



ADDRESSING URBAN AIR POLLUTION

CHIRAG BHIMANI

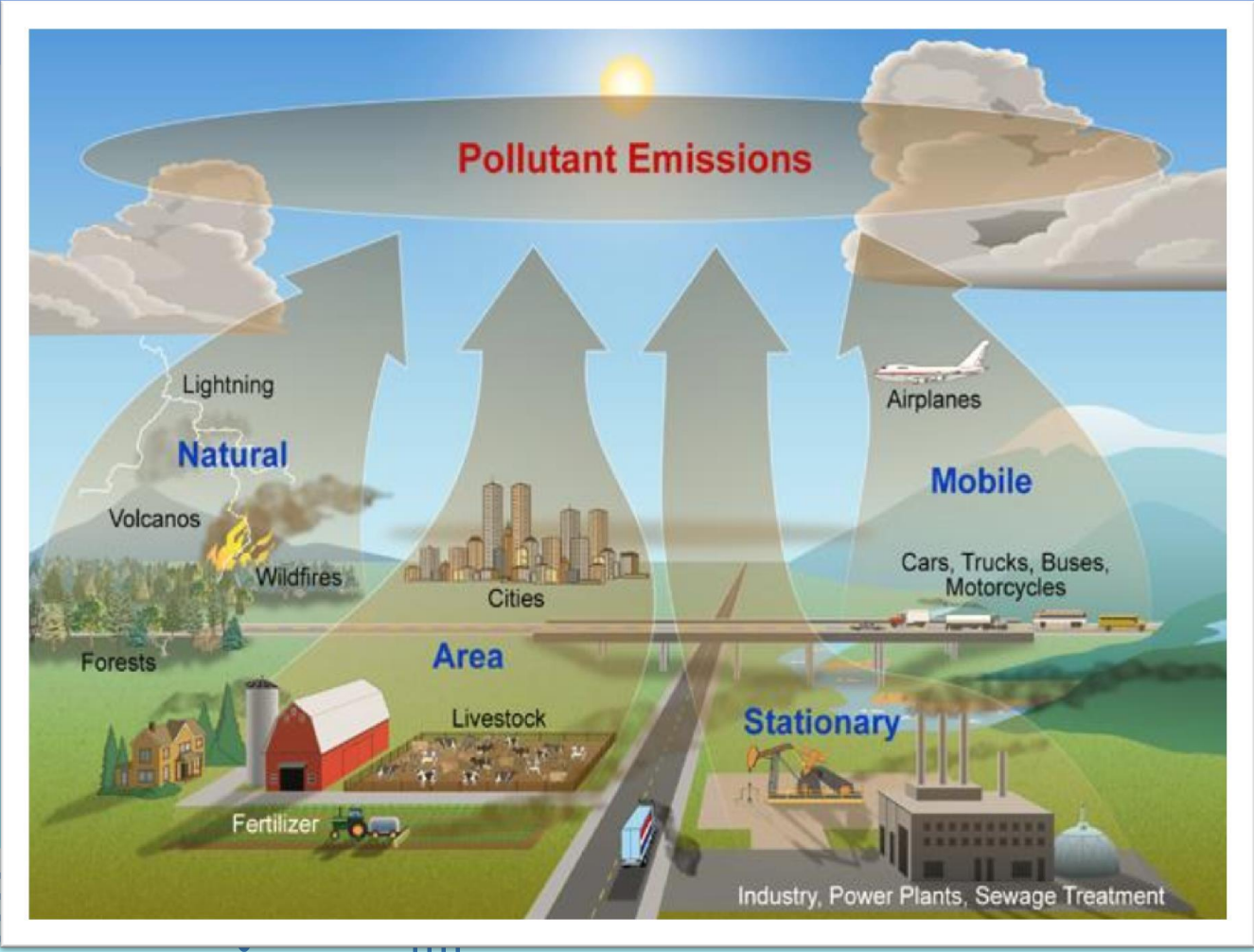
THE AIR POLLUTION CHALLENGE



Household Urban Peri-urban Regional Global

Local to Global





LIFE OF POLLUTANTS

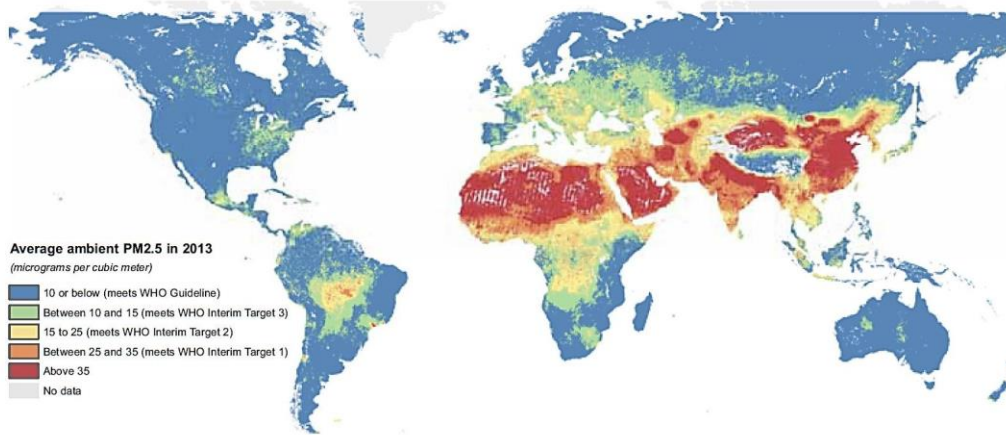
SHORT-LIVED CLIMATE POLLUTANTS

Near term response to mitigation

SUBSTANCE	ANTHROPOGENIC SOURCES	LIFETIME IN ATMOSPHERE	IMPACTS/MITIGATION		
			LOCAL	REGIONAL	GLOBAL
