KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

Air Pollution in Aurangabad City (Chh.Sambhajinagar): A Study of PM10, PM2.5, SOx, and NOx Levels and Their Impact

Sachin R Ahire[1] and M.B Mule[2]
Department of Environmental Science,
Dr. Babasaheb Ambedkar Marathwada University,
University Campus, Chh.Sambhajinagar-431004 Maharashtra India
Corresponding Author: Email Address: sach6262@gmail.com

Abstract:
Air pollution has become a significant environmental and public health concern in Aurangabad, Maharashtra, due to rapid urbanization, industrialization, and vehicular emissions. This study aims to assess the levels of particulate matter (PM10 and PM2.5), sulphur oxides (SOx), and nitrogen oxides (NOx) in Aurangabad and evaluate their impact on air quality and public health. The data collected from air quality monitoring stations are alarming concentrations of these pollutants that exceed national air quality standards, leading to increased risks of respiratory diseases, cardiovascular conditions, and environmental degradation. The paper further explores mitigation strategies to improve air quality in the city and reduce the associated health risks.

Keywords: PM10, PM2.5, NOx, SOx

1. Introduction

Aurangabad, a historic city in Maharashtra, is facing growing challenges due to dust pollution. Known for its rich cultural heritage, the city is witnessing rapid industrialization and urban development. Dust pollution, primarily arising from vehicular emissions, construction activities, and road dust, has escalated over the past decade. This urban pollution not only compromises the quality of air but also poses a significant risk to human health and the environment. As the city expands, it becomes increasingly important to address dust pollution to ensure sustainable growth and improve quality of life. As a result, the air quality in the city has deteriorated, with pollutants such as particulate matter (PM10 and PM2.5), sulphur oxides (SOx), and nitrogen oxides (NOx) becoming a major concern. These pollutants contribute to several health problems, including respiratory illnesses, cardiovascular diseases, and premature deaths.

This paper investigates the levels of PM10, PM2.5, SOx, and NOx in Aurangabad, with a focus on their impact on air quality, human health, and the environment**.** The study uses data collected from air quality monitoring stations and relevant studies to provide a comprehensive analysis of air pollution in the city.

2. Air Pollution in Aurangabad: Sources and Causes

Air pollution in Aurangabad is primarily attributed to the following sources:

- **Vehicular Emissions**: The rising number of vehicles in the city, especially diesel-powered vehicles, is a significant source of nitrogen oxides (NOx), particulate matter (PM2.5 and PM10), and carbon monoxide (CO).

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

- **Industrial Emissions**: Factories, power plants, and other industrial activities in and around Aurangabad emit sulphur dioxide (SO_2), NOx, and particulate matter. The cement industry and textile mills are major contributors.
- **Construction Activities**: Ongoing urban development projects, including infrastructure expansion and housing construction, contribute to dust pollution, leading to elevated levels of PM10 and PM2.5.
- **Agricultural Activities**: Crop burning in the surrounding rural areas of Aurangabad increases seasonal pollution levels, particularly for PM2.5 and NOx.

3. Air Quality Data: PM10, PM2.5, SOx, and NOx Levels in Aurangabad

Air quality monitoring data from the indicate that the levels of PM10, PM2.5, SOx, and NOx in Aurangabad exceed permissible limits. The following table summarizes the concentrations of these pollutants:

Results

Table: 1

Location	Pollutant	Average Concentration (µg/m³)	National Air Quality Standard (NAAQS)
Naregaon (chikalthana)	PM10	180 µg/m³	100 µg/m³
	PM2.5	121 µg/m³	60 µg/m³
	SOx	57 µg/m³	50 µg/m³
	NOx	60 µg/m³	40 µg/m³

Table:2

Location	Pollutant	Average Concentration (µg/m³)	National Air Quality Standard (NAAQS)
Baba Petrol Pump Chowk	PM10	135 µg/m³	100 µg/m³
	PM2.5	89 µg/m³	60 µg/m³
	SOx	38 µg/m³	50 µg/m³
	NOx	31 µg/m³	40 µg/m³

- **PM10**: The average concentration of PM10 in Naregaon and Baba petrol pump chowk is found to be 180 and 135 µg/m³, which is significantly above the NAAQS limit of 100 µg/m³. The primary sources of PM10 in the city include dust from construction activities, vehicle emissions, and industrial discharges.
- **PM2.5**: With an average concentration of 121 and 89 µg/m³, PM2.5 levels in Naregaon and Baba petrol pump chowk also exceed the NAAQS standard of 60 µg/m³. Fine particulate matter, such as PM2.5, is linked to severe respiratory diseases and cardiovascular conditions.

