



Strengthening India's Air Quality Management

This editorial is based on “[Delhi's Winter Action Plan for pollution appears unconvincing](#)” which was published in The Hindu on 07/05/2024. The article brings into picture the recurring air pollution crisis in Delhi, emphasizing the need for a comprehensive, year-round strategy rather than short-term fixes. It also highlights systemic flaws in India's broader air quality management, calling for more proactive and science-based interventions.

For Prelims: [Air pollution crisis](#), [Commission for Air Quality Management](#), [Electric vehicles](#), [Central Pollution Control Board](#), [Pradhan Mantri Ujjwala Yojana](#), [Intergovernmental Panel on Climate Change](#), [FAME-II](#), [SATAT](#), [National Air Quality Index](#), [Graded Response Action Plan](#).

For Mains: Issue of Air Pollution in India, Key Steps Taken by the Government for Air Quality Improvement.

As winter approaches, Delhi once again grapples with its **annual air pollution crisis**, implementing a **Winter Action Plan** with some promising additions like drone monitoring and inter-departmental task forces. However, the city's efforts remain plagued by delayed implementation and a short-term perspective. While the plan addresses immediate concerns such as stubble burning in neighboring states, it fails to integrate into a **comprehensive year-round strategy** necessary for a metropolis with consistently high baseline pollution levels.

The challenge extends beyond Delhi, highlighting **systemic issues in India's approach to air quality management**. The Central government's [Commission for Air Quality Management \(CAQM\)](#) has been criticized for lack of effective mediation between states. Moreover, despite expert recommendations for targeted, **geography-based interventions** using the airshed method, Delhi's plan lacks substantial implementation of this approach. As India faces another season of hazardous air quality, there is an urgent need for authorities to adopt more flexible, proactive, and scientifically informed strategies to combat this persistent public health emergency.

Why Air Pollution Remains a Major Concern in India?

- **Ineffective Implementation of Pollution Control Measures:** Despite numerous policies and regulations, India struggles with the implementation of pollution control measures.
 - For instance, the [National Clean Air Programme \(NCAP\)](#) launched in 2019 aimed to reduce particulate matter concentrations by 20-30% by 2024 in 122 cities.
 - However, as of 2023, **only 95 cities** have shown a decrease in PM10 levels, with many still far from reaching the target.
- **Persistent Agricultural Practices Contributing to Seasonal Spikes:** The practice of **stubble burning in northern India** continues to be a significant contributor to air pollution, especially during the winter months.
 - In 2022, Punjab alone reported over **30,000 stubble burning incidents**, despite efforts to provide farmers with alternative solutions.

