Advancing Air Pollution Control in India

This editorial is based on “Roti, kapda, makaan: Why not good air?” which was published in The Indian Express on 10/05/2024. The article brings into picture the rise of India’s gaming sector and challenges associated with it.

For Prelims: Air pollution, Solid Waste Management, National Green Tribunal, National Clean Air Programme, System of Air Quality and Weather Forecasting and Research (SAFAR) Portal, New Commission for Air Quality Management, Graded Response Action Plan

For Mains: Major Driving Factors of Air Pollution, Reasons for Persistent Air Pollution in India Despite Significant Initiatives

Air pollution has become an "**obvious environmental status**" in India, often perceived as a manifestation of economic progress. However, this issue has severe consequences, including economic losses and health impacts, making it crucial to address it urgently.

In 2023, India stood as the **third most polluted nation globally,** recording an average population-weighted fine particulate matter (PM) 2.5 concentration of **54.4 micrograms per cubic metre (µg/m^3)**, found a new global report by IQAir. The economic impact of air pollution is staggering. Annual deaths attributable to air pollution translate to an economic loss of **Rs 2.7 lakh crore,** which accounts for **1.36% of India's GDP.** Furthermore, a recent survey revealed that **India's GDP could have been 4.5% higher** if air pollution had grown 50% slower each year.

What is Air Pollution?

- **About**: Air pollution encompasses the presence of **solids, liquids, gases, noise, and radioactive radiation** in the atmosphere, at concentrations harmful to humans, living organisms, property, or environmental processes.
    - These substances, known as pollutants, can be either **natural or human-made** and can originate from various sources such as industrial processes, vehicle emissions, **agricultural activities**, and natural events like wildfires and volcanic eruptions.
- **Air Pollutants:**

Air Pollutants

Sulphur Dioxide (SO_2)

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 (O_3)

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

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

Nitrogen Dioxide (NO_2)

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 (NH_3)

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.*

- **Major Driving Factors of Air Pollution:**
    - **Vehicular and Industrial Emissions:** Carbon monoxide (CO), nitrogen oxides (NOx), and non-methane volatile organic compounds (NMVOCs) are the primary pollutants from vehicles (>80%).
        - Industries like **iron and steel, sugar, paper, cement, fertiliser, copper, and aluminum** contribute to suspended particulate matter (SPM), sulfur oxides (SOx), nitrogen oxides (NOx), and carbon dioxide (CO2).
        - Road transport presently accounts for **12% of India's energy-related** CO_2 emissions and is a key contributor to urban air pollution (International Energy Agency)
    - **Solid Waste Burning:** According to a report by **The Energy and Resources Institute (TERI),** India generates over 62 million tons (MT) of waste in a year, a significant portion of which is burned openly or in informal dump sites.
        - Open burning of solid waste contributes to the release of various pollutants, including PM, dioxins, and furans.
    - **Stubble Burning and Other Agricultural Activities:** Intentional burning of straw stubble after harvesting grains like **paddy and wheat,** particularly in **Punjab, Haryana, and UP,** contributes significantly to air pollution, especially in the NCR region during winter.
        - The Supreme Court in 2023 proposed excluding stubble-burning farmers from minimum support price (MSP) as part of efforts to discourage this practice in Punjab and neighboring states near Delhi.
        - In addition to crop residue burning, other agricultural activities like **tilling, fertilizer and pesticide application**, and improper livestock farming contribute to air pollution.
            - These activities release ammonia, methane, and particulate matter into the air.
    - **Domestic Cooking and Heating**: Around 62-65% of India's rural households rely on solid fuels, such as **biomass, coal, and kerosene**, for cooking and heating purposes.
        - The incomplete combustion of these fuels releases harmful pollutants, including PM, carbon monoxide (CO), and volatile organic compounds (VOCs).
    - **Coal Based Power Plants**: Coal-based thermal power stations with no pollution control technology are responsible for over half sulfur dioxide (SO2), 30% oxides of nitrogen (NOx), about 20% particulate matter (PM), among other man-made emissions in India **(International Energy Agency).**
    - **Improper Use of Pyroly**sis: Pyrolysis, a technique to break down synthetic material, leaves fine carbon matter and residue like pyro gas and oil, contributing to pollution.
        - The National Green Tribunal, **in 2014,** prohibited used tyres from being burnt in the open or used as fuel in brick kilns.

What are the Key Government Initiatives for Controlling Air Pollution?

- National Clean Air Programme
- System of Air Quality and Weather Forecasting and Research (SAFAR) Portal.
- New Commission for Air Quality Management
- Graded Response Action Plan (for Delhi).
- **For Reducing Vehicular Pollution:**
    - BS-VI Vehicles.
    - National Electric Mobility Mission Plan

Note: In ***M.C. Mehta vs. Union of India***, the Supreme Court treated the right to live in pollution free environment as a part of fundamental right to life under **Article 21 of the Constitution.**

Why is India not able to Contain Air Pollution Despite Significant Initiatives?

