can cite the following data regarding the link between air pollution and labor productivity. Scientific studies show that high concentrations of harmful substances in the atmospheric air (PM2.5, PM10, SO<sub>2</sub>, NO<sub>x</sub>, CO, and others) cause diseases of the respiratory tract, cardiovascular system, and nervous system in the human body. This, in turn, leads to a decline in labor productivity through the following mechanisms:

- rapid fatigue of employees and reduced ability to concentrate;
- an increase in the number of sick leaves (temporary incapacity for work);
- a rise in errors during working hours and an increase in production defects;
- in the long term, the departure of qualified personnel from the labor market.

In the conditions of Uzbekistan, particularly in large industrial regions, the negative impact of air pollution on the health of labor resources is especially pronounced.



<sup>1</sup> <https://kun.uz/65842027#!>Havo ifloslanishi va aholi salomatligi bilan bogʻliq inqirozdan chiqish: Yaponiya tajribasi

### Economic Consequences at Enterprises

Air pollution causes the following economic damages to enterprises:

1. Direct costs: Medical care for affected employees and insurance payments. In Uzbekistan, health-related expenditures linked to air pollution account for 0.7–3% of GDP.

2. Indirect losses: Decline in labor productivity and loss of working days. According to World Bank estimates, the annual economic damage in Tashkent due to the impact of PM2.5 reaches 2–4 billion US dollars.

3. Long-term effects: Migration of qualified personnel and decline in the enterprise's reputation.

In Uzbekistan, particularly in the construction and manufacturing sectors, on days with high air pollution levels project deadlines are extended and costs increase by 5–10%.

### Economic Consequences at the Enterprise Level

As a result of the impact of air pollution on labor productivity, enterprises experience a number of direct and indirect economic losses:

#### Economic Consequences Arising at Enterprises

In the conditions of Uzbekistan, enterprises face the following direct and indirect losses due to air pollution:

- Reduction in production volume: Every 1% decrease in labor productivity leads to a significant reduction in annual revenue at large industrial enterprises.
- Increase in costs: Enterprises are forced to allocate additional funds for employees' medical insurance, installation and maintenance of workplace air purification systems (filtration), and occupational safety measures.
- Degradation of human capital: Chronic air pollution causes qualified specialists to migrate to other regions (ecological migration) or results in the premature loss of working capacity.

#### Indirect Economic Losses

- decline in the enterprise's competitiveness;
- reduction of resources allocated to innovative activities;
- weakening of the enterprise's social reputation and trust from investors;
- emergence of skilled labor shortages in the regional labor market.

#### Relevance of the Problem in the Context of Uzbekistan

At a time when Uzbekistan's economy is transitioning to a new stage of industrial and infrastructure development, neglecting environmental factors may seriously undermine long-term economic stability.

The issue becomes particularly acute given that a significant portion of the labor force is employed in sectors that operate in open air or in areas with elevated environmental risks. This circumstance further heightens the relevance and urgency of the problem.

#### Innovative Approaches and Proposals

To mitigate the negative impact of air pollution on labor productivity, the following innovative measures can be proposed:

- Introduction of environmental monitoring systems and digital sensor networks at enterprises;
- Expansion of investments in "green technologies" and energy-efficient equipment;
- Development of corporate programs specifically aimed at protecting employees' health;
- Strengthening of environmental standards through public-private partnerships;

- Adoption of management decisions based on the economic evaluation of environmental risks.

### **Conclusion**

Air pollution exerts a significant negative impact on labor productivity, resulting in substantial economic losses for both individual enterprises and the national economy as a whole. In the context of Uzbekistan, addressing this issue requires the organic integration of environmental and economic policies.

Improving air quality should be regarded as a strategic priority in the preservation of human capital and the enhancement of production efficiency.

This scientific article has specifically highlighted these problems and their potential solutions.

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