Compliance programme
Current practice and future plans in India

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Centre for Science and Environment

Can we prevent another dieselgate?

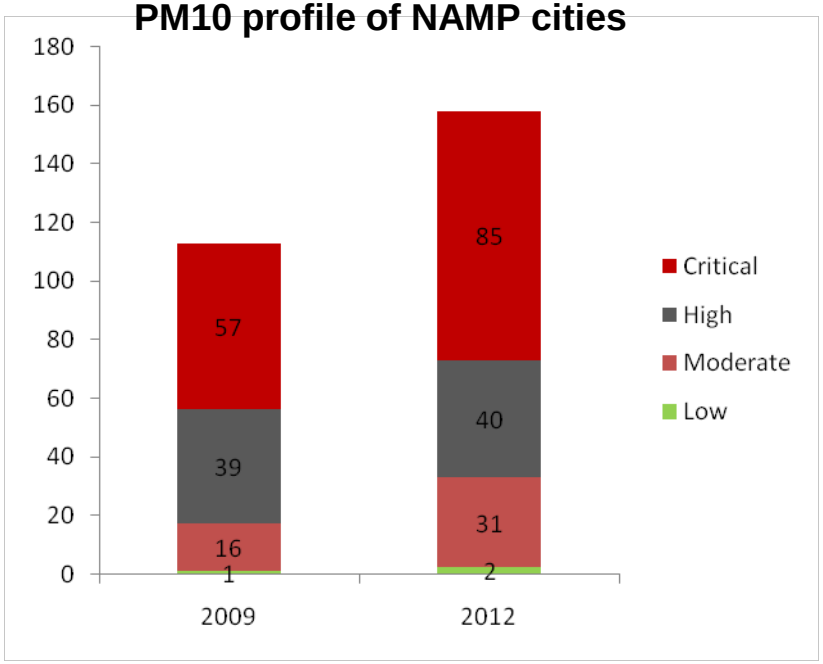
FIA Foundation
London, June 8, 2016

Diesel related emissions high in India.....

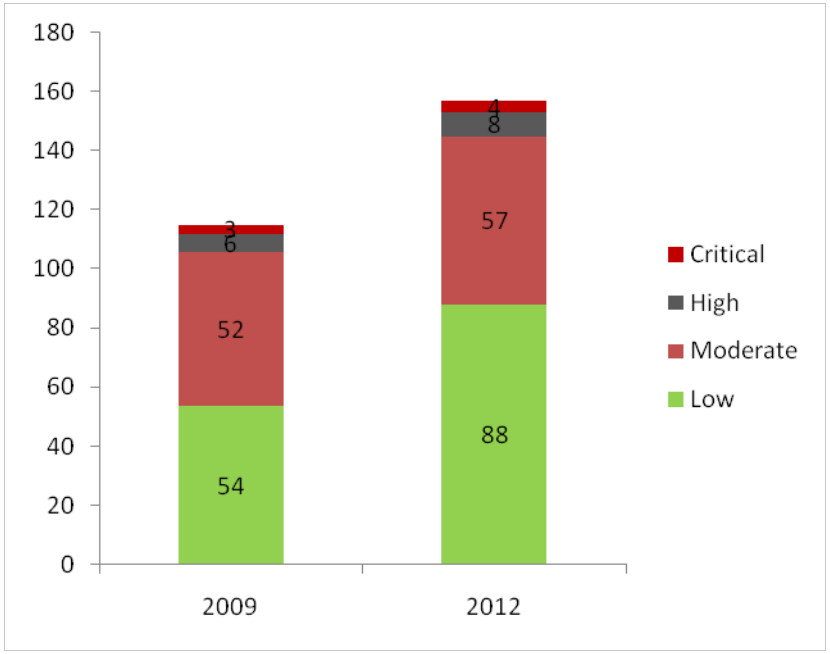
More cities in grip of toxic pollution

Majority of urban population exposed to unacceptable levels of pollution.
95% of Indians are breathing air pollution levels above WHO guidelines

PM10 profile of NAMP cities



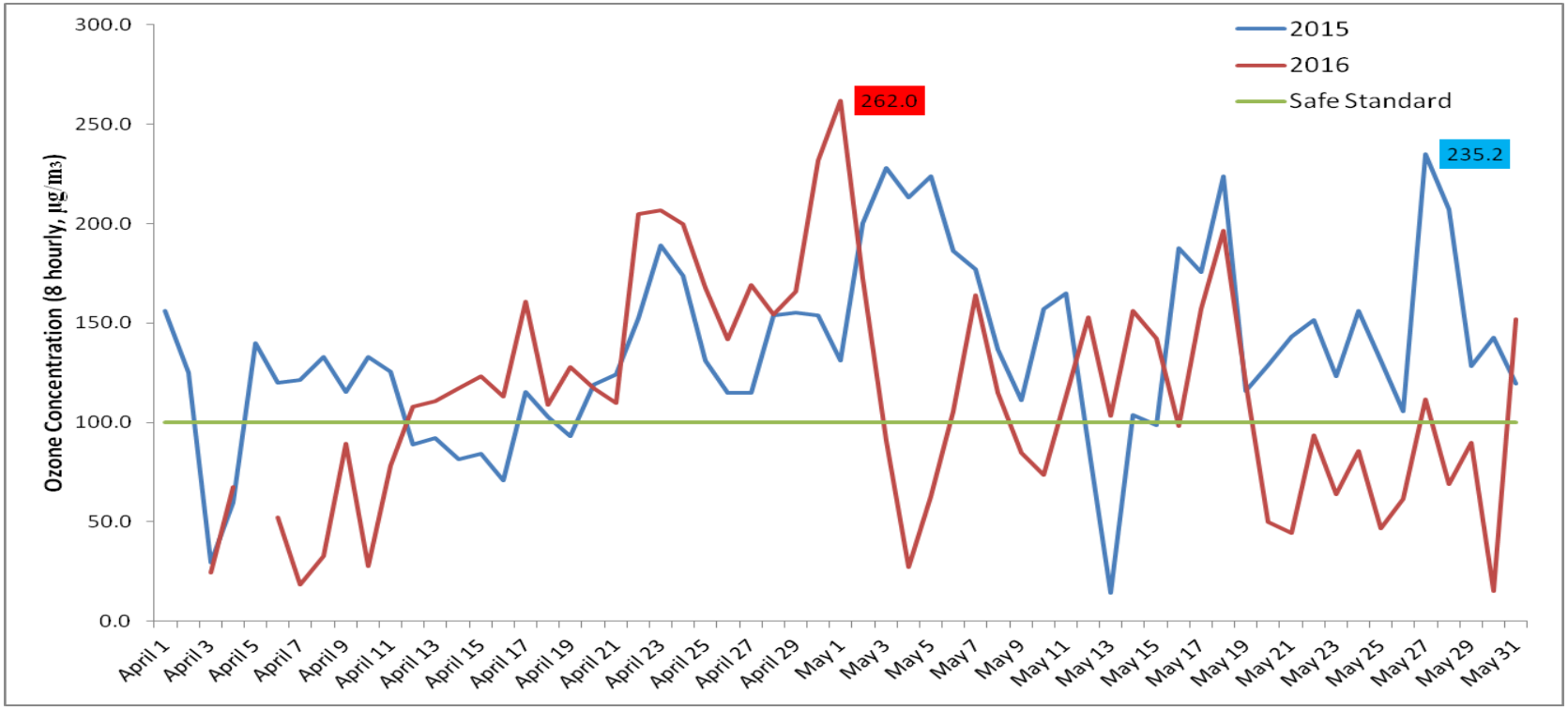
NO2 profile of NAMP cities



Source: based on National Ambient Air Quality Status, CPCB for 2009 and 2012 (latest available)

New threat in our cities…….Multi-pollutant crisis

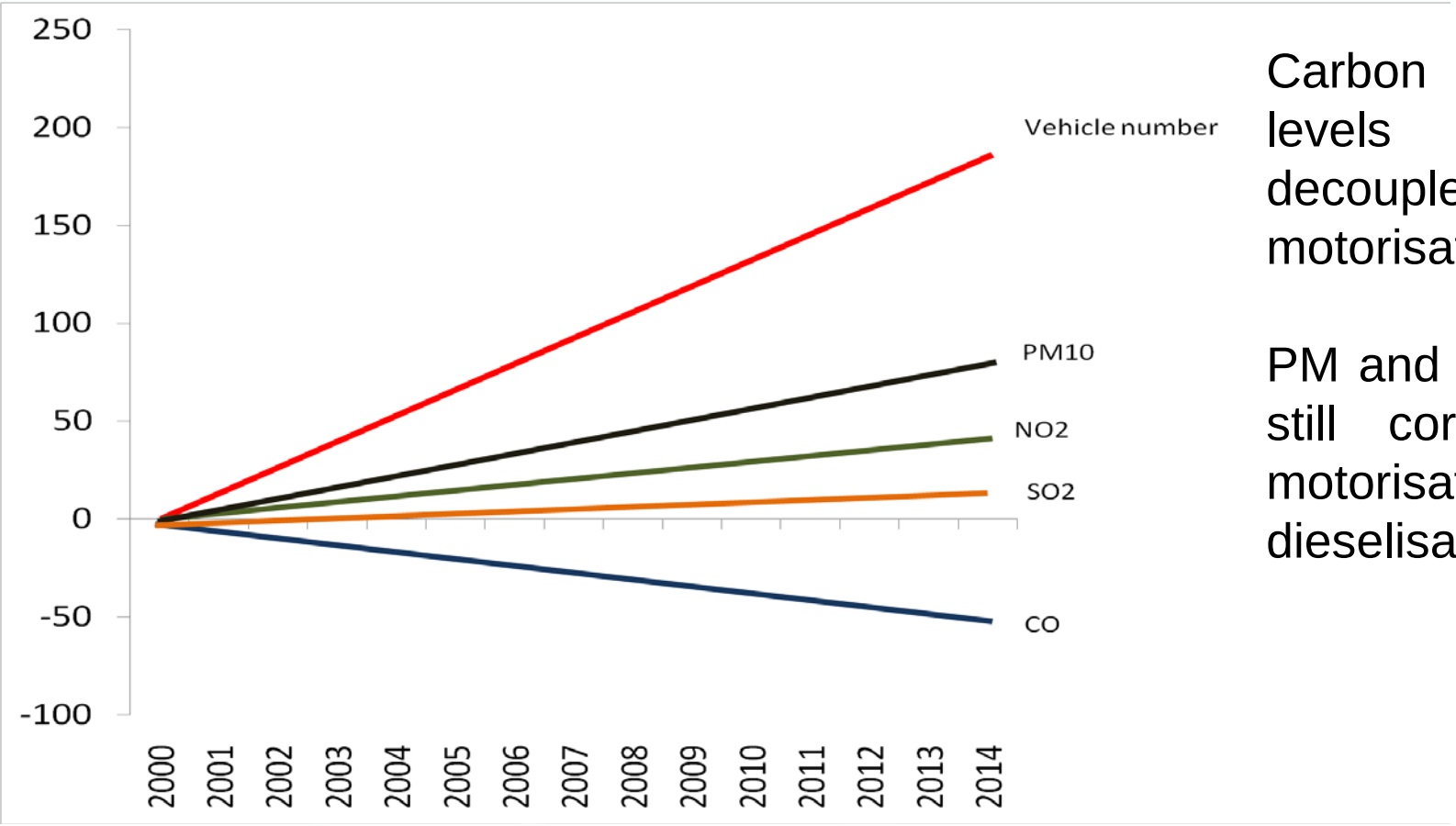
City wide average summer ozone concentrations (8 hourly average, April and May, 2015 and 2016)



Dieselisation poses serious threat...

Source: Based on DPCC air quality data

Diesel related pollution rising



Carbon monoxide levels have decoupled from motorisation

PM and Nox trends still corelate with motorisation and dieselisation

Source: CSE's Estimation of Economic Survey of Delhi 2014-15

Serious health concerns...

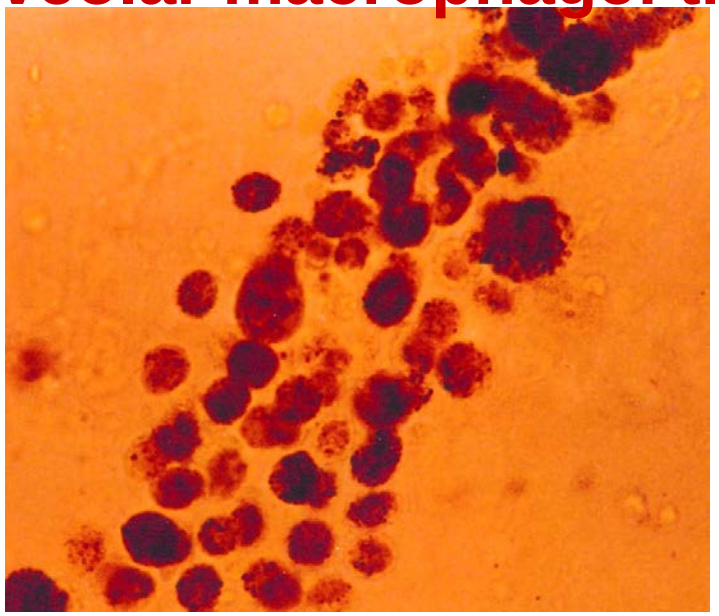
2012 epidemiological study on children in Delhi (CPCB and Chittaranjan National Cancer Institute of Kolkata):

-- Covered about **12,000 school-going children from 36 schools**.

-- **Every third child has reduced lung function. Sputum of Delhi's children contains four times more iron-laden macrophages** than those from cleaner environs, **indicating pulmonary hemorrhage**.

-- **The levels of these biomarkers in children have been found to be higher in areas with high PM10 levels**.