- **Rapid Vehicular Growth Outpacing Infrastructure Development**: India's economic boom has led to a surge in vehicle ownership, particularly **two-wheelers and budget cars**, which often have lax emission standards.
    - According to the Society of Indian Automobile Manufacturers (SIAM), passenger vehicles sales in India grew by **26.7%** in the fiscal year 2022-23.
    - Public transportation infrastructure like **metro networks and electric buses** have not kept pace with this growth, leading to increased traffic congestion and higher emissions.
    - Also, while policies like the Bharat Stage VI emission standards are aimed at reducing vehicular emissions, the impact of such policies takes time as the vehicle fleet does not change overnight.
- **Inadequate Infrastructure for Monitoring and Data Collection**: Many cities in India, particularly smaller towns and rural areas, lack adequate air quality monitoring stations or reliable data collection mechanisms.
    - For instance, **Bihar,** which is 63 times the size of Delhi in square kilometers, has just **35 continuous ambient air quality monitoring stations.**
- **Inconsistent Implementation of NCAP**: The **National Clean Air Programme (NCAP)**, launched in 2019, aimed to reduce particulate matter (PM) levels by **20-30% by 2024.** It was later revised to 40% by 2026.
    - However, According to the Ministry of Environment, Forest, and Climate Change, on average, only **60% of the allocated funds have been used thus far,** with 27% of cities spending less than 30% of their designated budgets.
        - **Visakhapatnam and Bengaluru** have spent **0% and 1%** of their NCAP funds, respectively.
- **Failure to Address Regional and Cross-Border Pollution**: The NCAP's design flaw is that it requires cities to reduce pollution within their boundaries, **but cities cannot control emissions coming from outside their borders.**
    - For example, in Delhi, only about **one-third of the city's pollution** is generated within its borders, while the rest comes from neighboring states due to industrial emissions or stubble burning.

What Measures can be Adopted to Expedite Air Pollution Control in India?

- **Introduce Air Quality Bonds**: Mandate industries and other major polluters to purchase **Air Quality Bonds**, where the bond amount is proportional to their emissions.
    - The funds collected can be used for **remediation efforts, public awareness campaigns**, and subsidies for clean technologies.
    - Non-compliance would lead to penalties or loss of the bond amount.
- **Biochar Brigade**: Empowering rural communities, particularly **women's self-help groups**, to create and distribute biochar, a charcoal-like substance produced by burning organic waste in a controlled environment.
    - Biochar can be mixed with soil to improve fertility and sequester carbon. It can also be used as a **fuel source,** reducing dependence on polluting firewood.
    - The Pradhan Mantri Ujjwala Yojana distributes LPG cylinders to rural households, reducing firewood use. A similar program could promote biochar production and utilization.
- **Increasing Urban Forest Canopy Cover**: Launching a national competition among cities to increase their urban forest canopy cover.
    - Cities with the most significant increase in green spaces within a set timeframe win grants for further greening initiatives.
    - **Curitiba, Brazil,** is known for its innovative urban planning with a focus on green spaces. India could adapt similar strategies specific to its climate and urban environments.
- **Air Quality-Based Tolling:** Implementing dynamic toll pricing on highways and bridges based on real-time air quality data.
    - This strategy can regulate traffic flow and reduce emissions during high-pollution days. Revenue generated can be used for public transport improvement or clean air initiatives.
    - **Stockholm, Sweden**, has implemented a similar system to manage traffic congestion. India can adapt this concept with a focus on air quality management.
- **National Air Quality Awareness Corps**: Create a dedicated National Air Quality Awareness Corps comprising trained volunteers and professionals who can conduct **grassroots awareness**

campaigns, educate communities, and promote citizen engagement in air pollution mitigation efforts.

- **Building with Biomimicry**: Building construction can be revolutionized through **biomimicry.** For instance, incorporating **natural ventilation systems modeled after termite mounds or developing facades with microstructures** inspired by leaves can enhance airflow naturally.
    - Integrating greenery such as **vertical gardens and rooftop plantings** not only adds aesthetic value but also acts as natural air purifiers, absorbing harmful gases and particulate matter.
    - **Green City Solutions from Europe** that has introduced tree benches across major city landmarks is a significant example.
        - These benches, coated with moss, effectively absorb pollutants from the air, offering a unique solution to combat pollution.

Drishti Mains Question:

Assess the primary sources of air pollution in urban areas of India and propose actionable measures to combat the rising pollution levels. Evaluate the role of technological advancements and public awareness in achieving long-term improvements in air quality

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)**