BLACK CARBON (BC)		DAYS	●	○	●
METHANE (CH ₄)		12 YEARS	●	○	●
TROPOSPHERIC OZONE (O ₃)		WEEKS	●	○	●
HYDROFLUORO-CARBONS (HFCs)		15 YEARS (WEIGHTED BY USAGE)			●

POLLUTANT LEVELS

MAP 2.1 Locations Where 2013 Annual Average PM_{2.5} Concentrations ($\mu\text{g}/\text{m}^3$) Meet or Exceed World Health Organization's (WHO) Air Quality Guideline or Exceed Interim Targets



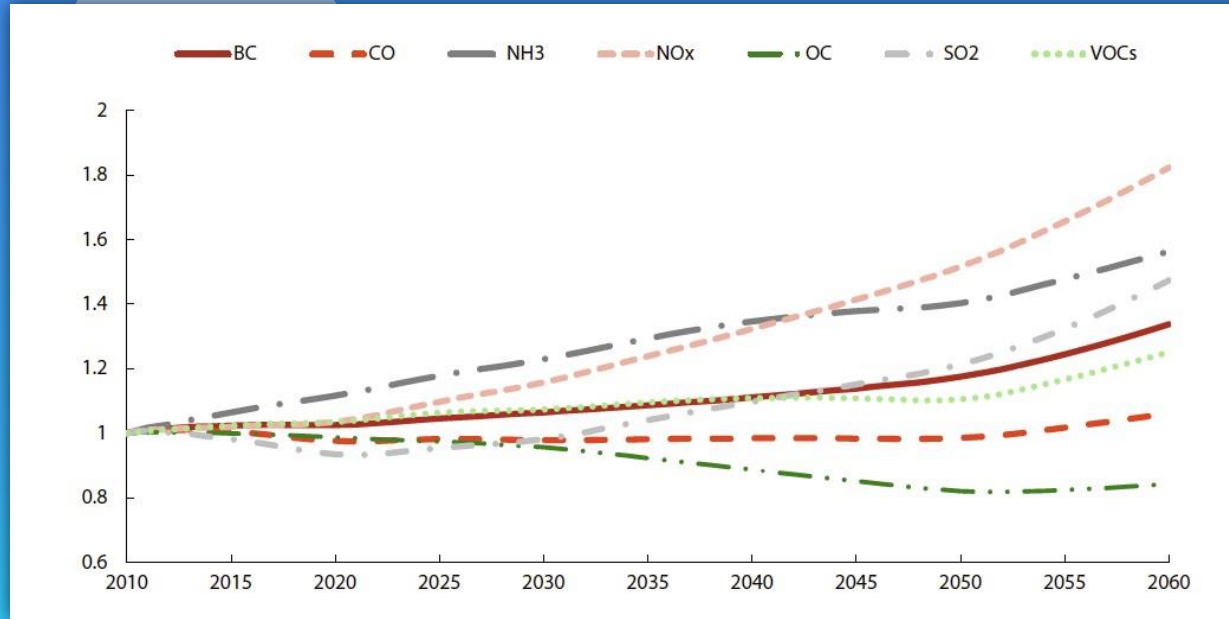
Source: Brauer et al. 2016.