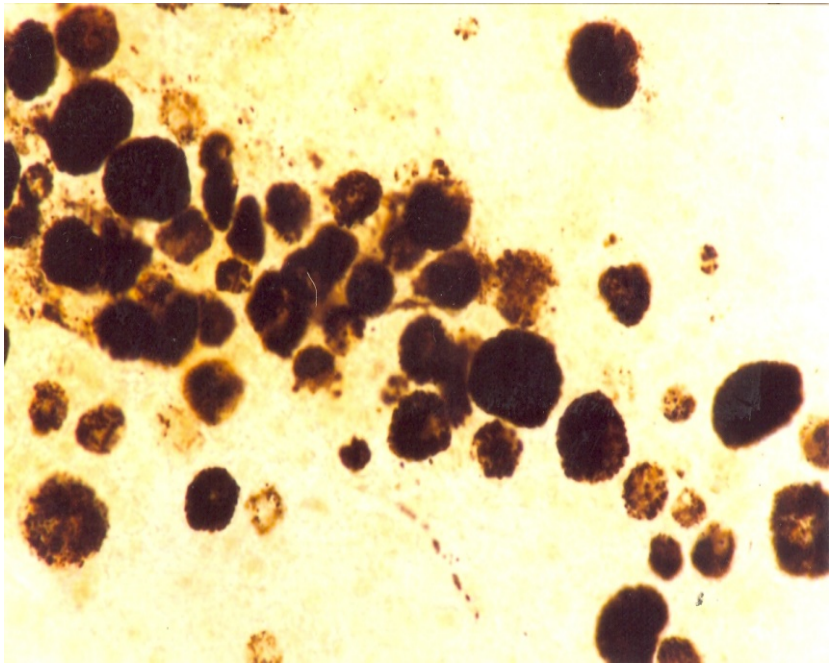
Alveolar macrophage: the biomarker of air pollution



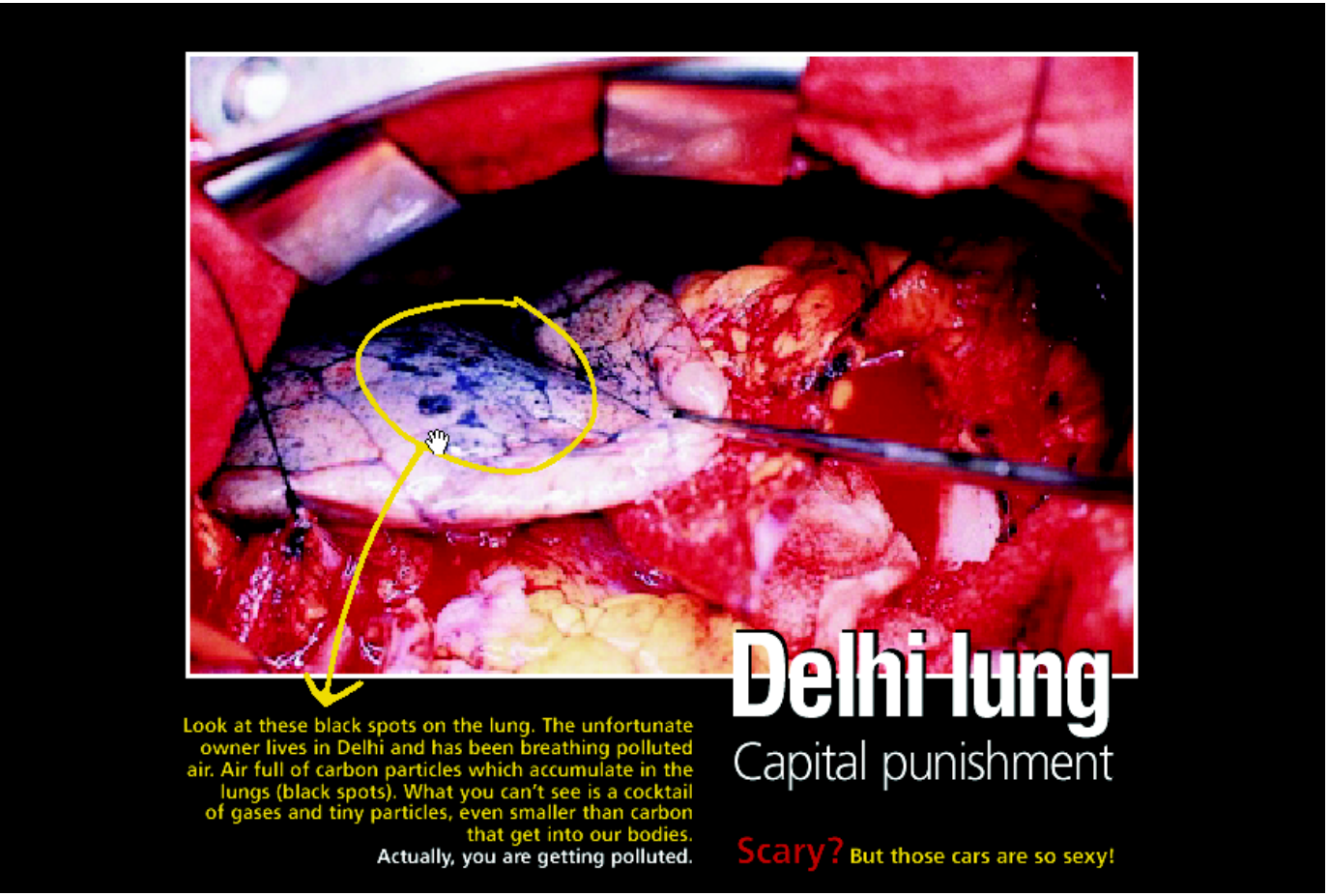
Sputum cytology of a 14-year old girl, showing abundance of particle laden AM

Exposed group; Kolkata taxi driver

Increase in AM number



Growing toxic risk…

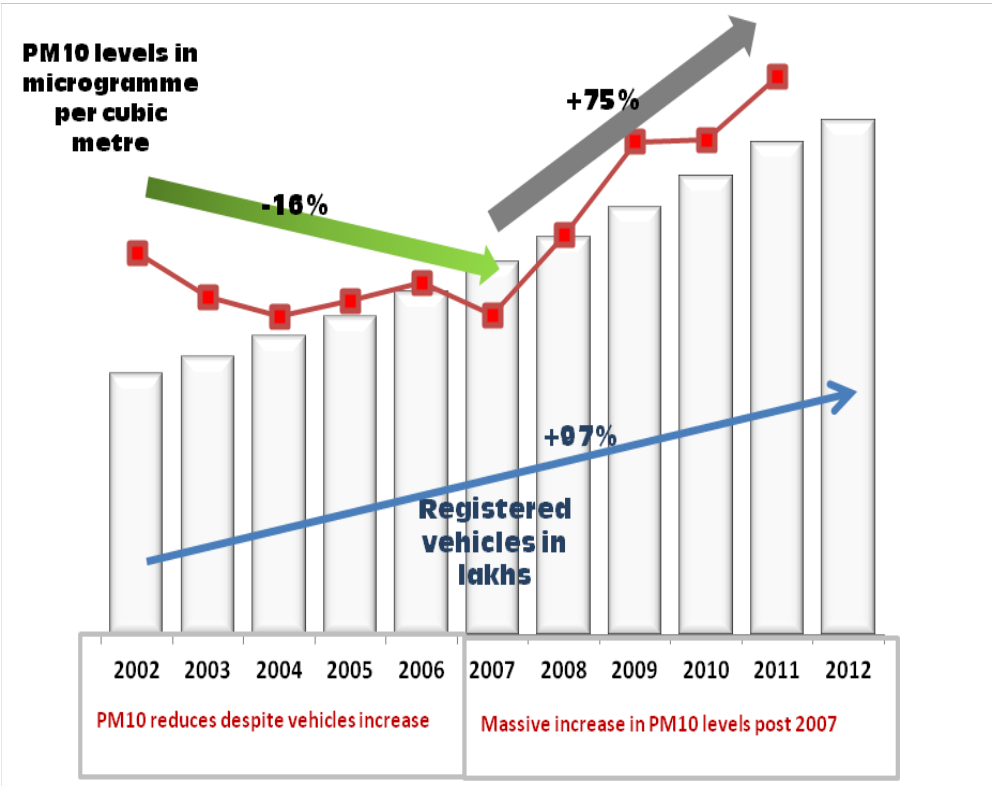


33% increase in lung cancer incidence since the middle of last decade in Delhi – Highest among all metro cities….

(National Cancer Registry Programme)

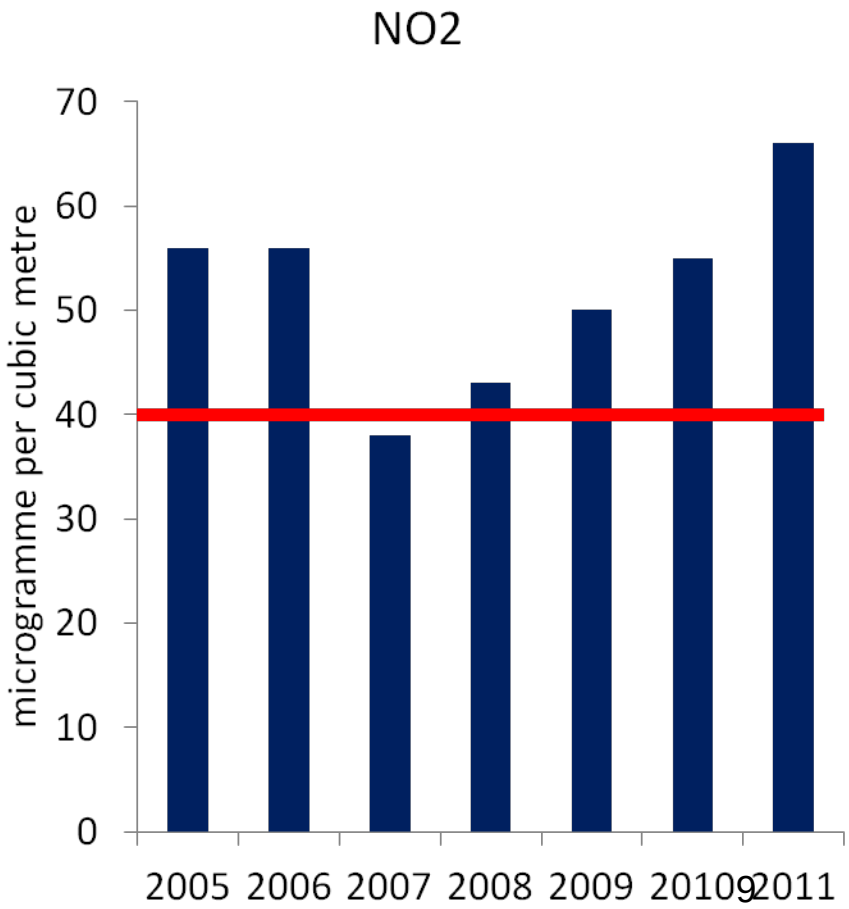
Delhi: After a short respite pollution curve turns upward

Particulate pollution decline and rise again due to rapid increase in vehicle numbers

