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EDITORIAL

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Tackling Air Pollution in India: Challenges, Initiatives, and Global Perspectives

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Introduction

Air pollution in India has reached critical levels, becoming one of the country's most severe environmental and public health challenges. Often perceived as an unfortunate byproduct of economic growth, air pollution has far-reaching consequences, including economic losses and health impacts, making its urgent resolution essential. With India ranked as the third most polluted country globally in 2023, it recorded an average PM2.5 concentration of 54.4 µg/m³. Addressing this issue requires comprehensive policies and a balance of domestic and international best practices.

Key Facts for Prelims

- **Air Pollution**: Presence of harmful substances like gases, particulates, and chemicals in the air.
- **Solid Waste Management**: A crucial component to reduce open burning and waste-related emissions.
- **National Green Tribunal (NGT)**: Regulates environmental issues, including air pollution.
- **National Clean Air Programme (NCAP)**: Launched to reduce particulate pollution by 20-30% by 2024, now revised to 40% by 2026.
- **System of Air Quality and Weather Forecasting and Research (SAFAR) Portal**: Provides real-time air quality updates.
- **New Commission for Air Quality Management**: Focuses on air quality improvement in Delhi-NCR and neighboring states.
- **Graded Response Action Plan (GRAP)**: Defines measures to reduce air pollution based on severity levels, especially in Delhi.

Understanding Air Pollution

Air pollution results from the accumulation of various pollutants in the atmosphere, including solid particles, gases, and chemical compounds that pose risks to health and the environment. Key pollutants include **particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NO_x)**, and **carbon monoxide (CO)**, with their sources ranging from natural events like wildfires to human activities such as vehicular emissions and industrial processes.

Major Driving Factors of Air Pollution in India

1. **Vehicular and Industrial Emissions**:
   - **Vehicles**: Account for over 80% of emissions, primarily releasing CO, NO_x, and NMVOCs.

- **Industries**: Sectors like steel, sugar, cement, and paper contribute to pollutants like **suspended particulate matter (SPM)**, SO_x, NO_x, and CO_2.
- **Road Transport**: Generates about 12% of India's CO_2 emissions, according to the International Energy Agency.

2. **Solid Waste Burning**:
   - India generates over **62 million tons** of waste annually, much of which is either burned openly or left in informal dumps, releasing pollutants like **dioxins, furans, and PM**.
3. **Agricultural Practices**:
   - **Stubble burning** after paddy and wheat harvests, particularly in Punjab, Haryana, and Uttar Pradesh, significantly increases pollution levels, especially during winter in the National Capital Region (NCR).
   - Other agricultural practices like fertilizer application and livestock farming release **ammonia, methane,** and particulate matter.
4. **Domestic Cooking and Heating**:
   - About **62-65%** of rural households rely on solid fuels, like biomass and coal, leading to significant indoor and outdoor pollution.
5. **Coal-Based Power Plants**:
   - Coal-based thermal power plants without adequate pollution control technologies account for over **50% of SO_2**, **30% of NO_x**, and **20% of PM** emissions in India.
6. **Improper Use of Pyrolysis**:
   - Pyrolysis, a process to break down synthetic material, produces fine carbon residue and pollutants. In 2014, the National Green Tribunal (NGT) banned the open burning of used tires for pyrolysis.