Note: Reprinted with permission from Ambient Air Pollution Exposure Estimation for the Global Burden of Disease 2013. Brauer M, Freedman G, Frostad J, van Donkelaar A, Martin RV, Dentener F, van Dingenen R, Estep K, Amiri H, Apte JS, Balakrishnan K, Barregard L, Broday D, Feigin V, Ghosh S, Hopke PK, Knibbs LD, Kokubo Y, Liu Y, Ma S, Morawska L, Sangrador JL, Shaddick G, Anderson HR, Vos T, Forouzanfar MH, Burnett RT, Cohen A. Environ Sci Technol. 2016 Jan 5; 50(1):79–88. doi: 10.1021/acs.est.5b03709. Copyright 2016 American Chemical Society.

Source : World Bank/WHO 2016

- **92% of the world's population lives in places where air quality levels exceed WHO's Ambient Air quality guidelines for annual mean of PM_{2.5} ($10 \mu\text{g}/\text{m}^3$)**
- **Nearly 90% of air-pollution-related deaths occur in low- and middle-income countries, with nearly 2 out of 3 occurring in WHO's South-East Asia and Western Pacific regions.**

FUTURE EMISSIONS OF OUTDOOR AIR POLLUTANTS



Most air pollutants emissions are projected to increase over the coming decades. Especially, nitrogen oxides (NO_x) and ammonia (NH₃) due to increases in agricultural products and energy (incl. transport and power generation)

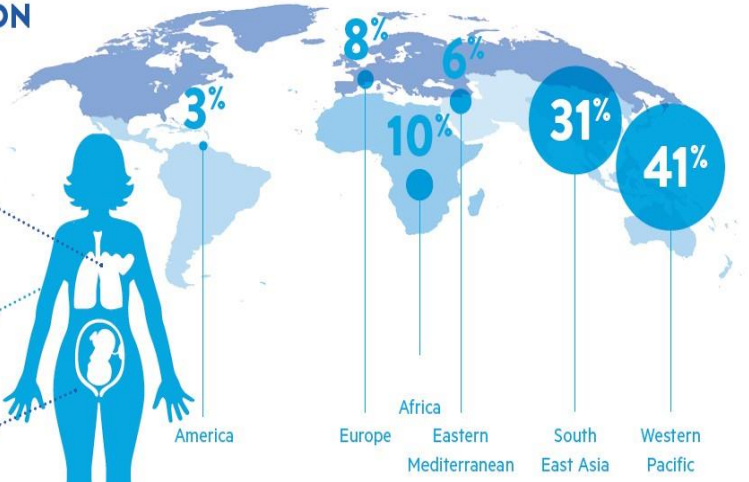
Source : OECD 2016

EFFECTS OF AIR POLLUTANTS

DISEASES DUE TO:

- OZONE (O₃)
- PM2.5 AIR POLLUTION

- Chronic obstructive pulmonary disease (COPD)
- Childhood pneumonia
- Ischaemic heart disease
- Stroke
- Asthma
- Breathing problems
- airway inflammation
- Chronic respiratory illness
- Reduced lung function
- Low birth weight



APPROXIMATE SHARE OF PREMATURE DEATH FROM AIR POLLUTION (YEAR 2012)