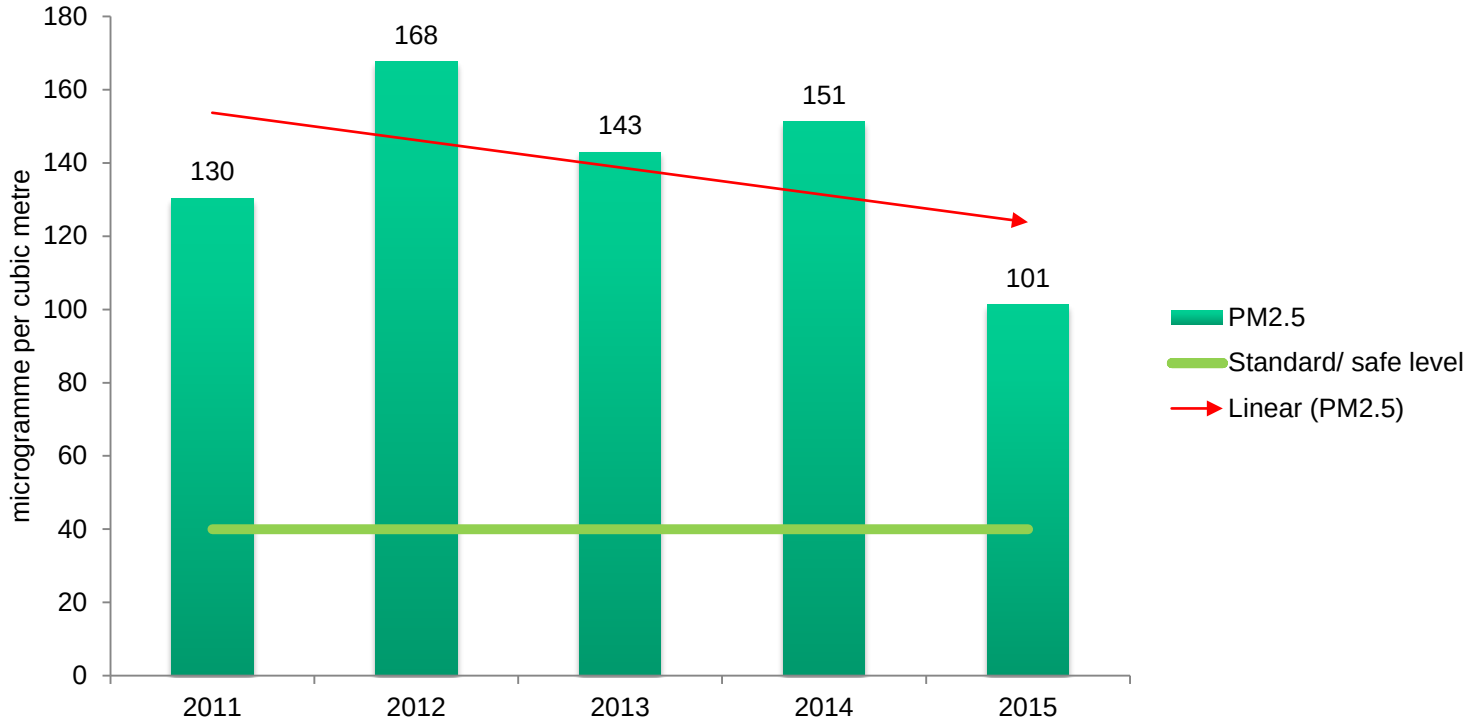


Based on CPCB data

NO2 levels rising steadily



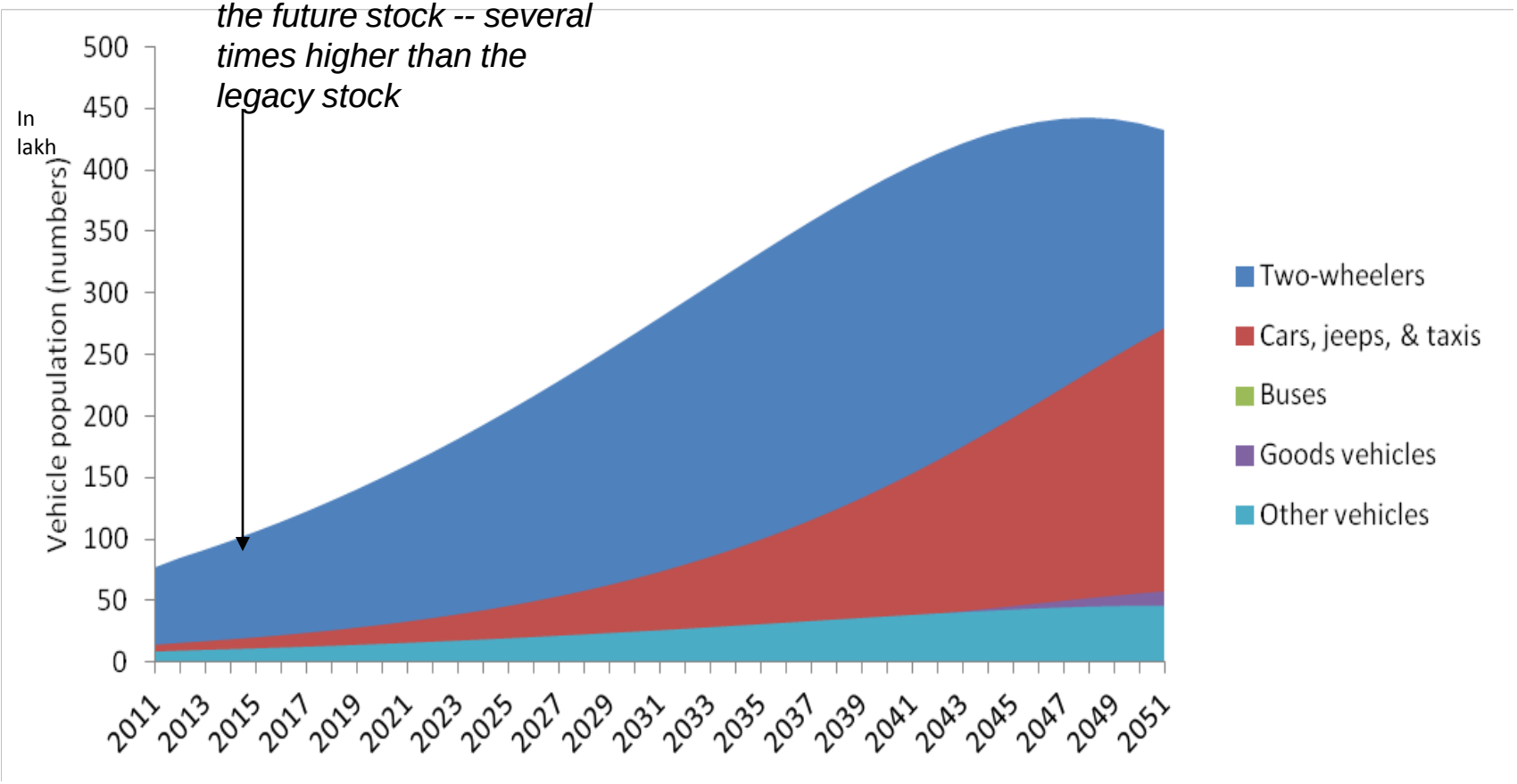
PM2.5 level in Delhi: stabilising again?



Source: Submission of Delhi Pollution Control Committee in High Court 2016

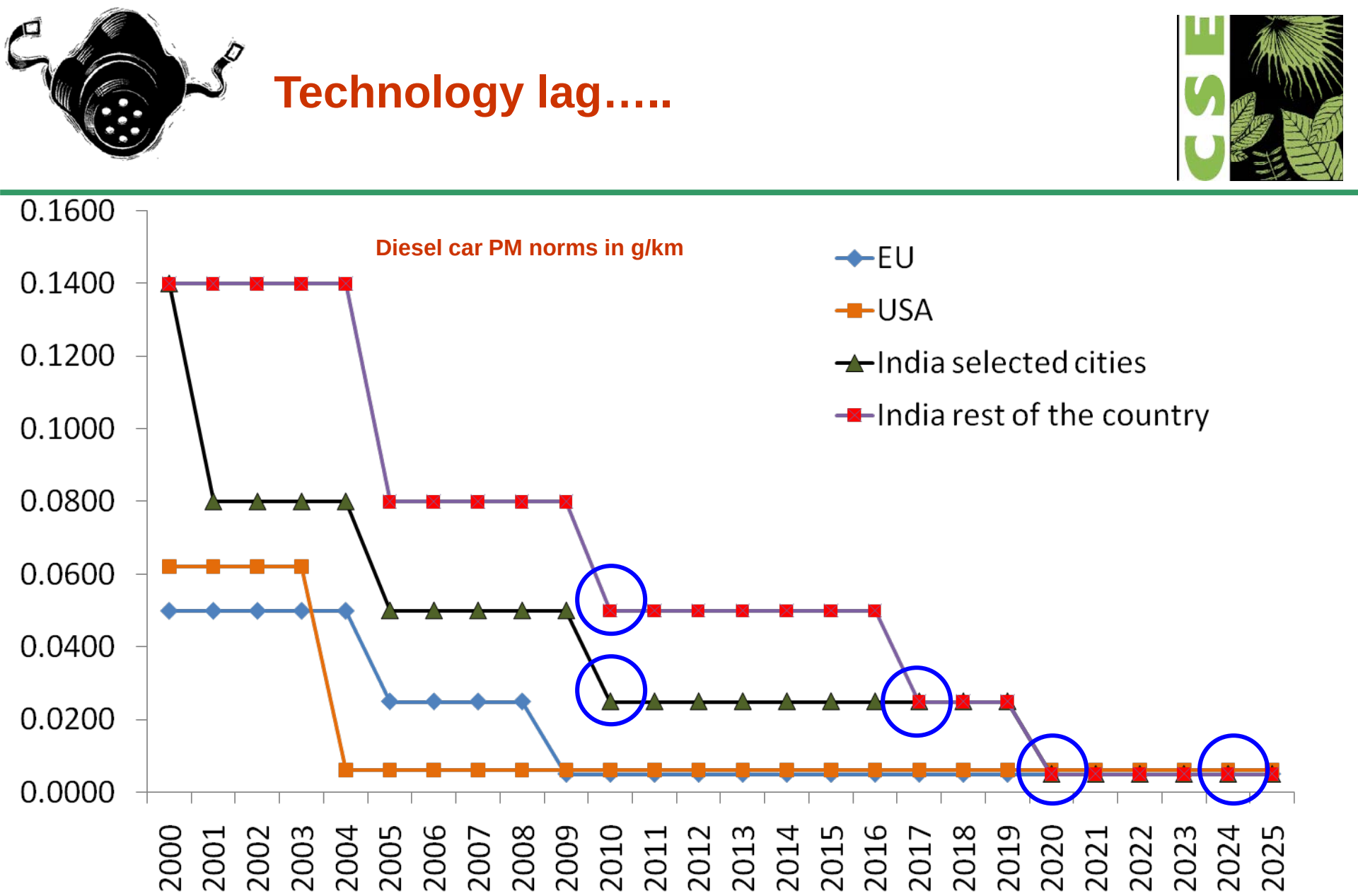
Motorisation based on outdated polluting technology and fuels locking up enormous pollution and ill health…..

Need stringent and preventive action and decision here to influence the future stock -- several times higher than the legacy stock



Source: CSE

Technology lag…..



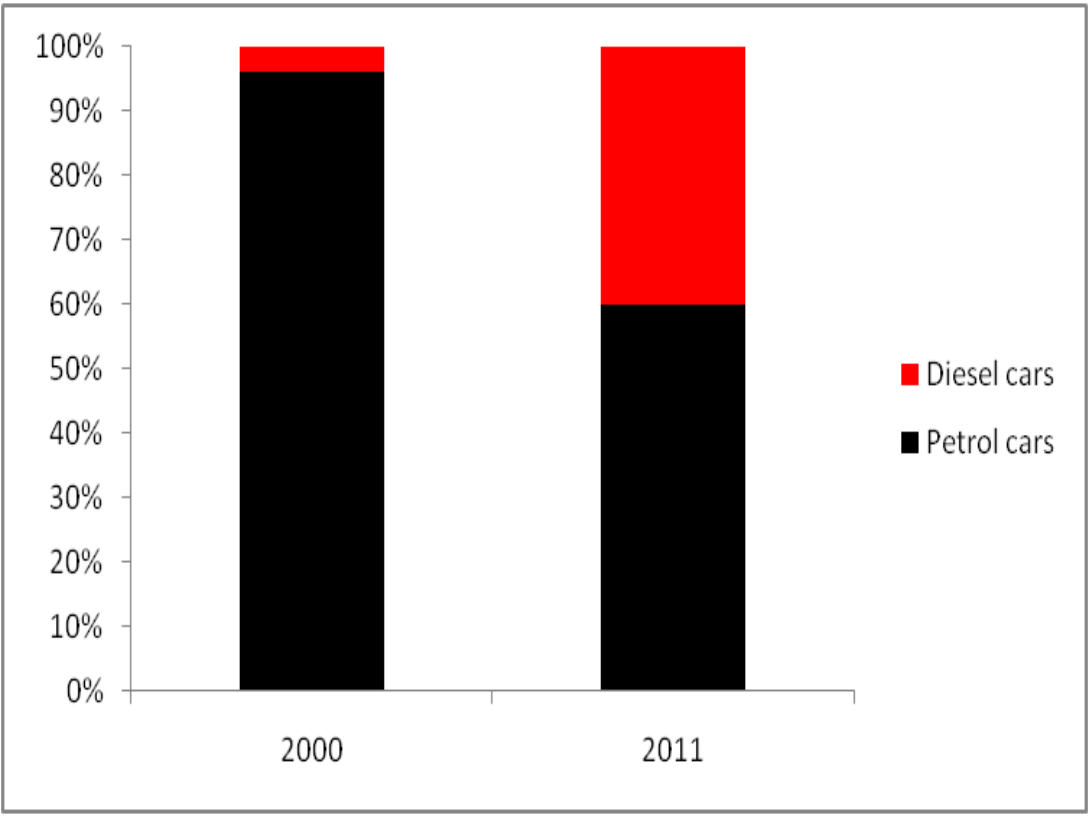
Source: India, Europe compiled from Diesel Net, USA data provided by Axel Friedrich, Germany

Note: Europe has additionally introduced particle number standards at Euro V level

Future norms of US and Europe are tightening NOx norms for diesel more

Rapid dieselisation of car segment ……..

2000: 4% of new car sales
2011: 49% ….
Subsequently more than half

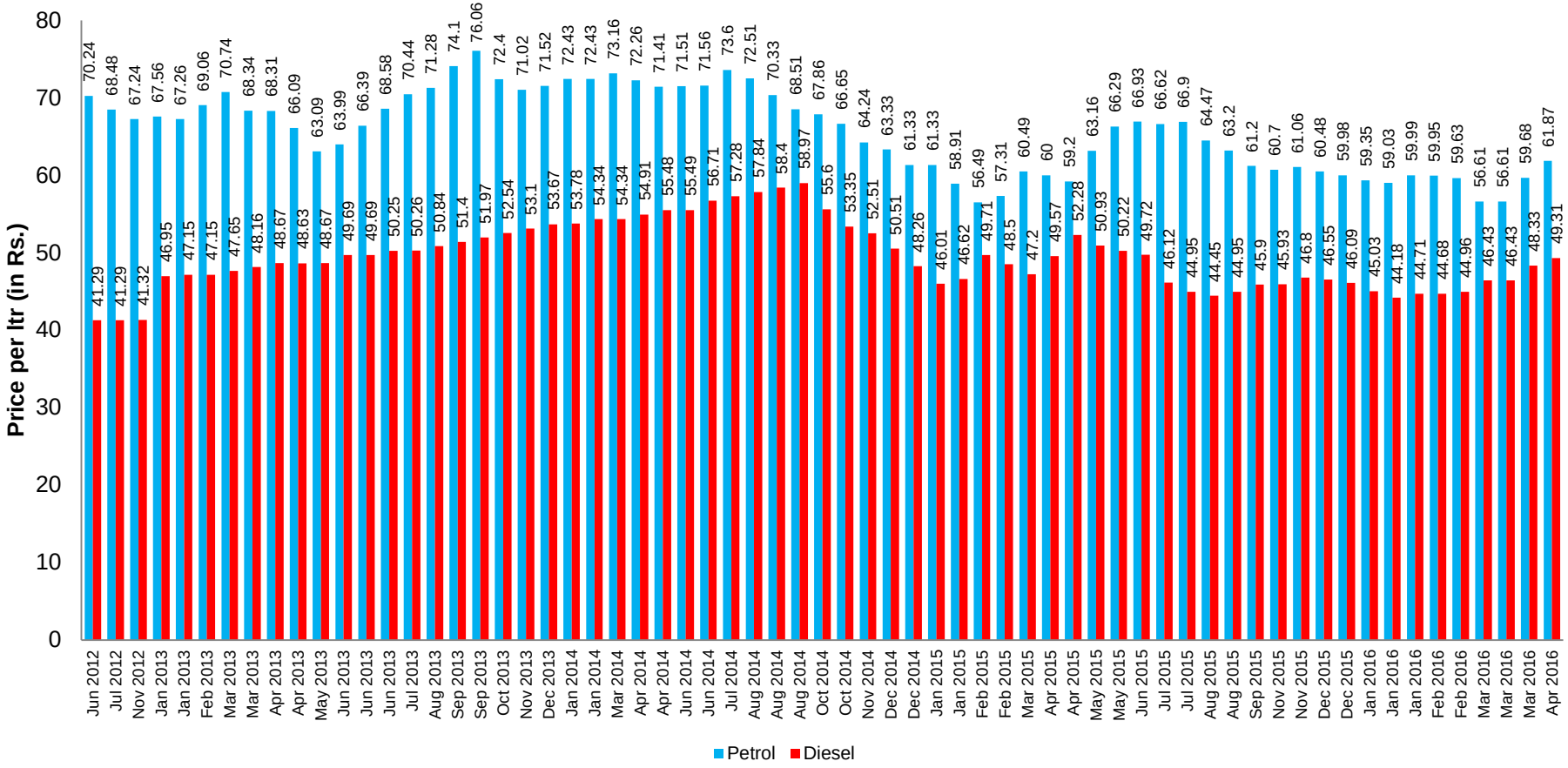


Source: Based on market data

Even at a moderate and flat growth rate of 20% a year, the total diesel cars in 2020 will be double the size of the total car sales today.