Government Initiatives to Control Air Pollution

1. **National Clean Air Programme (NCAP)**:
   - Aims to reduce PM levels by **40% by 2026**. However, challenges in fund utilization and uneven implementation hinder its effectiveness.
2. **System of Air Quality and Weather Forecasting and Research (SAFAR)**:
   - Provides real-time air quality data to inform the public and enable better decision-making by authorities.
3. **New Commission for Air Quality Management**:
   - Established to address the critical air pollution situation in Delhi-NCR, with authority over emission sources and cross-state pollution management.
4. **Graded Response Action Plan (GRAP)**:
   - Specific measures are implemented according to pollution severity levels, focusing on traffic restrictions and industry regulation during high pollution seasons.
5. **Policies to Reduce Vehicular Pollution**:
   - **BS-VI Emission Standards**: Implemented for vehicles to reduce emissions.
   - **National Electric Mobility Mission Plan**: Promotes electric vehicle adoption to curb vehicular emissions.
6. **Judicial Support**:
   - In **M.C. Mehta vs. Union of India**, the Supreme Court upheld the right to a pollution-free environment as part of the fundamental right to life under **Article 21** of the Indian Constitution.

Challenges in Addressing Air Pollution in India

1. **Rapid Vehicular Growth**:
   - Economic growth has spurred vehicle ownership, especially two-wheelers and budget cars, contributing to higher emissions. Public transport systems have not kept pace, exacerbating congestion and pollution.

2. **Inadequate Monitoring Infrastructure**:
   - Many cities, especially smaller towns, lack adequate air quality monitoring facilities. For instance, **Bihar** has only **35 air quality stations** despite its vast area, impacting data reliability and timely action.
3. **Inconsistent Implementation of NCAP**:
   - Only **60% of NCAP funds** have been utilized, with some cities using less than 30%. This inefficiency affects the overall success of pollution reduction efforts.
4. **Cross-Border Pollution**:
   - NCAP lacks provisions to tackle pollution from neighboring regions. For example, in Delhi, around two-thirds of air pollution originates from neighboring states.

Global Perspective on Air Pollution: Initiatives and Best Practices

Global Impacts of Air Pollution: Air pollution affects nearly every country, with **WHO reporting** that 99% of the global population breathes air that exceeds WHO guideline limits. **State of Global Air 2021** indicated that air pollution contributed to 8.1 million deaths, underlining the urgency for a global response. Countries worldwide are experimenting with innovative practices and policies to address this issue effectively.

Successful Global Practices to Tackle Air Pollution

1. **Adoption of Renewable Energy**:
   - **Germany's Energiewende Program**: A national initiative to transition to renewable energy sources, reducing dependence on coal and decreasing pollution. Germany aims to source 80% of its power from renewables by 2030.
   - **Denmark's Wind Energy**: Denmark has invested significantly in wind energy, meeting over 50% of its electricity needs from wind, which drastically reduces fossil fuel emissions.
2. **Dynamic Tolling and Congestion Pricing**:
   - **Sweden's Stockholm Congestion Tax**: Toll pricing is dynamically adjusted based on air quality and congestion levels. This practice has successfully reduced vehicle emissions and can be adapted to Indian cities to regulate traffic on high-pollution days.
3. **Emission Reduction Targets under International Agreements**:
   - **Paris Agreement on Climate Change**: By committing to specific emission reduction targets, countries can simultaneously address greenhouse gases and air pollutants. The EU has pledged to reduce emissions by 55% by 2030, setting an example for other regions.
4. **Advanced Emission Monitoring Systems**:
   - **China's 'Blue Sky' Campaign**: The Chinese government deployed a national network of monitoring stations to track pollutants and implemented real-time public access to data. Strict penalties for non-compliance have contributed to improved air quality in major cities like Beijing.
5. **Air Quality Awareness and Public Participation**:
   - **United Kingdom's Clean Air Strategy**: The UK launched a public awareness campaign targeting individuals, schools, and communities to reduce activities contributing to pollution. Information is provided on minimizing exposure and contributing to clean air initiatives.
6. **Green Urban Infrastructure and Urban Forests**:
   - **Curitiba, Brazil's Green Planning**: Curitiba's urban planning emphasizes green spaces, with a national initiative to increase urban green cover. This initiative has reduced urban temperatures, improved air quality, and provided sustainable growth models.

