



## **Vehicular pollution: case for an effective roadmap**

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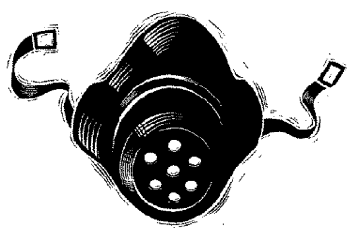
*Workshop on vehicular air pollution and its  
impact on human health*

MOEF, CPCB, EPCA and ICCT  
New Delhi, September 1-2, 2011





A quick recap from the last conversation....



# Clean air action has taken roots in our cities.....



## On vehicles

- Introduced low sulphur fuels and petrol with 1 per cent benzene
- Mandated pre-mix petrol to two- and three-wheelers
- Moved from Euro I to Euro IV over the last decade
- Implemented largest ever CNG based public transport programme
- Capped the number of three-wheelers
- Phased out 15 year old commercial vehicles
- Strengthened vehicle inspection programme (PUC)
- Efforts made to divert transit traffic
- Set up independent fuel testing laboratories to check fuel adulteration

## On industry

- Relocated polluting units
- Tighter controls on power plants. No new power plants.

## Air quality monitoring

- Adopted new ambient air quality standards
- Expanded air quality monitoring and reporting

## Other sources

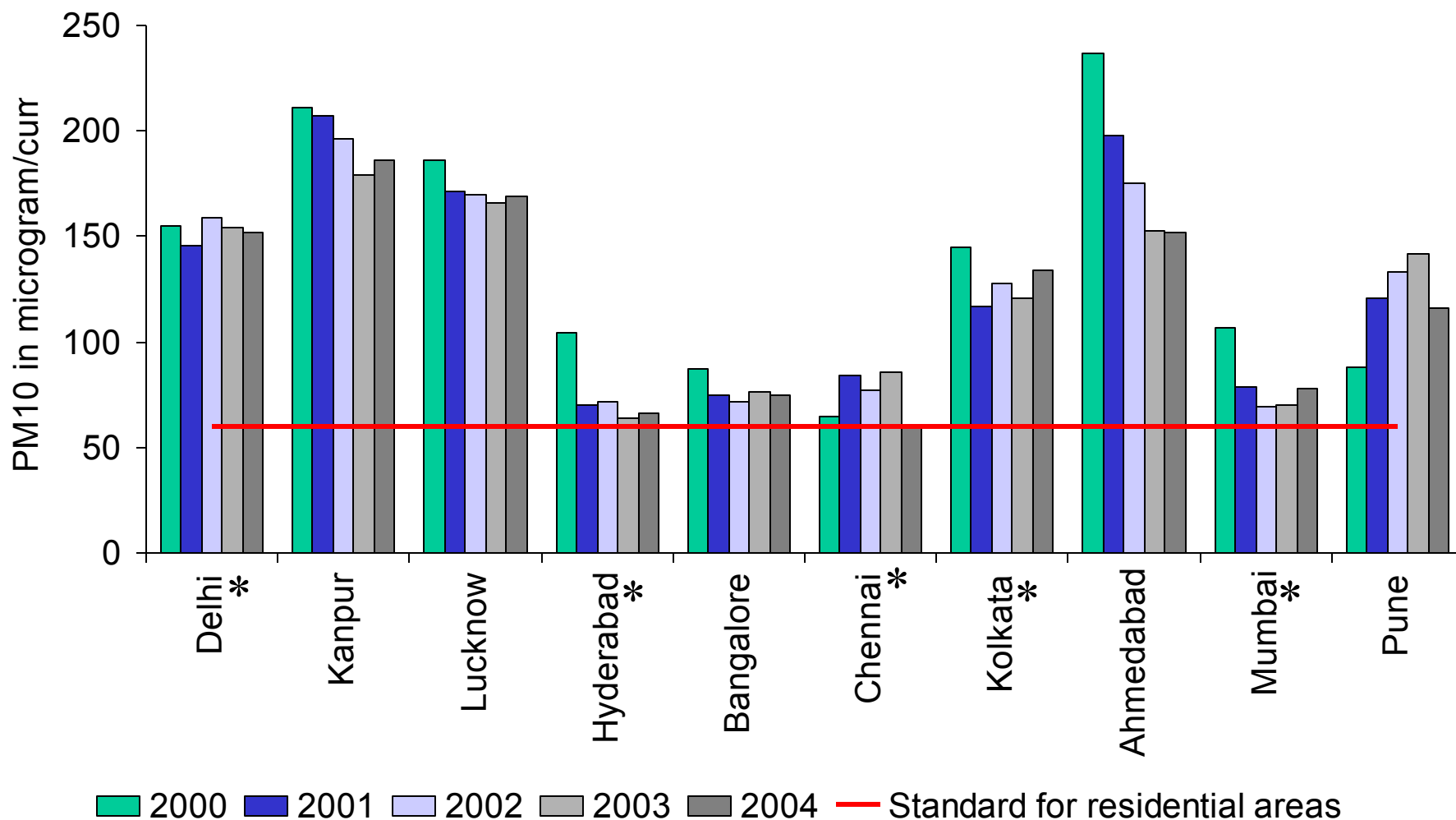
- Emissions standards for generator sets
- Ban on open burning of biomass

**This now needs scale and stringent enforcement**



## Evidence of action: Health Benefits

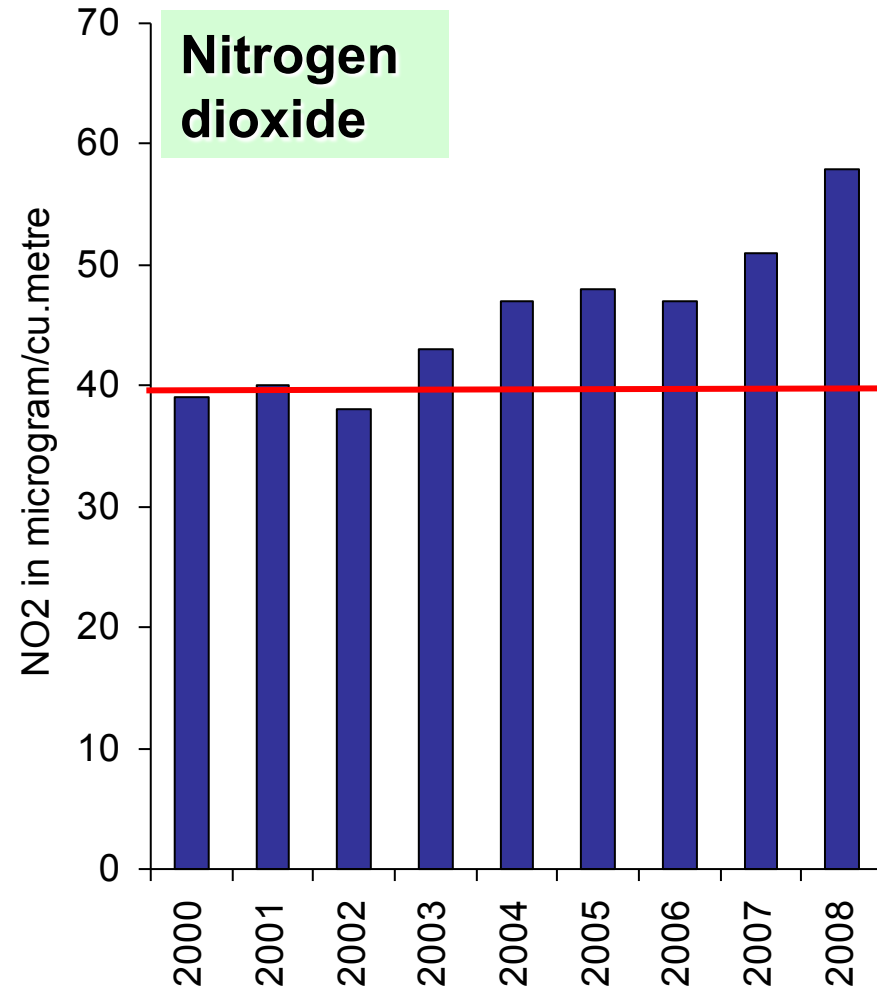
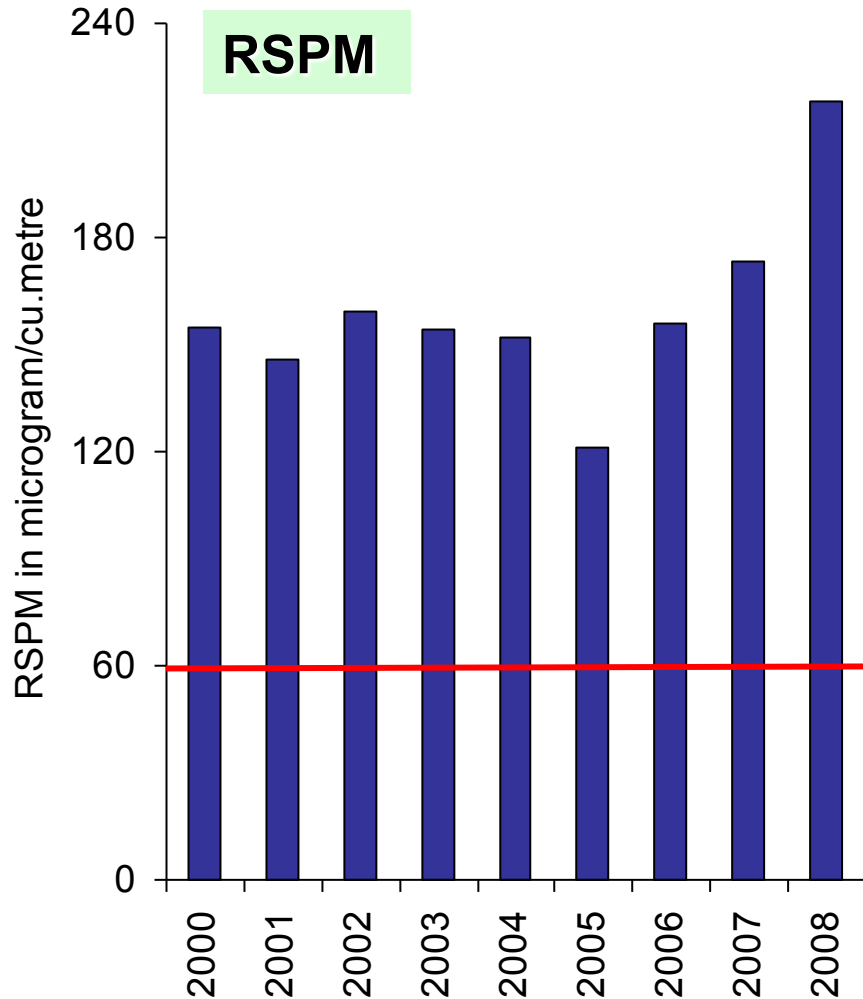
**Downward PM10 trend in five cities\* have led to 13,000 less premature deaths and reduction in respiratory illness<sup>1</sup>**





