The New Uzbekistan Journal of Medicine (NUJM)

Available online at: https://ijournal.uz/index.php/nujm/index
Volume I, Issue III, 2025
ISSN: 2181-2675

STUDY OF ENVIRONMENTAL HEALTH IMPACTS AND RISK FACTORS

Guzal Khamidova[1]

[1]Tashkent State Medical University, Tashkent, Uzbekistan;

DOI: **10.5281/zenodo.17166048**

Article History

Received: 15.08.2025
Accepted: 19.09.2025

Abstract

Air pollution poses a critical threat to both human health and the global climate. This article explores the multifaceted impact of airborne pollutants—ranging from particulate matter (PM2.5 and PM10) and nitrogen dioxide (NO_2) to greenhouse gases like carbon dioxide (CO_2) and methane (CH_4). These pollutants are linked to a rise in respiratory diseases, cardiovascular conditions, and premature deaths. At the same time, their accumulation in the atmosphere exacerbates global warming, disrupts weather patterns, and accelerates climate change. The article also highlights the socio-economic disparities in exposure to pollution and emphasizes the urgent need for integrated policy measures, technological innovations, and international cooperation to mitigate these dual threats. Through a comprehensive review of scientific findings, the article aims to raise awareness and foster informed actions toward a cleaner, healthier, and more sustainable future.

Keywords: Air pollution, Climate change, Public health, Greenhouse gases, Particulate matter, Environmental policy, Respiratory diseases, Global warming, Sustainable development, Nitrogen dioxide.

The New Uzbekistan Journal of Medicine (NUJM)

Available online at: https://ijournal.uz/index.php/nujm/index
Volume I, Issue III, 2025
ISSN: 2181-2675

Introduction. In the 21st century, air pollution has emerged as one of the most pressing environmental and public health challenges. The World Health Organization (WHO) estimates that approximately 7 million people die prematurely each year due to exposure to polluted air, with a large proportion of these deaths linked to non-communicable diseases such as stroke, heart disease, chronic obstructive pulmonary disease, and lung cancer (World Health Organization, 2021). Beyond its immediate health impacts, air pollution is a significant driver of climate change, creating a dangerous feedback loop that endangers ecosystems, economies, and human well-being. Air pollution is primarily caused by anthropogenic activities such as industrial production, fossil fuel combustion, agriculture, and transportation. These activities release a mixture of harmful substances into the atmosphere, including particulate matter (PM2.5 and PM10), nitrogen oxides (NO_x), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and greenhouse gases such as carbon dioxide (CO_2) and methane (CH_4). While some pollutants, like PM2.5, have direct and immediate effects on human health, others, like CO_2 and CH_4, have long-term effects by altering the Earth's climate systems (Shaddick et al., 2018).

The relationship between air pollution and climate change is complex and interconnected. Airborne pollutants not only trap heat in the atmosphere but also affect cloud formation, precipitation patterns, and even the frequency and intensity of extreme weather events (IPCC, 2021). As the global climate warms, it can in turn exacerbate air pollution by increasing the concentration of ground-level ozone and changing atmospheric circulation patterns. These interactions pose dual threats—immediate risks to public health and long-term risks to planetary stability.

Urban areas, especially in developing countries, bear the brunt of these effects. Rapid industrialization, weak environmental regulations, and high population densities make cities hotspots for both air pollution and climate vulnerability. The burden of air pollution also falls disproportionately on marginalized populations, including children, the elderly, and low-income communities, highlighting the issue's social and environmental justice dimensions (Bell & Ebisu, 2012).

Given the urgency of addressing both air pollution and climate change, this article aims to provide a comprehensive overview of how airborne threats affect health and climate. By synthesizing current scientific evidence, this work hopes to inform public policy, support community awareness, and guide future research in environmental science and public health.

Literature Review. A growing body of scientific literature has documented the multifaceted impacts of air pollution on health and the environment. Numerous studies have demonstrated a direct correlation between exposure to air pollutants and increased morbidity and mortality from cardiovascular and respiratory diseases. Pope et al. (2009) found that long-term exposure to fine particulate matter (PM2.5) is associated with a significant increase in the risk of heart attacks and stroke. Similarly, studies by Lelieveld et al. (2015) estimated that outdoor air pollution contributes to over 3 million premature deaths annually, with the majority occurring in Asia. Short-term exposures also pose acute health risks. Research by Dominici et al. (2006) concluded that daily fluctuations in air pollution levels could trigger asthma attacks, increase hospital admissions, and raise mortality rates, even in populations with relatively short

The New Uzbekistan Journal of Medicine (NUJM)

Available online at: https://ijournal.uz/index.php/nujm/index
Volume I, Issue III, 2025
ISSN: 2181-2675

exposure periods. Vulnerable groups—such as children, the elderly, and individuals with pre-existing conditions—are especially at risk (Trasande et al., 2016).