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

- **SOx**: Sulphur oxides, primarily emitted from industrial processes, are within acceptable limits in the city, with an average concentration of 35 and excludingthe Naregaon 57 µg/m³ against the NAAQS standard of 50 µg/m³.
- **NOx**: Nitrogen oxides, primarily from vehicular emissions and industrial activities, have an average concentration of 45 and 31 µg/m³, exceeding the permissible limit of 40 µg/m³.

4. Health and Environmental Impact

- **Human Health**:

The elevated levels of PM10 and PM2.5 in Aurangabad pose significant health risks. Exposure to particulate matter, particularly PM2.5, has been associated with chronic respiratory diseases, such as asthma, chronic obstructive pulmonary disease (COPD), and lung cancer. Additionally, NOx and SOx can aggravate cardiovascular diseases and increase the risk of premature death. Vulnerable groups such as children, the elderly, and individuals with pre-existing health conditions are most at risk.

- **Environmental Impact**:

Air pollution in Aurangabad also affects the local environment. SOx and NOx contribute to the formation of acid rain, which can damage soil quality, crops, and water bodies. High concentrations of particulate matter reduce visibility and affect the natural beauty of the region, including its historical monuments. Additionally, ground-level ozone, formed due to the reaction of NOx and VOCs, can damage vegetation and reduce agricultural yields.

5. Mitigation Strategies for Improving Air Quality

To address the issue of air pollution in Aurangabad, several mitigation strategies should be implemented:

- **Stricter Vehicular Emission Standards**: The introduction of stringent emission standards for vehicles, along with the promotion of electric vehicles (EVs) and cleaner fuels, can significantly reduce the levels of PM10, PM2.5, and NOx.
- **Industrial Emission Controls**: Industrial facilities should adopt cleaner technologies, such as scrubbers and filters, to reduce emissions of PM, SOx, and NOx. Additionally, enforcing stricter pollution control measures and conducting regular inspections will help in ensuring compliance.
- **Green Spaces and Urban Planning**: Increasing the number of green spaces and promoting sustainable urban planning can help mitigate air pollution. Planting trees and increasing vegetation can absorb pollutants and improve air quality.
- **Public Awareness Campaigns**: Educating the public about the health risks associated with air pollution and promoting environmentally friendly practices, such as reducing vehicle usage and avoiding waste burning, can help reduce pollution levels.

6. Conclusion

Air pollution in Aurangabad is a growing concern that requires immediate attention from local authorities, industries, and residents. The levels of PM10, PM2.5, SOx, and NOx in the city exceed permissible limits, contributing to significant health problems and

KNOWLEDGE FLAME
E-ISSN: 3049-1541
International Multidisciplinary Research Journal (KF-IMRJ)
(An International Indexed & Peer Reviewed Journal
Impact Factor: 5.292 https://knowledgeflame.in PRGI Reg. No. MAHMUL/2024/89852

environmental degradation. While some measures, such as air quality monitoring and industrial regulations, are already in place, more aggressive actions are needed to mitigate the effects of air pollution. Through stricter regulations, technological advancements, and public participation, it is possible to improve air quality in Aurangabad and protect the health and well-being of its residents.

References

1. Maharashtra Pollution Control Board (MPCB). (2023). Air Quality Monitoring Data for Aurangabad. [MPCB].
2. Central Pollution Control Board (CPCB). (2022). National Air Quality Standards and Pollutant Guidelines.[CPCB].
3. World Health Organization (WHO). (2020). Ambient Air Pollution: A Global Assessment of Exposure and Burden of Disease. WHO.
4. Kaur, G., & Gupta, S. (2021). Health Impacts of Air Pollution in Indian Cities: A Review. Journal of Environmental Health, 55(4), 183-194
5. Al-Dousari, A., & Al-Zamel, I. (2017). The role of vegetation in controlling dust pollution in desert regions. Environmental Research Letters, 12(8), 084014.
6. Goudie, A. S. (2013). Desert dust and human health. *Environment International, 61*, 5-13.
7. Haines, A., & Apte, J. (2019). Dust storms and their health impacts. The Lancet, 394(10195), 541-552.
8. Wu, W., & Zhang, Y. (2020). Impact of green infrastructure on urban air quality in dry regions. Urban Climate, 31, 100552.