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Insights

Air Pollution:
A Silent Crisis More Urgent Than Ever

Smeer Unhale[1]

Abstract

Air pollution, responsible for 8 million deaths globally in 2021, is a pressing public health crisis often overlooked as a seasonal issue. This essay examines its causes, including vehicular emissions, construction, industrial pollution, stubble burning, and open waste dumping, and critiques the limitations of current governance frameworks. Despite advancements in municipal governance, institutional gaps hinder effective action against air pollution. The essay advocates for an ecosystem approach involving academic, regulatory, industrial, and community stakeholders, supported by emerging technologies like IoT sensors, AI, and digital twins. Addressing air pollution requires a whole-of-society approach, data-driven governance, and behavioral changes for sustainable outcomes.

Keywords: Air pollution, municipal governance, urban poly-crisis, sustainable living

1. Introduction: Air Pollution and Its Global Impact

According to a UNICEF press release, air pollution was responsible for approximately 8 million deaths globally in 2021. This staggering figure is ten times or 1000 percent more than the annual death toll attributed to World War II gas chambers. Despite these alarming numbers, air pollution is often treated as a seasonal issue, briefly highlighted during the winter months before fading from public discourse until the following year.

The problem is exacerbated by weather conditions during the winter, which overburden local air circulation systems, making it difficult to cleanse the air. As a result, urban air quality deteriorates, turning into what could aptly be described in a Raj Kapoor-esque movie title as, "India, Teri Hawa Bighadi."

[1] State Joint Commissioner, Urban Maharashtra
sameer.unhale@gmail.com

2. Air Pollution: An Invisible Pandemic

Air pollution is not merely a remote environmental concern but a pressing public health crisis comparable to a pandemic. Its silent, invisible nature belies its devastating impact, particularly in urban areas. The growing urban poly-crisis, including air pollution, could easily overwhelm municipal administrative boundaries, statutory powers, financial resources, and managerial capacities.

During the COVID-19 lockdown, with most urban activities halted, air quality improved dramatically. This temporary improvement highlighted the primary contributors to air pollution: vehicular emissions, construction activities, industrial pollution, and, in the case of northern Indian cities, stubble burning. Yet, the contribution of open dumpsites and untreated municipal waste remains underestimated in public discussions on air pollution.

3. A Brief History of Municipal Governance in India

To understand the institutional challenges in combating air pollution, it is important to review the history of municipal governance in India:

1. *The Municipal Phase (1850):* Indian cities entered the municipal governance phase with the implementation of Act No. 24 of 1850. This phase was characterized by city-level governance focusing on basic administration and service delivery.
2. *The Town Planning Phase (Post-1890s):* Health crises such as bubonic plague and cholera epidemics led to the establishment of town planning mechanisms through improvement trusts.
3. *The Parastatal Phase (1950s):* Around the time of independence, specialized agencies for water supply, sewerage, and electricity distribution were introduced. City buses, operated as state monopolies, became a common feature of urban transport.
4. *The Metropolitan Phase (1970s):* Organizations like the Delhi Development Authority (DDA) and Mumbai Metropolitan Region Development Authority (MMRDA) were established for regional land use planning and infrastructure development.
5. *The 74th Constitutional Amendment (1990s):* This amendment suggested environmental responsibilities in the 12th Schedule but left them largely indicative rather than mandatory.
6. *Post-2000 Innovations:* Central and state-run metro companies introduced mass rapid transit systems, while Smart City Special Purpose Vehicles (SPVs) were introduced in 2015. Private sector involvement has grown in areas such as data management.

Despite these developments, the institutional matrix remains inadequate to address emerging challenges like air pollution, carbon neutrality, and climate change.

4. The Role of Municipal Governments in Combating Air Pollution

Municipal governments play a crucial role in addressing air pollution but face significant limitations. While activities like construction, street sweeping, garbage fires, open dumping, and landfill sites fall within their jurisdiction, other major contributors, such as industrial emissions and vehicular pollution, often lie beyond their control.

The current institutional framework for tackling air pollution relies heavily on punitive mechanisms such as tribunals and pollution control boards. However, there is an urgent need to strengthen dedicated execution and implementation agencies. A sectoral framework needs to be reworked fundamentally, shifting from a punitive approach to one focused on execution and coordination.

5. Towards an Ecosystem Approach

An ecosystem or network approach is essential for combating air pollution. This approach should synchronize efforts across various stakeholders, including academic institutions, research organizations, regulatory bodies, industries, startups, media, and community-based organizations (CBOs). Currently, media coverage disproportionately focuses on activism, advocacy, and litigation, often sidelining actionable solutions.

Addressing air pollution requires a whole-of-society approach. This involves collaboration across all sectors, adoption of emerging technologies, and, most importantly, individual behavioral changes. Public participation and informed citizenship are essential to combat this invisible, silent crisis effectively.

6. Assessing the Real Extent of the Crisis

Accurate assessment of the air pollution crisis is a critical first step. This requires fostering an environment where genuine efforts are not punished, enabling better data collection and sharing. Data-driven governance and evidence-based policymaking are essential, especially in the rapidly urbanizing Global South.

6.1 Understanding the Air Quality Index (AQI)

The Air Quality Index (AQI) is primarily a communication tool designed to simplify complex air pollution data for public understanding. However, its limitations must be acknowledged.

6.2 Variations in AQI Frameworks

Different countries, such as the US, Canada, China, Japan, and India, have their own AQI frameworks. These vary in terms of monitoring frequency, benchmark pollution levels, and the number of pollutants measured (ranging from three to eight).

For instance, the US Environmental Protection Agency (EPA) calculates AQI based on six indicators: PM2.5, PM10, carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide. The highest single sub-index among these is reported as the AQI.

India's National AQI (NAQI) employs a different formula. This highlights the inconsistencies in air quality measurements, especially when data is sourced from diverse platforms. The reduction of air quality to a single number creates a paradoxical disconnect between the actual situation and public perception.

6.3 Limitations and Media Sensationalism

Media sensationalism around AQI and WHO standards often evokes negative emotions such as fear, guilt, and blame. Environmental journalism tends to follow predictable templates, focusing more on criticism than solutions.

7. Leveraging Emerging Technologies

Despite the availability of low-cost, indigenous technologies and real-time data sensors, cities have been slow to adopt them due to concerns over cost audits and lack of precedence. Wider, localized air quality monitoring can prepare an informed citizenry. Emerging technologies that should be prioritized include:

1. IoT-Based Sensors: Low-cost, real-time sensors for localized air quality monitoring.
2. Earth Observation Systems: Satellite-based tools for large-scale data collection.
3. Digital Twins: Advanced modeling systems for simulating urban environments.
4. AI and Photonics: Predictive analytics and advanced sensing technologies for better decision-making.

7.1 Personalized Advisory Systems

Air pollution disproportionately affects vulnerable populations, including the elderly and those with pre-existing health conditions. Integrated data systems and citizen apps could enable personalized advisories, improving public health outcomes.

7.2 Developing a Data Economy for Environmental Challenges

India's environmental data is often acquired by global entities and sold back to Indian businesses, highlighting a missed opportunity to develop a local data economy. By fostering local expertise in environmental data management, the Global South could enhance awareness and drive effective actions.

Conclusion

Air pollution is a silent pandemic that demands immediate attention. The institutional framework for addressing this crisis needs significant rethinking, moving

from punitive measures to coordinated, execution-focused efforts. By integrating traditional governance structures with modern technologies and fostering collaboration across all sectors, India can pave the way for sustainable urban living. Addressing air pollution is not just an environmental imperative but a critical public health and societal challenge that requires urgent and collective action.