Status of Air Pollution in India & Mitigation Strategies

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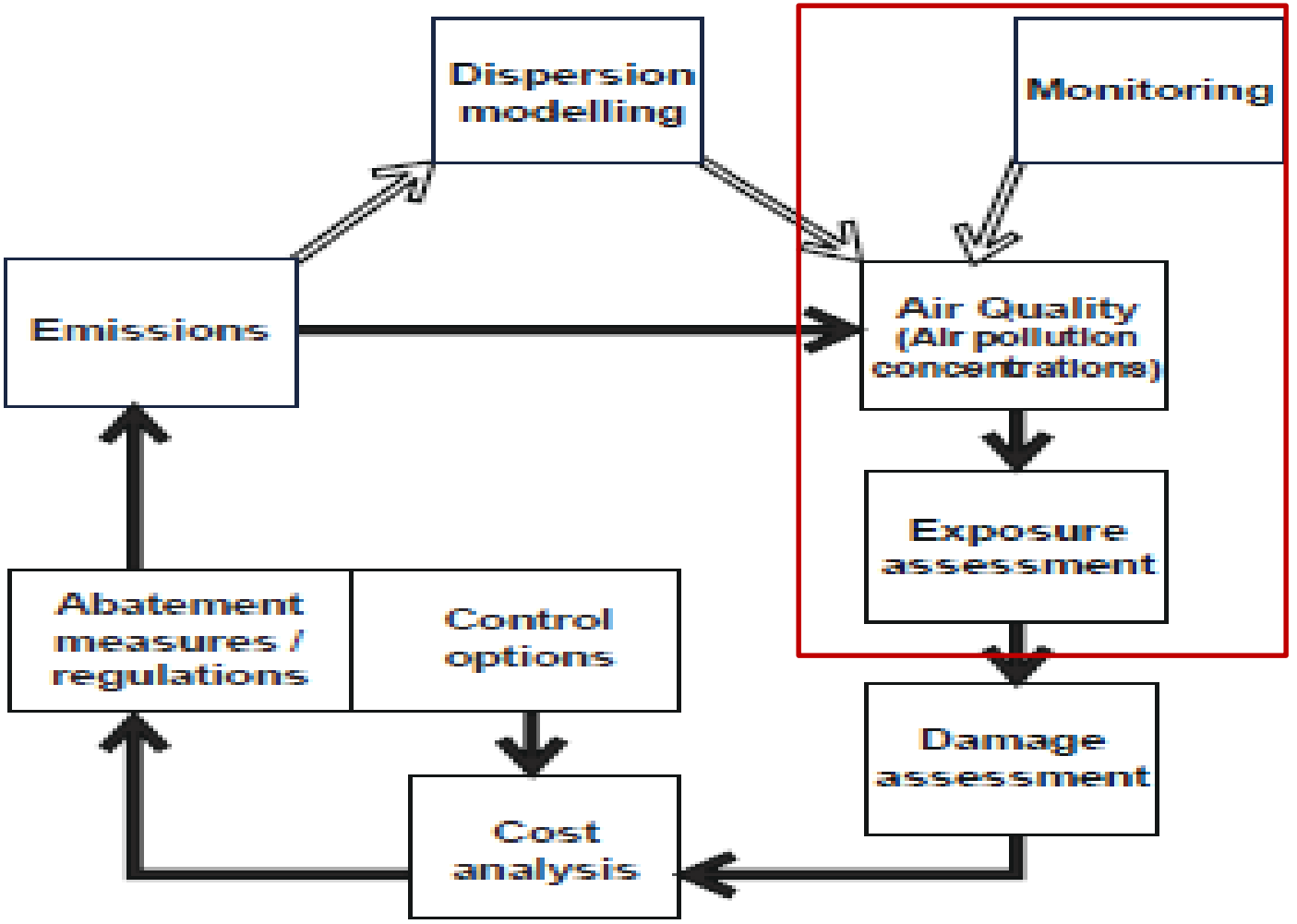
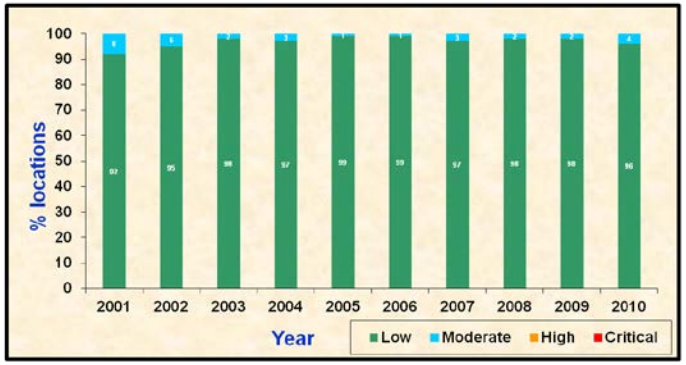
Focus of Presentation/Discussion

- **Where we stand/gaps in critically polluted cities?–Current Status**
- **What are the perceived causes/pollution sources?-Strategic planning**
- **Status of Action Taken & Results on major sources– Past Experience**
- **What we should focus more? – Way Forward**