# Reversal of gains....

After a short respite pollution curve turns upward



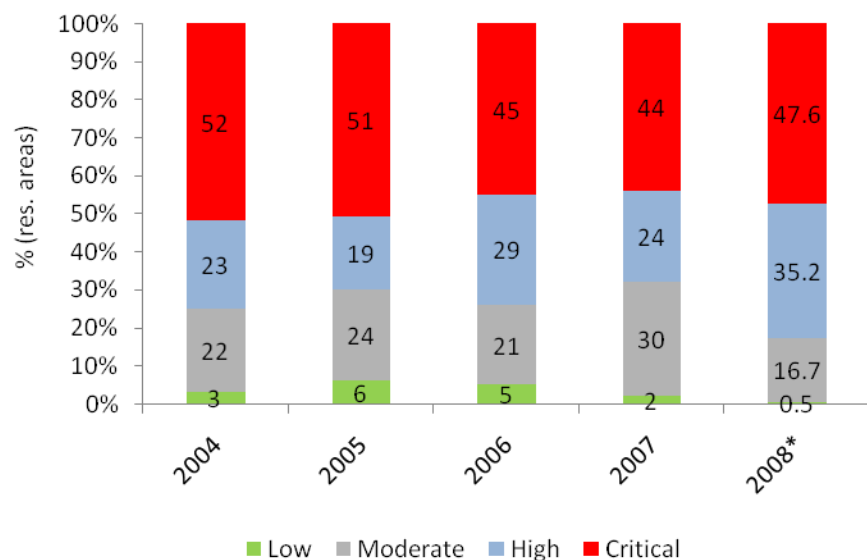


## Growing concern in other cities



### Status of PM10 levels

**Nearly half of the cities (residential areas) are critically polluted**

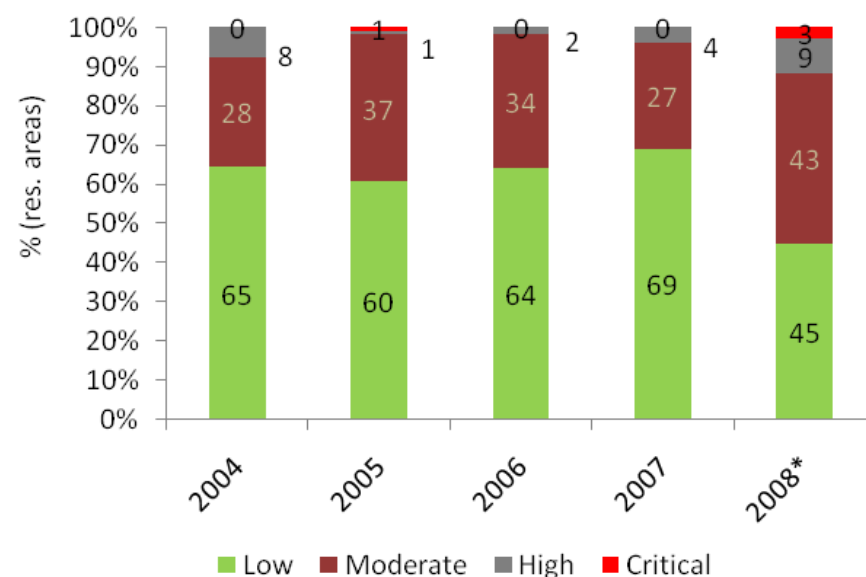


Note: \* From 2008 onwards new standard of 60 microgram per cubic metre has been applied

Source: Based on CPCB air quality statistics

### Graph: Status of NO2 levels

**NO2 is an emerging threat in many cities**



Note: \* From 2008 onwards new standard of 40 microgram per cubic metre has been applied

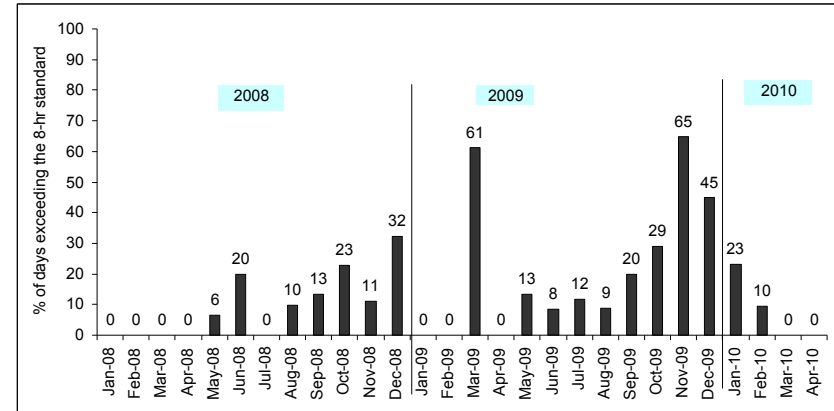
Source: Based on CPCB data



# New risks in our cities



Percentage of days exceeding hourly Ozone standards (Siri Fort, 2008-2010)

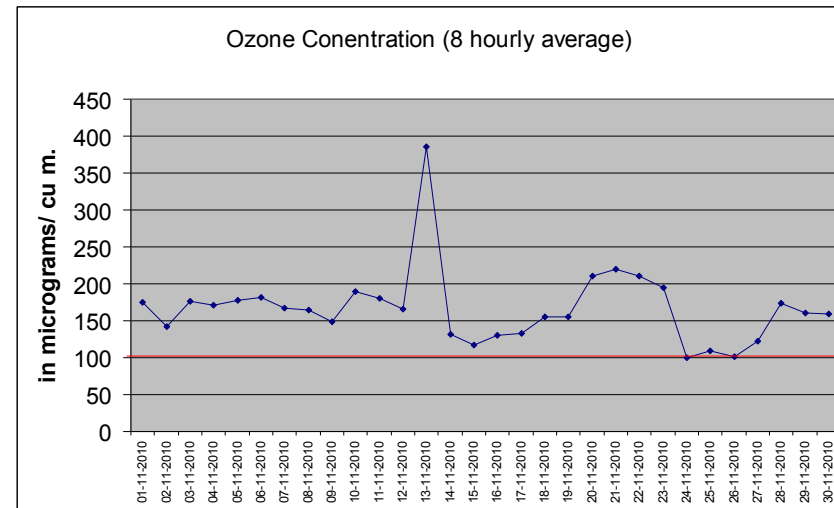


## Ozone: emerging threat

Ozone is particularly harmful for those suffering from respiratory and asthmatic problems, and those involved in outdoor activities

