

Air Pollution - Monitoring and Management

A case Study –Delhi

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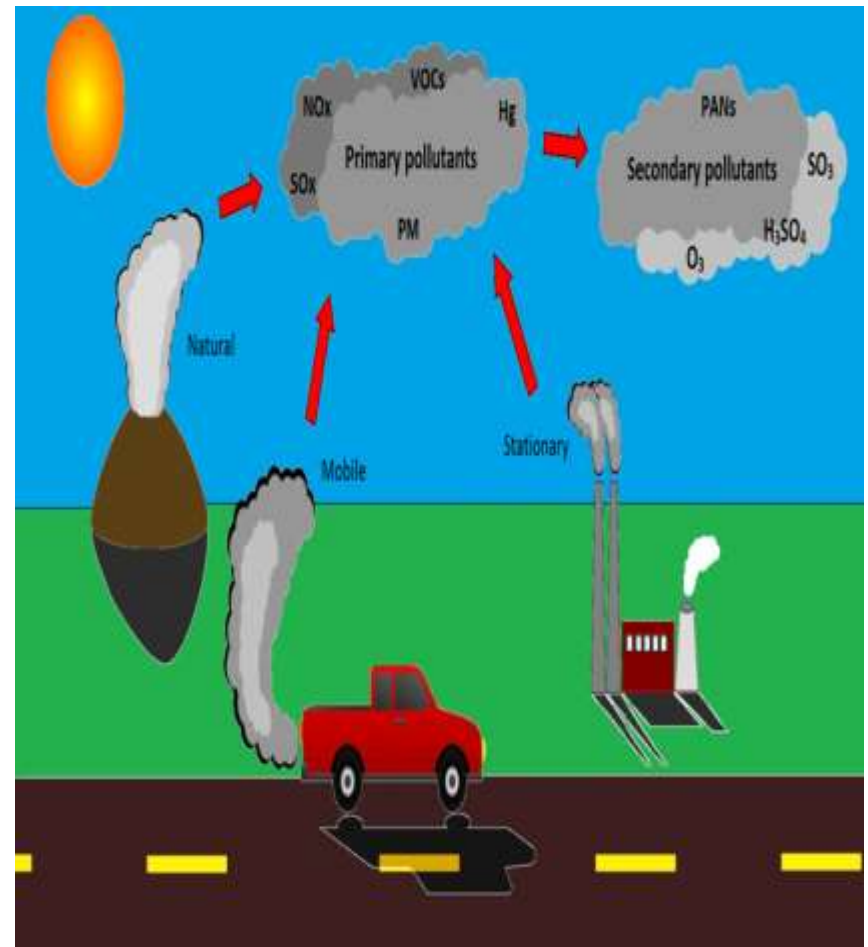
Delhi Pollution Control Committee

Air Pollution

- **Air pollution** is the **contamination** of **air** due to the presence or introduction of a substance which has a poisonous effect.
- **Air pollution** is a type of **environmental pollution** that affects the **air** and is usually caused by Dust, smoke or other harmful gases, mainly oxides of carbon, sulphur and nitrogen.

Pollutants

A pollutant is a substance or energy introduced into the environment that has undesired effects, or adversely affects the usefulness of a resource



Critical Pollutants

Pollutants	Source
Particulate : PM2.5 and PM 10	Wind blown Dust, Emission from Industries and Construction site , road Re suspension Dust and emission from vehicle
Carbon monoxide	Fossil fuel Burning ,and garbage and waste burning , agriculture residue burning
Sulphur di oxide	Fossil fuel Burning
Nitrogen dioxide	Vehicular emission and burning at high temperature
Ozone	Photochemical reaction

Delhi-an Unique City

- Landlocked city with 1434sq.Km. Area
- Population aprox. 17 million
- Vehicular Population 9million
- Vehicle daily entering from other states 0.25million trips
- Extreme climate 2° C to 46°C
- Rains only in Monsoon or Scanty winter rains .
- 26 types of vehicle moves on same road space
- Consumption of diesel 12,67,000 metric tonnes in
- consumption of petrol from 9,06,000 metric tonnes

Air Pollution and Delhi city

- Air quality in Delhi has remained poor throughout the year for various reasons, construction projects, and vehicular as well as wind blown and road re-suspension dust .
- Short distance and trans boundary movement of pollutants also effect the Air quality
- Crop residue burning (CRB) by farmers in neighboring states also major factor in particular season.