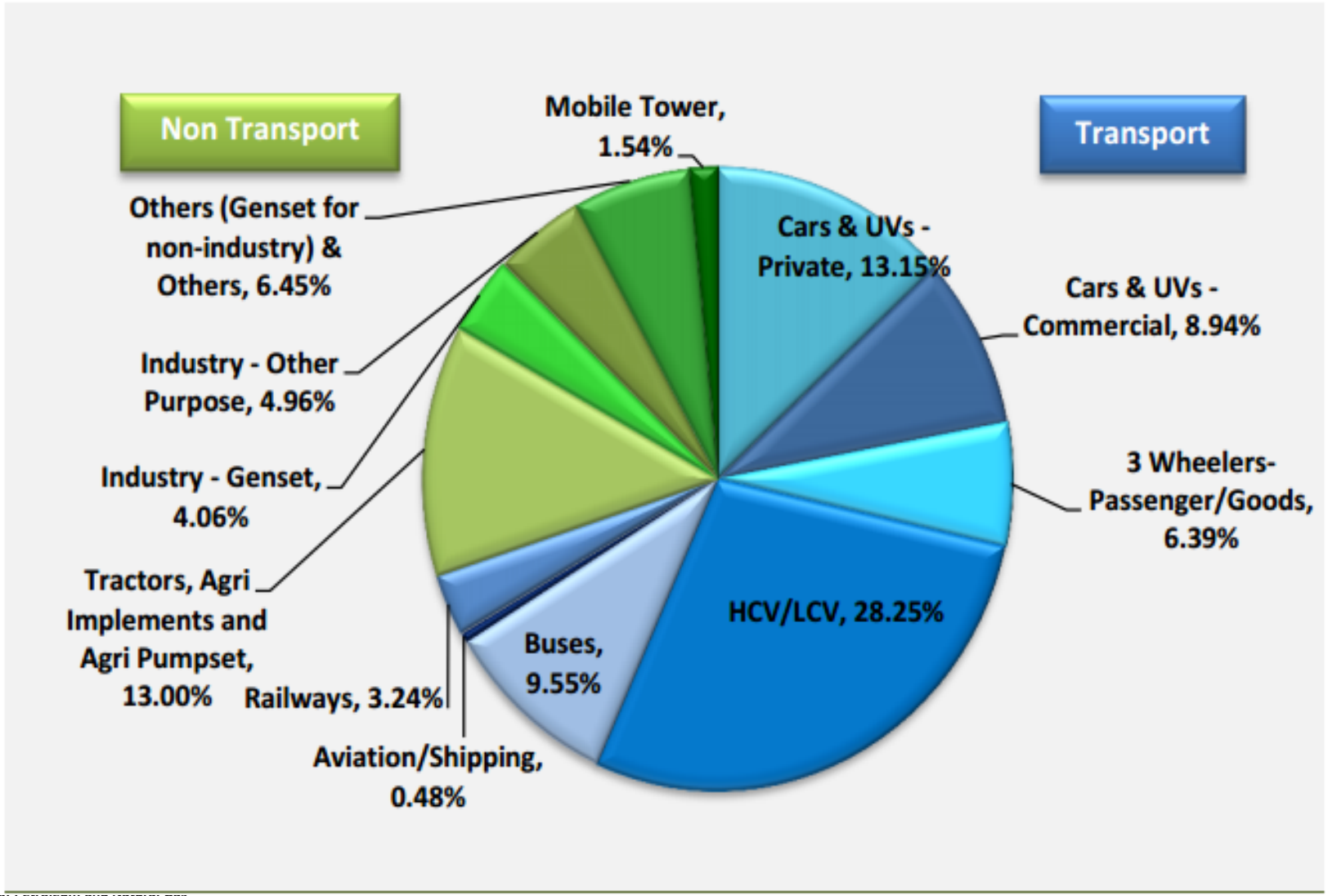
Enticing price gaps

Difference between retail prices of diesel and petrol



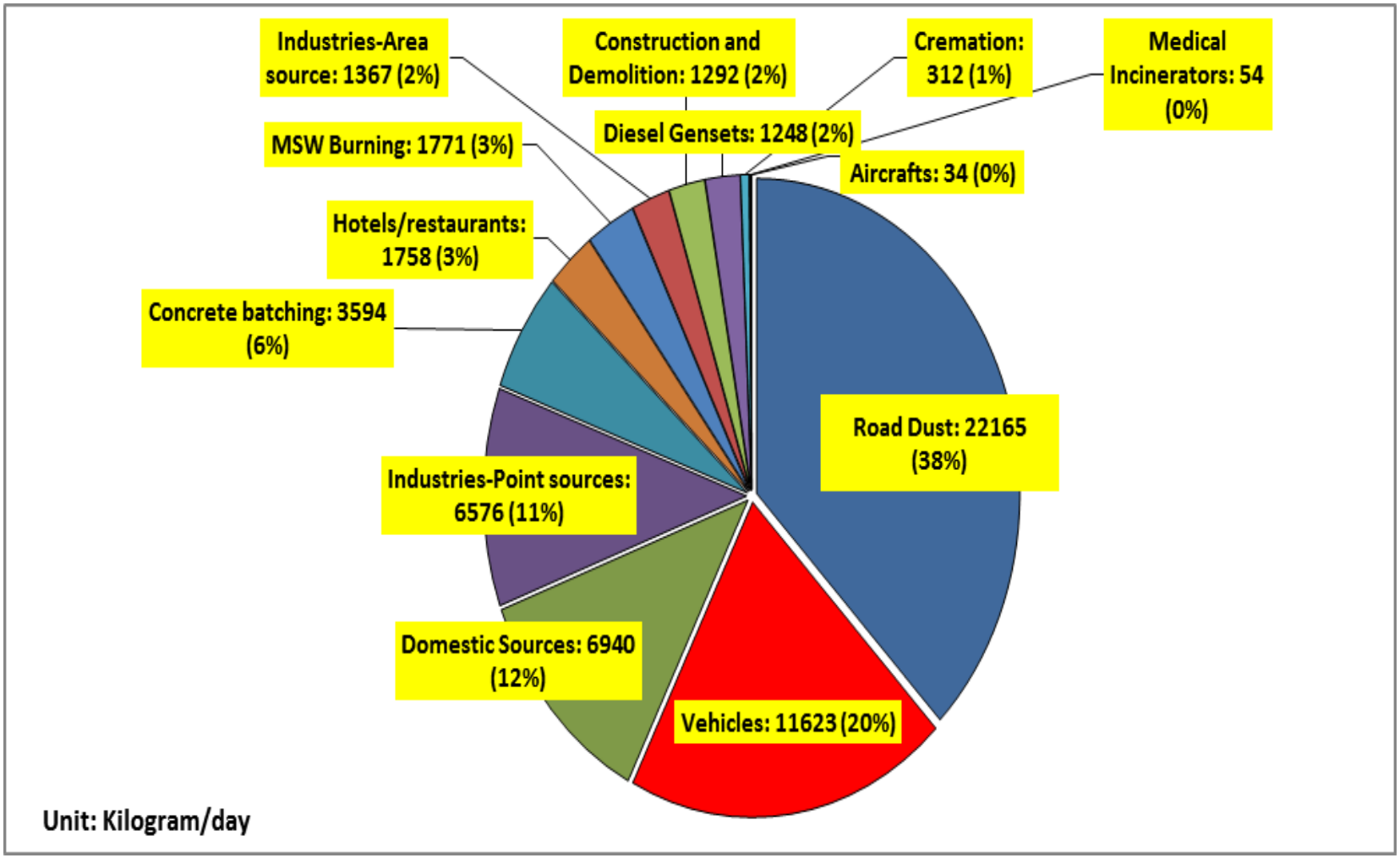
Source: Ministry of Petroleum and Natural Gas Gas

Cars are second largest user of diesel



Source: Ministry of Petroleum and Natural Gas

Pollution profile of Delhi and number game of pollution



Source:IIT Kanpur

New policy paradigm

***Steering committee report on air pollution and health* of Union Ministry of Health and Family Welfare**

-- Concentration management to exposure management to prioritizes policies and actions

--- What matter**s is not just the absolute emissions but how much of the pollution is breathed in by individuals, -- "intake fraction" --**

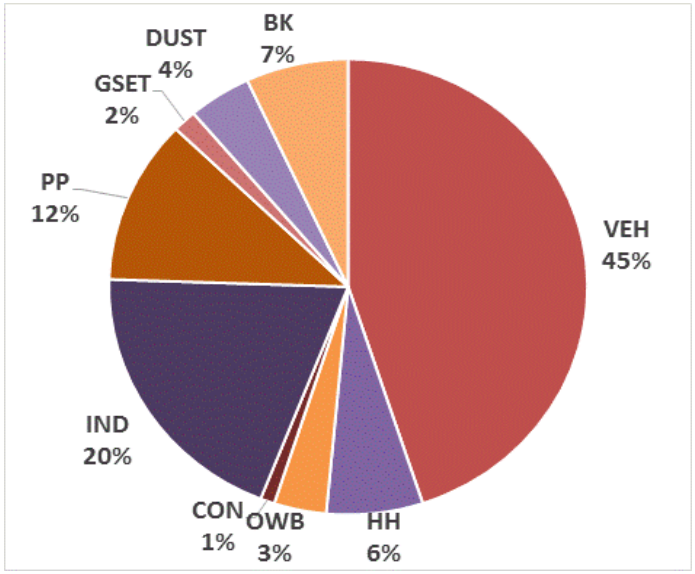
How close we are to the pollution source, what are we inhaling, and how much time we spend close to the pollution source than what occurs generally in the air that is influenced by climate and weather.

--- Ambient concentration is not a good surrogate for total air pollution risk, -- cannot indicate exposure and health outcome

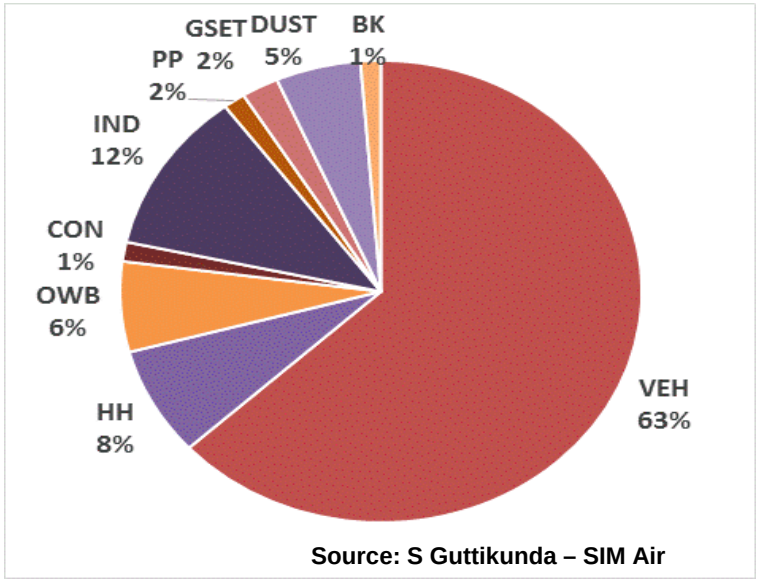
Ambient vs Exposure

Chennai

$PM_{2.5}$ emission apportionment



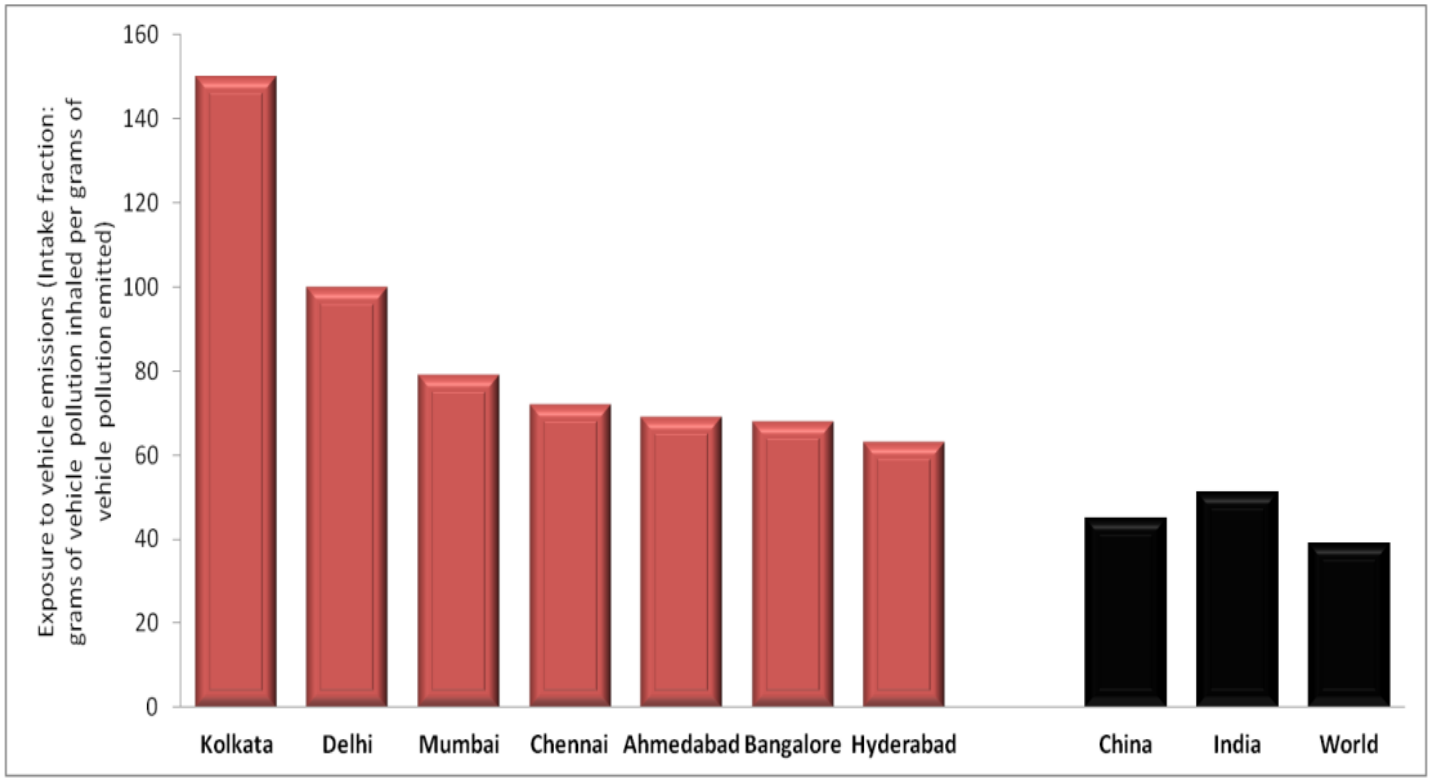
$PM_{2.5}$ exposure apportionment



Source: S Guttikunda – SIM Air

Estimate exposure

In Delhi and Kolkata, the people's exposure to vehicle exhaust is 3 to 4 times higher than the world average