Even short duration exposure can be very harmful

**Out of 30 days in November, 2010 the 8-hourly average of ozone exceeded standard on 28 days in Civil Lines**

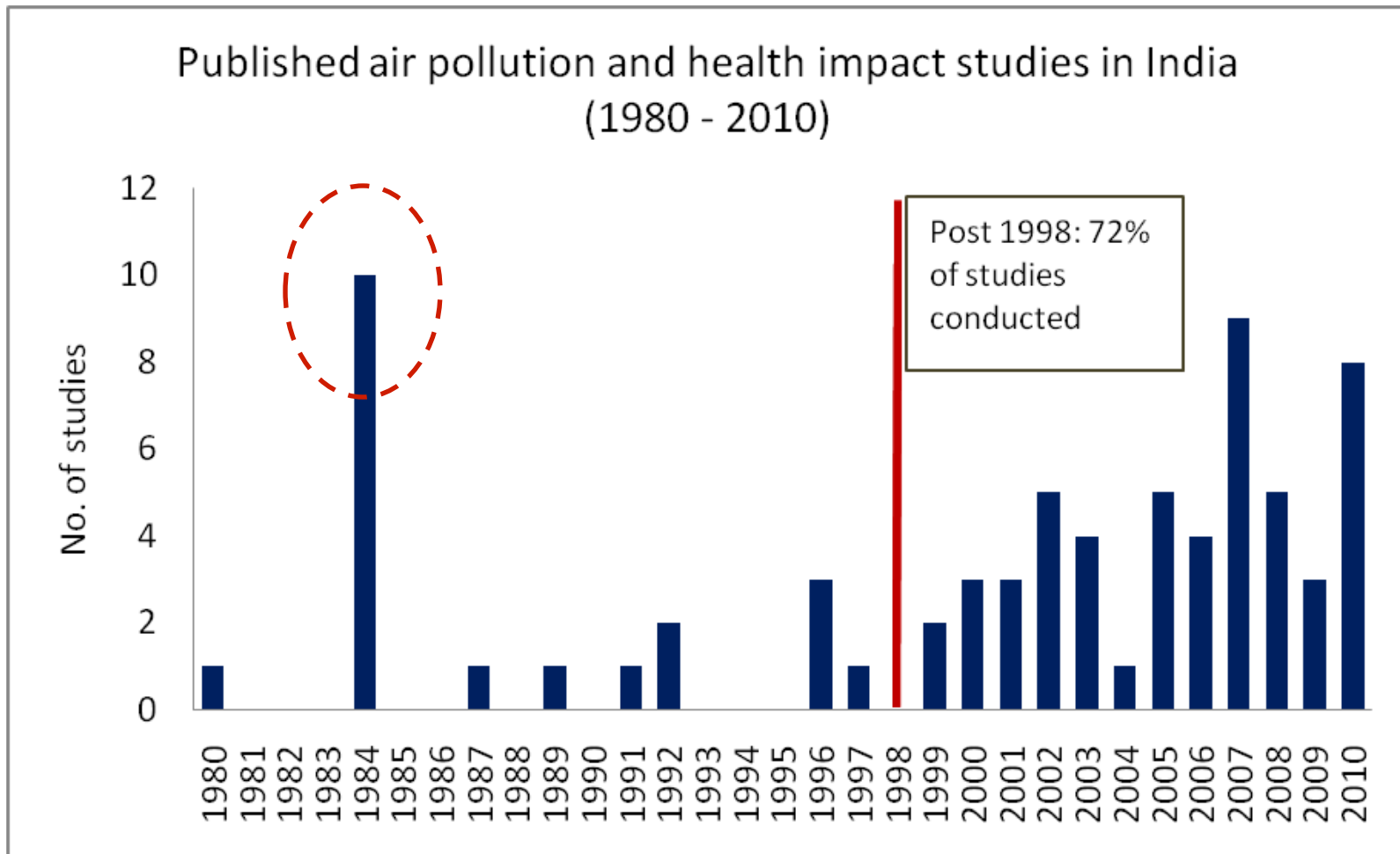


Source: CSE analysis based on CPCB/DPCC air quality data





## Mounting health evidences in our cities..



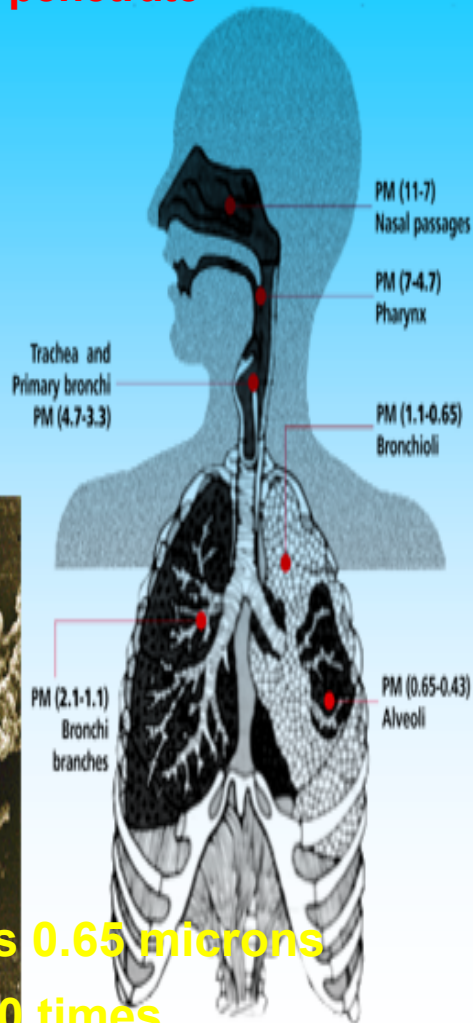




# Tighter benchmark for clean air.....



**How far tiny particles penetrate your lungs**



**Ultrafine particles 0.65 microns**  
**Magnified 200,000 times**

**India has tightened national ambient air quality standards**

- New PM10 standards increased the number of critically polluted locations from 123 to 176
- New NO2 standards have brought 17 locations in critical rank as opposed to 6 earlier; highly polluted locations have increased from 13 to 41.
- Critically polluted residential locations for NO2 have increased from none to 8, and highly polluted from 8 to 20.

**Particulate matter: Special worries:**

WHO says -- no evidence of threshold or safe level -- Recommends eliminating extreme cases of high pollution and reducing average exposure levels for people.

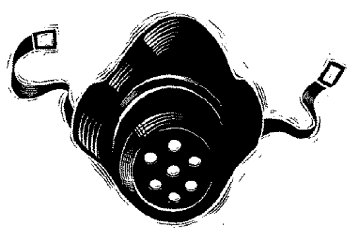


The post 2010 emissions standards roadmap will be framed in this context

In 2003 the Auto Fuel Policy was framed for the first time to give a roadmap until 2010...

But why 2011-12 will be different from 2003?

**Can public health be an effective driver for the stage 2 Auto Fuel Policy?**



## How did the system respond to health information last time?...



- The initial TOR for the 2003 policy did not even include ‘*health*’ . Added post facto....
- Over emphasis on “*very large uncertainties*” in health studies....
- Health effects of PM understated -- “*Much less certain are the extent to which primary PM10 from road transport is responsible for the health effects of PM10. (P 95).*” ....
- “*....future large cuts in particulate matter from vehicles may have small impact on PM10 concentration except those immediately adjacent to the busiest roads.*” (P 92).
- Problem of diesel emissions understated --- ‘*weak evidence on both cancer and non-cancer effect....*’ limited to “*occupational exposure*” ...
- “*Available studies indicate that vehicular emissions are one of the causes of for respiratory and ocular ailments and organ systems. But the studies do not establish a cause and effect relationship between pollutants and health.*” (P 99)
- No cognizance of the global evidences from the large scale studies in



## The roadmap was not expected to make a difference.....



The studies carried out for the Auto Fuel Policy projected that –

*“If the business as usual was allowed to continue till 2010 the pollution load from vehicles would remain virtually the same as in the base year (2000). This inspite of the estimated increase of about 50% in traffic loads.”* ....Because old vehicles will be replaced with new vehicles.....



