Innovative: International Multi-disciplinary Journal of Applied Technology
(ISSN 2995-486X) VOLUME 03 ISSUE 11, 2025

# AN INTEGRATED APPROACH TO CREATING ENVIRONMENTAL SUSTAINABILITY AND A HEALTHY WORKPLACE IN UZBEKISTAN

***Razzokov Khabib Kholiqovich***
Associate Professor, Department of "Occupational Safety and Health Engineering", Samarkand State University of Architecture and Construction
***Ashurov Islomiddin***
1st-year Master's Student, Department of "Occupational Safety and Health Engineering", Samarkand State University of Architecture and Construction

**Abstract:**

The research investigates the role of an integrated approach in promoting environmental sustainability and ensuring healthy working conditions within the industrial sectors of Uzbekistan. While legislation at the national level and international standards (including ISO 14001 and ISO 45001) encourage safer and greener production, a review of the available literature reveals limited analytical attention to how they can be applied together in the workplace. The study considers air quality, noise map, climatological conditions and waste treatments in typical enterprises by application of environmental monitoring, hygienic assessment and risk-analysis methods. While, findings show, general air pollution in Uzbekistan has slightly decreased in recent years, some industrial areas frequently violate recommended limits for particulate matter and emissions, continuing to pose dangers to the health of workers. The outcomes also show that environmental safety indices in particular areas are beneath the customary 0.7 with the need of stricter hygienic controls and present-day technologies. The study concludes that if ecological management systems, occupational hygiene, and safety systems are integrated well it may lead to better workplace well-paying and it may cause operational efficiency. It will also encourage the promotion of real-time monitoring, energy-saving technologies and alignment of national standards with international best practices towards the sustainable industrial development of Uzbekistan.

**Keywords:** environmental sustainability, occupational hygiene, industrial sanitation, integrated approach, labor protection, ISO 14001, ISO 45001, Republic of Uzbekistan.

## Introduction

As we move into the 21st century and global economy with gradual growth, health and safety of ecological environment in workplace have become one the global prominent public health issues. Making the work environment ecologically sustainable not only protects the health of workers but also enhances productivity and organizational performance [1]. In the Republic of Uzbekistan, increasing interest and steps towards environmental protection, labour safety and sustainable industrial development is being observed, as evidenced by recent adoption of a number of key regulatory documents such as: the Law of the Republic of Uzbekistan "On Environmental Protection" in 2021, the adopted updated Labour Code at the beginning of 2023 and the Concept of Environmental Safety [2]. They are in line with national efforts to bring industrial practice in line with modern sustainability requirements and global expectations.

Also, international norms such as ISO 14001:2015 (Environmental Management Systems) and ISO 45001:2018 (Occupational Health and Safety Management Systems) have achieved the status of being indispensable elements of a holistic workplace ecological safety expression [3]. Literature highlights that institutionalization of work environmental sustainability involves functioning of occupational hygiene, industrial sanitation, and the environmental management system in concert, as factors interlinked in achieving safe and sustainable working conditions [4]. Nevertheless, there is a wide gap in knowledge concerning the joint implementation of these principles in the industrial sectors of Uzbekistan and the way national legislation can be aligned so that it meets the international standards. The existing studies mainly address either environment (especially, environmental) or workplace hygiene alone and comprehensive, integrated models are insufficiently addressed.

Given these gaps, this study aims to provide a scientific basis and rationalisation for an integrative framework of achieving environmental sustainability and a healthy working environment for Uzbekistan production processes. The study utilizing an integrated approach of environmental monitoring, hygienic examination, and management system assessment points out the most of concerns and scopes. The results and perspectives will assist not only in theoretical aspects, but also in the practical implications of safer, greener, and more sustainable industrialization in Uzbekistan.

**Literature review.** Use of the "Environmental Sustainability" concept in a global scientific literature has various interpretations. Sustainability is widely defined, among others, by the well-known Brundtland Commission (1987) and Sachs (2015), as the process of balance between human activities and nature [5]. In occupational contexts, such an environmentally sustainable atmosphere is based on solid occupational hygiene and sanitation. In Uzbekistan, the national Sanitary Rules and Norms (SanPiN №0293-20), that set hygienic standards for workplaces air quality is the primary regulatory framework that inform these requirements [6].

Across the globe, United Nations Sustainable Development Goals (SDGs) support this contention; particularly SDG 8, encouraging decent work and economic growth through safer working environments, and SDG 13, focused on climate action, which directly relate to workplace environmental sustainability [7]. Integrated assessment tools like Life Cycle Assessment (LCA) and Environmental Risk Assessment (ERA) are commonly used to assess hygienic safety and ecological efficiency. Such methods enable tracking of waste, energy use, and human health impacts along production [8].