RESPONSE



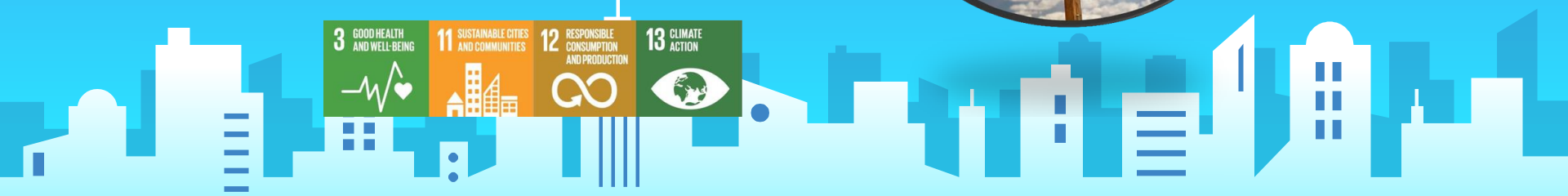
CLIMATE CHANGE (COP21)	
KEEP GLOBAL TEMPERATURES RISE WELL BELOW 2°C	WITH ASPIRATION TO 1.5°C
ALL COUNTRIES TO REPORT REGULARLY ON THEIR EMISSIONS AND EFFORTS TO REDUCE THEM	NEW TRANSPARENCY AND ACCOUNTING SYSTEM IN PLACE
EVERY 5 YEARS	REVIEW EACH COUNTRY'S CONTRIBUTIONS TO GHG EMISSIONS CUTS SO THAT THEY CAN BE SCALED UP
DEVELOPED COUNTRIES TO PROVIDE \$100BN CLIMATE FINANCE PER YEAR UNTIL 2025	



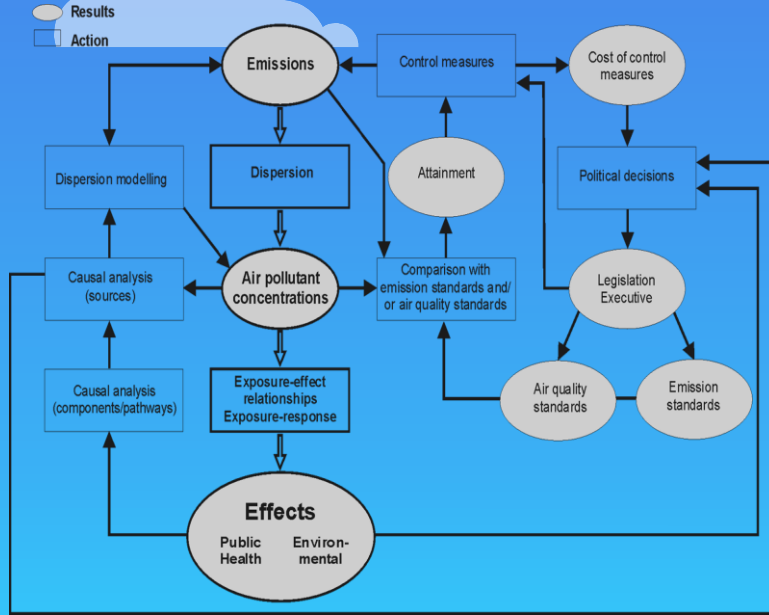
- Promote measures that support cleaner cities
- Take action to address climate change by reducing their greenhouse gas emissions
- Strengthen resilience in cities to reduce the risk and the impact of disasters



<p>3 GOOD HEALTH AND WELL-BEING</p>	<p>11 SUSTAINABLE CITIES AND COMMUNITIES</p>	<p>12 RESPONSIBLE CONSUMPTION AND PRODUCTION</p>	<p>13 CLIMATE ACTION</p>
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AIR QUALITY MANAGEMENT SYSTEM



A collection of air pollution strategies designed to:

- **Eliminate or reduce ambient air pollutant concentrations to acceptable levels.**
- **Avoid adverse effects to human health and the environment.**
- **Prevent material damage and economic loss.**

