Towards Cleaner Air in Surat
Chemicals/particulate matter added to the atmosphere by human activities or natural events
Understanding the air pollution is essential for each us to help reduce emissions, protect human health and the environment.
Why it is important to understand the air pollution?

Premature Mortalities associated different risk factors in India

Dietary risks
High systolic blood pressure
Air pollution
Tobacco
High fasting plasma glucose
Child and maternal malnutrition
Unsafe water, sanitation, and handwashing
High LDL cholesterol
Alcohol use
High body-mass index
Impaired kidney function
Other environmental risks
Occupational risks
Low physical activity
Low bone mineral density
Unsafe sex
Drug use
Intimate partner violence
Childhood maltreatment

Why it is important to understand the air pollution?
WHAT NO ONE CHARTED: 300% JUMP IN CASES AT AIIMS OPD, RESPIRATORY WARD

Records accessed by The Indian Express show how the number of OPD cases of respiratory ailments at AIIMS has been rising since 2006-07 — to an average of over 100 a day now.

2005-06: 10,296
2007-08: 9,519
2008-09: 9,831
2010-11: 11,984
2012-13: 24,480
2014-15: 37,069

NAME: VAIBHAV SHARMA
AGE: 13
Home: Sahibabad
Ailments: Suffers from allergies, chronic cough and breathing difficulty
Life: Forced to skip school often, needed 3 hospital visits this winter

* AIIMS started a full-fledged respiratory department only in 2013, patients were treated in the chest unit till then.
Common Pollutants that are of Human Health Concern

- Carbon monoxide (CO)
- Nitrogen dioxide (NO$_2$)
- Lead (Pb)
- Sulfur dioxide (SO$_2$)
- Ozone (O$_3$)
- Particulate matter (PM$_{2.5}$, PM$_{10}$)
Major sources of Air Pollution
PM2.5 Concentration in cities (year 2014-15)

WHO air quality guidelines and interim targets
PM2.5 level (µg/m³)
- AQG: 0 - 10
- IT-3: 10.1 - 15
- IT-2: 15.1 - 25
- IT-1: 25.1 - 35
- >35
NCAP: National Clean Air Programme

The goal of the NCAP is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated timeframe (long-term).
## National Ambient Air Quality Standards (NAAQS)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Pollutants</th>
<th>Time Weighted Average</th>
<th>Concentration in Industrial, Residential, Rural, and Other Areas</th>
<th>Concentration in Ecologically Sensitive Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sulphur dioxide (SO₂), μg/m³</td>
<td>Annual* 24 hours**</td>
<td>50 80</td>
<td>20 80</td>
</tr>
<tr>
<td>2</td>
<td>Nitrogen dioxide (NO₂), μg/m³</td>
<td>Annual* 24 hours**</td>
<td>40 80</td>
<td>30 80</td>
</tr>
<tr>
<td>3</td>
<td>Particulate matter (Size &lt;10 μm) or PM₁₀, μg/m³</td>
<td>Annual* 24 hours**</td>
<td>60 100</td>
<td>60 100</td>
</tr>
<tr>
<td>4</td>
<td>Particulate matter (Size&lt;2.5 μm) or PM₅₀, μg/m³</td>
<td>Annual* 24 hours**</td>
<td>40 60</td>
<td>40 60</td>
</tr>
<tr>
<td>5</td>
<td>Ozone (O₃), μg/m³</td>
<td>8 hours** 1 hours **</td>
<td>100 180</td>
<td>100 180</td>
</tr>
<tr>
<td>6</td>
<td>Lead (Pb), μg/m³</td>
<td>Annual* 24 hours**</td>
<td>0.50 1.0</td>
<td>0.50 1.0</td>
</tr>
<tr>
<td>7</td>
<td>Carbon monoxide (CO), mg/m³</td>
<td>8 hours** 1 hours **</td>
<td>02 04</td>
<td>02 04</td>
</tr>
<tr>
<td>8</td>
<td>Ammonia (NH₃), μg/m³</td>
<td>Annual* 24 hours**</td>
<td>100 400</td>
<td>100 400</td>
</tr>
<tr>
<td>9</td>
<td>Benzene (C₆ H₆), μg/m³</td>
<td>Annual*</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>10</td>
<td>Benzo(a) pyrene (BaP)-particulate phase only, ng/m³</td>
<td>Annual*</td>
<td>01</td>
<td>01</td>
</tr>
<tr>
<td>11</td>
<td>Arsenic (As), ng/m³</td>
<td>Annual*</td>
<td>06</td>
<td>06</td>
</tr>
<tr>
<td>12</td>
<td>Nickel (Ni), ng/m³</td>
<td>Annual*</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>
KEY SECTORAL INTERVENTIONS UNDER NCAP

