



India's Air Pollution Crisis

For Prelims: [Air Quality Index \(AQI\)](#), [Environmental Protection Agency \(EPA\)](#), [PM 10](#), [PM 2.5](#), [Ozone \(O3\)](#), [Ammonia \(NH3\)](#), [Lead \(Pb\)](#), [Graded Response Action Plan](#), [Commission for Air Quality Management \(CAQM\)](#).

For Mains: Challenges posed by air pollution and ways to tackle them.

[Source: TH](#)

Why in News?

Air pollution in India has escalated into a persistent **public health crisis**, impacting millions of lives annually. It is not merely an environmental issue but a multi-faceted challenge affecting health, economy, and development.

Air Pollution

- Air pollution is the contamination of air by **chemical, physical, or biological agents** that alter its natural composition.
- Major sources include **combustion, vehicles, industries, and fires**.
- Air pollutants like PM, CO, O₃, NO₂, and SO₂ cause respiratory diseases and high mortality.

Air Pollutants

Sulphur Dioxide (SO₂)



It comes from the consumption of fossil fuels (oil, coal and natural gas). Reacts with water to form acid rain.

Impact: Causes respiratory problems.

Ozone (O₃)



Secondary pollutant formed from other pollutants (NO_x and VOC) under the action of the sun.

Impact: Irritation of the eye and respiratory mucous membranes, asthma attacks.

Nitrogen Dioxide (NO₂)



Emissions from road transport, industry and energy production sectors. Contributes to Ozone and PM formation.

Impact: Chronic lung disease.

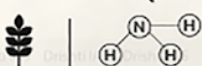
Carbon Monoxide (CO)



It is a product of the incomplete combustion of carbon-containing compounds.

Impact: Fatigue, confusion, and dizziness due to inadequate oxygen delivery to the brain.

Ammonia (NH₃)



Produced by the metabolism of amino acids and other compounds which contain nitrogen.

Impact: Immediate burning of the eyes, nose, throat and respiratory tract and can result in blindness, lung damage.

Lead (Pb)



Released as a waste product from extraction of metals such as silver, platinum, and iron from their respective ores.

Impact: Anemia, weakness, and kidney and brain damage.

Particulate Matter (PM)



PM10: Inhalable particles, with diameters that are generally 10 micrometers and smaller.

PM2.5: Fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller.

Source: Emitted from construction sites, unpaved roads, fields, fires.

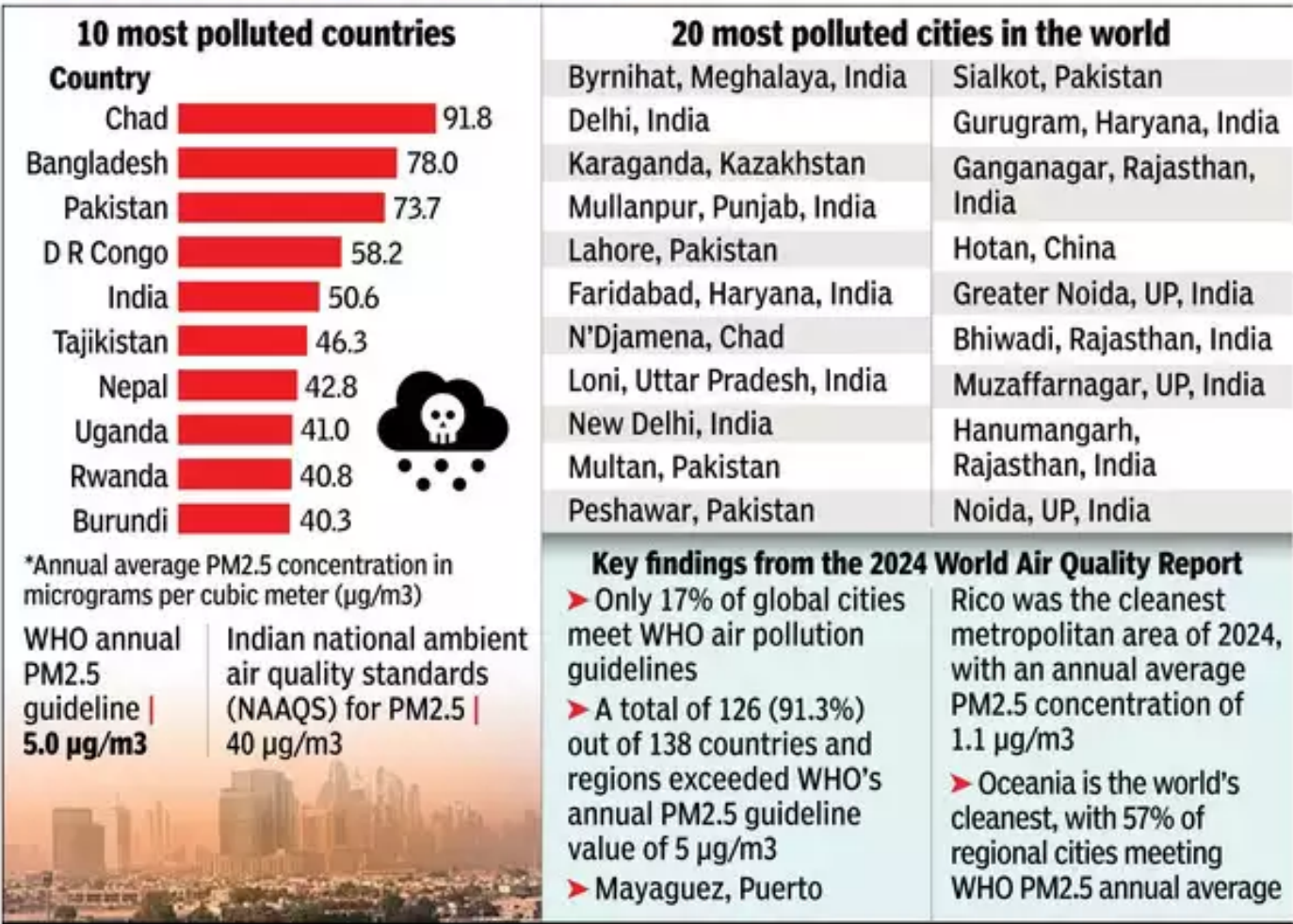
Impact: Irregular heartbeat, aggravated asthma, decreased lung function.