## Yet the Supreme Court responded differently .....



### The Supreme Court takes on board the health information.....

April 5 2002 order – *“During the course of argument literature was filed in court giving data from cities from all over the world which co-relates increased air pollution with increased cardio vascular and respiratory disease and also show carcinogenic nature of RSPM...”*

Most significant is the recognition of the American Cancer Society study published then. It states –

*“JAMA has published in recent issue (2002) the finding of the study involving over 500,000 people – conducted over 16 years in different cities of the US – their research indicate with an increase of every 10 microgramme per cum of fine particles the risk of lung cancer increase by 8%.”*





# The Supreme Court addressed the vulnerable.....



## Children.....

*“...increase in respiratory diseases especially among the children should normally be the cause of concern for any responsible government .....*”

***“.....children do not agitate or hold rallies and therefore their voice is not heard....”***

*“... the only concern of the government appear to be to protect the financial health of the polluters...including the oil companies who produce low quality of petrol and diesel at the cost of public health....”*



## 2001: clean fuel was defined by the Supreme Court.....



July 1998 order: move buses, taxis and autos to CNG or clean fuel .....

2001: Supreme Court said --- The committee may submit a report to this court ..... *Indicate as to which fuel can be regarded as “clean fuel” which does not cause pollution or is otherwise injurious to health...*

EPCA submission July 2001: Listed “environmentally acceptable fuels” -- that included – “*ULSD with 10 ppm sulphur and low PAH content will be significantly less polluting provided it is used with particulate trap and cat converter – but take measure that it does not get adulterated..*”

“... *Euro II fuel only a transitional fuel for a limited period. This period should be as short as possible because of adverse health effect...*”





What will happen this time?

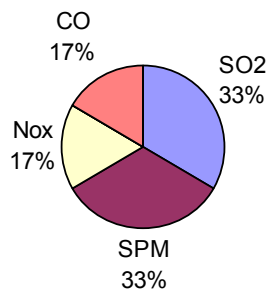
How will the emerging health concerns set the terms of action...



More health evidences in cities.....

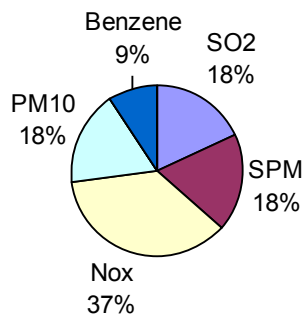
Studies have targeted wider range of pollutants.....

**1990**

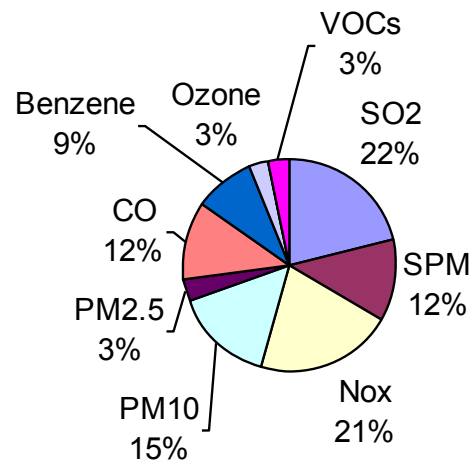


Source: CSE

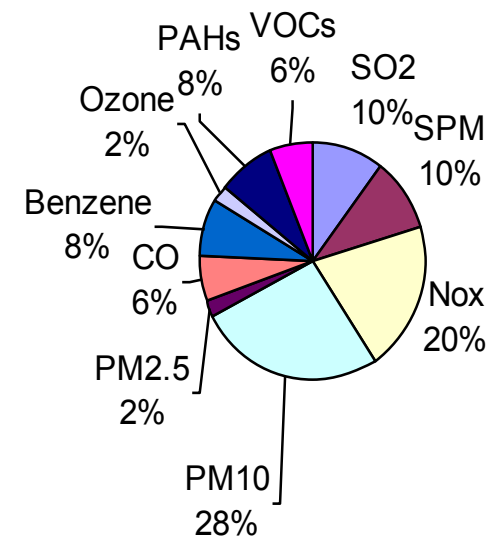
**2000**

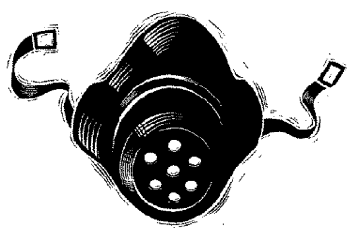


**2005**



**2010**

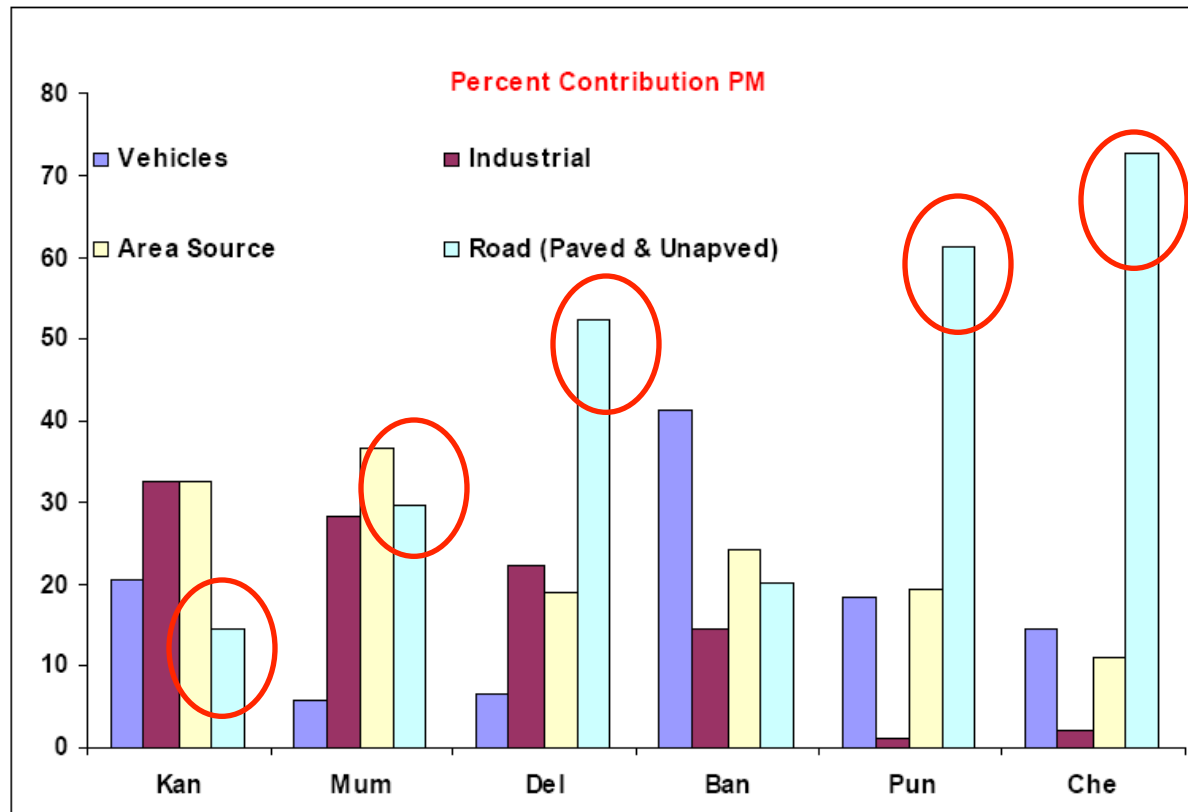




# Six cities have generated their own data on how much each source contribute This was mandated by Auto Fuel Policy

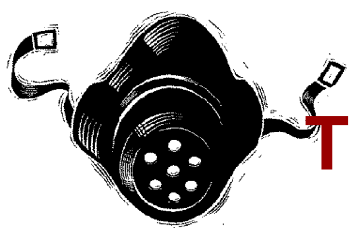


But road dust is the blinding evidence....