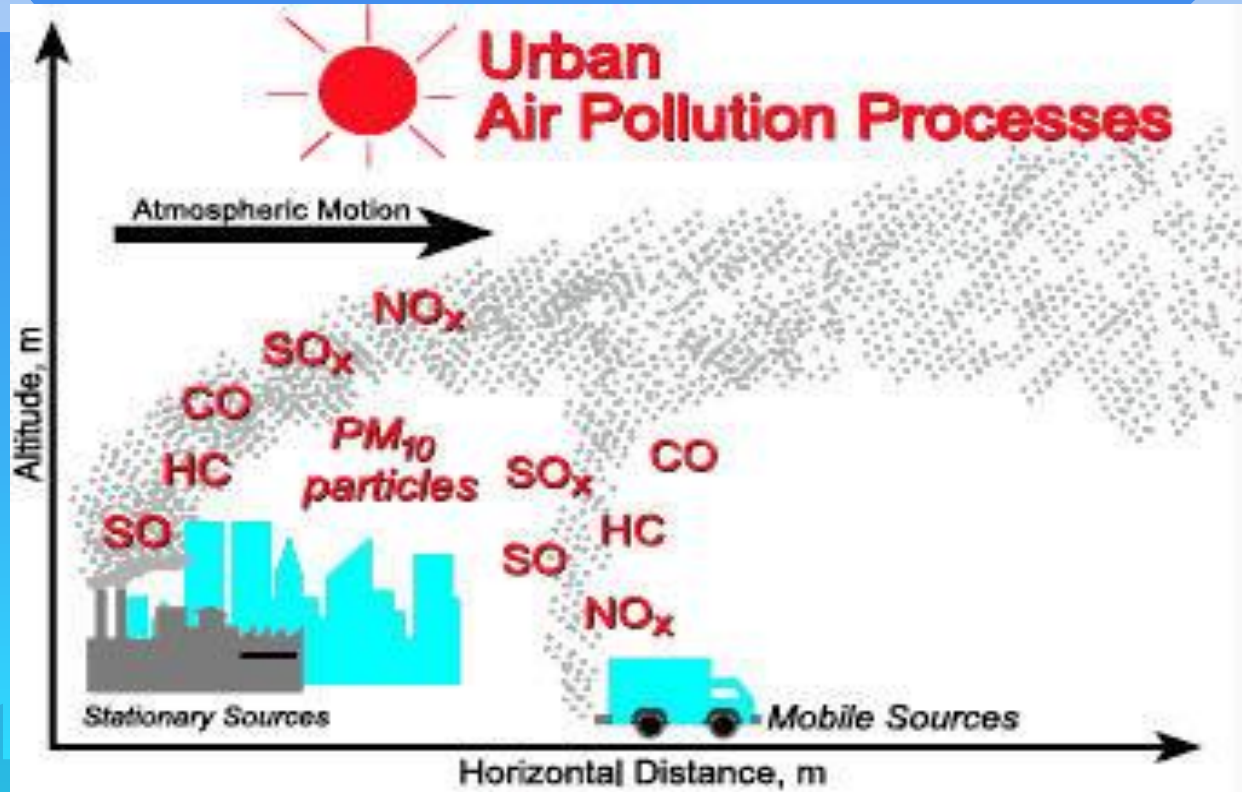
Emission
Inventory

Air Pollution
Modelling

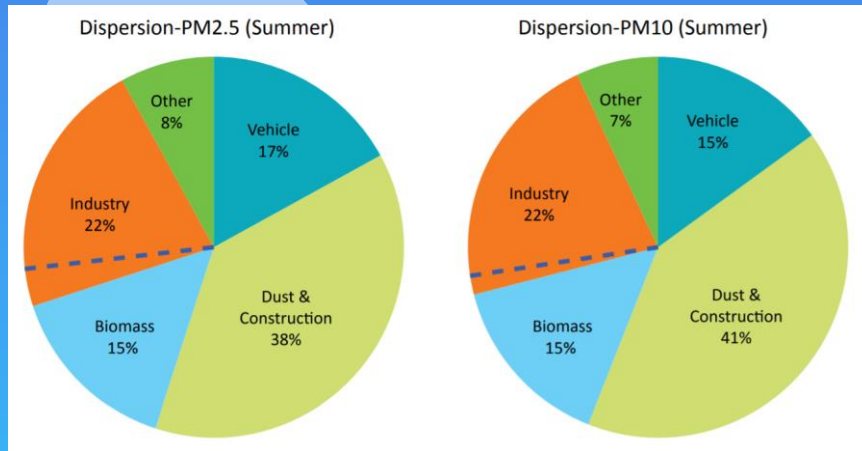
Air Quality
Monitoring

Control
Measures

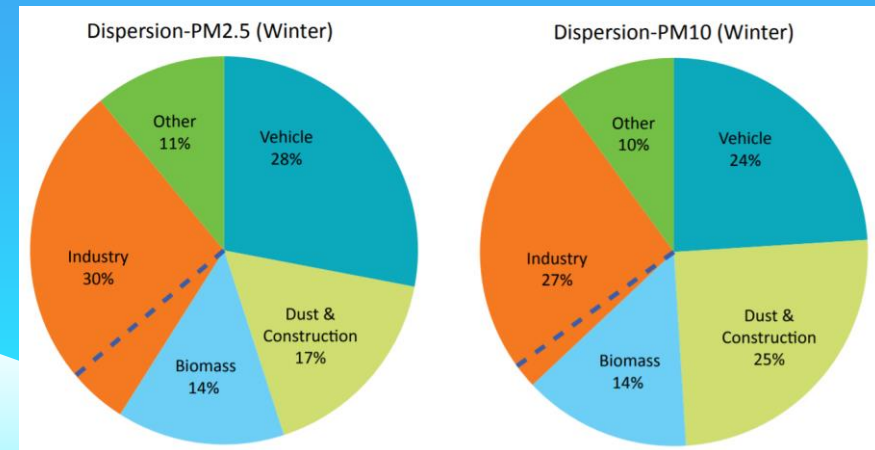
ABOUT URBAN AIR POLLUTION PROCESSES



SOURCES OF URBAN AIR POLLUTION IN INDIA



Source Contributions to PM_{2.5} & PM₁₀ Concentrations In Delhi