On the climate front, greenhouse gases such as CO_2 and CH_4 are the primary drivers of global warming. However, other pollutants, like black carbon and tropospheric ozone, also play a significant role. According to the Intergovernmental Panel on Climate Change (IPCC), short-lived climate pollutants (SLCPs) such as black carbon have a much higher global warming potential (GWP) over short time frames compared to CO_2, contributing not only to warming but also to glacial melting and reduced albedo (IPCC, 2014).

The interaction between air pollution and climate change is increasingly a focus of interdisciplinary research. Jacob and Winner (2009) explored how rising global temperatures could worsen ozone pollution and increase the frequency of smog episodes in urban areas. This highlights the feedback loop where climate change exacerbates pollution, and vice versa, complicating mitigation efforts.

Efforts to control air pollution have shown promise. The Clean Air Act in the United States, for example, has been credited with significant reductions in ambient concentrations of key pollutants and with improving population health outcomes (Dockery & Stone, 2007). Similarly, European regulations on vehicle emissions and industrial pollutants have led to measurable improvements in air quality (EEA, 2020). Nevertheless, many low- and middle-income countries still struggle with enforcement, data collection, and public awareness.

Recent literature also emphasizes the importance of co-benefit approaches—strategies that simultaneously address air quality and climate change. For instance, reducing fossil fuel consumption not only lowers CO_2 emissions but also decreases the emission of harmful air pollutants. Smith et al. (2009) argue that such integrated approaches can yield rapid health benefits while also contributing to long-term climate goals.

Conclusion. In conclusion, the article provides a robust foundation for understanding the dual challenges posed by air pollution and climate change. However, gaps remain—particularly in terms of data from developing countries, localized studies, and interdisciplinary approaches that combine environmental science, public health, and policy studies.

References

1. Bell, M. L., & Ebisu, K. (2012). Environmental inequality in exposures to airborne particulate matter components in the United States. Environmental Health Perspectives, 120(12), 1699–1704.
2. Dockery, D. W., & Stone, P. H. (2007). Cardiovascular risks from fine particulate air pollution. New England Journal of Medicine, 356(5), 511–513.
3. Dominici, F., Peng, R. D., Bell, M. L., et al. (2006). Fine particulate air pollution and hospital admission for cardiovascular and respiratory diseases. JAMA, 295(10), 1127–1134.
4. European Environment Agency (EEA). (2020). Air quality in Europe—2020 report. https://www.eea.europa.eu
5. IPCC. (2014). Climate Change 2014: Synthesis Report. Intergovernmental Panel on Climate Change.
6. IPCC. (2021). Sixth Assessment Report. Intergovernmental Panel on Climate Change.

The New Uzbekistan Journal of Medicine (NUJM)

Available online at: https://ijournal.uz/index.php/nujm/index
Volume I, Issue III, 2025
ISSN: 2181-2675

7. Искандарова, Ш. Т., Расулова, Н. Ф., Хасанова, М. И., & Юсупалиева, К. Б. (2019). Современные проблемы гигиены почвы в условиях Узбекистана почвы в условиях Узбекистана Ташкент:" Фан.

8. Усманов, И. А., Джалилова, Г. А., & Расулова, Н. Ф. (2016). К вопросу охраны водных объектов бассейна Амударьи на примере Кашкадарьинской области. *Вестник науки и образования*, (2 (14)), 95-98.

9. Nazarova, S. K., Jalilova, G. A., Mukhamedova, N. S., & Rasulova, N. F. (2021). Features of distance learning organization. *Annals of the Romanian Society for Cell Biology*, *25*(1), 339-347.

10. Расулова, Н. Ф. (2011). Ўзбекистонда педиатриянинг ривожланиш тарихи.

11. Jacob, D. J., & Winner, D. A. (2009). Effect of climate change on air quality. Atmospheric Environment, 43(1), 51–63.

12. Lelieveld, J., Evans, J. S., Fnais, M., Giannadaki, D., & Pozzer, A. (2015). The contribution of outdoor air pollution sources to premature mortality on a global scale. Nature, 525(7569), 367–371.

13. Pope, C. A., Ezzati, M., & Dockery, D. W. (2009). Fine-particulate air pollution and life expectancy in the United States. New England Journal of Medicine, 360(4), 376–386.