Source: MOEF

Figure 4.3: Prominence of Sources of PM<sub>10</sub>



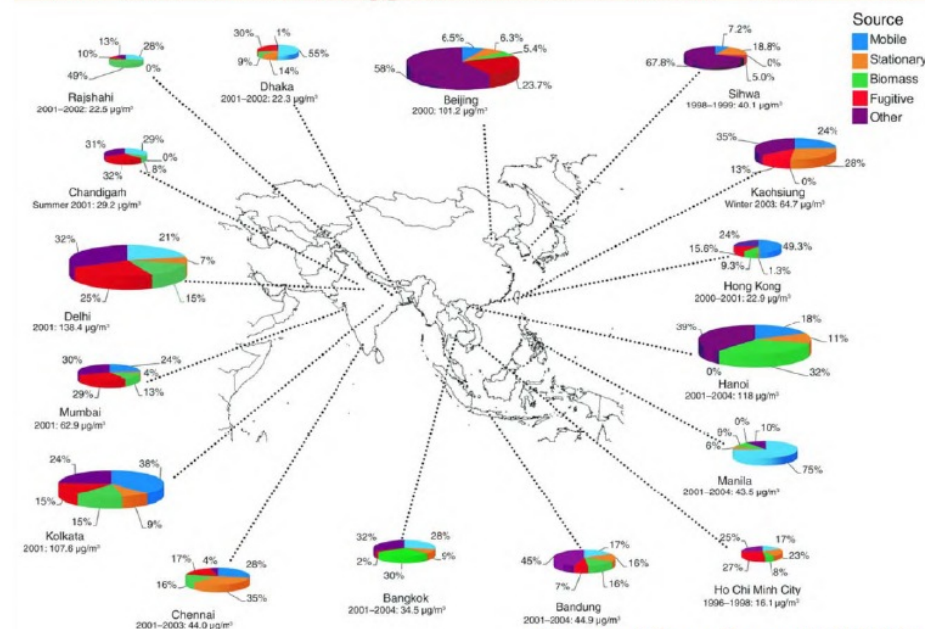
# There are other estimates as well



Pollutant	Transport	Industry	Domestic & others
CO	76-90	37-13	10-16
NO <sub>2</sub>	66-74	13-29	1-2
SO <sub>2</sub>	5-12	84 -95	Nil-4
PM	3-22	74-16	2-4

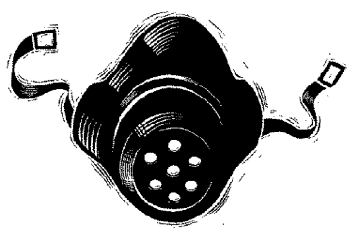
Source: CPCB

## Asia PM 2.5 Source Apportionment: Vehicles ~20% - 35%



Central Pollution Control Board has compiled the results of various studies on relative contribution of pollution sources. Found:

- Vehicles contribute most of CO; maximum NO<sub>x</sub> and a lot of PM.
- Industry and power plants are the major sources of SO<sub>2</sub> and PM



## Roadmap will have to address the next generation health concerns



- **Mounting and irrefutable evidences** on illnesses and premature deaths from the rapidly growing body of Indian studies as well as the global studies .....
- **Multi-pollutant crisis**..... finer PM, NO<sub>x</sub>, ozone and VOCs.....
- More health end points of air pollution**-- looking beyond lungs to other health end points .... to a range of NCDs.....especially as NCD burden is exploding in India (ICMR, World Bank, WHO,.....)
- **Growing toxic risks**....rapidly growing cancer burden and the concern over environmental health risk.....
- **Mounting evidences on vulnerability of children and poor**....
- **What and how much do we inhale**....
  - New research in Delhi from University of California, Berkeley: Commuters breathe far more harmful particles inside vehicles -- PM<sub>2.5</sub> concentrations inside vehicles can be 1.5 times higher than the ambient air ... short-term peaks can go above 1000 microgramme per cum – nearly 16 times the daily limit.
  - Health Effects Institute on Delhi: About 55% of Delhiites live within 500 meters from arterial roads that is the direct influence zone.....
- Account for health costs and benefits of policy interventions... other governments are doing this**.....



# Challenge of mobility crisis



Need technology  
leapfrog  
-- Quickly phase in  
clean cars, two-  
wheelers, buses,  
trucks to cut  
emissions  
drastically....

And

Mobility management  
to promote bus,  
walking and cycling  
and reduce  
dependence on  
cars.....





Diesel and much awaited technology  
leapfrog.....





## Dieselised.....



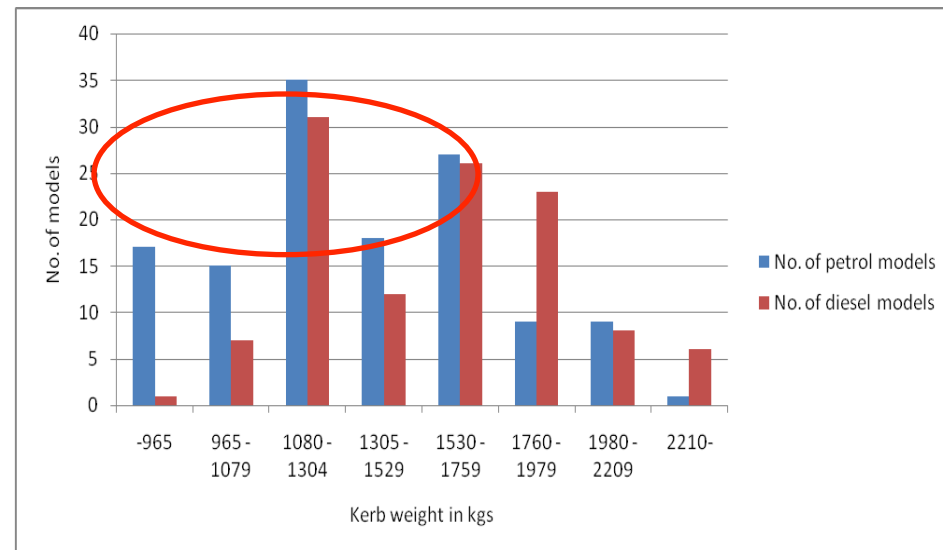
2000: Diesel cars 4% of the new sales...  
Now – Diesel car sales explosive -- 36 % of the new car sales and is expected to be half soon.

**Cars the second biggest beneficiaries of the official tax policy after trucks.**

- **Cars use up 15% of diesel in the country**
- Buses and agriculture 12% each,
- Industry 10 %
- Railways 6 %
- Power generation 8 %

- A quirk in the definition of small diesel car -- For the purpose taxation small diesel car is defined as -- length not exceeding 4,000 mm and with an engine capacity not exceeding 1,200 cc for petrol cars and 1,500 cc for diesel cars. -- Led to rapid proliferation of diesel models even in small segments