(TERI-ARAI Source Apportionment Study)



(Source : NCAP Report, MoEFCC)

ABOUT ENVIRONMENTAL TECHNOLOGY

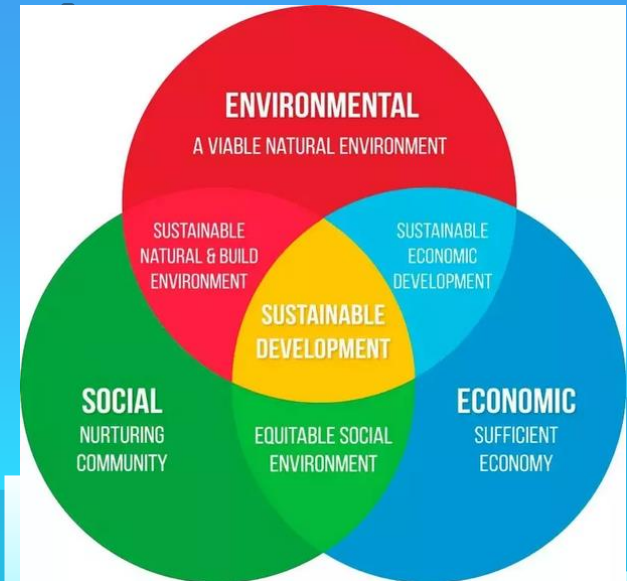
Environmental Science,
Green Chemistry,
Environmental
Monitoring and
Electronic Devices

Environmental
Technology
(EnviroTech) OR
Green Technology
(GreenTech) OR
Clean Technology
(CleanTech)