Note: These major air pollutants are included in the Air quality index for which short-term National Ambient Air Quality Standards are prescribed.

What is the State and Impact of Air Pollution in India?

- **Air Pollution in India:** According to the [World Air Quality Report 2024](#) by IQAir, India is the **5th most polluted country**, with an average **PM2.5 level of 50.6 µg/m³**, **10 times** the **WHO safe limit (5 µg/m³)**.
 - **Delhi** remains the **most polluted capital**, while **Byrnihat (Assam-Meghalaya border)** is the **world's most polluted city**.
 - India dominates the global pollution list, with **6 of the top 10** and **13 of the top 20 most polluted cities**.
 - **Globally, WHO** reports that **99% of the population breathes polluted air**, with low- and middle-income countries most affected.

LITTLE KNOWN BYRNIHAT WORLD'S MOST POLLUTED



- **Impact of Air Pollution:**
 - **Health Impact:** In 2021, air pollution caused **8.1 million deaths globally**, with **India (2.1 million)** and **China (2.3 million)** being the worst affected (**State of Global Air Report 2024**).
 - Health impacts include [respiratory infections](#), lung diseases, [chronic obstructive pulmonary disease \(COPD\)](#), asthma, [cardiac arrest](#), and gastrointestinal issues.

- **Economic Loss:** Air pollution lowers GDP growth by reducing productivity, **lowering consumer activity**, increasing health costs, and **decreasing asset efficiency**.
- **Reduced Solar Efficiency:** Air pollution **reduces solar power efficiency** by **blocking radiation**, while **rising temperatures lower photovoltaic performance**.
 - By **2041-2050**, India's solar panel efficiency may drop **by 2.3%**, causing an **annual loss of at least 840 GWh of electricity**.
- **Environmental Degradation:** Air pollution **accelerates climate change** by increasing **greenhouse gases**, degrades ecosystems through **acid rain and toxin buildup**, and **threatens biodiversity**.
 - It weakens plants by excess nitrogen deposition and reduces crop yields by impairing photosynthesis due to ozone pollution.

What are the Causes of Air Pollution?

Click Here to Read: [Causes of Air Pollution](#)

What Measures Have Been Taken to Control Air Pollution?

- [National Clean Air Programme \(NCAP\)](#)
- [System of Air Quality and Weather Forecasting and Research \(SAFAR\) Portal](#)
- [Graded Response Action Plan \(for Delhi\)](#)
- **For Reducing Vehicular Pollution:**
 - [BS-VI Vehicles](#)
 - [Faster Adoption and Manufacturing of Hybrid and Electric Vehicles \(FAME\)](#)
- [Pradhan Mantri Ujjwala Yojana \(PMUY\)](#)
- **WHO's 4 Pillar Strategy:** WHO adopted a resolution in **2015** to address the adverse health effects of air pollution adopting a [4 Pillar Strategy](#). Those 4 pillars are:
 - Expanding the knowledge base
 - Monitoring and reporting
 - Global leadership and coordination
 - Institutional capacity strengthening

What are the Challenges in Combating Air Pollution in India?