**Number of cars (by fuel type) in different weight categories as given in fuel economy database**



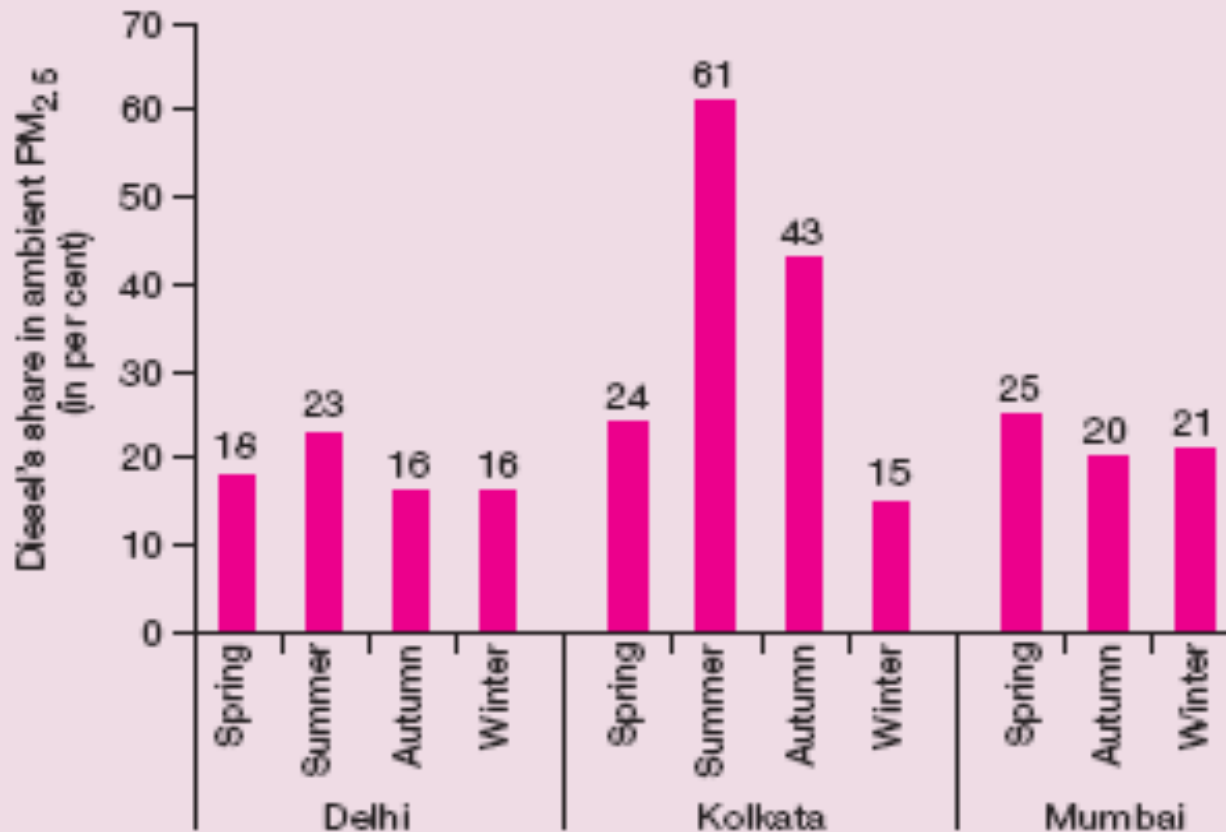


# Studies have found high contribution of diesel combustion to PM<sub>2.5</sub> in Indian cities



## DIESELISED AIR

Diesel's contribution to ambient PM<sub>2.5</sub> levels

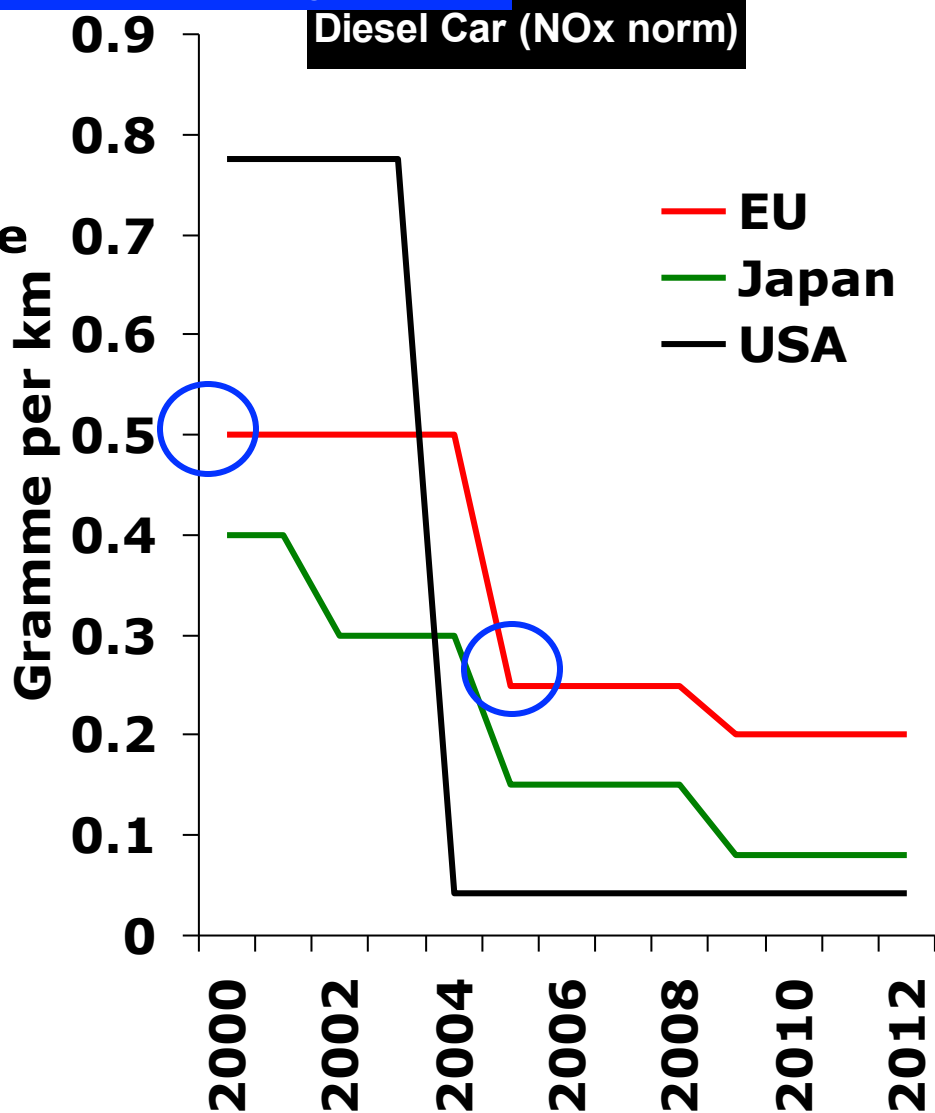
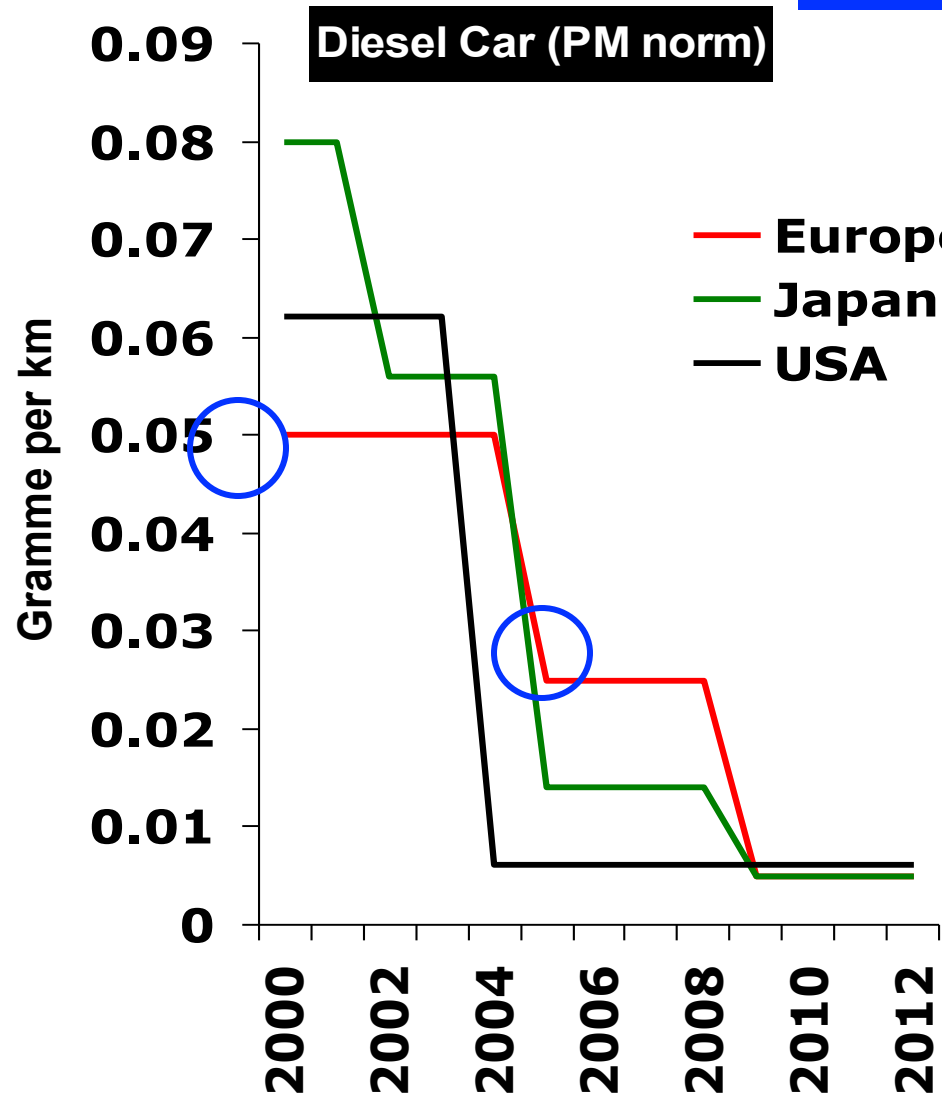




## Public policy fails to reduce the time lag in emission regulations



Indian metros today (Euro IV).  
But rest of the country Euro III





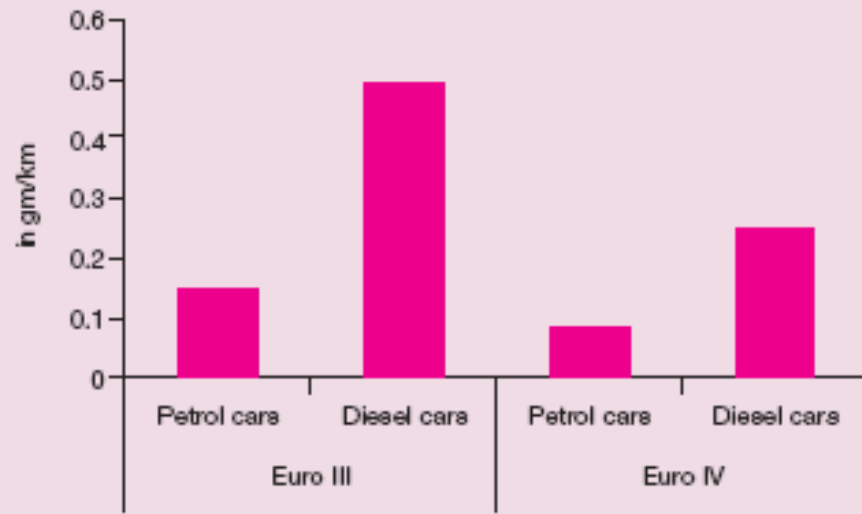
## Diesel cars have the legal license to emit more PM and NOX: key concerns in our cities