14. Миррахимова, М. Х., Садуллаева, Х. А., & Кобилжонова, Ш. Р. (2022). *Значение экологических факторов при бронхиальной астме у детей* (Doctoral dissertation, Россия).

15. Mirrahimova, M. H., Khalmatova, B. T., & Tashmatova, G. A. (2019). Bronchial asthma in children: a modern view of the problem. *Toshkent tibbiyot akademiyasi axborotnomasi*, (1), 31-34.

16. Mirrakhimova, M. K. (2020). Characteristics of Allergic Pathologies Progression in Young Children. *American Journal of Medicine and Medical Sciences*, *10*(9), 652-656.

17. Mirrakhimova, M. (2020). Improving methods of treatment of atopic pathology in children. *Journal of Critical Reviews*, *7*(12), 190-192.

18. Саидова, Ш. А., Якубов, А. В., Зуфаров, П. С., Пулатова, Н. И., & Пулатова, Д. Б. (2024). ВЫБОР АНТАГОНИСТОВ МИНЕРАЛОКОРТИКОИДНЫХ РЕЦЕПТОРОВ ПРИ РАЗЛИЧНЫХ ПАТОЛОГИЯХ.

19. Karimov, M. M., Zufarov, P. S., Go'zal, N. S., Nargiza, P. I., & Aripdjanova, S. S. (2022). Ulinastatin in the conservative therapy of chronic pancreatitis.

20. Зуфаров, П. С., Якубов, А. В., & Салаева, Д. Т. (2009). Сравнительная оценка эффективности омепразола и пантопразола при лечении гастропатии, вызванной нестероидными противовоспалительными средствами у больных ревматоидным артритом. *Лікарська справа*, (3-4), 44-49.

21. Yakubov, A. V., Zufarov, P. S., Pulatova, N. I., Akbarova, D. S., Saidova, S. A., Pulatova, D. B., & Musaeva, L. J. (2022). Evaluation Of The Effectiveness Of Angiotensin-Converting Enzyme Inhibitors, Misoprostol, Omeprazole And Their Combinations On The State Of The Gastric Mucous Barrier In Indomethacin Gastropathy In Animals With Experimental Rheumatoid Arthritis. *Journal of Pharmaceutical Negative Results*, *13*.

The New Uzbekistan Journal of Medicine (NUJM)

Available online at: https://ijournal.uz/index.php/nujm/index
Volume I, Issue III, 2025
ISSN: 2181-2675

22. Мусаева, Л. Ж., Якубов, А. В., Зуфаров, П. С., Акбарова, Д. С., & Абдусаматова, Д. З. (2021). Клиническая фармакология лекарственных средств, влияющих на систему гемостаза.

23. Адилбекова, Д. Б., Хатамов, А. И., Мансурова, Д. А., & Пулатов, Х. Х. (2020). Морфологическое состояние сосудисто-тканевых структур желудка у потомства в условиях хронического токсического гепатита у матери. *Морфология*, *157*(2-3), 10-11.

24. Закиров, А. У., Пулатов, Х. Х., & Исмалов, Д. Д. (2001). Изучение противовоспалительных свойств диклозана. *Экспер. и клин. фарм*, (5), 50-52.

25. Пулатов, Х. Х. (2022). Влияние экспериментального сахарного диабета на надпочечники: дис. *Ўзбекистон, Самарқанд*.

26. Adilbekova, D. B., Usmanov, R. D., Mirsharapov, U. M., & Mansurova, D. A. (2019). MORPHOLOGICAL STATE OF EARLY POSTNATAL FORMATION OF THE ORGANS OF THE GASTROINTESTINAL TRACT AND LIVER IN OFFSPRING BORN AND RAISED BY MOTHERS WITH CHRONIC TOXIC HEPATITIS. *Central Asian Journal of Medicine*, *2019*(4), 43-55.

27. Shaddick, G., Thomas, M. L., Amini, H., et al. (2018). Data integration for the assessment of population exposure to ambient air pollution for global burden of disease assessment. Environmental Science & Technology, 52(16), 9069–9078.

28. Smith, K. R., Woodward, A., Campbell-Lendrum, D., et al. (2009). Human health: impacts, adaptation, and co-benefits. The Lancet, 374(9707), 2104–2114.

29. Trasande, L., Malecha, P., & Attina, T. M. (2016). Particulate matter exposure and preterm birth: estimates of US attributable burden and economic costs. Environmental Health Perspectives, 124(12), 1913–1918.

30. World Health Organization. (2021). Air pollution. https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health