- The stubble burning contributes about **25% to 30% of the air quality issues** (in Delhi) during peak burning days.
- While there has been a slight decrease in burning incidents compared to previous years, the **practice remains widespread due to economic constraints faced by farmers** and the lack of viable alternatives, highlighting the need for more comprehensive and supportive policies.
- **Rapid Urbanization and Infrastructure Development:** India's rapid urbanization and infrastructure development continue to exacerbate air pollution levels.
 - According to the **2019 London Atmospheric Emissions Inventory (LAEI)**, construction activities account for approximately **30% of particulate matter (PM10) emissions in the city**, along with **8% of fine particulate matter (PM2.5)**.
 - This **unchecked growth**, coupled with inadequate dust management practices, significantly contributes to the deterioration of air quality in urban areas.
- **Increasing Vehicle Emissions in Urban Centers:** The burgeoning number of vehicles in Indian cities continues to be a major source of air pollution.
 - India is the **largest tractor producer, second-largest bus manufacturer, and third-largest heavy truck manufacturer** in the world.
 - India's annual production of automobiles in FY23 was **25.9 million vehicles**.
 - Despite efforts to promote [electric vehicles \(EVs\)](#), they still represent only a small fraction of total vehicles.
 - The **slow transition to cleaner fuels and electric mobility**, coupled with **inadequate public transportation infrastructure**, keeps vehicle emissions a persistent problem in urban air quality management.
- **Industrial Emissions and Lack of Stringent Enforcement:** Industrial emissions remain a significant contributor to air pollution in India.
 - Only 5% of India's coal-fired power plants have installed air pollution control devices for sulfur dioxide emissions.
 - Furthermore, the [Central Pollution Control Board](#) identified 43 industrial clusters in 17 States as **Critically Polluted Areas (CPAs)**.
 - Further, **32 industrial clusters** are categorized as **Severely Polluted Areas (SPAs)**.
 - The lack of stringent enforcement and frequent relaxation of norms for industries highlight the ongoing challenge in balancing economic growth with environmental protection.
- **Indoor Air Pollution and Its Health Impacts:** Indoor air pollution remains an often-overlooked but critical issue in India.
 - According to the World Health Organization's 2023 report, about **6.7 million premature deaths** annually are attributed to indoor air pollution globally, with India being one of the most affected countries.
 - Despite government initiatives like the [Pradhan Mantri Ujjwala Yojana](#), the sustained use of clean fuels remains a challenge due to economic factors and cultural preferences.
 - Around **53% of Indian households** still depend on solid fuels for part or all of their cooking needs.
 - The practice of using solid fuels alongside LPG, known as **fuel stacking**, leads to ongoing exposure to [harmful household air pollution \(HAP\)](#), even for those with access to LPG connections.
- **Climate Change Exacerbating Air Quality Issues:** Climate change is increasingly **recognized as a factor exacerbating air pollution in India**.
 - The **2023 report by the Intergovernmental Panel on Climate Change (IPCC)** highlighted that rising temperatures and changing weather patterns in South Asia are likely to increase the frequency and intensity of air pollution episodes.
 - For instance, the **unusual rainfall patterns in October 2023 in North India** led to prolonged periods of **stagnant air, trapping pollutants and worsening air quality**.
 - The interplay between [climate change](#) and **air pollution creates a vicious cycle**, where each exacerbates the other, making it crucial to address both issues simultaneously for effective long-term solutions.

What are the Key Steps Taken by the Government for Air Quality Improvement?

- **National Clean Air Programme (NCAP):** Launched in January 2019, the NCAP aims to improve air quality in 131 non-attainment and million-plus cities by reducing **PM10 levels by 40% by 2025-26.**
 - Public grievance systems, emergency response mechanisms, and other measures have been implemented, showing improvements in 88 out of 131 cities as of FY 2022-23.
- **Control of Vehicular Emissions:** The government has implemented **BS-VI fuel standards** nationwide and introduced BS VI-compliant vehicles since April 2020.
 - Schemes like [FAME-II](#) promote electric vehicles, while [SATAT](#) supports biogas production.
 - New expressways and highways divert non-destined traffic from major cities to reduce vehicular emissions.
- **Control of Industrial Emissions:** New standards for SO₂ and NO_x emissions in thermal power plants have been enforced.
 - **Pet coke and furnace oil are banned in NCR states**, and industrial units are shifting to cleaner fuels like PNG or biomass.
 - Emission standards for 56 industrial sectors have been notified, and **online continuous emission monitoring systems (OCEMS)** are mandated for high-polluting industries.
- **Measures to Control Stubble Burning:** Subsidies are provided for crop residue management machinery to prevent stubble burning in **Punjab, Haryana, and Uttar Pradesh.**
 - Financial assistance has been offered to set up [pelletization and torrefaction](#) plants to utilize paddy straw.
 - Monitoring by CPCB and enforcement by the **Commission for Air Quality Management (CAQM)** help prevent stubble burning incidents during harvest seasons.
- **Air Quality Monitoring and Network:** The [National Air Quality Index](#) (AQI) was launched in 2015, with over 1,400 air quality monitoring stations set up across the country.
 - Data is disseminated through bulletins, and air quality forecasts are made available, especially for Delhi-NCR. The Central Control Room provides real-time tracking of air quality data and hotspots.
- **Control of MSW and Construction Waste:** Guidelines for **managing construction and demolition (C&D) waste have been issued**, and directions were provided for deploying anti-smog guns at large construction sites.
 - Efforts to manage **municipal solid waste (MSW) include bioremediation** of legacy waste and preventing fires at landfill sites, contributing to overall air quality improvement.
- **Regulatory Actions and Graded Response Action Plan (GRAP):** CPCB has implemented the [Graded Response Action Plan \(GRAP\)](#) to address air pollution based on AQI categories.
 - Revised versions of GRAP, effective from 2022, include measures like **restricting DG set usage, shifting industries to cleaner fuels**, and imposing dust control measures.
 - These policies help in curbing air pollution in the NCR region.