Diesel cars are legally allowed to emit three times more NO<sub>x</sub> than petrol cars under the Euro norms

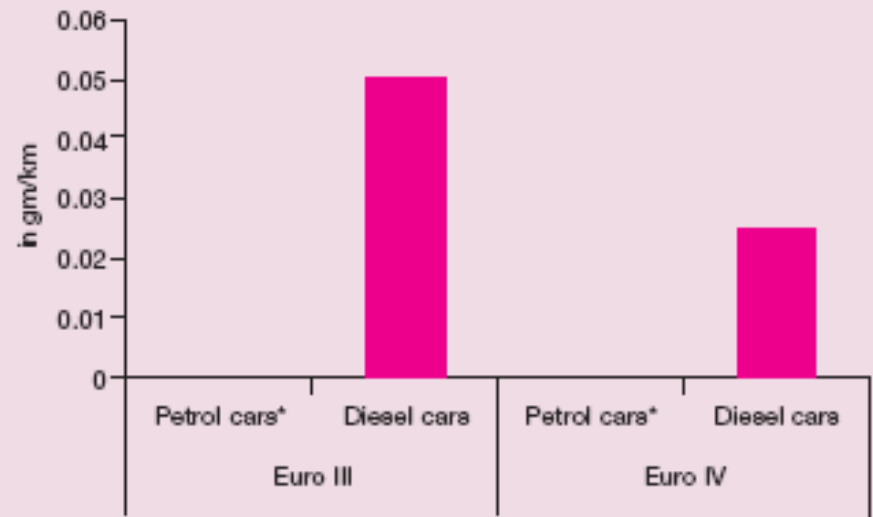
### NO<sub>x</sub> norms for cars

A. NO<sub>x</sub> norms for cars



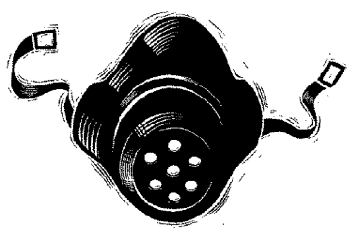
### PM norms for cars

B. PM norms for cars



One diesel car emits as much NO<sub>x</sub> as 3 to 5 petrol cars. PM is several times higher