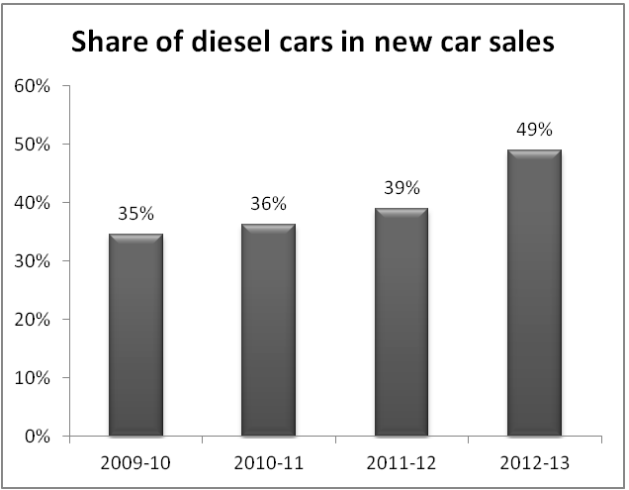


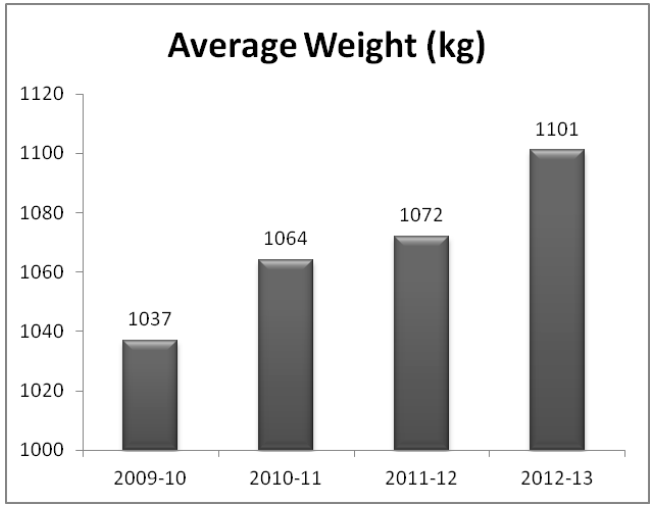
Exposure (iF) is the population-weighted intake fraction, or the grams of vehicle pollution inhaled per grams of vehicle pollution emitted.

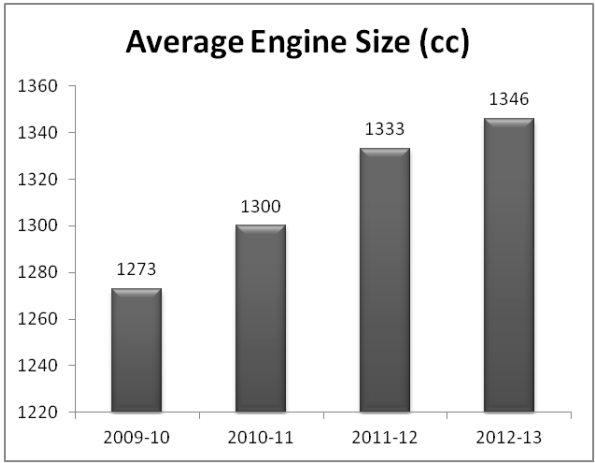
Estimates from Apte, J. S., Bombrun, E., Marshall, J. D., & Nazaroff, W. W. (2012). Global Intraurban Intake Fractions for Primary Air Pollutants from Vehicles and Other Distributed Sources. *Environmental Science and Technology*, *46*(6), 3415–3423.

Dieselisation pushing Indian market towards heavier vehicles

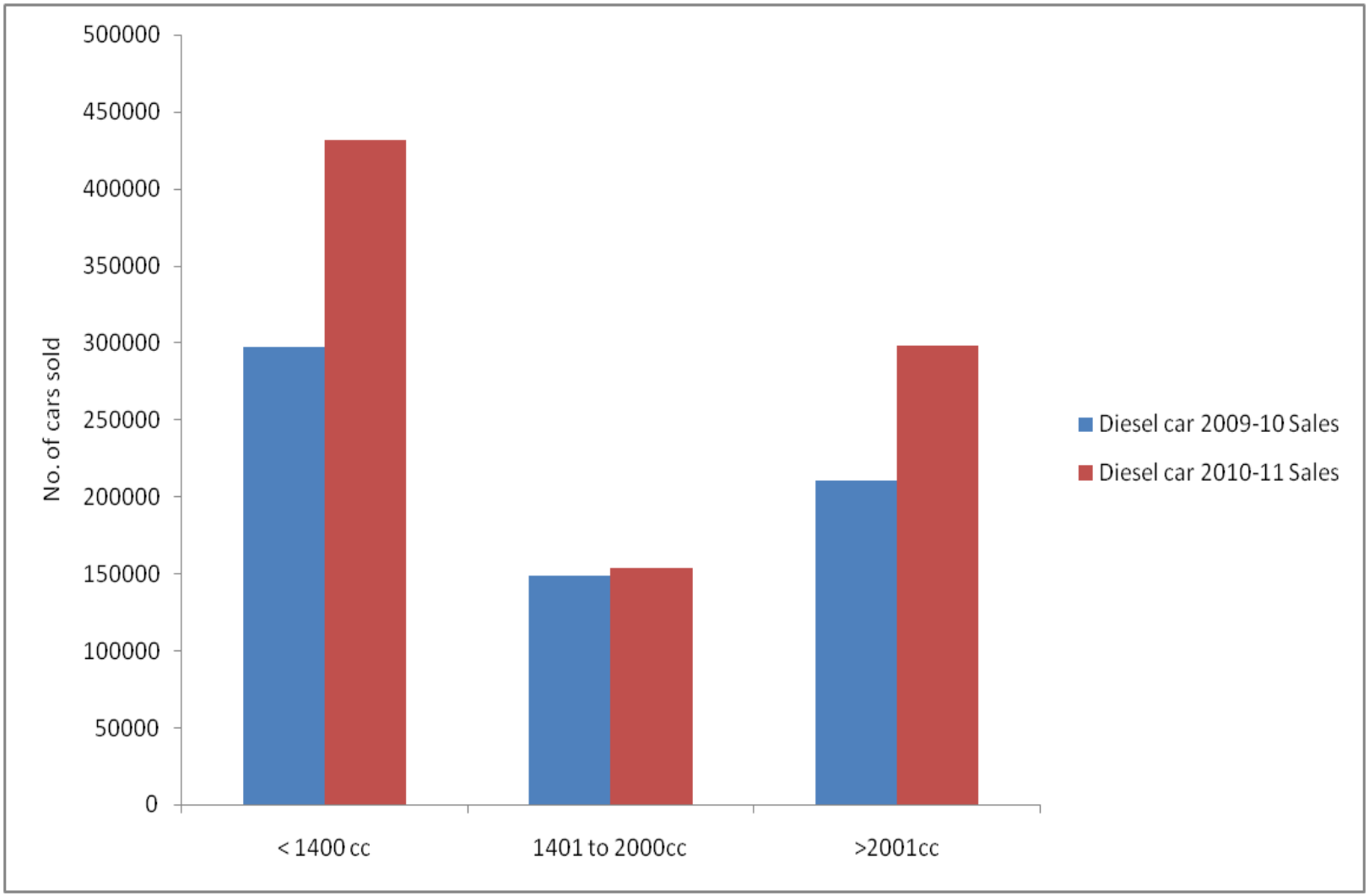
- Average weight and engine size during 2009-10 and 2012-13 has increased by 6%.
- On an average the weight and size of new vehicles is increasing at a rate of 2%.
- While 87% of petrol cars have engine size below 1.2 litres, 40% of diesel is 1.5 litre and the rest are more.
- Even at a moderate and flat growth rate of 20 per cent a year, the total diesel cars in 2020 will be double the size of the total car sales today.





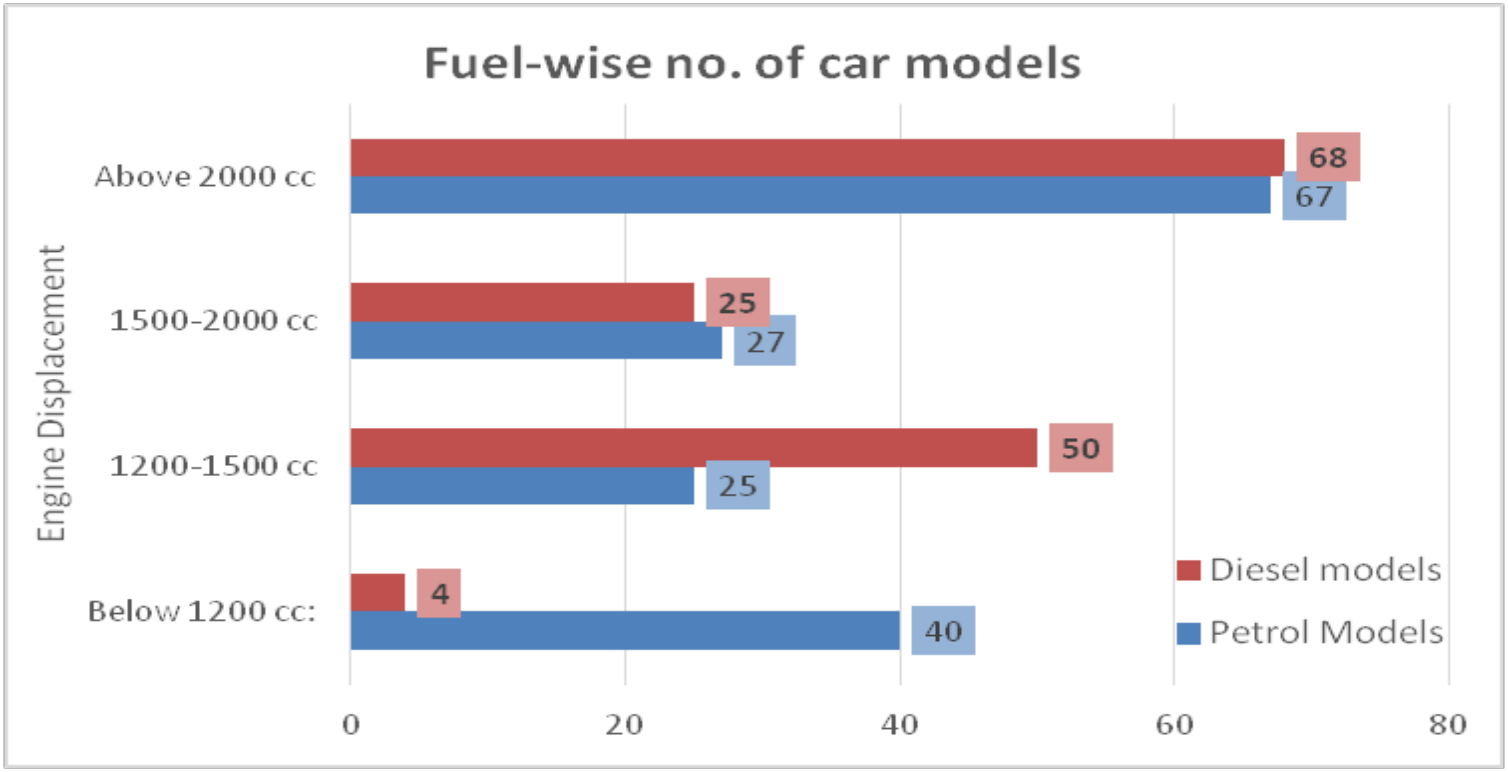


Rate of growth of diesel cars in different engine size category

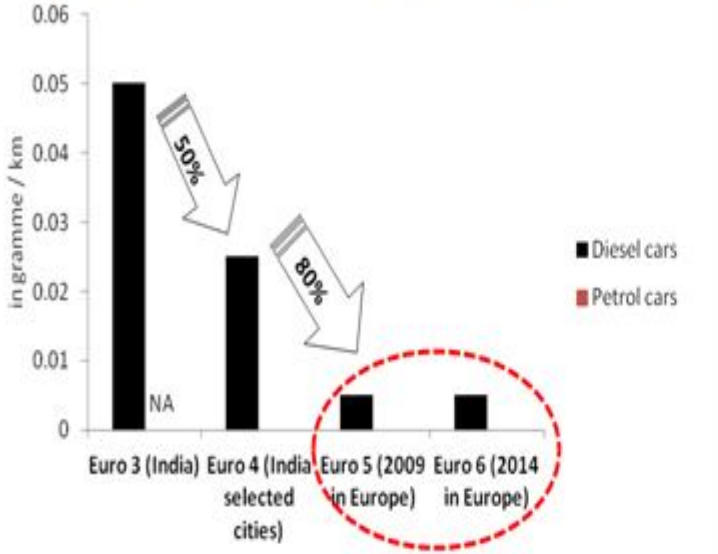
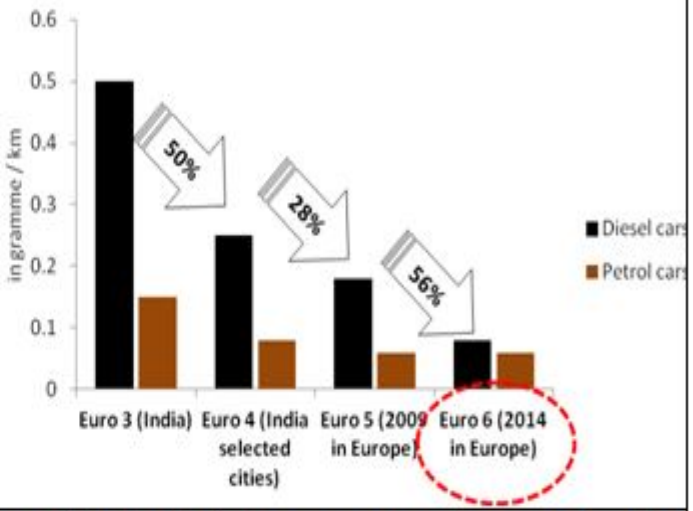