Causes

- October and November is the most critical months .
- The air pollution levels in Delhi go up in the winter as particulate matter gets trapped at the ambient level due to negligible wind speed for dispersal, coupled with contribution by farm fires in the northern plains of India.
- The reason is simple—if there is no wind speed in Delhi to disperse particulates causing temperature inversion, how can there be wind bringing smoke pollutants from the northern plains.

- The Lancet Commission on Pollution and Health found that in 2015, there were 9 million premature deaths stemming from air pollution around the world.
- India suffered the worst toll of any country, with more than 2.5 million of these deaths .
- Pollution has also shaved 3.2 years from the life expectancies of 660 million people in the country, according to one estimate.

- One of the key provisions of this law changed how farmers plant rice. Rice production typically takes place in two stages, where the crop is first cultivated in a nursery before being transplanted to a paddy. The water act prohibited nursery sowing before May 10 and transplanting before June 10. The delay allowed for seasonal monsoon rains to arrive and replenish aquifers.
- By most accounts, the law worked. It slowed the [decline of Punjab's water table](#). But delaying planting means delaying the harvest. With a late October rice harvest, farmers now have barely a month to clear their fields for [winter wheat](#), which is typically sown mid-November.
- These farms are often run by small-scale farmers that can't hire a large number of workers or afford the machinery needed to rapidly clear their fields of the leftovers from the last harvest. So they turned to the cheapest and quickest method to prepare for the next planting — burning crop stubble.

Public Perception

- A few years ago, an American journalist stationed in Delhi wrote a farewell piece saying that he was leaving Delhi because the air pollution monitors in the US embassy showed that staying in the Capital would put his children's health at risk.
- There was an outburst of nationalistic outrage that the embassy was probably exaggerating the problem.