- **Diverse Sources:** Air pollution **arises from industries, vehicles, biomass burning**, construction, and seasonal factors like stubble burning, **with rural and urban areas facing distinct challenges**.
- **Weak Monitoring and Policy Gaps:** India faces weak air quality monitoring and policy gaps.
 - While **BS-VI norms and PMUY** encourage cleaner fuels, **enforcement is lacking**.
 - **FAME's push for electric vehicles struggles** due to a **shortage of charging and battery swapping stations**.
- **Financial & Technological Constraints:** Limited funding, **outdated pollution control technologies**, and underutilization of resources are slowing progress.
 - **NCAP aims for a 40% PM2.5 reduction by 2026** but faces challenges in implementation and funding, with a **meagre budget (less than 1% of China's air pollution control expenditure)**.
- **Over-Reliance on Technology:** India is focusing too much on high-tech solutions like **smog towers and AI dashboards** while **ignoring major pollution sources** like biomass burning, **old industrial processes**, and polluting vehicles.
- **Behavioral & Social Barriers:** Public **resistance to green technologies**, **reliance on solid fuels**, and **low awareness** of air pollution's health risks hinder progress.
 - Additionally, **focusing more on research than real implementation** delays effective policy implementation.
- **Coordination & Seasonal Challenges:** Weak inter-state cooperation and seasonal spikes in

pollution (**Eg: stubble burning**, winter smog, dust storms) complicate enforcement.

- Local policies like **odd-even schemes** and **construction restrictions** provide temporary relief but **lack long-term impact**.

Way Forward

- **Decentralized and Data-Driven Governance:** Strengthen local governance by empowering **municipal bodies, urban planners, and community leaders**.
 - Use **real-time emissions tracking** instead of relying solely on ambient air monitoring for targeted interventions.
- **Technological and Structural Reforms:** Balance innovations like **AI dashboards and smog towers** with systemic reforms, such as **transitioning to renewable energy** and restricting coal usage in urban areas.
- **Learning from Global Best Practices:** India can learn from **global best practices** by accelerating its clean energy transition like **China**, integrating waste workers into formal recycling systems like **Brazil**, and reinvesting pollution fines into green initiatives like **California**.
- **Sector-Specific Pollution Control:**
 - **Vehicular Emissions:** Strengthen public transport, enforce [vehicle scrappage policies](#), and expand EV infrastructure.
 - **Industrial Pollution:** Tighten emission norms, promote clean technologies, and **phase out coal-based industries**.
 - **Construction & Biomass Burning:** Enforce dust control, improve waste management, and promote alternatives for crop residue.
- **Behavioral Change:** Raise **awareness**, **involve local communities** in pollution monitoring, and promote **public engagement** through reporting mechanisms and advocacy for sustainable practices.

Best Practices for Air Pollution in Other Countries

- **Clean Energy Transition (China):** China reduced pollution by **phasing out coal, enforcing strict emission norms, and investing in renewables**.
- **Community-Led Waste Management (Brazil):** Brazil **integrated informal waste workers into formal recycling systems**, improving waste segregation and reducing landfill emissions.
- **Pollution Revenue Reinvestment (California, USA):** California's **cap-and-trade system reinvests pollution fines into clean energy and disadvantaged communities**.
- **Coal Ban & Low Emission Zones (London, UK):** London reduced air pollution by **banning coal and imposing congestion pricing**.

Conclusion

India's clean air future depends on effective local governance, data-driven policies, and community participation. Air pollution must be tackled as part of urban planning, public health, and economic growth. Achieving clean air requires strong political will, scientific solutions, and collective action for sustainable change.

Drishti Mains Question:

Critically analyse the factors contributing to severe air pollution in India. Suggest measures to address the issue effectively.

Prelims

Q. Which of the following are the reasons/factors for exposure to benzene pollution? (2020)

1. Automobile exhaust
2. Tobacco smoke
3. Wood burning
4. Using varnished wooden furniture
5. Using products made of polyurethane

Select the correct answer using the code given below:

- (a) 1, 2 and 3 only
- (b) 2 and 4 only
- (c) 1, 3 and 4 only
- (d) 1, 2, 3, 4 and 5

Ans: (a)

Q. In the context of solving pollution problems, what is/are the advantage/advantages of bioremediation techniques? (2017)

1. It is a technique for cleaning up pollution by enhancing the same biodegradation process that occurs in nature.
2. Any contaminant with heavy metals such as cadmium and lead can be readily and completely treated by bioremediation using microorganisms.
3. Genetic engineering can be used to create microorganisms specifically designed for bioremediation.

Select the correct answer using the code given below:

- (a) 1 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Ans: (c)

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)

Q. What are the key features of the National Clean Air Programme (NCAP) initiated by the government of India? (2020)