Best Practices and Recommendations for India

1. **Adopt Air Quality Bonds**:
   - Major industries could be required to purchase **Air Quality Bonds**, with bond values proportional to their emissions. The funds raised can finance pollution control measures, public awareness campaigns, and clean technology subsidies. Non-compliance should result in penalties or bond forfeiture.
2. **Biochar Production and Distribution**:
   - Biochar, produced from organic waste, can serve as an alternative to traditional solid fuels and improve soil fertility when used as an additive. **Women's self-help groups** could be trained to produce and distribute biochar, especially in rural areas.
3. **Increase Urban Forest Canopy Cover**:
   - India could launch a national competition to encourage cities to increase urban forest cover. Similar to Curitiba's green city model, urban forests can absorb pollutants, provide shade, and reduce urban heat, creating healthier urban spaces.
4. **Introduce Air Quality-Based Tolling**:
   - India could implement tolls based on real-time air quality data to reduce traffic on high-pollution days. Revenue could be channeled toward public transportation improvements or pollution control measures.
5. **Establish a National Air Quality Awareness Corps**:
   - Trained volunteers could conduct **grassroots campaigns** to educate communities on pollution sources, preventive measures, and health impacts. This corps could promote initiatives like biochar, urban greening, and local air quality monitoring.
6. **Promote Biomimicry in Building Designs**:
   - Buildings can be designed with natural ventilation systems inspired by termite mounds or facades with microstructures mimicking leaves. This would reduce reliance on artificial cooling and contribute to better indoor air quality.
7. **Enhance Cross-Border Pollution Management**:
   - For cities like Delhi that receive pollution from neighboring states, India could explore agreements similar to the **Regional Greenhouse Gas Initiative (RGGI)** in the United States. Such frameworks allow states to work collaboratively on pollution control, sharing funds and resources for cross-border emissions management.
8. **Encourage Citizen Participation in Policy Development**:
   - Public awareness campaigns similar to the **UK's Clean Air Strategy** could help people understand the health impacts of pollution and ways to reduce exposure. Schools, workplaces, and communities could play active roles in air quality improvement.

Proposed Measures for Enhanced Air Pollution Control in India

1. **Air Quality Bonds**:
   - Industries and major polluters could be mandated to buy Air Quality Bonds, with the funds used for pollution control projects. Non-compliance would result in penalties.
2. **Biochar Production**:
   - Empowering rural communities to produce biochar, a fuel alternative, can reduce dependence on firewood and curb indoor pollution. A program like **Pradhan Mantri Ujjwala Yojana** could include biochar distribution.
3. **Increasing Urban Forest Cover**:
   - A national competition to increase urban green spaces could be incentivized with grants, as seen in Curitiba, Brazil, where green planning is integral to urban development.
4. **Air Quality-Based Tolling**:

- Introducing tolls based on real-time air quality could reduce traffic on high-pollution days and generate funds for public transport improvements.

5. **National Air Quality Awareness Corps**:
   - Creating a dedicated corps of volunteers and professionals to educate communities and promote engagement in air pollution reduction efforts.
6. **Biomimicry in Architecture**:
   - Buildings designed to mimic natural ventilation, like termite mounds, can enhance airflow and reduce reliance on artificial cooling, contributing to reduced urban pollution.

Conclusion

India's air pollution crisis is a complex issue, requiring a comprehensive approach that balances **policy measures, public awareness, and technological solutions**. Despite existing initiatives, challenges persist due to rapid industrialization, population growth, and vehicular expansion. By learning from successful global practices, leveraging renewable energy, and increasing green urban spaces, India can work towards a sustainable solution. Collaborative efforts between the government, private sector, and civil society will be essential to achieve cleaner air and a healthier environment for future generations.

MAINS QUESTION

India has implemented several air quality control programs like the National Clean Air Programme (NCAP) and Graded Response Action Plan (GRAP). Critically analyze their effectiveness in addressing India's air pollution crisis. Suggest measures to overcome the challenges faced in their implementation. (250 words)