A GSP WORKSHOP FOR SCHOOL TEACHERS

CLEARING THE AIR

An introduction to the crisis of air pollution and mobility, and what schools can do about it

DATE: MARCH 5-7, 2024
VENUE: ANIL AGARWAL ENVIRONMENT TRAINING INSTITUTE (AAETI), NIMLI, RAJASTHAN
Breathing Bad: Sources of Bad Air — Vehicles, Industries, Waste, Construction

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Programme Manager, Clean Air & Sustainable Mobility
Definition

- Occurs when the air contain gases, liquids, solids in harmful amount
- It is when these pollutants exceeds the safe limits

Air pollution is a silent killer
Causes

- Natural Sources
- Man-made sources
Where is Pollution coming from?

- Fires
- Industry
- Transport including shipping
- Indoor cooking/heating
- Dust
- Agriculture: fertilizers/livestock
- Construction and Waste burning
- Fireworks

Atmospheric chemistry

Secondary PM$_{2.5}$
PM$_{2.5}$: Impact on health?

- Stroke
- Lung Cancer
- Asthma
- Allergies
- Bronchitis

AIR POLLUTION
THE SILENT KILLER
Standard and Air Quality Index (AQI)

Understand the lingo!

**WHO standard: 15 µg/m³**

**Indian standard: 60 µg/m³**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Pollutant</th>
<th>Time Weighted average</th>
<th>Concentration in Ambient Air</th>
<th>Ecologically sensitive area (as per Central Govt.)</th>
<th>Methods of Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>1</td>
<td>Sulphur Dioxide (SO₂), µg/m³</td>
<td>Annual* 50 20</td>
<td>80 80</td>
<td></td>
<td>Improved West and East Gradient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours** 80 80</td>
<td>80 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen Dioxide (NO₂), µg/m³</td>
<td>Annual* 40 30</td>
<td>80 80</td>
<td></td>
<td>Modified Jacob &amp; Howeser (Nitrogen)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours** 80 80</td>
<td>80 80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Particulate Matter (size less than 10 µm or PM₁₀), µg/m³</td>
<td>Annual* 60 60</td>
<td>100 100</td>
<td></td>
<td>Gravimetric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours** 100 100</td>
<td>100 100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Particulate Matter (size less than 2.5 microns or PM₂.₅), µg/m³</td>
<td>Annual* 40 40</td>
<td>60 60</td>
<td></td>
<td>Gravimetric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 hours** 60 60</td>
<td>60 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Ozone (O₃), µg/m³</td>
<td>8 hours** 100 100</td>
<td>180 180</td>
<td></td>
<td>UV photometric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 hour** 180 180</td>
<td>180 180</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Broad guidelines for Public**

- **Good (0–50)**: Minimal Impact
  - May cause minor breathing discomfort to sensitive people

- **Satisfactory (51–100)**: May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults

- **Moderate (101–200)**: May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease with short exposure

- **Poor (201–300)**: May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases

- **Very Poor (301–400)**: May cause respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

- **Severe (401–500)**:
## Air Quality Index

<table>
<thead>
<tr>
<th>AQI Category</th>
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<th>Concentration range*</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>PM$_{10}$</td>
<td>PM$_{2.5}$</td>
</tr>
<tr>
<td>Good</td>
<td>0 - 50</td>
<td>0 - 30</td>
</tr>
<tr>
<td>Satisfactory</td>
<td>51 - 100</td>
<td>51 - 100</td>
</tr>
<tr>
<td>Moderately polluted</td>
<td>101 - 200</td>
<td>101 - 250</td>
</tr>
<tr>
<td>Poor</td>
<td>201 - 300</td>
<td>251 - 350</td>
</tr>
<tr>
<td>Very Poor</td>
<td>301 - 400</td>
<td>351 - 430</td>
</tr>
<tr>
<td>Severe</td>
<td>401 - 500</td>
<td>430 - 430</td>
</tr>
</tbody>
</table>

* CO in mg/m$^3$ and other pollutants in μg/m$^3$; 2h-hourly average values for PM$_{10}$, PM$_{2.5}$, NO$_2$, SO$_2$, NH$_3$, and Pb, and 8-hourly values for CO and O$_3$.

### Broad guidelines for Public

<table>
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<tr>
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<th>Associated Health Impacts</th>
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Impact of bad air quality

**Health Effects**
- Respiratory diseases such as asthma and bronchitis
- Cardiovascular diseases such as COPD
- Others such as impaired cognitive function, stress etc

**Environmental Impact**
- Ecosystems- reduced crop yields, disrupted wildlife, soil and water contamination
- Climate change- release of GHGs
Sources of pollution in cities

Source: Based on published studies
Average fractional contribution of sources of pollution to PM2.5 in Delhi (December 1, 2021– January 31, 2022)

Source: CSE’s analysis based on Decision Support System for Air Quality Management in Delhi of IITM