Hard selling diesel

Rapid proliferation of diesel models



Legal license to emit more particulate and nitrogen oxides

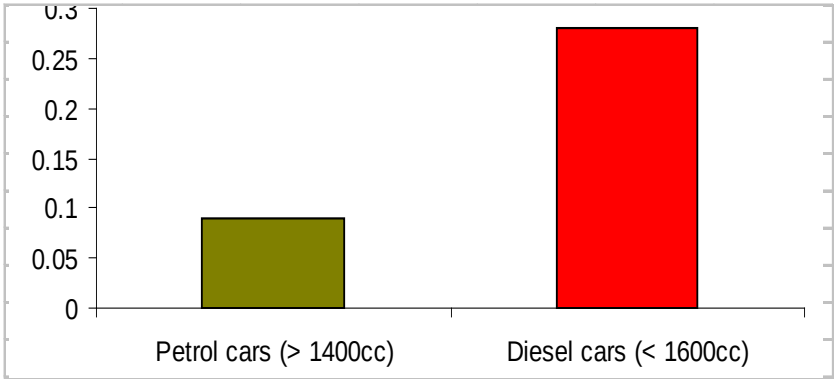
Particulate norms for diesel car (Particulate emissions from petrol cars are negligible and not regulated)	NOx norms for petrol and diesel cars. (Diesel emissions equalize with petrol only at Euro VI level)
	

Note: PM emissions from petrol vehicles are so negligible that these are not regulated in petrol vehicles

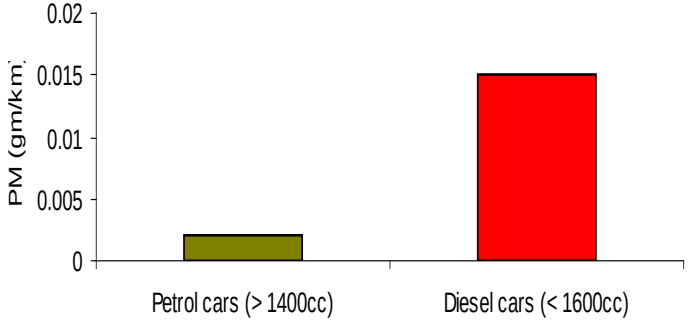
Source: Based on data available in www.dieselnet.com

Trade-off

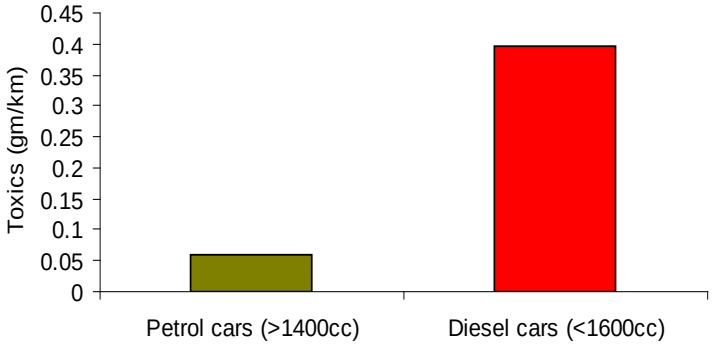
NOx



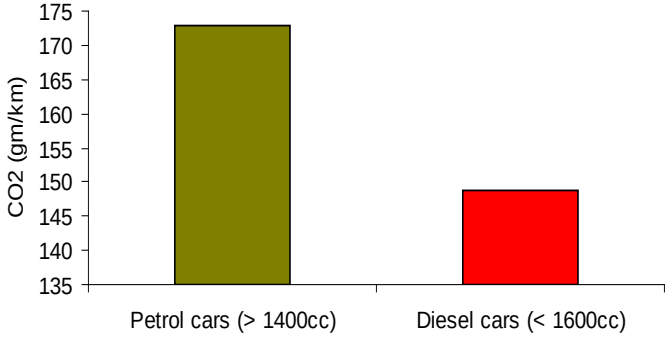
PM



Toxics

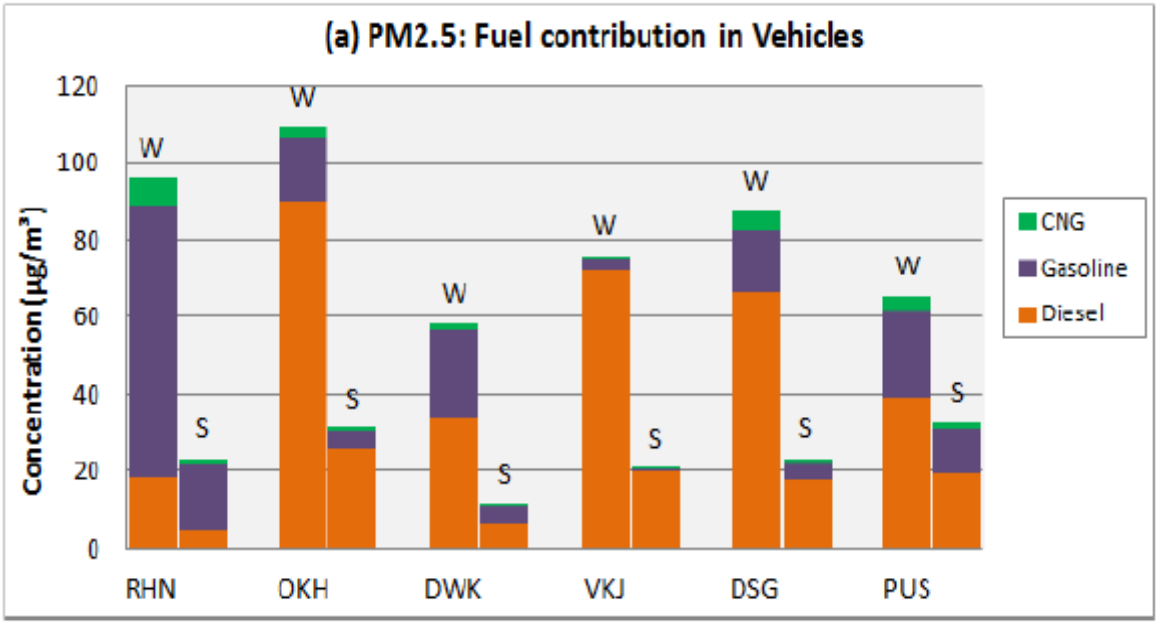


CO2



Source ARAI

High contribution of diesel cars to PM2.5 levels in Delhi



Source: IIT Kanpur Study, 2015

IIT Kanpur study: Diesel cars are 25% of the total car fleet and contribute an average of 78% of PM2.5 from vehicles

ICCT estimates of cancer effects: -

-- 4 times greater cancer risk in Delhi from diesel cars compared to petrol cars

-- The annual number of avoidable cancers caused by diesel exhaust in Delhi region is 280,000

(based on emissions estimates of IIT Kanpur study)

Dieselgate in India?

India’s tryst with corporate fraud

2005 --2012: General Motors sold 114,000 units of Tavera diesel SUV —BS-III and BS-IV variants—by tampering type approval tests.

For the certification, the company had sent pre-selected samples that were fitted with improved engines and were in a different weight category than what it sold afterwards.

The Ministry of Road Transport and Highways initiated a probe

GM admitted to the fraud and recalled 114,000 units of the Tavera in 2012-13.

But India does not have a system to penalise companies for such corporate fraud.

Tavera fraud did not lead to system change.....

After the Tavera case Nitin Gokarn committee recommended: -- Certification laboratories like ARAI to identify samples from factories and dealers. Companies to transport the sample cars to ARAI with proper coding and identification number.

-- No system in place that legally allows testing agencies to select any vehicle, anywhere, anytime . -- Indian certification agencies give prior notice to manufacturers about the approximate time during which samples will be collected from a given lot.

-- The type approval certificate is issued when a vehicle passes COP testing. If, after repeated attempts, a vehicle fails to pass COP procedures, the government has the legal authority to take action against a manufacturer, such as issuing a recall.

-- But this has not happened to date, though, and legal procedures for the MoRTH to issue mandatory recalls or levy fines have not been established.

VW under scrutiny in India

- **Government directed testing of VW models:** Automotive Research Association of India (ARAI) submitted report on emission levels of VW models
- **Gross violation reported**: ARAI tested 11 vehicles manufactured by Volkswagen Group in India. Found five to nine times higher emissions compared with the tests done during the prototype approval stage.
- **Voluntary recall:** Ministry of Heavy Industries & Public Enterprises directed Volkswagen to initiate vehicle recall in India. Volkswagen recalled some models
- **Proposal to do more tests and consider penalty:** Ministry of heavy industries considered on-road testing along with laboratory test as a norm. That the official agencies would do pilot testing of models of other OEMS as well.
- Proposed a committee of experts to look into Volkswagen's emission-test cheating case before deciding on any penalty.

Voluntary recall

December 2015: VW had said they would recall 3.24 lakh cars from VW Audi and Skoda brand

June 2016: VW announced that the recall will begin in July 2016.

(EA189 diesel engine family)

VW brand – 1.9 lakh cars

Skoda – 88700 cars

Audi -- 36500 cars

Several recalls in India since 2012 (related to emissions and technical/safety parameters)

2012: Ford – 1.2 lakh cars Figo and Classic models (Rear suspensions and steering)

2013: General Motors – Tavera (Emissions related)

2014 Maruti Suzuki – 1 lakh (Dzire, Swift, Artiga)

2015: Honda 2.23 lakh; General Motors 1.5 lakh;

VW – 1.55 lakh cars (emissions related)

2016: Maruti Suzuki (75,4190 cars; Ford 48,700 cars); Honda (57676 cars**) (safety related)**

Current in-use emissions surveillance too weak to prevent dieselgate

Diesel vehicles

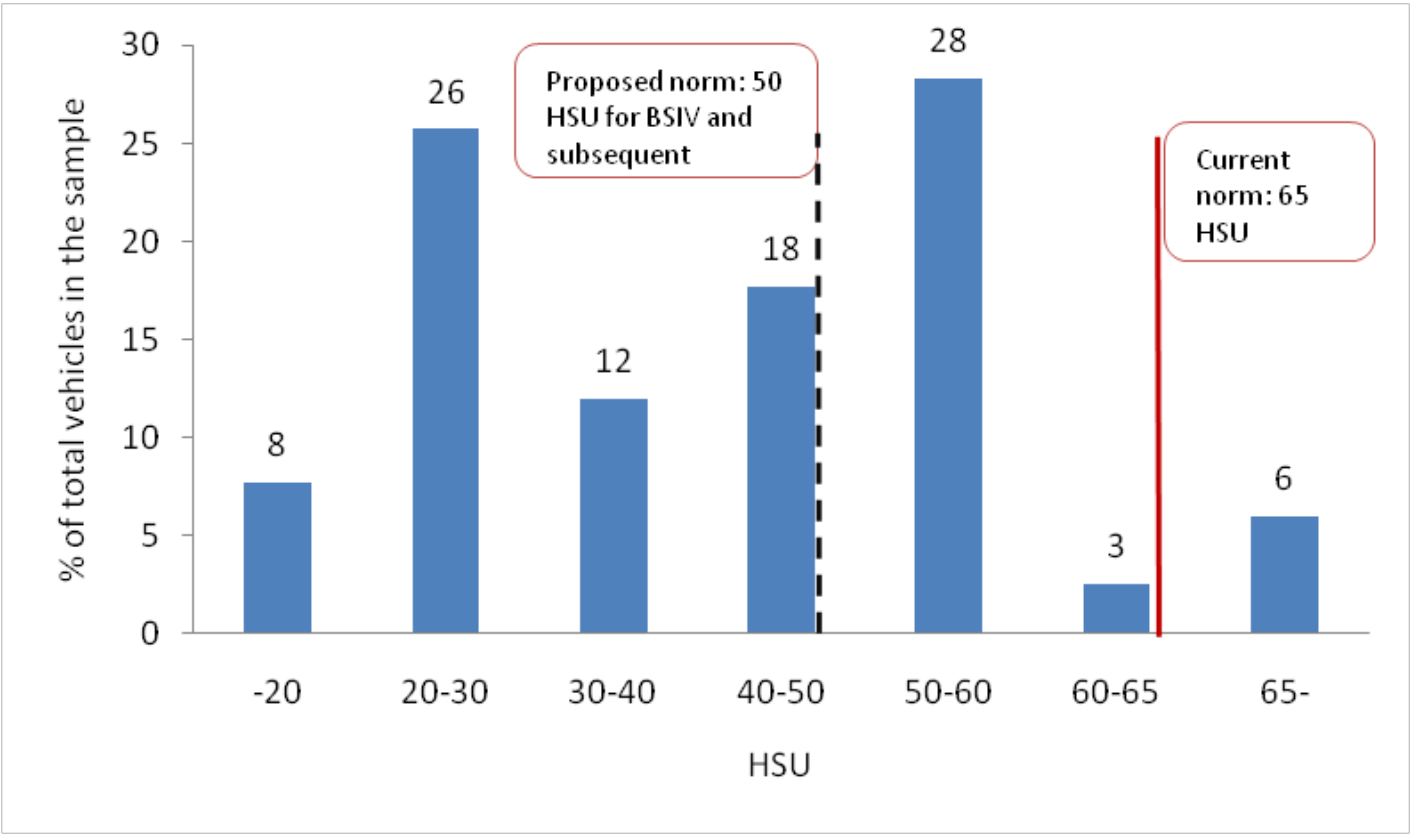
Based entirely on visible smoke that -- tested by "snap-idle" opacity test(SAE J1667). Very ineffective.