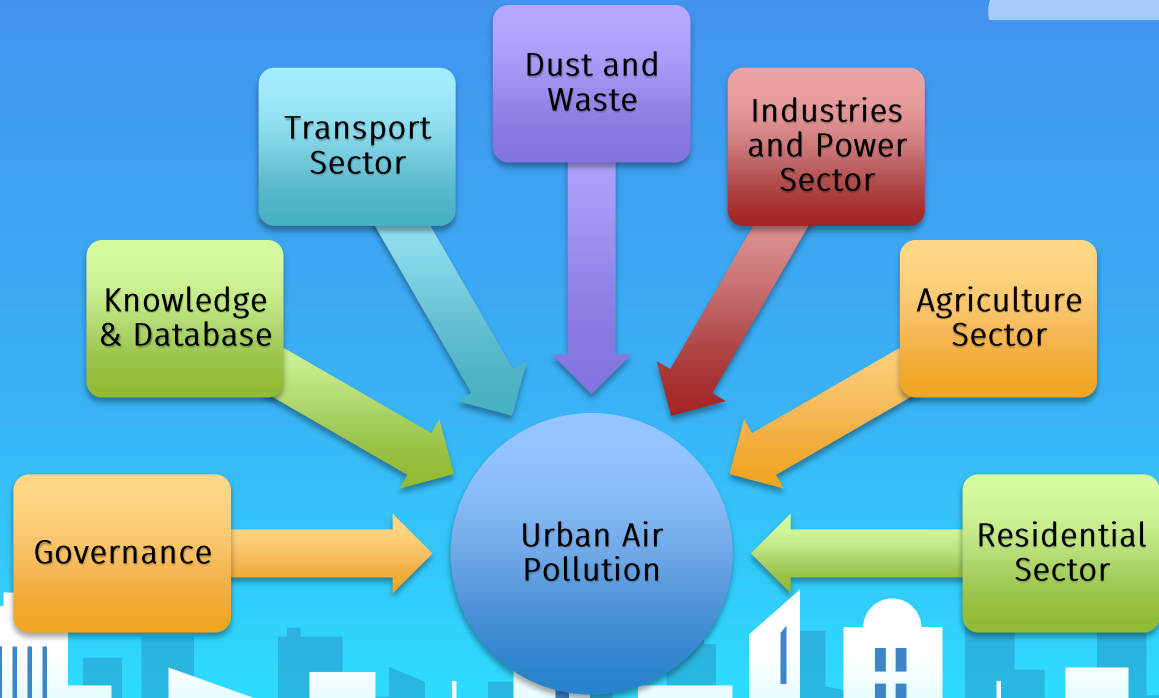
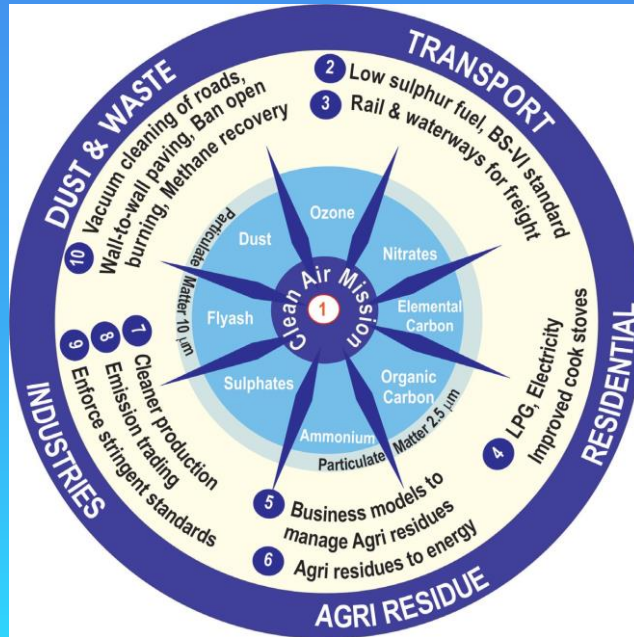
To Monitor,
Model and
Conserve the
Natural
Environment
and Resources

To curb the
Negative
Impacts of
Human
Involvement

Sustainable Development
is the core of
Environmental Technologies



REDUCING URBAN AIR POLLUTION IN INDIA



REDUCING URBAN AIR POLLUTION IN INDIA

Governance

National Clean Air Program (NCAP)