Ambient Air Quality –Media's Perspective

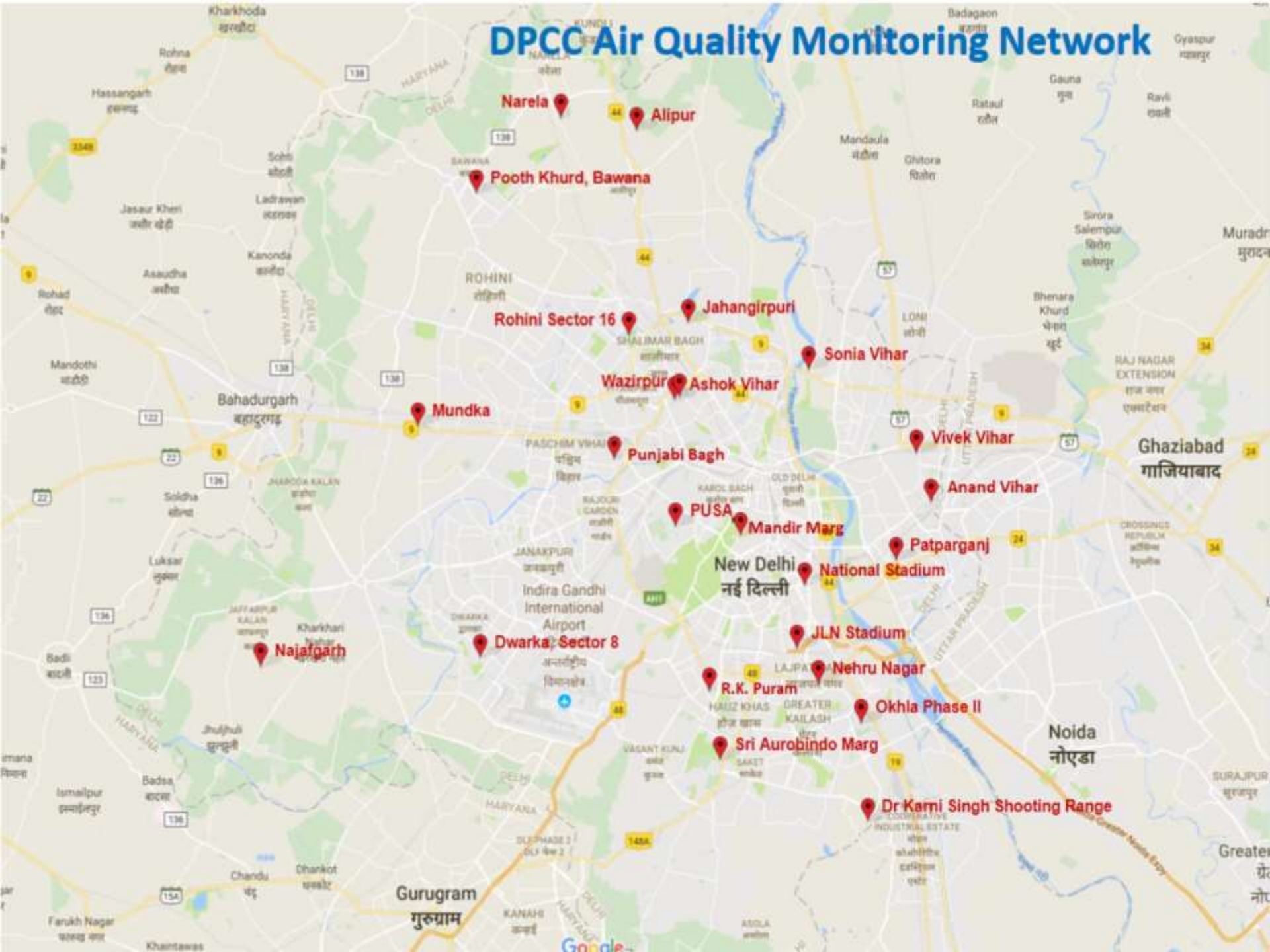


- **Delhi air will never be safe because of its geographical disadvantage**
- Public perception was “contrary to scientific information”.