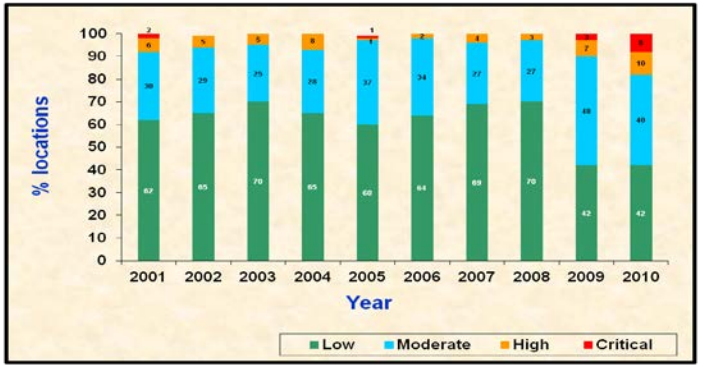
Summary of Tasks Under AQMS



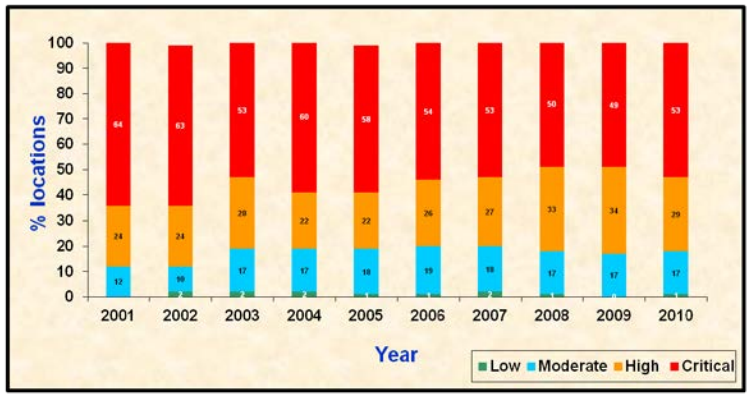
PERCENTAGE OF CITIES (RES. AREAS) WITH LOW, MODERATE, HIGH AND CRITICAL LEVELS



SO_2

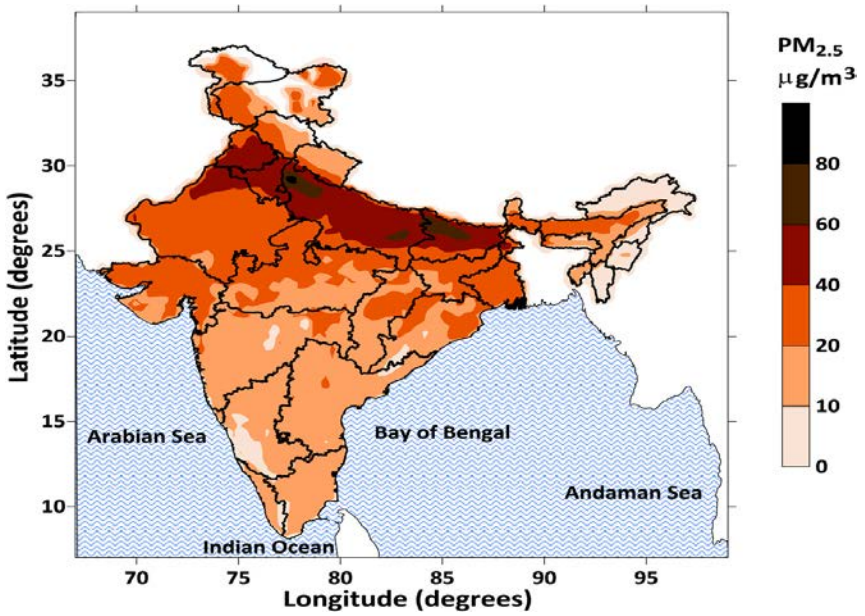


NO_2



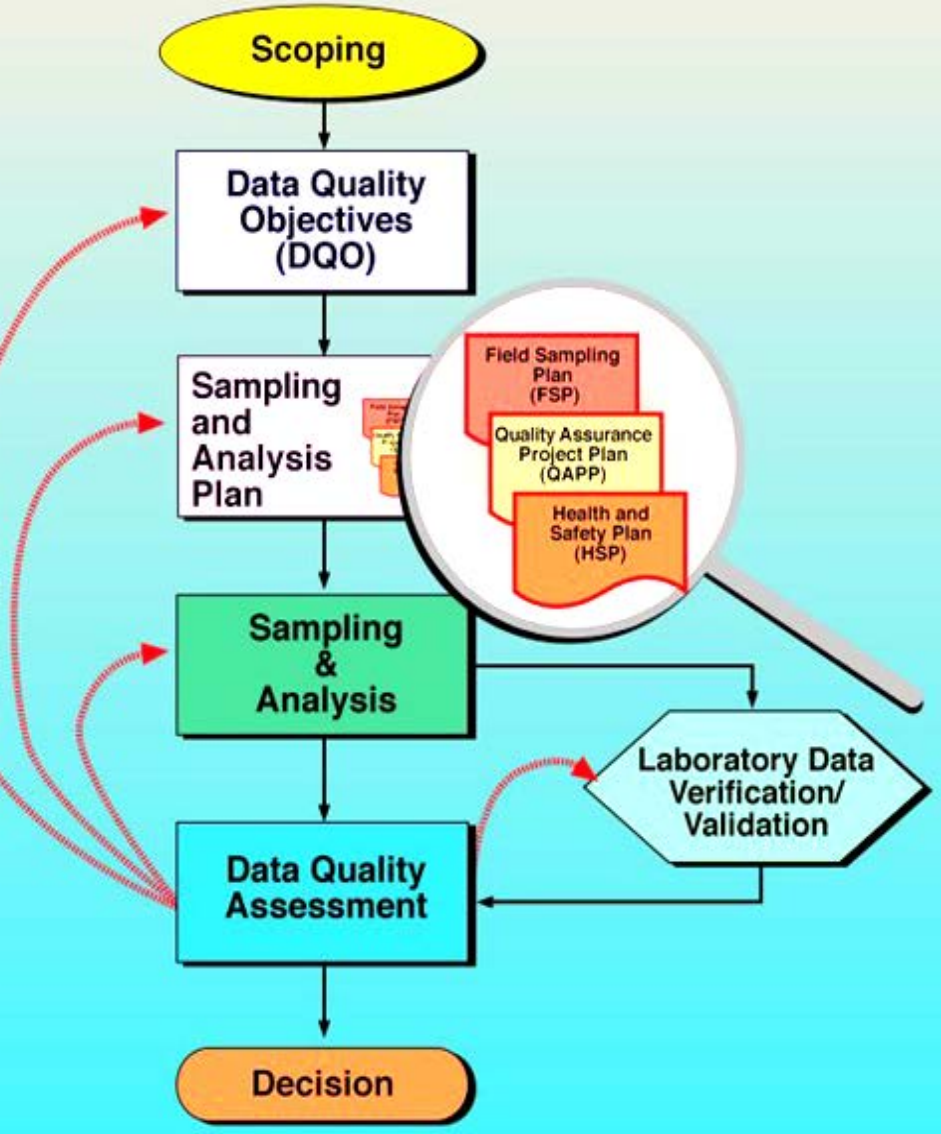
PM_{10}

- 560 operating stations covering 175 cities/towns – 700 stations sanctioned
- Parameters monitored – SO_2, NO_2, TSP, PM_{10} (at all the locations); $PM_{2.5}$, BTX, PAH, O_3, CO, NH_3 (Selected locations)
- Continuous monitoring initiated in 16 cities – 50 stations for all major parameters (including Meteorology)