Smoke tests for diesel vehicles: A farce

- Smoke readings differ depending on how well the vehicle is warmed up. It is very difficult to get consistent readings.
- Results vary depending on the way the accelerator pedal is pressed.
- Doesn't really measure particulate.
- The smoke readings at different PUC

Poor failure rate in pre-Euro IV and Euro IV vehicles

Diesel vehicles: Smoke density norm of 65HSU
-- Failure rate 6%



Negligible failure in Euro IV vehicles meeting Euro IV standards

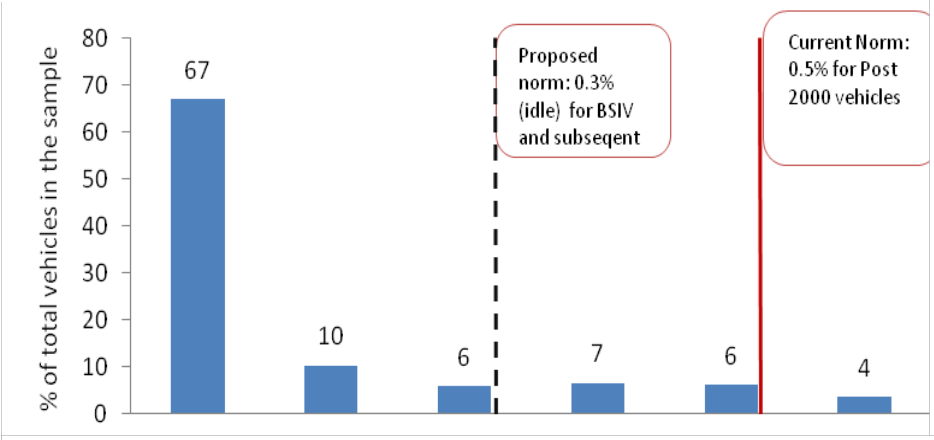
Smoke density limit was revised to 50 ppm only for Euro IV vehicles Virtually no failure

Source: CSE

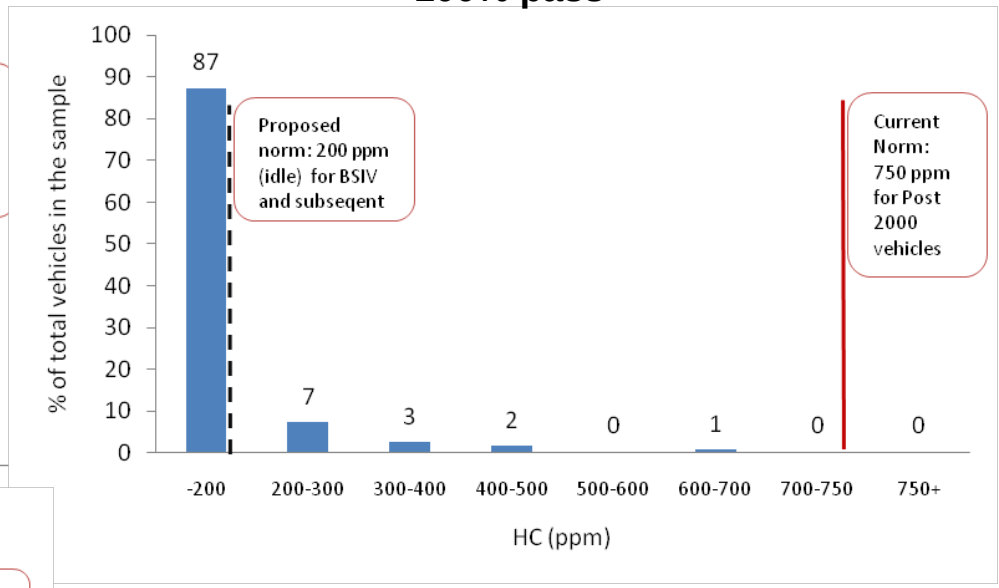
Current system cannot make a difference……

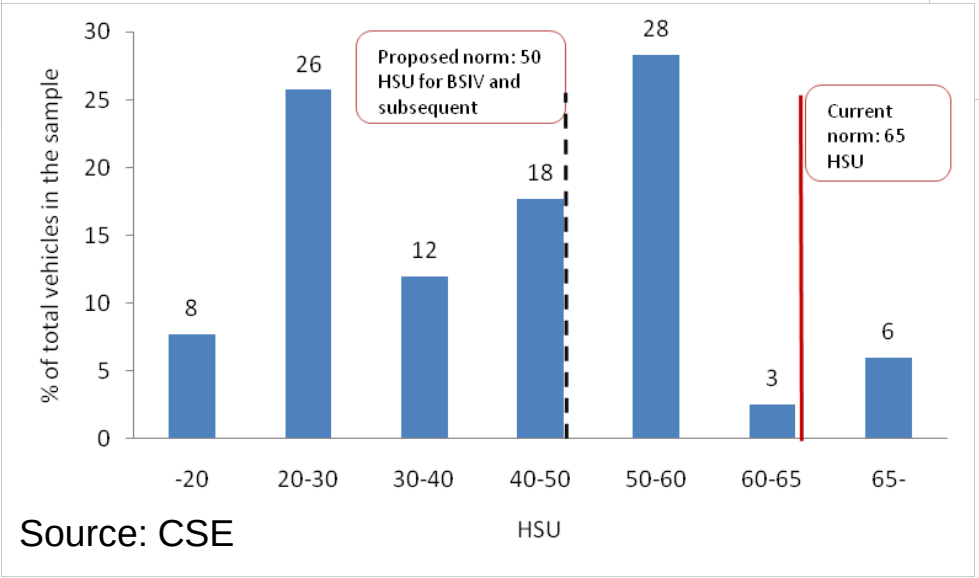
Carbon monoxide for post2000 cars 0.5% (idle)

-- 4% fail. 96% pass



Hydrocarbons norms for post 2000 cars 750 ppm (idle) -- 100% pass





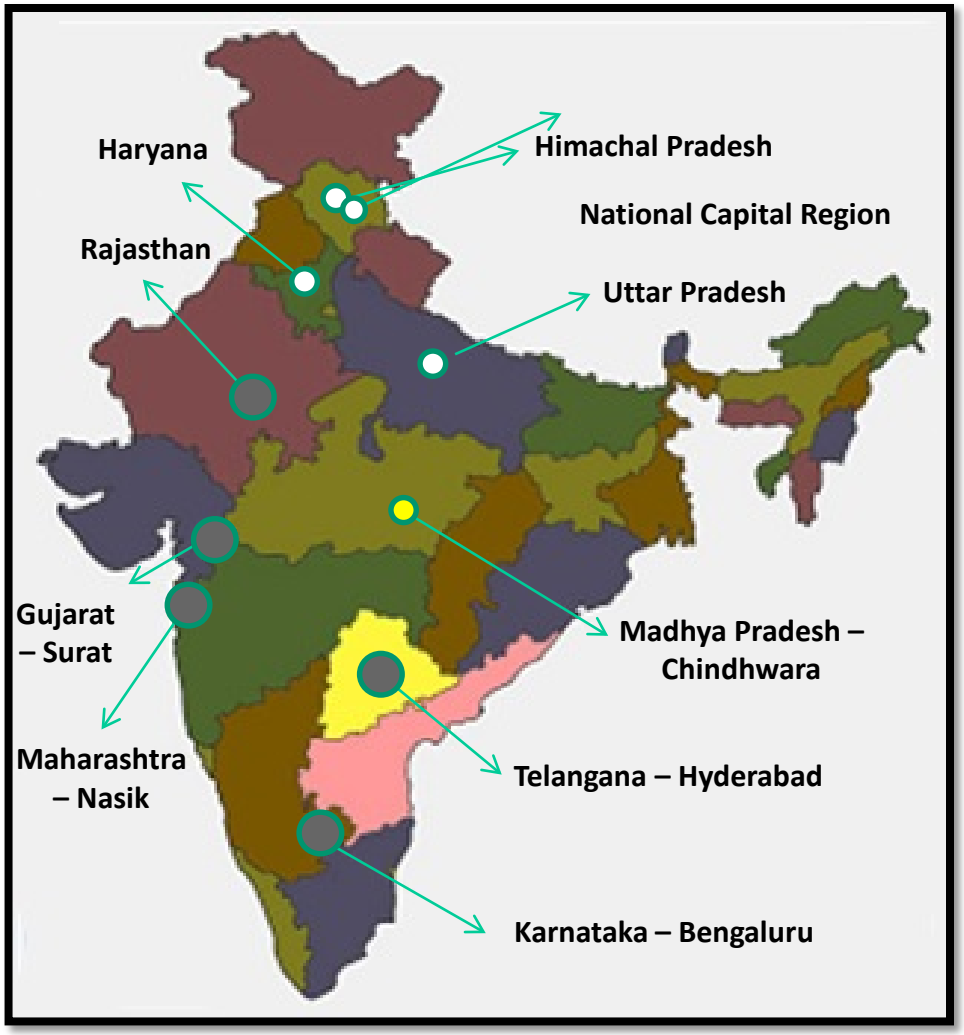
Source: CSE

Diesel vehicles: Smoke density norm of 65HSU

-- Failure rate 6%

What happens when we raise the bar?

10 Model I&C Test Centers being established..



- Centers to be facilitated by ARAI
- Centers to be facilitated by iCAT
- Center to be facilitated by SIAM

ARAI will facilitate setting up centres at Cuttack, Odisha and at Trissur, Kerala under II phase

Source: ARAI

Inspection and Certification Test Center- Nasik

Source: ARAI

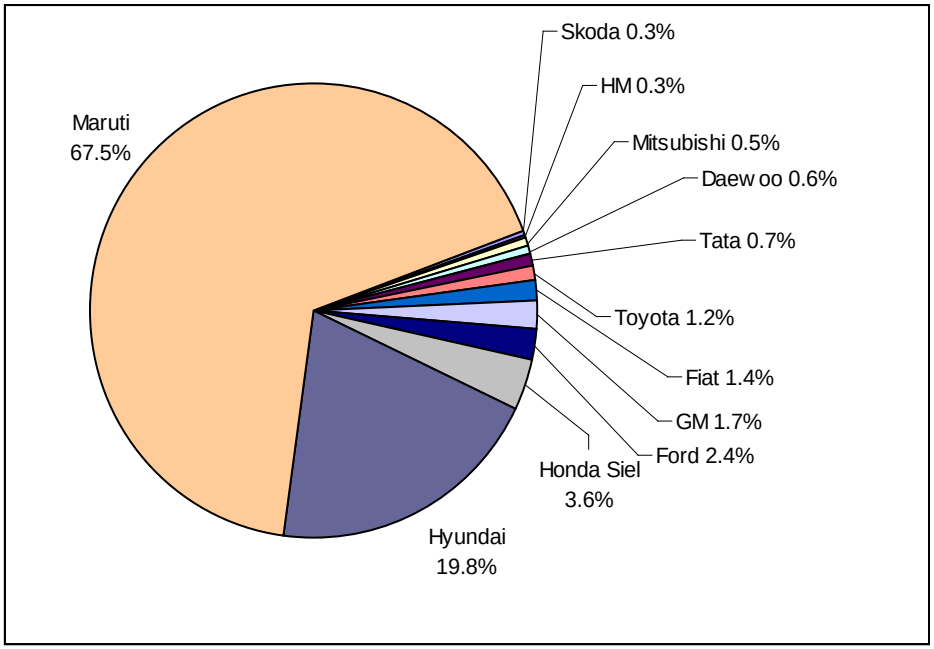
Rigorous fitness inspection exposes wide deviation

Annual fitness tests of commercial vehicles: Every year a fitness certificate is issued to all the public service and commercial vehicles running on the road by transport department as per rule 62.

Improved fitness testing and trial analysis in new I&C centre: Trial analysis of 1257 vehicles in August 2015. That included 50% light-duty vehicles; 37% heavy-duty vehicles: 9% three wheelers; 5% medium commercial vehicles.

Disturbing results: Of these 93% vehicles failed

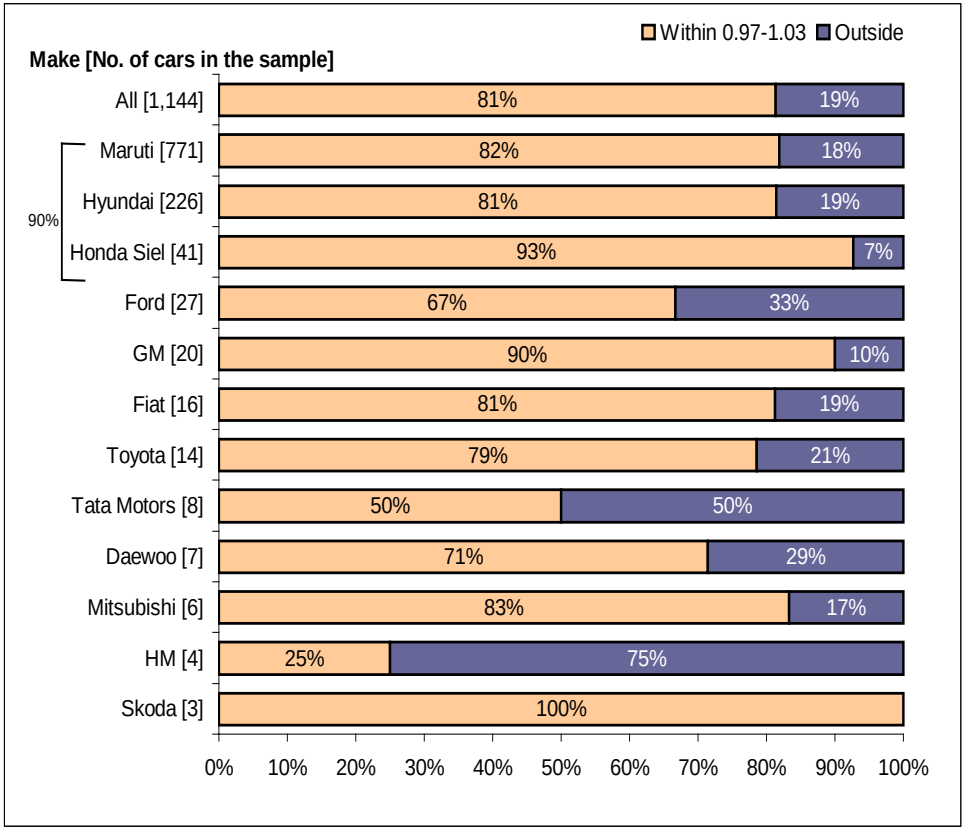
The Lambda fiasco



Share of different makes in the sample

lambda value of 1± 0.03

Make-wise lambda result



New policy developments

National level

-- Euro VI emissions standards to be introduced in 2020

-- Differentiated infra tax on petrol and diesel cars

Delhi region

-- Temporary ban on diesel cars with 2000 cc engines and above until environment compensation charge is fixed for all diesel cars