Monitoring

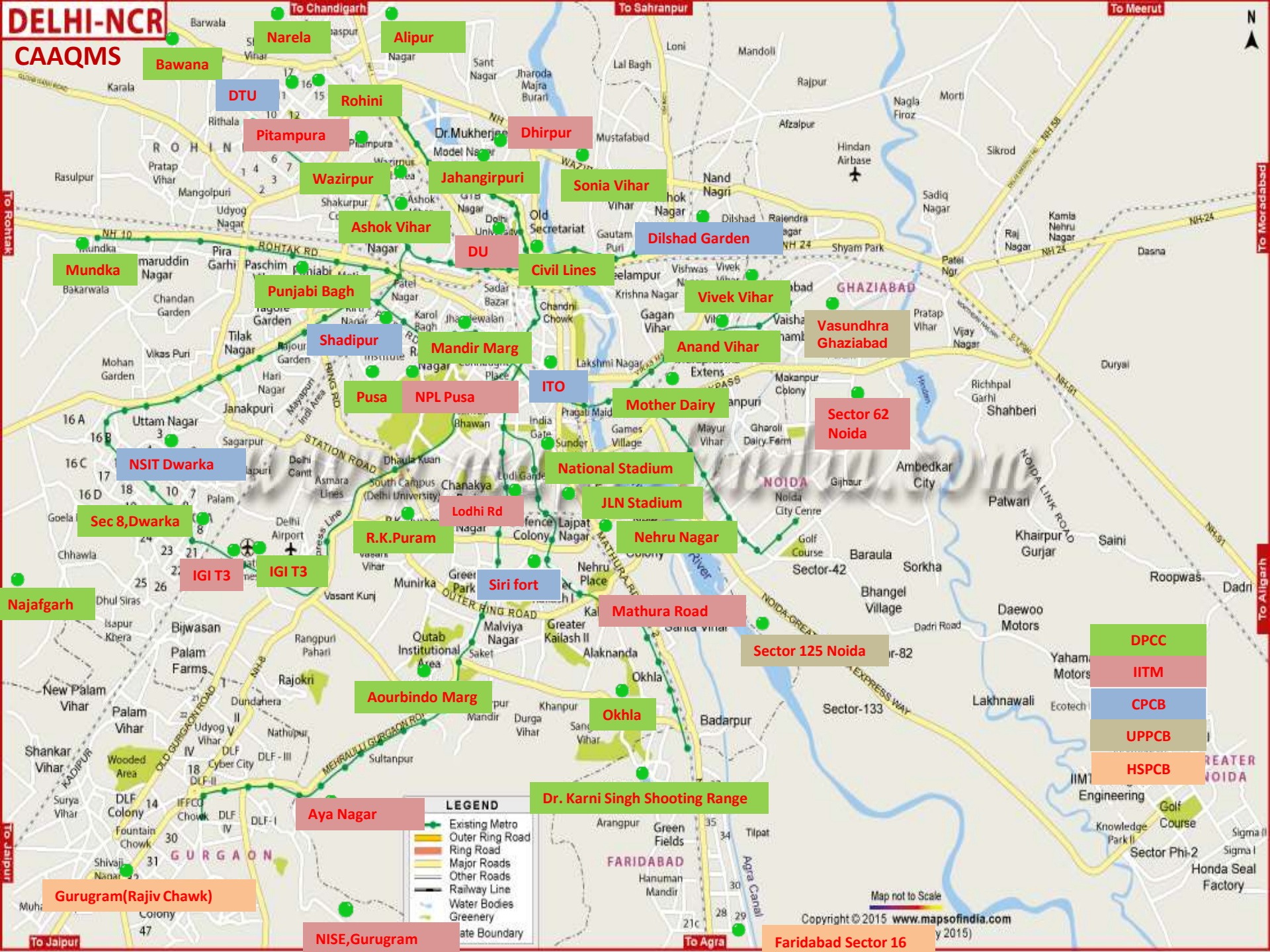
- What to monitor –Parameter
- How to monitor –Method
- Where to monitor – Location
- Frequency of monitoring –
- Duration of monitoring -Hourly / Daily /Monthly

DPCC Air Quality Monitoring Network



DELHI-NCR

CAAQMS



CONTINUOUS AMBIENT AIR QUALITY MONITORING STATIONS IN DELHI-NCR

SN	CAAQMS(DPCC)
1	Alipur
2	Jahangirpuri
3	Narela
4	Sonia Vihar
5	Patparganj
6	Ashok Vihar
7	Nehru Nagar
8	Sri Aurobindo Marg
9	Najafgarh
10	Vivek Vihar
11	PUSA
12	National Stadium
13	JLN Stadium
14	Dr. karni singh shooting range
15	Dwarka, Sector 8
16	Mundka
17	Rohini, Sector 16
18	Wazirpur
19	Okhla, Phase II
20	Pooth Khurd,Bawana
21	R.K.Puram
22	Punjabi Bagh
23	Mandir Marg
24	Anand Vihar
25	Civil Lines
26	IGI Airport

SN	CAAQMS(CPCB)
1	Dilshad Garden
2	Siri fort
3	ITO
4	Shadipur
5	DTU,Bawana
6	NSIT, Dwarka

SN	CAAQMS(IITM)
1	Noida Sec 62
2	Aya Nagar
3	Lodhi Road
4	Mathura Road
5	Dhirpur
6	Pitampura
7	Delhi University
8	PUSA(NPL)
9	Gurugram
10	Airport T3

SN	CAAQMS(UPPCB)
1	Noida Sec 125
2	Ghaziabad Vasundhra

SN	CAAQMS(HSPCB)
1	Faridabad
2	Gurugram (Rajiv Chawk)

Why is it needed?