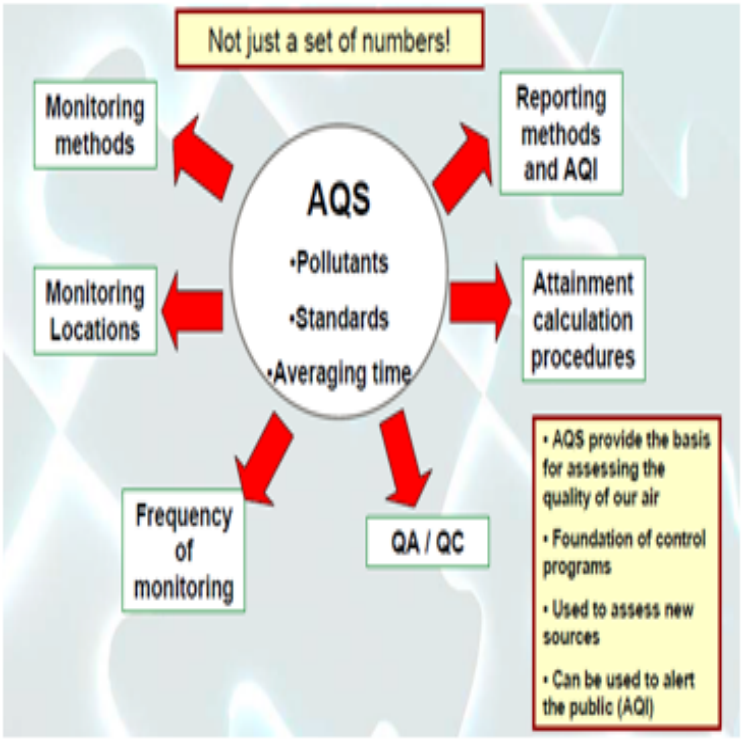


CPCB –NAQM Data Base

The Decision Process



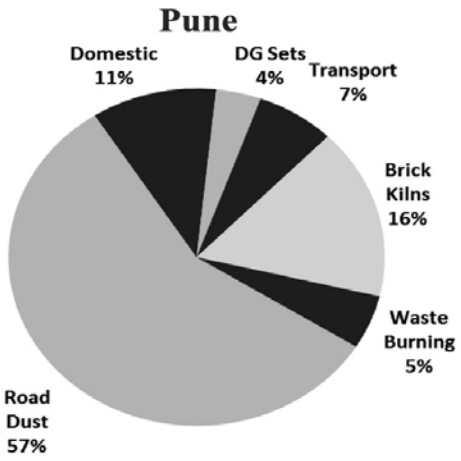
Different Tasks AQMS Required

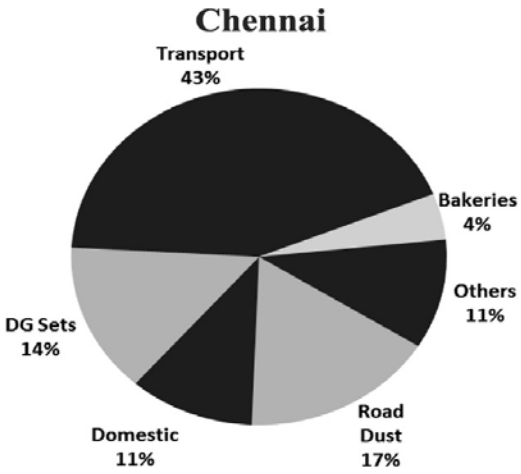


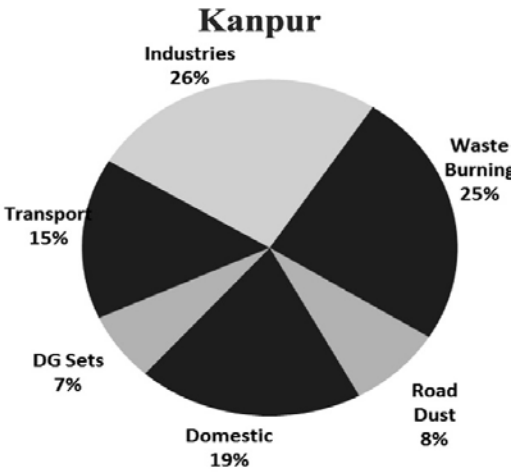
Important Requirements:

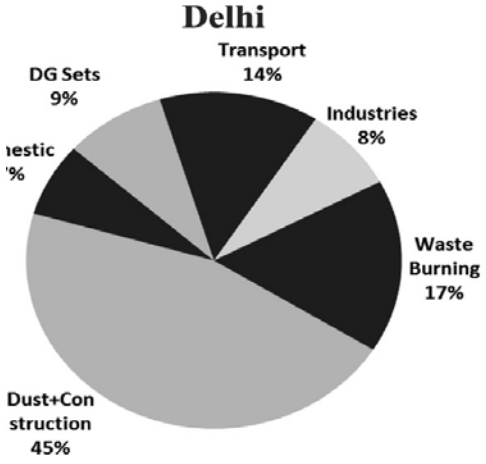
- SOPs (for networks, methods as well as Data Analysis), QA/QC etc.
- All Analyzed Data made available to public.
- Particulate analysis for toxic component (metals, oxides etc), BC, O_3 should also be made public on web site.

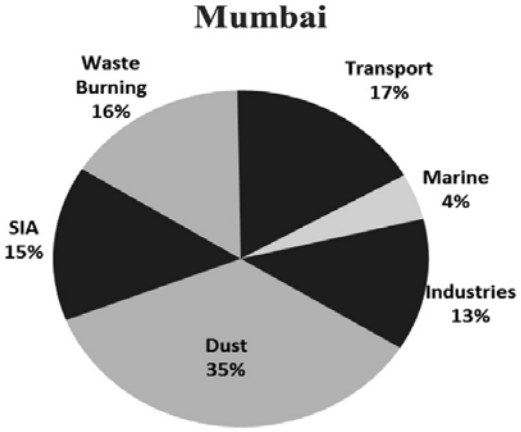
CPCB Air pollution Source Apportionment Study: 2008