Note: 1) Data for few hours on December 27 and 28 is missing. However, it was raining during these hours.
2) This is the mean of the daily average contribution for period December 1, 2021– January 31, 2022
3) The “other districts” category includes contributions from all the other regions/districts (apart from the 19 districts already included in the NCR districts). This includes the remaining districts of Haryana, UP, MP, Bihar, Rajasthan, etc and also across the borders
Understanding sources of pollution in Rajasthan

Source: IIT Kanpur and UrbanEmissions.info
Local sources of pollution in Jaipur

Unpaved dusty junction, Ram Nagariya

Industrial waste dumping and burning in VKIA

Waste Burning at the landfill site

Vehicular pollution
Local sources of pollution in Jodhpur

- Construction material dumped on unpaved roadside in Vidhya Nagar
- Stack emissions from industries in Boronada industrial area
- Construction dust
- Vehicular pollution
- Waste Burning
Local sources of pollution in Kota

Unpaved road due to construction of flyover, Anantpura

Movement of trucks in Roongta industrial area- congestion on the road

Stack emissions

Fugitive emissions

Along Nanta road

Nanta dumping ground
Vehicles

- **Emissions from exhaust**: Combustion of fuel releases pollutants like carbon monoxide and nitrogen oxides.

- **Road dust**: Vehicle movement on unpaved surfaces creates dust laden with harmful particulate matter

- **Traffic congestion**: Idling vehicles result in increased emissions and poor air quality.
Industries

- **Stack emissions**: Industrial factories release pollutants into the air, including sulfur dioxide, nitrogen oxides, and particulate matter.

- **Fugitive emissions**: Mining, unloading, crushing, storage and transport

- **Production**: Chemical manufacturing processes can result in the emission of toxic gases and hazardous particulates.

- **Industrial waste burning**

- **Power plants**: Coal-burning power plants release large amounts of sulfur dioxide and other harmful pollutants.
Waste Management

Solid waste management

- **Improper Disposal**: Waste from landfills and incineration contributes to air pollution.
- **Pollutants**: Chemicals and gases released from waste can degrade air quality.
- **Methane Emissions**: Decomposing organic waste generates methane, a potent greenhouse gas

Construction and Demolition waste management

- Use of heavy machinery, dust from excavation, and emissions from construction equipment
- Transportation, and usage of building materials release harmful pollutants into the air.
The Role of Schools, Teachers, and Students in reducing Air Pollution

**Education and Awareness**
Teachers can educate students about the effects of air pollution and the importance of reducing it

**Promoting Sustainable Practices**
Schools can implement eco-friendly practices, such as waste reduction and recycling programs. Use of sustainable transport

**Advocating for Change**
Students can participate in advocacy efforts, such as petitioners or awareness campaigns to influence policy changes

**Community Engagement**
Schools can collaborate with local communities to organize clean-up drives and pollution reducing initiatives
Encouraging active transportation to school

- Promote walking and bicycling: Encourage students to walk or bike to school, promoting physical activity
- Reducing vehicle emissions—buses, carpooling, shared mobility, electric vehicles
- Organize walking groups: Create walking groups with designated routes to ensure students' safety and provide social support
- Advocate for safe routes: Work with local authorities to establish safe pathways for walking and biking to school, increasing accessibility and safety.
## Implementing Green School Initiatives

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy-efficient lighting</strong></td>
<td>• Replace traditional lights with LED fixtures to reduce energy consumption and emissions. Install motion sensors lights.</td>
</tr>
<tr>
<td><strong>Sustainable landscaping</strong></td>
<td>• Implement drought-resistant plants and rain gardens to minimize water use and run-off.</td>
</tr>
<tr>
<td><strong>Waste reduction</strong></td>
<td>• Adopt recycling programs, composting, and reusable materials to minimize waste generation.</td>
</tr>
<tr>
<td><strong>Optimize Heating and Cooling systems</strong></td>
<td>• Program thermostats to conserve energy during non-operational hours and school holidays. Seal air leaks and insulate buildings to improve energy efficiency and reduce heating/cooling loads.</td>
</tr>
<tr>
<td><strong>Integrate Renewable Energy sources</strong></td>
<td>• Implement solar panels and wind turbines to generate clean, renewable energy on school premises.</td>
</tr>
<tr>
<td></td>
<td>• Educate students on the benefits of renewable energy while powering the school sustainably</td>
</tr>
</tbody>
</table>
# Conclusions and potential solutions

## Public Awareness
- Educating the public about the harmful effects of air pollution and the steps they can take to reduce it.

## Regulations and policies
- Implementing strict regulations and policies to control emissions from vehicles, industries, and construction sites.

## Investing in clean energy
- Promoting the use of clean energy sources and technology to reduce reliance on fossil fuels.

## Collaboration and action
- Encouraging collaboration between different sectors and taking immediate action to address the sources of bad air.
- Neighbourhood and departments
Clean Air on All Day.
No exceptions please!!!

Let's make the skies bluer and air cleaner for us, for them, for all!

#CleanAirForAll