- Air pollution is a very large public health issue in Delhi.
- The measurements are used to assess air pollution across Delhi, and to track trends over time.
- These measurements are used to create models that can assess how different government policies affect air pollution.
- The measurements help fulfill the local authorities Statutory obligations with regard to air pollution.
- The measurements are also used to help with research into the health effects of air pollution.

DPCC Air Quality Network

www.dpccairdata.com



www.cpcb.nic.in



Central Server



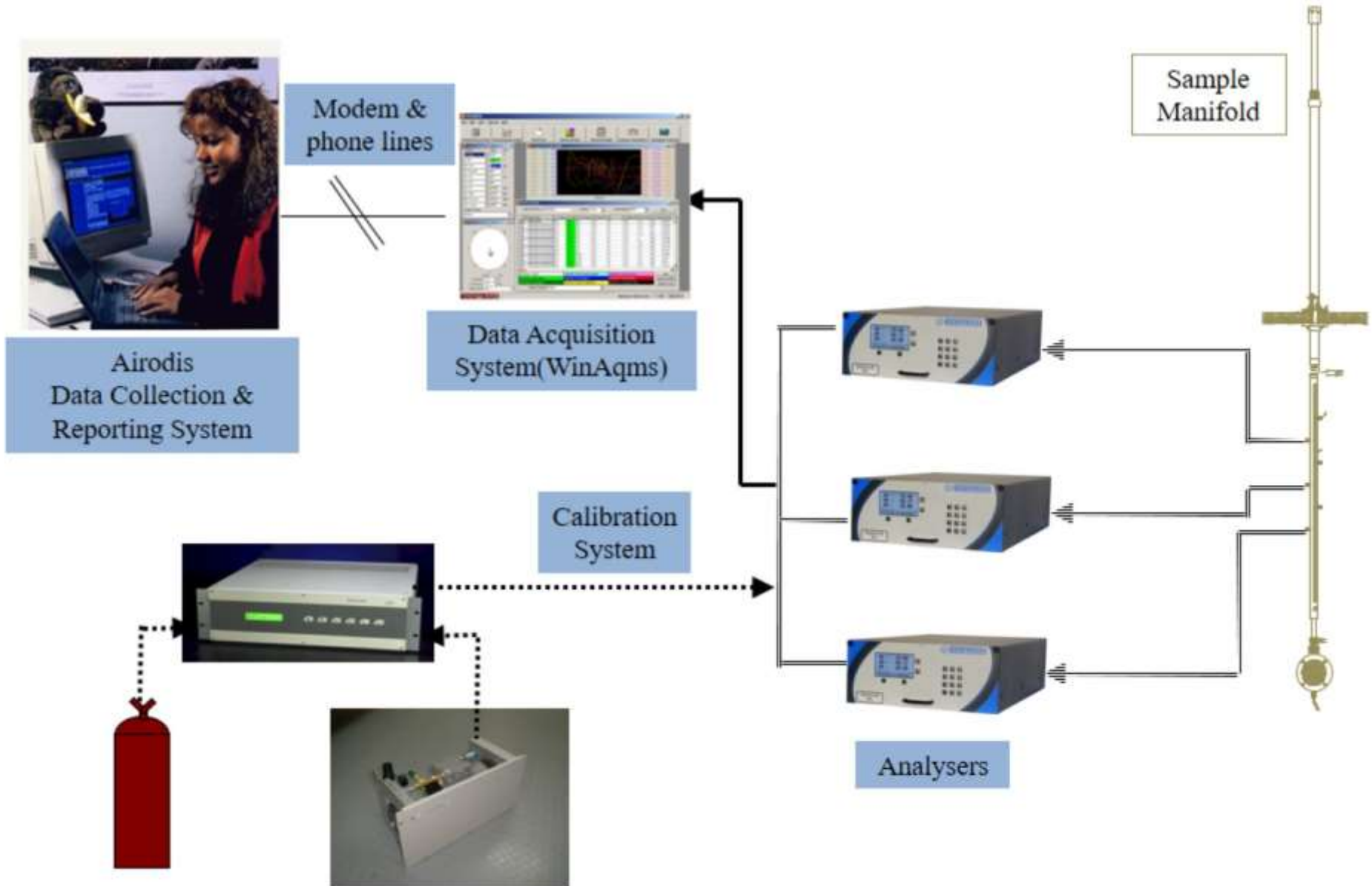
CAAQMS



CAAQMS



Ambient System Components



Analyzer Details

Particulars	Measurement Techniques	Instrument Make
Particulates (PM ₁₀ & PM _{2.5})	Beta Ray Attenuation	Met One, USA
SO ₂	Pulsed fluorescence	Ecotech, Australia
NO, NO ₂ & NO _x /NH ₃	Chemiluminescence	Ecotech, Australia
CO	Non Dispersive Infrared	Ecotech, Australia
O ₃	UV Absorption	Ecotech, Australia
BTX (<i>Benzene, Toluene, Xylene</i>)	GC PID	Synspec, Netherlands
Temperature (°C)	Thermistor	Met One, USA
Relative Humidity (%)	Capacitor	Met One, USA
Barometric Pressure (mm Hg/hPa)	Pressure Transducer	Met One, USA
Solar Radiation (Watts/m ²)	Photo Cell	Met One, USA
Wind Direction (Degrees)	Potentiometer	Met One, USA
Vertical Wind Speed (m/sec)	Gill Propeller anemometer	Met One, USA
Wind Speed (m/sec)	Anemometer	Met One, USA
Rain Fall (mm)	Tipping Bucket	Envirotech, India

MAJOR SOURCES OF AIR POLLUTION IN DELHI

As per the study conducted by IIT Kanpur in 2015, the major sources of air pollution in Delhi are:-

- Vehicular pollution**
- Road and soil dust**
- Dust generated due to construction and demolition activities**
- Burning of dry leaves/garbage etc.**