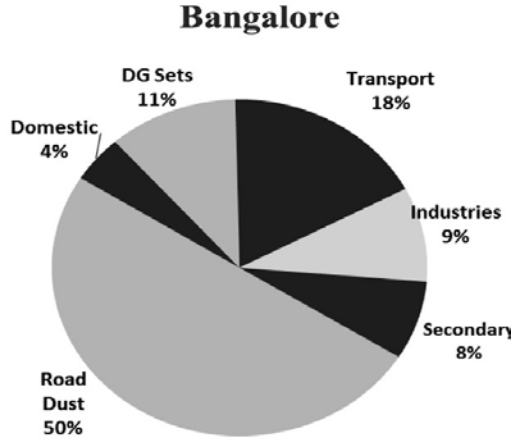










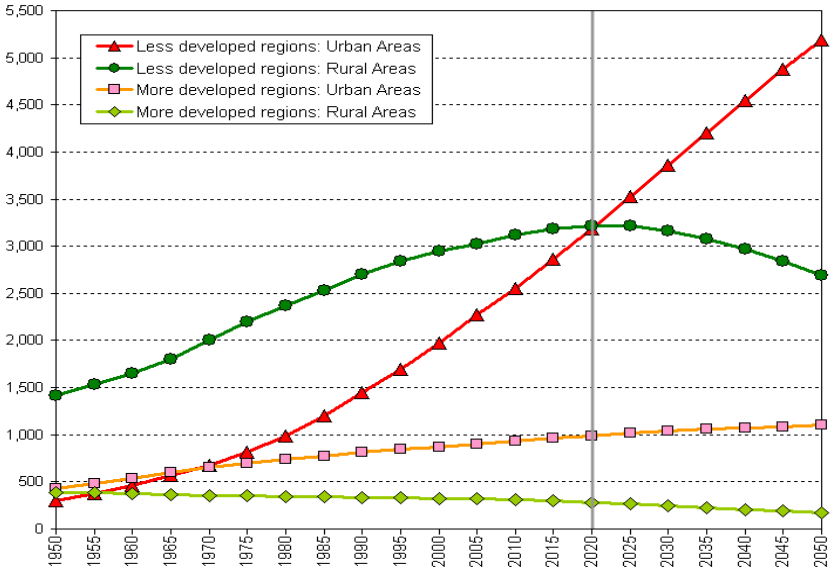


The most commonly identified sources are vehicles, manufacturing and electricity generation industries, construction activities, road dust, waste burning, combustion of oil, coal, and biomass in the households, and marine/sea salt.

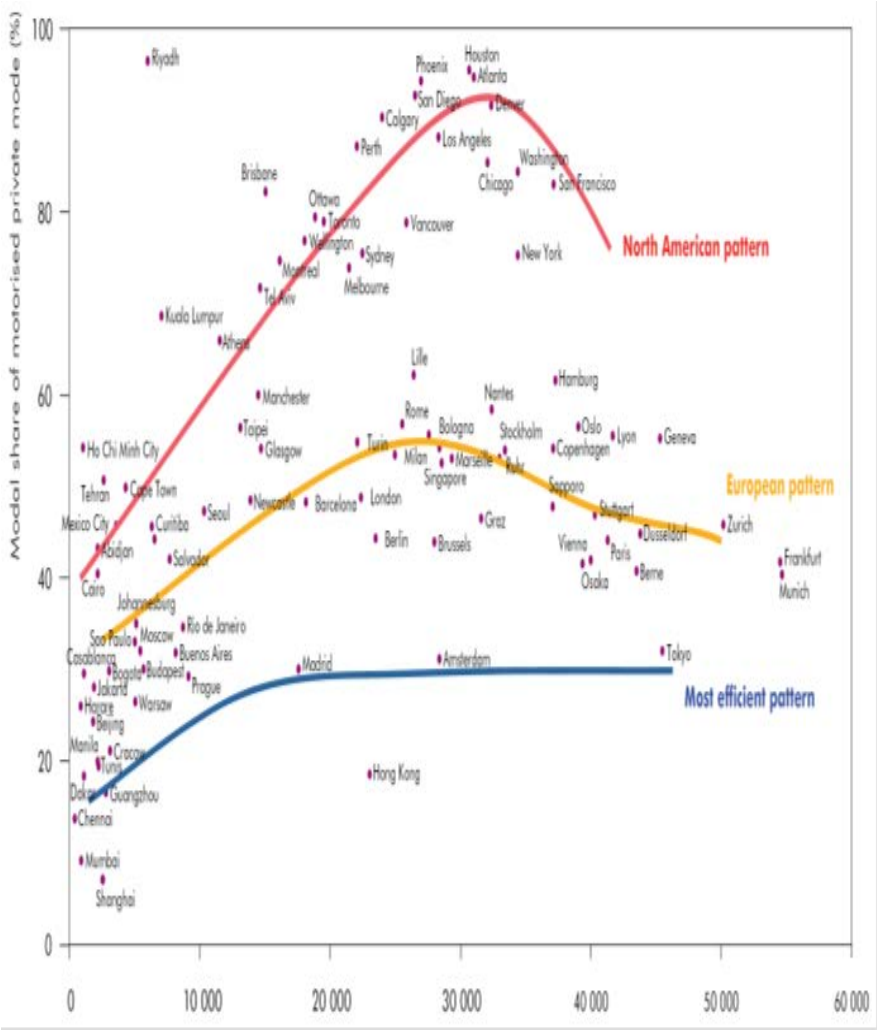
Increasing Urban Population Vs Increase in Demand

India Statistics

- **In 2011 - the population of India is 1.2 billion**
- **31% of population lives in urban areas**
- **53 cities have over a million population and eight metropolis cities (over 5 million population)**



Source: United Nations Population Division, World Urbanization Prospects, The 2009 Revision



Sources of Air Pollution & Mitigation Measures

Indian Urban Centres (eg. Delhi) are facing the similar problems of very high AP as other different cities faced at different point of time For example US had experienced similar situation between the 1940s and the 1970s (LA example) or China about 10-15 years ago.

Typical solutions/actions taken are as mentioned for different cities –Delhi needs all of them.