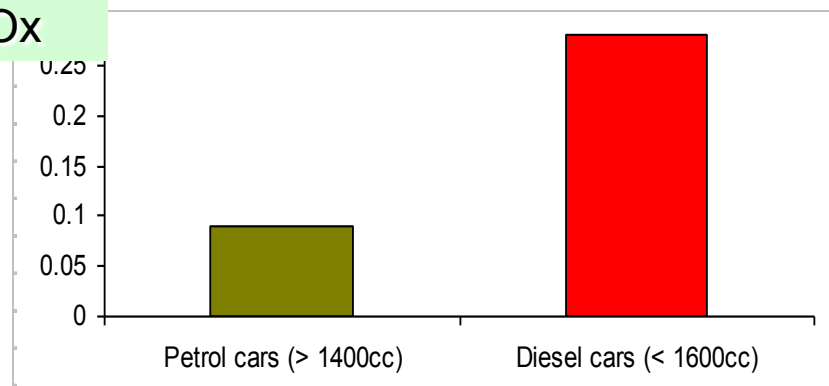
Source: MP Walsh



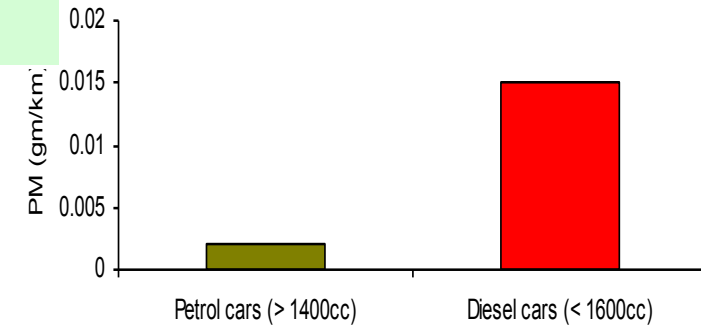
# Resolve emissions vs efficiency



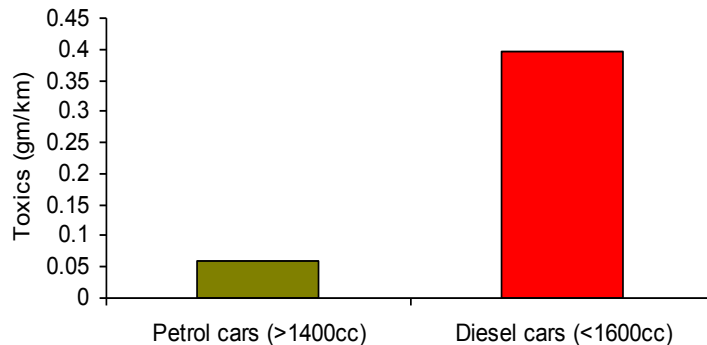
## NOx



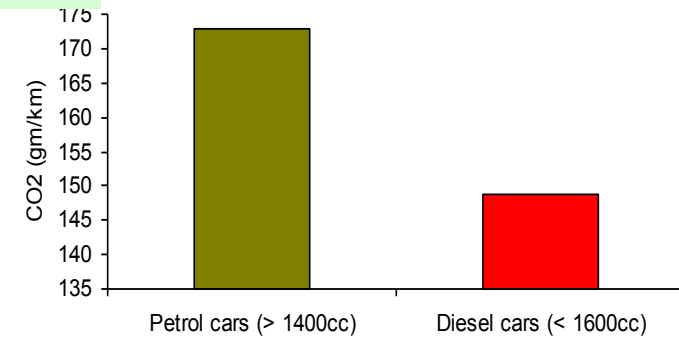
## PM



## Toxics



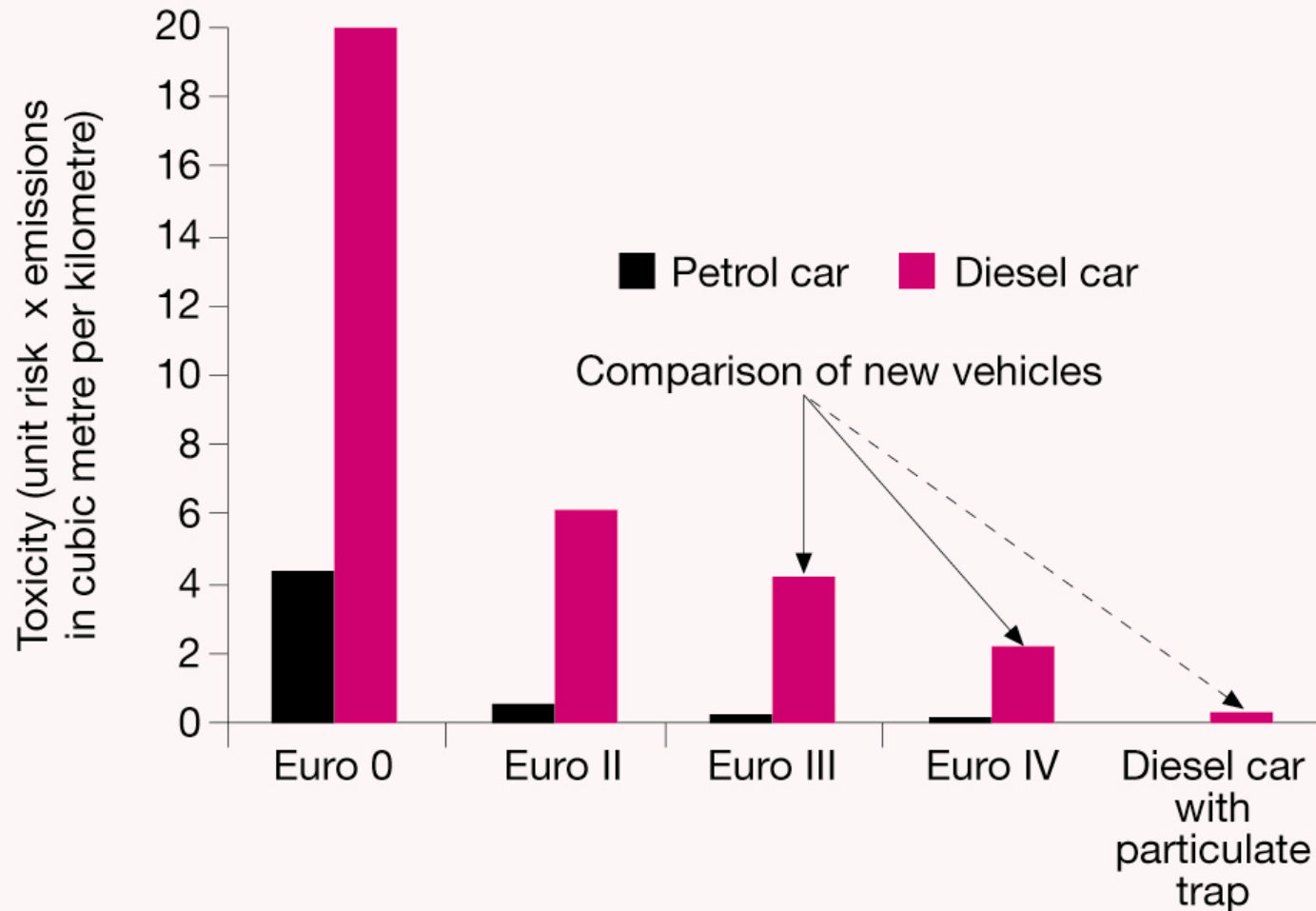
## CO2



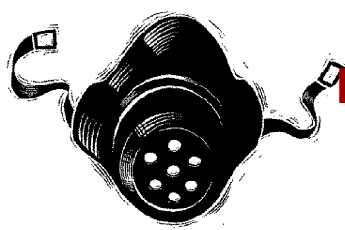
Emissions vs efficiency remains unresolved in India.....



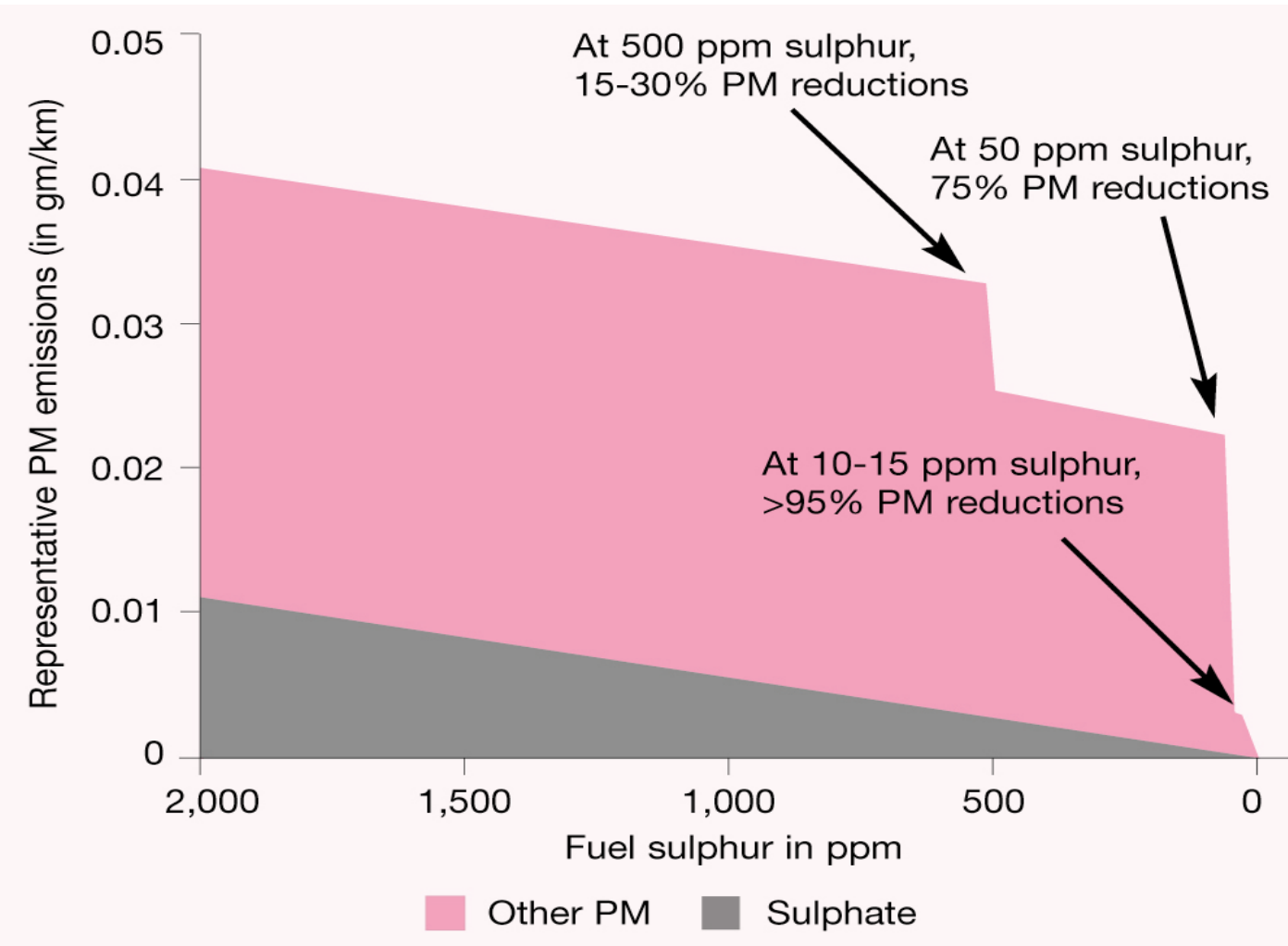
## Special concern over toxicity of diesel emissions



Source: MP Walsh



**It is possible to near eliminate harmful diesel particles.  
India needs clean diesel fuel and technology.....**



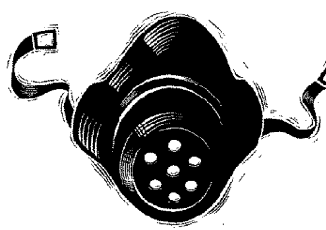
Source: ICCT

We need quick decision to enable diesel to meet the multiple challenges...  
...PM-NOx, efficiency etc





**Need hard decisions .....**



# Need immediate decision on the roadmap



- **The six city study has recommended working groups. Expedite the process**
- **Recommended control strategies for the 2015-17 timeframe:**
  - Progressive incremental introduction of BS IV from 2010 onwards
  - Progressive incremental introduction of BS V/VI from 2015 onwards
  - Electric vehicle to be 2 per cent of the city fleet
  - Hybrid to be 2 per cent of the fleet
  - All commercial three and four wheelers should be on CNG/LPG
  - 20 per cent shift in vehicle miles traveled to public transport

**Good beginning. Build on this. Need uniform standards nation-wide**

- **Assess refinery capacity, both technical and fiscal barriers to push for solutions**



# Meet clean air standards...



- India needs time bound air quality targets to meet standards
- Need punitive action if the ambient standards are not met.
- Abatement plans must be designed to meet local air quality demands
- The eleventh five year plan, already underway, mandates the central government to set monitorable target of air quality -- achieve the standards of air quality in all major cities by 2011–12. This has not happened.
- The 12<sup>th</sup> five year plan must expedite this
- In the US the air quality standards are federally enforceable. If the states fail to meet the air quality targets the EPA can impose sanctions, such as cut highway funds. Civil society can sue the state governments. “Citizen Court Suits” is explicitly allowed in the Act against EPA for failure to promulgate NAAQS, failure to adopt emissions standards, failure to develop or implement adequate state implementation plans.



## Enable health risk assessment to support policies



- **Mandate health risk assessment, health cost and benefit analysis to integrate with policy making**
- **Commit resources** for studies to inform policies.
- **Capacity building for highly trained professionals** for air quality monitoring, exposure assessment, and environmental epidemiology.
- **Build health information system -- need strong baseline data on diseases and deaths as well**
- **Build public information system on daily air quality with health advisories**



**Our cities need upscaled transition.....**

**This needs support. Must not be allowed  
to fail..**

**.....Otherwise what???**



Thank You