- Trans-state movement of pollutants specially due to burning of crop residue in neighboring states of Punjab, Haryana and UP**
- Industrial sources/Thermal Power stations.**

SOURCE APPORTIONMENT STUDY

Year Average

Parameters	Industrial Stack	Vehicles	Road Dust	Others
PM ₁₀	10%	9%	<u>56%</u>	<u>25%</u>
PM _{2.5}	11%	20%	<u>38%</u>	<u>31%</u>
NO _x	<u>52%</u>	<u>36%</u>	0%	12%
SO ₂	91%	1%	1%	7%
CO	3%	83%	0%	14%

SOURCE APPORTIONMENT

Winter

Pollutants	Secondary particles (Power plants+Industries+Gen Sets)	Vehicles	Biomass Burning	MSW Burning	Soil and Road Dust	Coal and Flyash	Construction Material
PM ₁₀	<u>25%</u>	<u>20%</u>	17%	9%	14%	12%	3%
PM _{2.5}	<u>30%</u>	<u>25%</u>	<u>26%</u>	8%	4%	5%	2%

- Secondary Particles – NO_x (greater load) and SO_x from Thermal Powers + Industries in Delhi + DG sets + Vehicles contribute to over 25%
- Control over Vehicular Pollution is of prime importance
- Parali (stubble) burning causes one fourth of the load
- Pollution due to road dust in absolute terms doesn't decline much

SOURCE APPORTIONMENT

Summer

Pollutants	Coal and Flyash	Road Dust	Biomass Burning	Secondary particles	MSW burning	Vehicles	Construction Material
PM ₁₀	<u>38%</u>	<u>27%</u>	7%	<u>10%</u>	8%	6%	4%
PM _{2.5}	<u>26%</u>	<u>27%</u>	<u>12%</u>	<u>15%</u>	7%	9%	3%

- Due to arid conditions and greater wind velocity- Flyash and Road Dust biggest contributor
- Secondary particles high-Vehicular Pollution and Thermal Power are main source
- Contribution of biomass burning is still high

Goal....

- Meeting National Ambient air quality standard
- Meeting World Health Organization Guidelines for Ambient air quality
- Seeing a blue sky!
- Proposing of effective, pragmatic and preventive (rather than combative) strategies
- Making accessible scientific data which is capable of analysis by common man

- Thanks