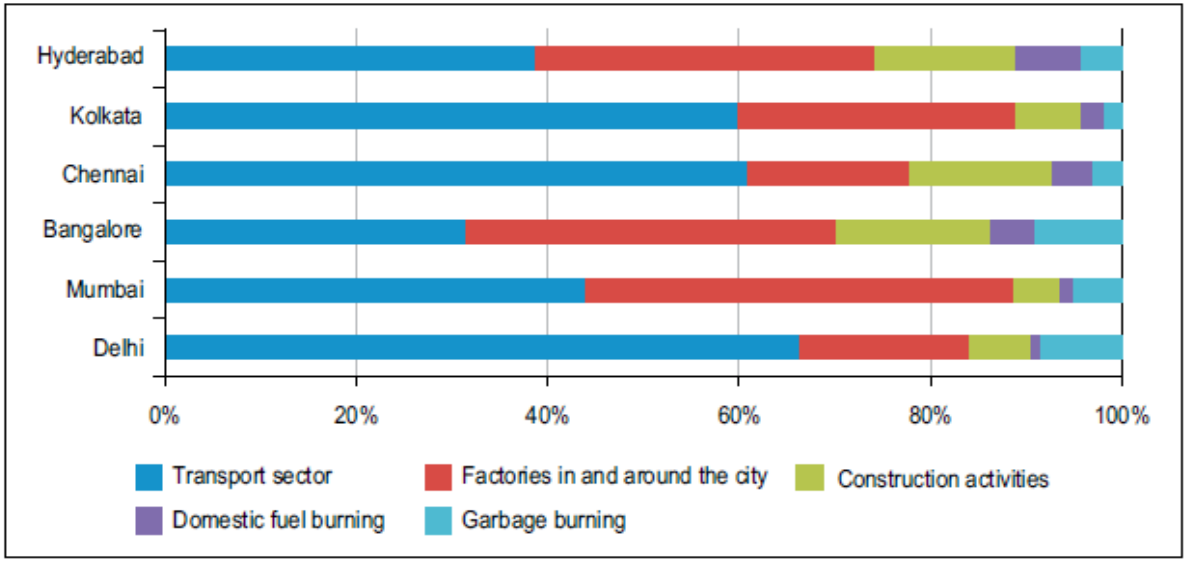
WHO Projection

The World Health Organization estimates that of the 67 risk factors studied in their Global Burden of Disease project, outdoor air pollution ranked 5th in mortality and 7th in health burden in India, contributing to 627,000 deaths and 17.7 million healthy years of life lost in 2010. The World Health Organization also found that thirteen of the twenty most polluted cities in the world are in India, with New Delhi at the top of the list.

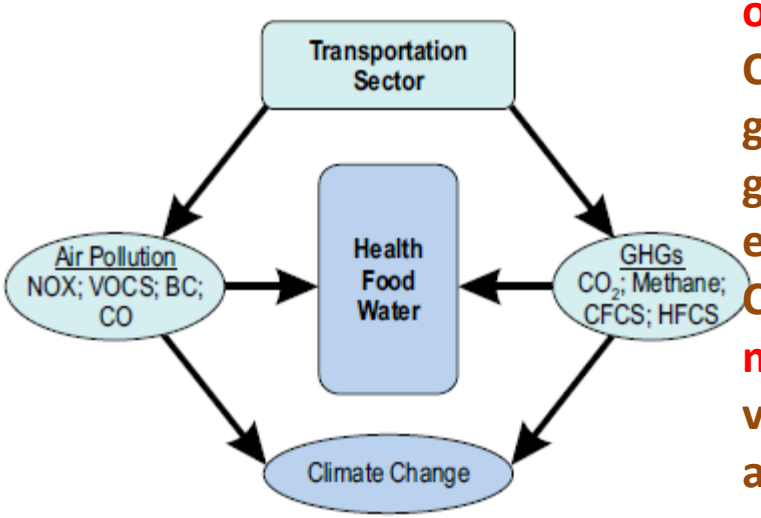
But the Scientific Question Emerge are:

- **Is the toxic fractions in PM_{10} and/or $PM_{2.5}$ for WHO study and Indian Scenario is comparable?.**
- **What are the correct air pollution loads to atmosphere from different PM sources?**
- **Relationship between ambient concentration to sources and exposure.**
- **What are health impacts and cost to population vs exposures quantum assessment.**