It was reported by environmental monitoring with the atmospheric pollution index in Uzbekistan ranging from 71 to 95, exceeding normative limits in some industrial regions [9]. It underscores the need for improved sanitary and hygienic measures in the workplace. The balance of the available theoretical and practical evidence generally indicates that incorporating environmental sustainability principles into the labor protection system is a strategic priority for industrial development in the modern economy [10].

**Object and subject of the study.** It highlights content of ecological-hygienic situation of industrial enterprises, workplaces at enterprise in Uzbekistan. For example, it examines air pollution, noise, micro climate, energy consumption and waste disposal systems [11] in metal production plants in the Tashkent region. It focuses on an integrated system in the field of hygiene, sanitation, energy management, and environmental control, which can provide a better and sustainable working environment [12].

The main goal of this study is to scientifically justify and develop an integrated model that supports environmental sustainability and a healthy workplace within industrial settings. To achieve this, the research focuses on several key tasks: analyzing Uzbekistan's environmental and labor-related regulations; identifying and assessing major ecological risk factors in production; integrating international standards such as ISO 14001 and ISO 45001 into national practice; creating a mathematical model for sustainable work environments; and formulating practical recommendations based on the findings [13].

**Methodology.** The study applied several scientific and practical methods. Environmental monitoring and sanitary-hygienic assessment were used to measure air composition ($CO_2$, $SO_2$, PM2.5) and microclimate conditions such as temperature and humidity in production areas. Life Cycle Assessment helped calculate waste levels, energy consumption, and atmospheric emissions [14]. Additionally, an environmental and health risk assessment model was used to determine and evaluate potential risks arising from human activities.

$$R = P \times C$$

$P$— probability of pollution,
$C$— extent of impact on human health.

Based on data from the Ministry of Ecology of Uzbekistan, the study analyzed air pollution levels (AQI) and statistics on occupational diseases between 2018 and 2024 [15]. Findings show that although the country's average air pollution index decreased by 15% over the past six years, several industrial regions still exhibit pollution levels that remain significantly above acceptable norms (Table 1).

Table 1. index of air pollution in some regions of Uzbekistan (2024)

| **Region** | **AQI Indicator** | **Pollution Level** | **Main Source** |
|---|---|---|---|
| Tashkent city | 93 | High | Motor vehicles, industrial emissions |
| Namangan region | 78 | Moderate | Dust, energy production |
| Navoi region | 88 | High | Chemical industry, metallurgy |
| Bukhara region | 70 | Moderate | Heating systems |

| Region | AQI Indicator | Pollution Level | Main Source |
|---|---|---|---|
| Republic of Karakalpakstan | 95 | High | Drought, dust storms |

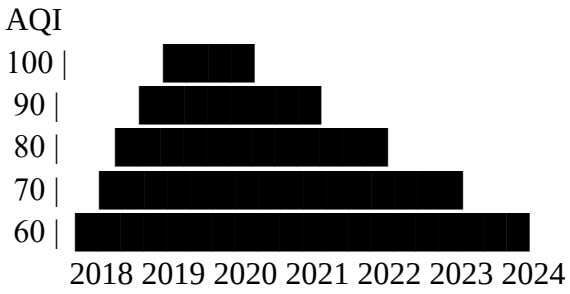


Figure 1. Dynamic of air pollution in Uzbekistan during 2018–2024

Despite favourable trends in the ecological monitoring records, the multiple graphical data demonstrates that pollution levels in 1.3–1.5 multiple industrial regions are beyond limits (Figure 1). This underscores the importance of upgrading workplace environment, especially the dust control, microclimate regulation and ventilation [16]. An integrated formula was then used to assess the overall level of environmental safety.

$$E_i = \frac{(Q_a + Q_n + Q_c)}{3} \times (1 - R)$$

$E_i$— ecological integration index of the working environment,
$Q_a$— air quality index,
$Q_n$— noice level index,
$Q_c$— dust level index,
$R$— overall risk coefficient.

Research findings show that the ecological integration index varies across regions: in Tashkent region $E_i$=0.72, in Namangan $E_i$=0.81, and in Navoi $E_i$=0.65. These values indicate that workplace safety levels in several areas remain moderate or relatively low. According to environmental safety guidelines, regions where the index falls below 0.7 require stronger occupational hygiene measures. ISO 14001 standards state that workplace air pollution should not exceed 0.05 mg/m³, while Uzbekistan's SanPiN norms require temperature levels of 18–22°C, humidity of 40–60%, and noise levels below 80 dB.

The obtained results show that the problem of maintaining ecological balance and sanitary-clean conditions of production forms, is a very acute issue, in different industrial productions of Uzbekistan. A stable and healthy working environment can only be achieved by supplementing the approach of an environmental monitor, hygienic control, and risk assessment as one system [17]. Despite capturing some improvements over the years, however, there are still many issues, such as low recycling rates of

waste, weak adoption of energy-efficient technologies and excessive air pollution from specific enterprises.