What are the Various Technology-driven Projects Aimed at Reducing Air Pollution?

- **Pariyayatra Filtration Units on Buses:** In a pilot study, 30 buses were retrofitted with Pariyayatra Filtration units on their rooftops.
 - These passive filters **capture dust particles from the environment**, reducing the pollution caused by vehicular movement.
 - Each unit provides filtration equivalent to six room air filters without requiring any power.
- **WAYU Air Purification Units at Traffic Intersections:** They were installed at major traffic intersections in Delhi to reduce the impact of vehicular emissions.
 - These localized **air purifiers target pollution at the source**, offering a solution for high-traffic areas.
- **Ionisation Technology for Air Pollution Reduction:** This technology neutralizes pollutants through ionization, improving air quality in targeted areas. It explores the **potential of ionization as a method to curb ambient pollution.**
- **Smog Towers:** Large-scale smog towers have been installed to act as air purifiers, specifically designed to reduce particulate matter and other pollutants over a wider area.
- **Retrofitting Emission Control Devices in Older Vehicles:** A pilot project focused on retrofitting older vehicles (**like BS III compliant ones**) with emission control devices.
 - This aims to lower emissions from in-use vehicles, helping reduce their environmental

impact.

What Measures can be Adopted to Enhance Air Quality Management in India?

- **Implement Stringent Industrial Emission Controls:** India can adopt more stringent industrial emission norms, similar to **China's coal-fired pollution control measures**.
 - For instance, mandating the installation of **Flue Gas Desulfurization (FGD)** units in all coal-based power plants, as per the latest Central Electricity Authority directive, could significantly reduce SO₂ emissions.
 - Implementing a **nation-wide emissions trading scheme**, like the one piloted in Gujarat, could incentivize industries to adopt cleaner technologies.
 - This approach, combined with **real-time emission monitoring systems linked directly to pollution control boards**, can ensure better compliance and reduce industrial pollution effectively.
- **Accelerate Transition to Clean Energy:** Rapidly scaling up renewable energy adoption is crucial for improving air quality.
 - India's target of **500 GW of non-fossil fuel capacity by 2030** is a step in the right direction. The recent success of the **Solar Parks scheme demonstrates** the feasibility of large-scale clean energy projects.
 - Encouraging **rooftop solar installations through simplified regulations** and incentives, as seen in **Gujarat's Suryashakti Kisan Yojana** can further accelerate this transition.
 - Additionally, promoting **energy storage solutions and green hydrogen** production can address intermittency issues and enable deeper penetration of renewables.
- **Enhance Urban Green Cover and Vertical Forests:** Taking inspiration from China's **vertical forest in Nanjing**, Indian cities can adopt similar green infrastructure projects.
 - For example, **Mumbai's recent initiative to create urban forests in Aarey Colony** is a step in this direction.
 - Implementing mandatory **green building codes that incorporate vertical gardens** and rooftop plantations, as seen in **Singapore's Skyrise Greenery Incentive Scheme**, could significantly increase urban green cover.
 - Cities like **Bengaluru**, can focus on creating mini-forests using the **Miyawaki technique**, which has shown success in creating dense urban forests in small areas, enhancing air purification capacity in cities.
- **Revolutionize Urban Transportation:** India needs to prioritize sustainable urban mobility to combat vehicular emissions.
 - The successful implementation of **Delhi's electric vehicle policy** can be replicated in other cities.
 - Expanding and improving public transport infrastructure, like **Kochi's water metro system launched in 2023**, can provide efficient alternatives to private vehicles.
 - Implementing **congestion pricing in major cities**, similar to **London's Ultra Low Emission Zone**, can discourage private vehicle use in high-pollution areas.
 - Additionally, creating extensive networks of **dedicated bicycle lanes and pedestrian zones**, as seen in **Copenhagen**, can promote non-motorized transport options.
- **Adopt Advanced Air Quality Monitoring and Management Systems:** Implementing a comprehensive, real-time air quality monitoring network across India is crucial.
 - The recent expansion of the **Central Pollution Control Board's network to 804 monitoring stations in 344 cities** is a positive step, but more granular data is needed.
 - Integrating **low-cost sensor networks**, satellite data, and AI-powered forecasting models can provide more accurate and localized air quality information.
 - Implementing a national-level air quality data platform, similar to **China's Blue Map app**, can increase public awareness and participation in air quality management.
 - **Pi Green Innovations**, a Pune-based green tech company, provides retrofit systems for vehicles and diesel generators to reduce carbon emissions and is a solution partner for UNDP's 'Clear Air Initiative' in India.