Sectors Perceived By Indian Population to be Contributing to Air Pollution



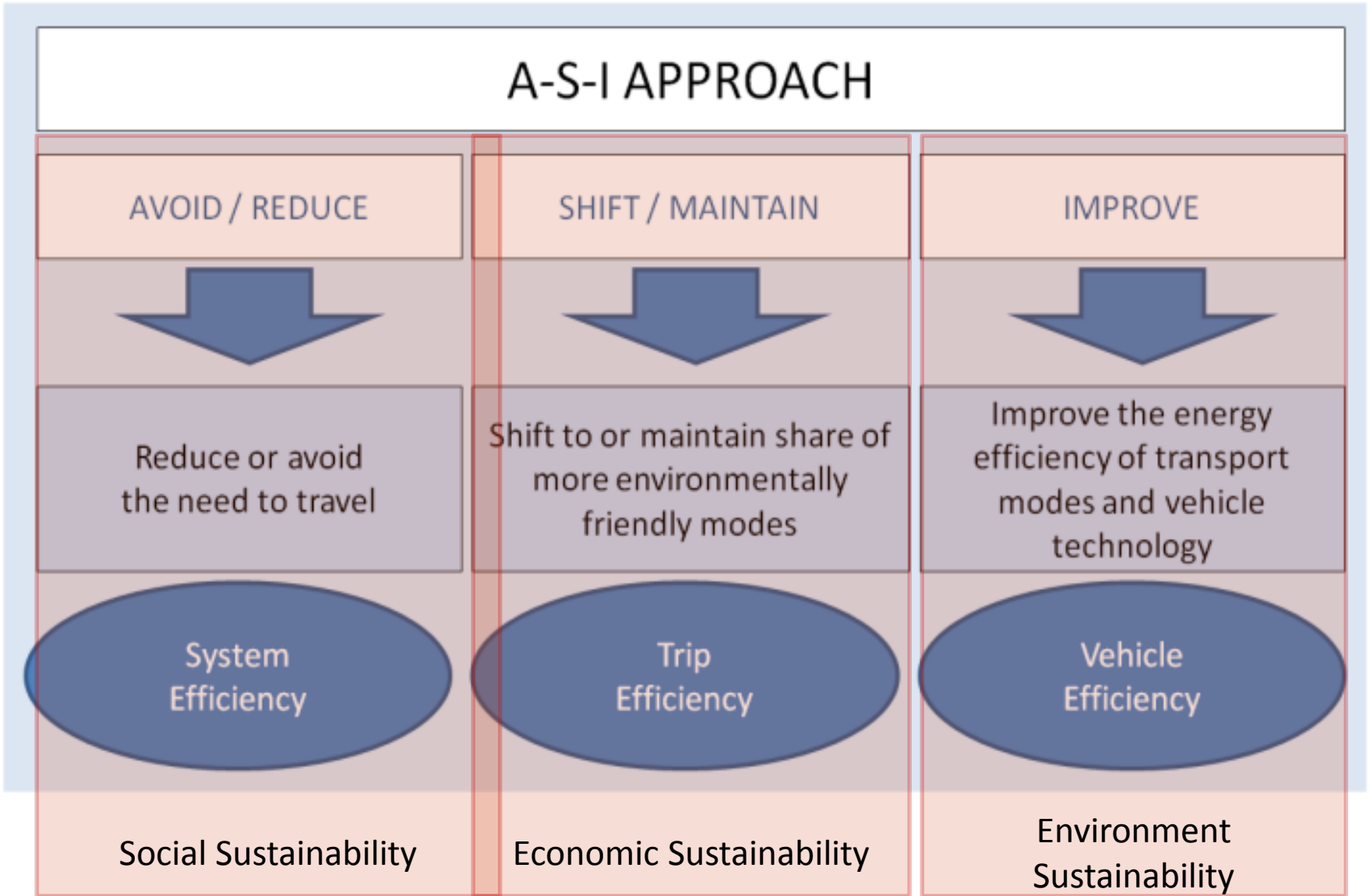
per cent of people listing activity as one of the top two contributors to air pollution in city
- (TERI 2013)



Globally, the transport sector accounts for 28 per cent of final energy demand, and emits 6.6 Gt (giga tons) of CO_2 out of the 35 Gt from fossil fuels with the highest its growth .The other major GHGs (greenhouse gases) emitted by this sector is methane (fugitive emissions from natural gas processing and delivery), CFCs and HFCs) and at current rates can contribute as much as 0.1 °C by 2050 and 0.5 °C by 2100. Diesel vehicles are one of the major sources of black carbon aerosols, which is an SLCP. (CAMP (USA) 2014)

Sustainable Management of Transport Emissions

A-S-I Approach Instead of 3-R (which is true for Industrial/Combustion Sources) for Demand Side as well as Supply Side Management



Status of Demand Side Management & Trip Efficiency

Mitigation strategies & Status on Demand Side Management & Trip Efficiency

Examples

- **Non Motorized Transport:**

Walk and Cycle infrastructure are either missing or being misused

- **Support Public Transport**

Public Transport is inadequate in quality and quantity, last mileage connectivity is poor & expansive