- E-mobility
- Power Sector Emissions
- Indoor Air Pollution including Clean Cooking
- Integrated Waste Management
- Transport Emissions
- Industrial Emissions
- Agricultural Emissions
- Clean construction and Road dust management
KEY COMPONENTS OF NCAP
Annual average ambient concentration of particulate matter (PM10) in Surat Municipal Corporation with WHO guideline and Central Pollution Control Board (CPCB) standard for PM10.
Health Risks benefits associated with different risk factors in Surat
Key Sectors for Surat City

- Industries
- Household Cooking
- Transportation
- Construction
- Municipal Solid Waste
Industries
Percentage of workers (main and marginal) working in different manufacturing sectors in Surat Municipal Corporation.
Number of different economic and manufacturing entities in Surat Municipal Corporation.
Household Cooking
Total PM2.5 emissions from household cooking (Mg)
Modeled Household PM2.5 concentration in Surat

PM2.5 Concentration (ug/m³)

Polluting fuel users (Primary) | Polluting fuel with LPG users (Secondary)
Transportation
Category-wise total registered motor vehicles (transport & non-transport) in Surat as on 31st March 2015

- Two-Wheelers: 78%
- Cars: 13%
- Passengers-Auto: 4%
- Jeeps: 1%
- Tractors & Lorries: 1%
- Light Motor Vehicles (Goods): 2%
- Buses: 0%
- Taxis: 0%
Mode of share for on-road transportation in Surat

- Bicycle: 22%
- Moped/Scooter/Motor Cycle: 45%
- Tempo/Autorickshaw/Taxi: 27%
- Car/Jeep/Van: 4%
- Bus: 2%
Average trip length

Source: Kumar & Electricwala 2014
VEHICULAR AIR POLLUTION INVENTORY MODEL

Vehicular Air Pollution Inventory (VAPI) model is an on-road transportation emissions model especially designed for Indian data availability conditions. It is able to estimate exhaust, non-exhaust and evaporative emissions from on-road vehicles.

QUICK START GUIDE

If you would like free copy of VAPI Model please email me at nagpursajay@gmail.com—include your name, business, and full mailing address.

Publications:


Traffic Emission Model

Traffic emission models are the computer program, which estimate emissions released by the vehicles during their operation and other activities during particular time span and region.

They predict and evaluate the efficiency of emissions control measures (e.g. policy, technology change etc) in transport sector at local and regional level.

Emission models can be used in the context of Decision Support Systems (DSS) to provide the analyst and the decision maker with quantitative estimates, trends, and insight on the policies simulated.

Data analysis/ Action to implement policy
Model based traffic emission inventory development
Evaluation of efficiency of policies
Development and implementation of Policy
Vehicle emissions models in various countries

Available Models in No.

2011 India
Not Available

SOURCES OF VEHICLE EMISSIONS

Exhaust Emissions

Emissions of pollutants from the combustion process which are released from the tailpipe while a vehicle is operating: CO, HC, NO\textsubscript{x}, CO\textsubscript{2}, PM, VOC etc.

Evaporative Emissions

Volatile organic compounds (VOC) also escape into the air through fuel refueling and evaporation.

Non-exhaust Emissions

Emissions from tyre and break wear (PM, Dust)
PM10 from various vehicle categories in Delhi

![Graph showing PM (Mg) emissions from different vehicle categories: 2-Wheeler, Car, 3-Wheeler, Taxi, Bus, LCV, HCV from 1991 to 2020.]

Exhaust and non-exhaust emissions (%)

Contribution of different vehicular sources for PM$_{10}$ emissions in Delhi