- **BreathEasy**, a Delhi-based company, offers air quality testing, portable and centralized air purification solutions, and green consulting services to optimize indoor environments.
- **Tackle Agricultural Emissions Through Sustainable Practices:** Addressing stubble burning requires a multi-faceted approach.
 - **Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue**, needs to be intensified.
 - Exploring innovative solutions like **bio-decomposers (PUSA Decomposer) and Palletisation**, can offer a cost-effective alternative to burning.
 - Additionally, promoting **crop diversification away from paddy in Punjab and Haryana**, can reduce stubble generation.
 - Implementing a reward system for farmers who adopt sustainable practices, similar to the **Payments for Environmental Services Program in Costa Rica**, could provide economic incentives for change.
- **Implement Sector-Specific Emission Reduction Strategies:** Developing and implementing targeted emission reduction strategies for key polluting sectors is essential.
 - For the construction sector, which contributes significantly to particulate matter pollution, enforcing strict dust control measures as mandated by the **Construction and Demolition Waste Management Rules, 2016**, is crucial.
 - The recent initiative by the **National Capital Region Planning Board to use artificial rain for dust suppression in Delhi-NCR** can be explored for wider application.
 - In the brick kiln industry, promoting the shift to cleaner technologies like **zig-zag kilns** can be implemented
 - For the transport sector, accelerating the adoption of **BS-VI fuel standards and incentivizing the scrapping of old vehicles** through programs like the **Vehicle Scrappage Policy launched in 2021** can significantly reduce vehicular emissions.

Conclusion

To effectively tackle India's persistent air pollution crisis, **a holistic approach is essential—one that integrates long-term, science-based solutions, stringent enforcement of emission norms**, and promotion of sustainable practices across industries, transportation, and agriculture. Enhanced coordination between states and a shift towards clean energy and urban green infrastructure will play a critical role. Only through **proactive and comprehensive efforts** can India safeguard public health and improve air quality for future generations.

Drishti Mains Question:

Despite various government initiatives, the problem of air pollution persists in India. Discuss the key challenges in managing air pollution in India and suggest long-term strategies for sustainable air quality improvement

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q. In the cities of our country, which among the following atmospheric gases are normally considered in calculating the value of the Air Quality Index? (2016)

1. Carbon dioxide
2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide
5. Methane

Select the correct answer using the code given below:

(a) 1, 2 and 3 only

(b) 2, 3 and 4 only

(c) 1, 4 and 5 only

(d) 1, 2, 3, 4 and 5

Ans: (b)

Mains

Q. Describe the key points of the revised Global Air Quality Guidelines (AQGs) recently released by the World Health Organisation (WHO). How are these different from its last update in 2005? What changes in India's National Clean Air Programme are required to achieve revised standards? **(2021)**

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