It requires to relate the ISO 14001 and ISO 45001 directly to the production processes in establishing the environmental management system and the occupational safety management guides. The PDCA cycle for continuous improvement under these standards allows for requirements for coordinated management of health and safety and environmental factors in the workplace. Ecologically sustainable production boosts worker well-being and promotes economic efficiency. World Bank overall estimates indicate that every dollar invested in provision of a sound workplace generates an average economic return of 2.5 dollars [18].

Uzbekistan has further identified sustainable working conditions throughout the production chain, aligning with the Green Economy Strategy (2020–2030) that focuses on safe working conditions in relation to goods and services that prioritize environmental integrity and safety [19]. The conclusion is that a combined hygiene, ecology, safety approach represents the only integrated route that can respond to industrial problems. Research in this domain provides an underpinning for establishing modern scientific models for occupational protection.

Based upon study results, a number of practical initiatives are suggested, the introduction of an Integrated Environmental Management System (IEMS), combining ISO 14001 and ISO 45001 within one platform; the Green Office concept sustainability-oriented approach at offices, using energy-efficient lighting, air filtration and recyclable materials; the Internet of things (IoT) and smart sensors for air quality, dust, noise control, and assessment in workplaces; digital E-eco map to enable risk zones within enterprises; continuous Eco-hygienic management training programs; and national standard improvement by developing the unity of SanPiN and GOST with iso standards and lightweight, as well as reviewing every three years [20].

These measures will contribute to sanitary-hygienic improvement, and also to enhancing economic and social sustainability of industrial sectors of Uzbekistan.

**Conclusion.** The results of the study led to some scientific and practical conclusions. The research proved that environmental sustainability and occupational safety is interrelated, hence contribute to the creation of healthy workplaces in Uzbekistan. The study found motor vehicles, energy production, and industrial emissions to be the main contributors of airborne pollutants. A good example of this was the integration of ISO 14001 and ISO 45001 for improvement in workplace safety. Geometrical transformation of results of the ecological integration index ($E_i$) found low safety level for the Tashkent and Navoi regions (0.65–0.72). By implementing new technologies including the IoT and implementation of sensor-based monitoring, it allows for real-time control of the environment. Harmonizing occupational hygiene and environmental management appears to be an important part of sustainable industrial development, as was also demonstrated in the findings. Moreover, the realization of the national "Green Economy Strategy" and "Environmental Safety Concept" are of particular importance for the progress.

## References


[1] World Health Organization, *Healthy Workplaces: A Global Framework*. Geneva, 2023.

[2] Republic of Uzbekistan, *Law on Environmental Protection*. 2021.

[3] International Organization for Standardization, *ISO 14001: Environmental Management Systems — Requirements with Guidance for Use*. Geneva, 2018.

[4] Xolmatov, A., *Environmental Approaches in Occupational Hygiene and Industrial Sanitation*. Tashkent: University of Economics Press, 2022.
[5] Sachs, J. D., *The Age of Sustainable Development*. New York: Columbia University Press, 2015.
[6] Republic of Uzbekistan SanPiN №0293-20, *Hygienic Requirements for Workplace Air*. 2020.
[7] United Nations, *Sustainable Development Goals Progress Report*. New York, 2022.
[8] European Environment Agency, *Environmental Risk Assessment and Life Cycle Analysis*. 2020.
[9] Ministry of Ecology and Climate Change of Uzbekistan, *State Environmental Monitoring Report*. 2024.
[10] Brundtland Commission, *Our Common Future*. Oxford University Press, 1987.
[11] Ministry of Innovation of Uzbekistan, *Industrial Environmental Efficiency Reports*. 2023.
[12] Jalilov, B., *Industrial Ecology and Workplace Sustainability in Central Asia*. Springer, 2022.
[13] UNEP, *Integrated Environmental Assessment Methodologies*. 2021.
[14] ISO, *Life Cycle Assessment (LCA) Standards Guide*. 2015.
[15] Ministry of Ecology and Climate Change of Uzbekistan, *Data for 2018–2024*. 2024.
[16] European Environment Agency, *Air Quality in Europe: Annual Report*. 2023.
[17] Xamdamov, F., *Innovative Approaches to Creating Environmentally Safe Workplaces in Uzbekistan*. Tashkent: TDTU Press, 2024.
[18] World Bank, *Investing in Healthy Workplaces*. Washington, D.C., 2023.
[19] Cabinet of Ministers of Uzbekistan, *Green Economy Concept 2020–2030*. 2020.
[20] Ministry of Ecology and Climate Change of Uzbekistan, *Environmental Safety Concept*. 2023.