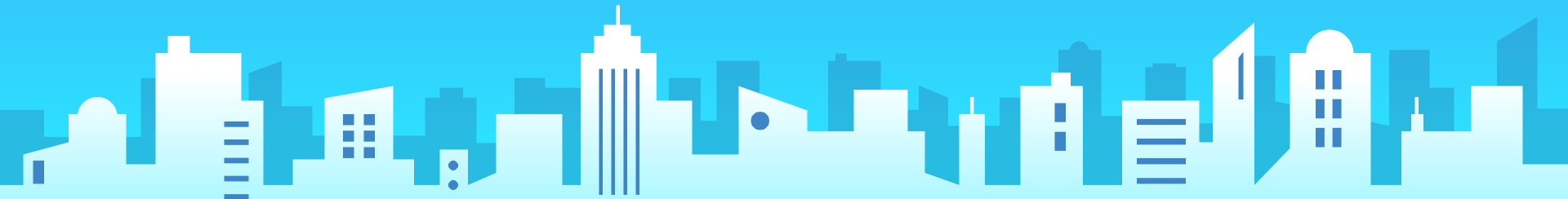
Collaborative,
Multi-scale and
Cross-Sectoral
Coordination

Institutional
Strengthening
and Capacity
Building

Dynamic and
Evolving with
time and as
information /
experiences
are available

Mainstreaming
/ Integrating of
existing &
programmes

Air Quality
Management
Including
Monitoring



REDUCING URBAN AIR POLLUTION IN INDIA

Knowledge & Database

Augment / Increase
Monitoring Stations
(Manual & Continuous)

Satellite Based and Drone
Based Monitoring

National Emissions
Inventory & Source
Apportionment

CEMS
(Real Time Air Pollution
Monitoring)

Study of International Best
Practices on Urban Air
Pollution Control

REDUCING URBAN AIR POLLUTION IN INDIA

Transport

Fuel Control



Switch to low sulphur fuel



Bharat- Stage VI Standards

Setting up low-emission zones within the city



Lowering Emissions from vehicles



Inspection & Maintenance System



Encourage Fleet Modernization



Incentivise use of Electric & Hybrid Vehicles



Strengthening public transport (both bus and rail- based)

REDUCING URBAN AIR POLLUTION IN INDIA

Dust & Waste



Wall-to-wall paving of streets, grassing / paving of open spaces



Vacuum cleaning of roads, water spraying during peak hours



Enforce ban on open burning of solid waste



Management of waste and recovery of methane from landfills



Management of Construction & Demolition Waste

REDUCING URBAN AIR POLLUTION IN INDIA

Industries & Power



Physical Planning and Zoning for Siting of Industries



Installation of CEMS for better and self-regulation



ETS – Cap & Trade for Power and Large Industries



Use of Cleaner Fuel & Improved Emissions Control System



Cleaner & Efficient Production Technologies (BAT)



Stringent Pollution Control Norms in Industries

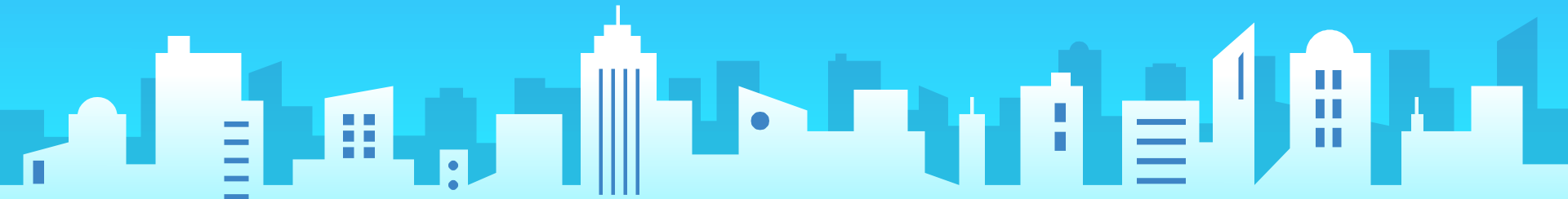
REDUCING URBAN AIR POLLUTION IN INDIA

Agriculture

New Business Models for collection, transport, and storage of agriculture residues and farm manure

Convert agriculture residues and farm manure into Energy or Electricity

Make Biomass pellets for households which depend on biomass stoves



REDUCING URBAN AIR POLLUTION IN INDIA

Residential

Shift to Cleaner
Fuels like LPG

Provide Biomass
stoves with
efficiency more
than 50%

Provide solar
powered
induction stoves

Add SO₂
absorbing
agents to fuel

THANK YOU



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