- **Transport Centric Urban Planning**

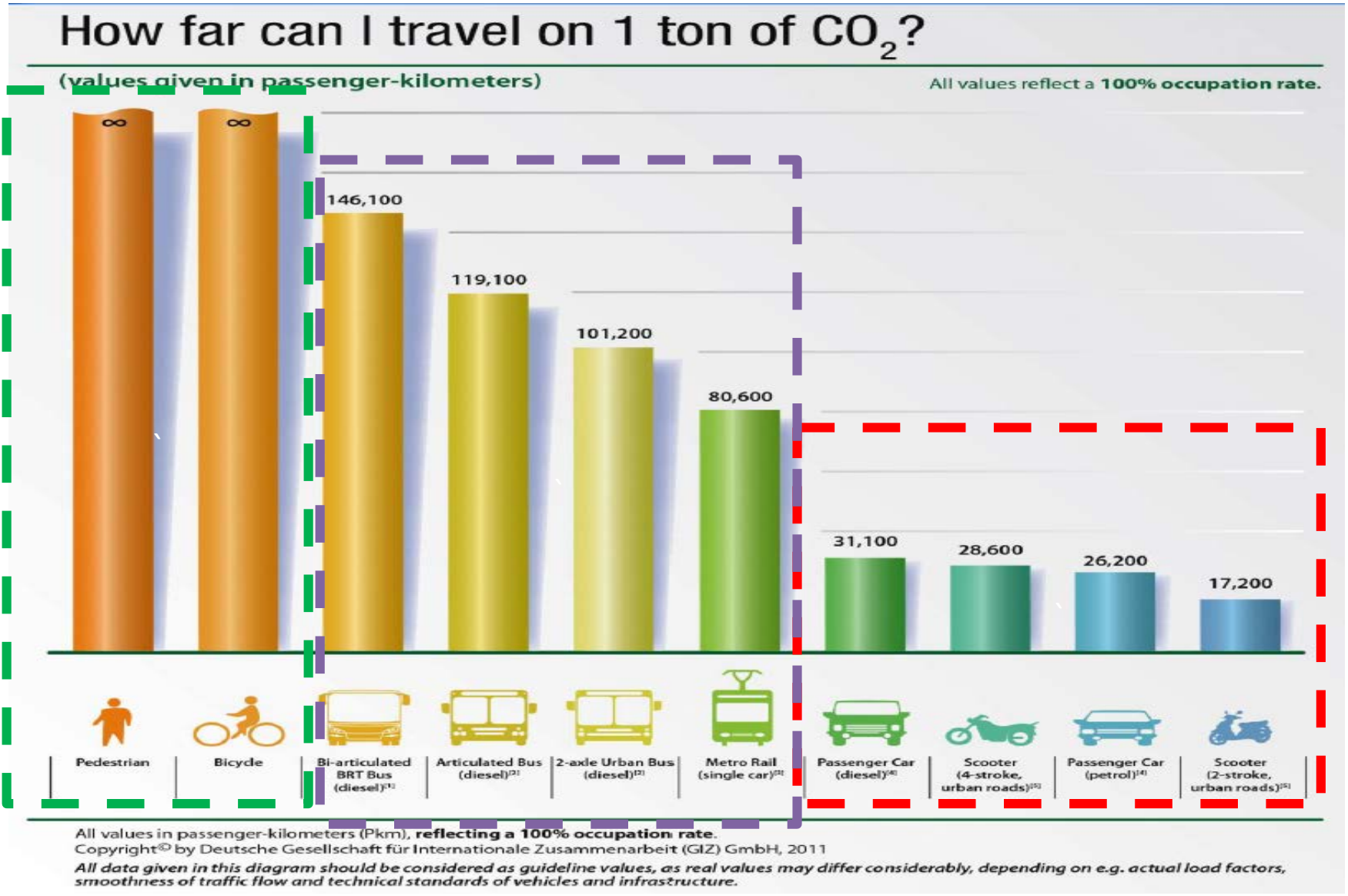
Such a land use planning is limited, no comprehensive/effective parking policy, inter state transport of goods/material is diesel based and also not efficient

Targeting air pollution emissions from the transportation sector has huge benefits for human health, water and food security as well as mitigating climate change because in India the transport emissions (black carbon and ozone are resulted from this sector and have very short life times - weeks to months) but are important contributors to global warming.

Sustainable Transport Management: Emission Efficiancy

Norms	Year of Implementation
Bharat Stage VI (Euro VI)	2020
1998 (Cat. Convertor Norms)	1998
Bharat Stage I (Euro I)	1999
Bharat Stage II (Euro II)	2001
Bharat Stage III (Euro III)	2005
BharatStage IV (Euro IV)	2010

Relative GHG Emissions from different Transport Modes



Link between Air Pollution & Climate Change : Different Transpor Modes

	Local Air Pollution	Greenhouse Gas Emissions
Reduce motorised travel	↓	↓
Modal shift from cars/motorbikes to buses/rail	↓	↓
Improve vehicle efficiency	↓	↓
Improve fuel quality (*e.g.*, lower sulphur)	↓	↑
Add oxidation or 3-way catalyst	↓	↑
Improve vehicle maintenance	↓	↓
Switch to CNG	↓ to ↓	↓ to ↑
Blend ethanol	↓ to ↑	↓ to ↑

Source: Fulton, 2006

Legend: ↓ Green arrow: positive change, reduction in emissions. ↑ Red arrow: negative change, increase in emissions.

What are the Different Air Quality Management Strategies

Strategies	Cost	Simplicity	Enforceability	Flexibility	Adaptability
Air Quality Management	Good	Poor	Fair	Fair	Fair
Emission Standards	Terrible	Excellent	Excellent	Poor	Fair
Emission Taxes	Fair	Excellent	Excellent	Unnecessary	Good
Cost-benefit Analysis	Excellent	Terrible	Unknown	Unknown	Good

Issues:

- **Currently Indian Air quality Management Strategy is based on Emission Standards where as decisions taken are based on Ambient Air quality Measurement but the correlation/impacts between these two is missing or inadequate.**

Ambient Air Quality Management Strategy

- **It is costly but comprehensive and is based on Bottom UP Approach.**

We should have Good Emission Inventory Studies or Source Apportionment Studies

Thank you