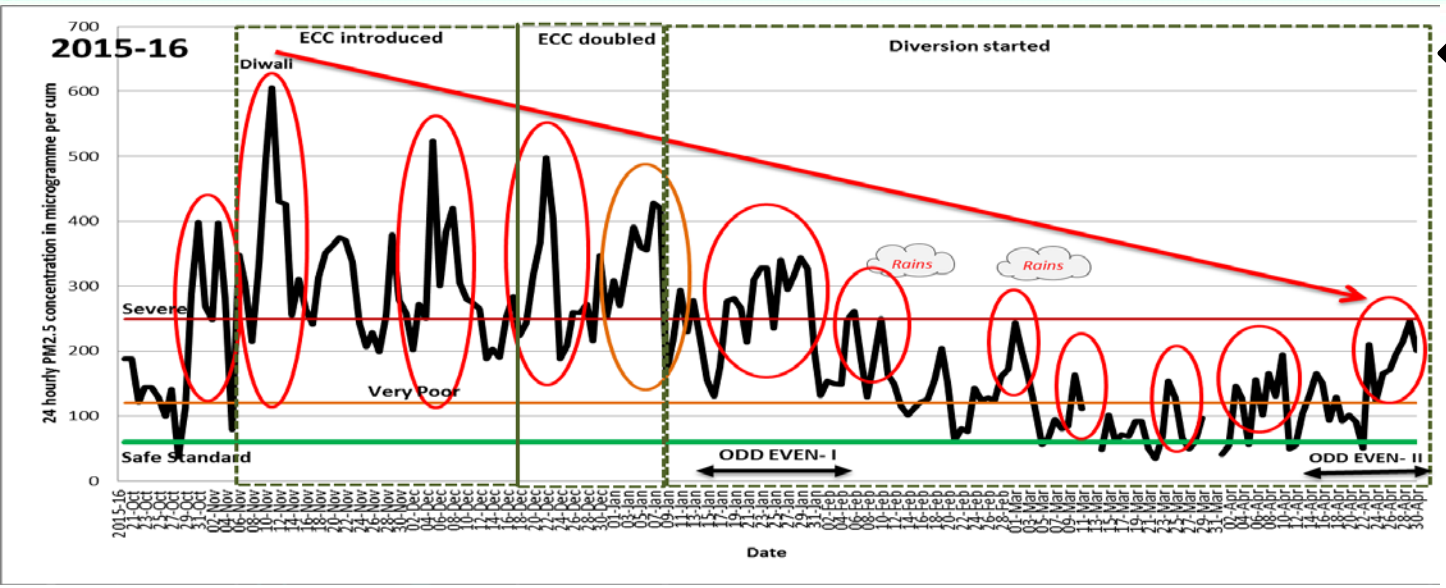
-- Imposition and doubling of environment compensation charge on all trucks entering Delhi – close to 50% drop in truck numbers reported

-- Banned entry of10 year old trucks; non-destined trucks not allowed

-- Diesel taxis not allowed

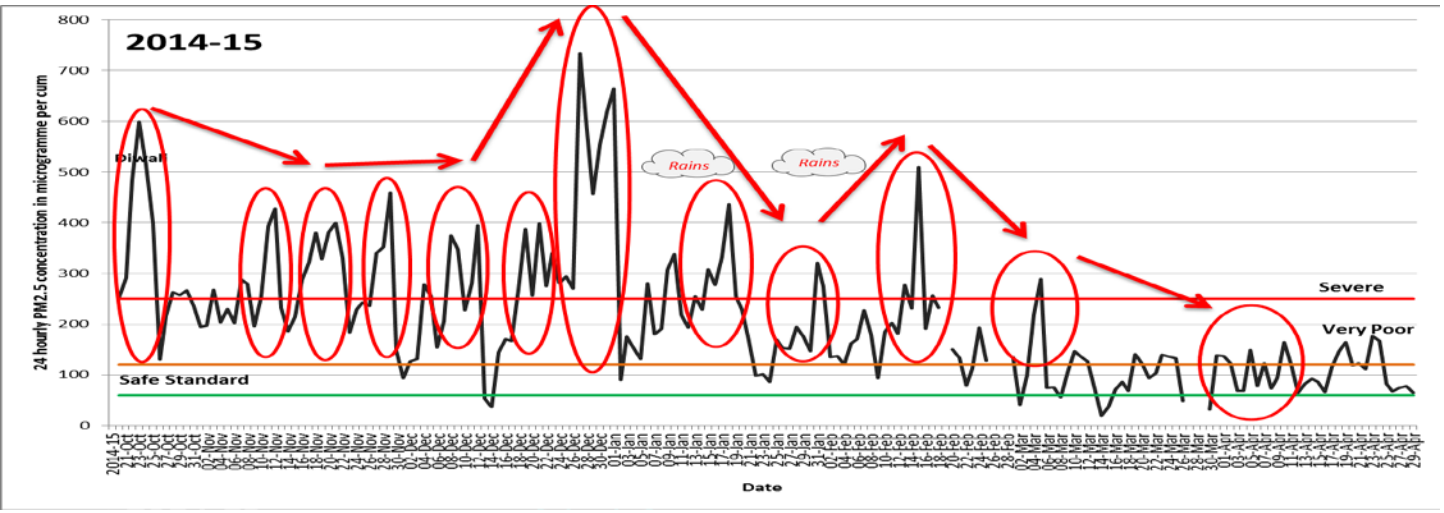
-- Environment tax on per litre of diesel sold.. Air Ambience Fund

Slowing down pollution peak since last year



2015-

More certain and consistent trend in response to action

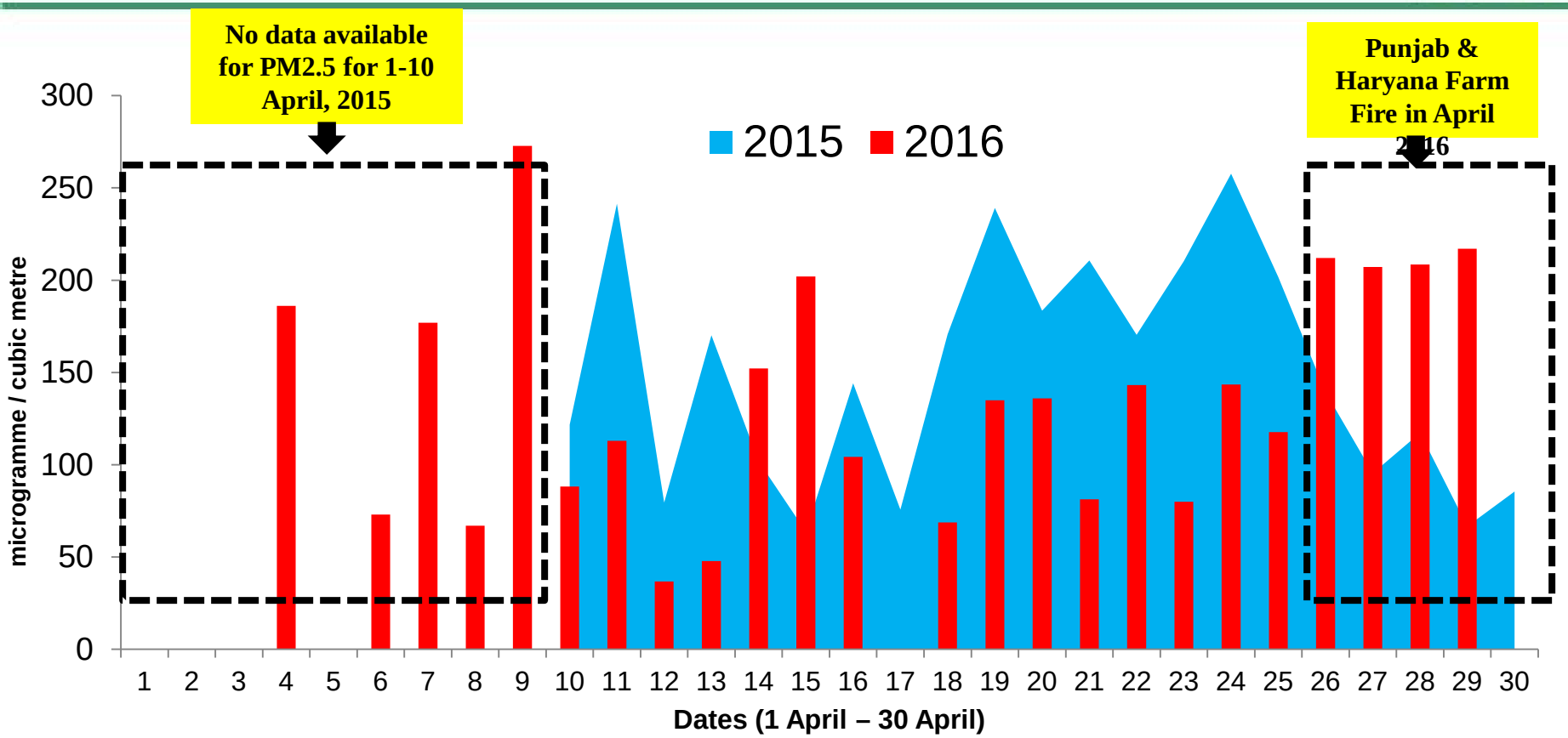


2014-

More erratic trend influenced by variable weather

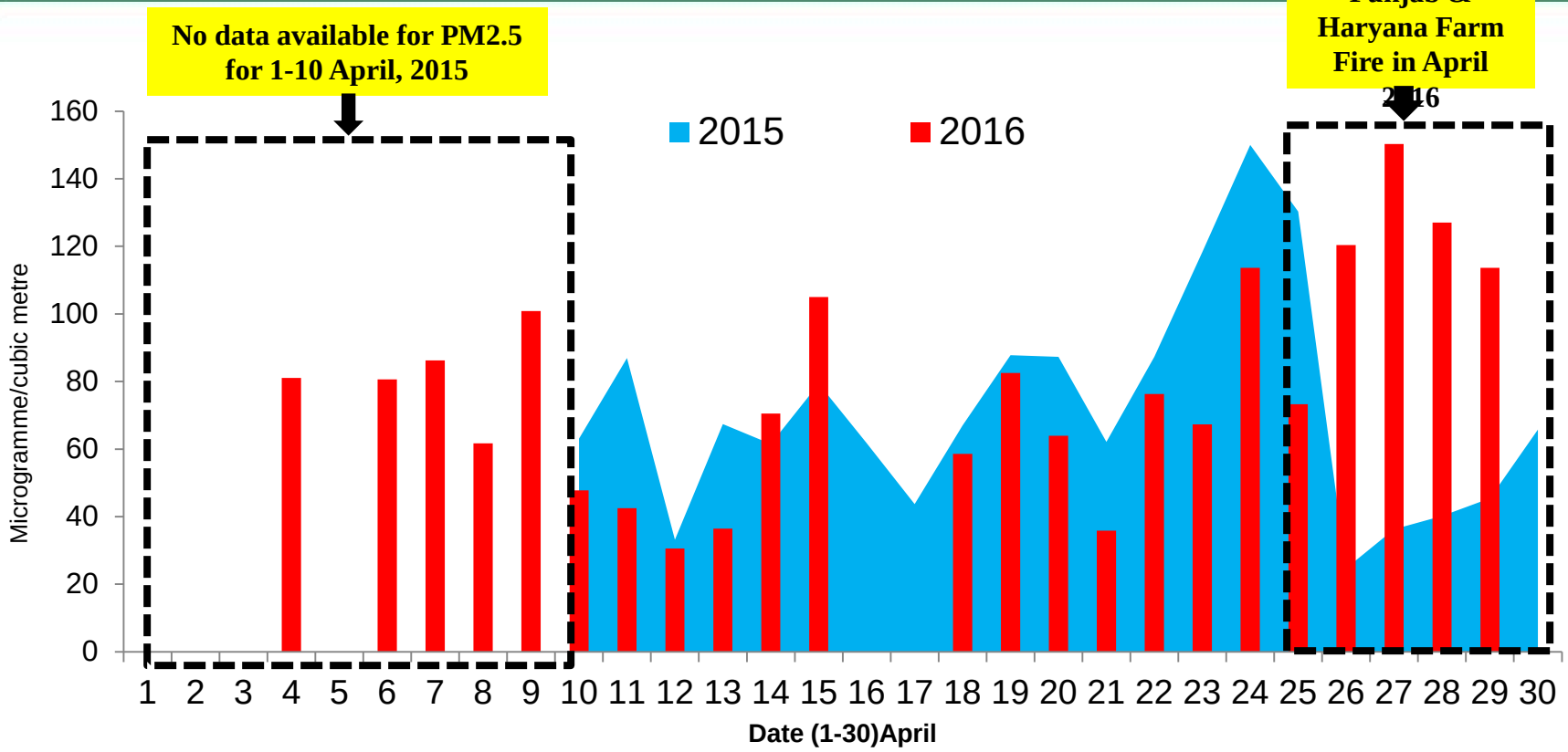
Source: Based on DPCC Real Time Monitoring Data

Night time pollution lower PM2.5 levels in April 2016 lower than April 2015



Source: CSE analysis based on realtime data of DPCC

Night time pollution lower NOx levels in April 2016 lower than April 2015



Source: CSE analysis based on realtime data of DPCC

Next steps under discussion

To push for in-service compliance regulations

Emissions warranty and recall programme:

Proposed by Auto Fuel Policy Committee; Penalty and mandatory recalls. Indian laws-- environment (protection) act and Motor Vehicles act, give government the authority to establish these rules.

The government can legally revoke certification if vehicles found non-compliant with COP requirements. Guidelines on government and manufacturer action to remove noncompliant vehicles from road not clear.

On board diagnostic and I/M

Transport departments to evaluate integration of OBD with I/M programme. Central government to frame rules for its integration OBD I requirement from 1 April 2010 and OBD II from 1 April 2013

Demand for transparent emissions data

Control dieselisation: Need fiscal measures

Thank You