Cleaning the Air: challenges and solutions

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SC drops a bomb, bans cracker s in Delhi-NCR

Amit Anand Choudhary| TNN | Oct 10, 2017, 06:25 IST

'सांसों' पर स्मॉग की 'स्याह' परतें

Updated on: Thu, 15 Nov 2012 02:00 AM (IST)

Delhi winter smog i

Nov 22, 2012

During the first week of November, Delhi smog. The breeze nearly stopped, and th and calm weather led to fumes settling clo masks, scarves or handkerchiefs to their fa

The resultant outcry in the smog-hit city had offici nothing new and that it happened every winter.

The new twist came from the NASA snapshots of sm agricultural fires in neighbouring Punjab. This triggers behind the smog – Delhi's vehicles or errant farmers'

Smog leaves Delhi gasping for breath

TNN | Nov 3, 2012, 01.33 AM IST

year's stock can use firecrackers.

City enveloped in smog, back to pre-CNG levels

Gains Of Switch To Cleaner Fuel Frittered Away

Neha Lalchandani | TNN

New Delhi: Delhi's air pollution has reached alarming levels. For proof, just look out of the window. The grey-white 'haze' that has been covering the city since October 28, say experts, is actually smog that is linked to the rapid rise in

▶High pollution, P 6

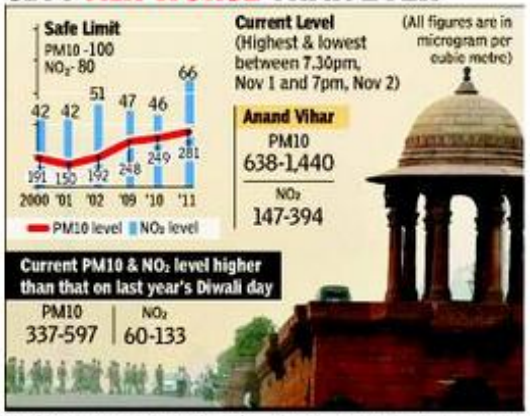
particulate matter and nitrogen dioxide levels.

The smog got thicker on Friday and blotted out the sun through the day. It was described by one expert as a "toxic cocktail of poisonous gases". Not coincidentally, Friday's air pollution levels were actually worse than the air quality recorded on Diwali last year (see graphic).

In 2001, alarmed by Delhi's rapidly deteriorating air quality, the judiciary had ordered the conversion of all public transport vehicles to the cleaner CNG. It can now be officially said — based on government data on nitrogen oxide and particulate matter (see graphic) — that gains in air quality made due to the CNG switch have now been squandered away.

"This is a clear case of haze and smog due to high pollution levels," said R K Jenamani, director in-charge of IGI Met.

CITY AIR WORSE THAN EVER



Asthma cases on the rise

The elderly and children are bearing the brunt of the smoggy weather, say doctors, as cases of asthma and chronic bronchitis rise sharply. "We are seeing many patients who are not able to walk at home due to breathing difficulty," said Dr Aroop Basu of Gangaram Hospital. The gloomy skies and fall in temperatures are also leading to a surge in headaches, mood swings and depression. P6

Most cities have unhealthy levels of PM2.5

Annual mean ambient PM2.5 (µg/m3)

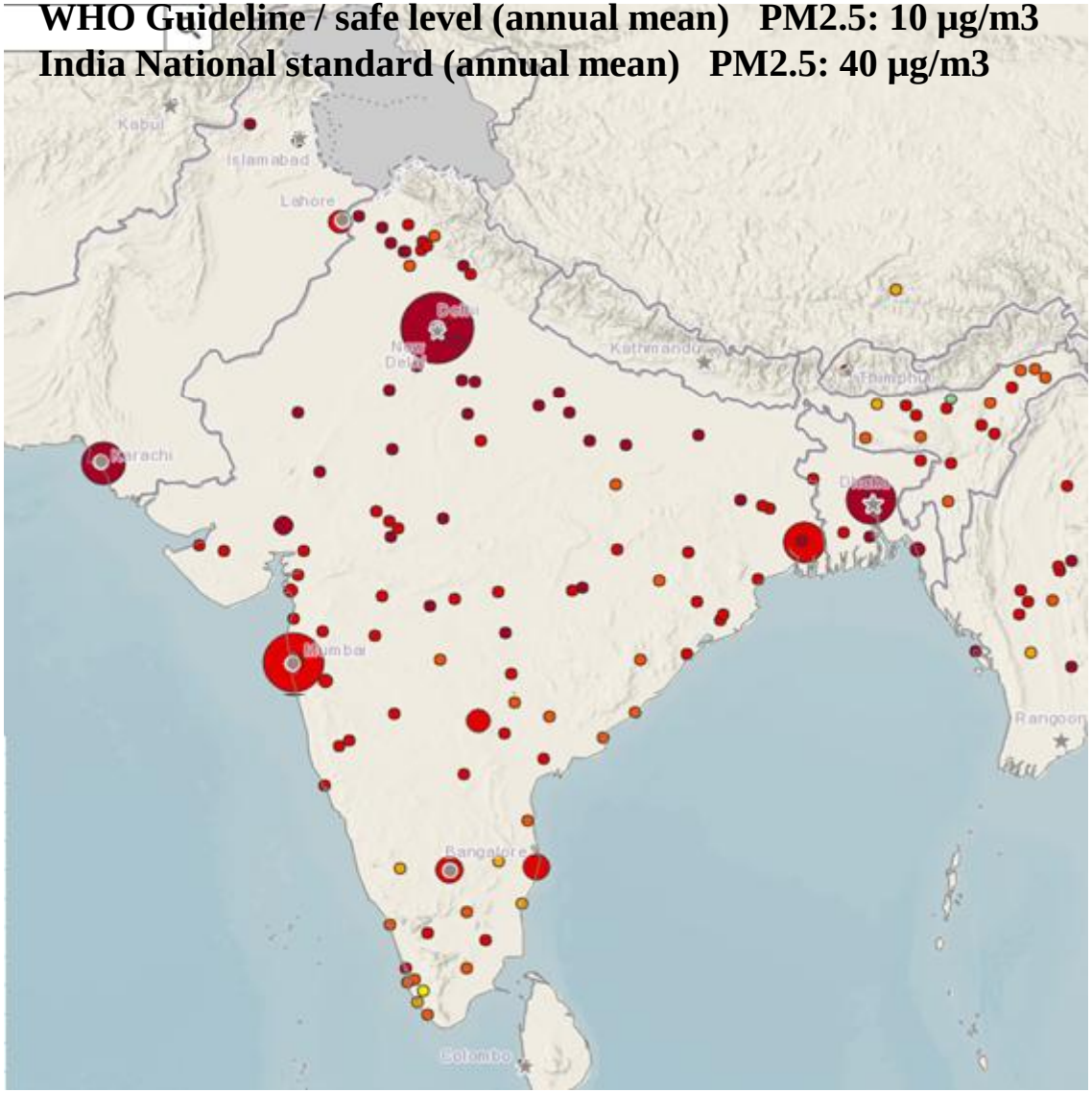
Circles: monitoring station / background: modeled estimates

- < 10
- 11 - 15
- 16 - 25
- 26 - 35
- 36 - 69
- 70 or more

Population

- > 25,000,000
- 20,000,000
- 15,000,000
- 10,000,000
- < 5,000,000

WHO Guideline / safe level (annual mean) PM2.5: 10 µg/m3
India National standard (annual mean) PM2.5: 40 µg/m3



- Source: WHO

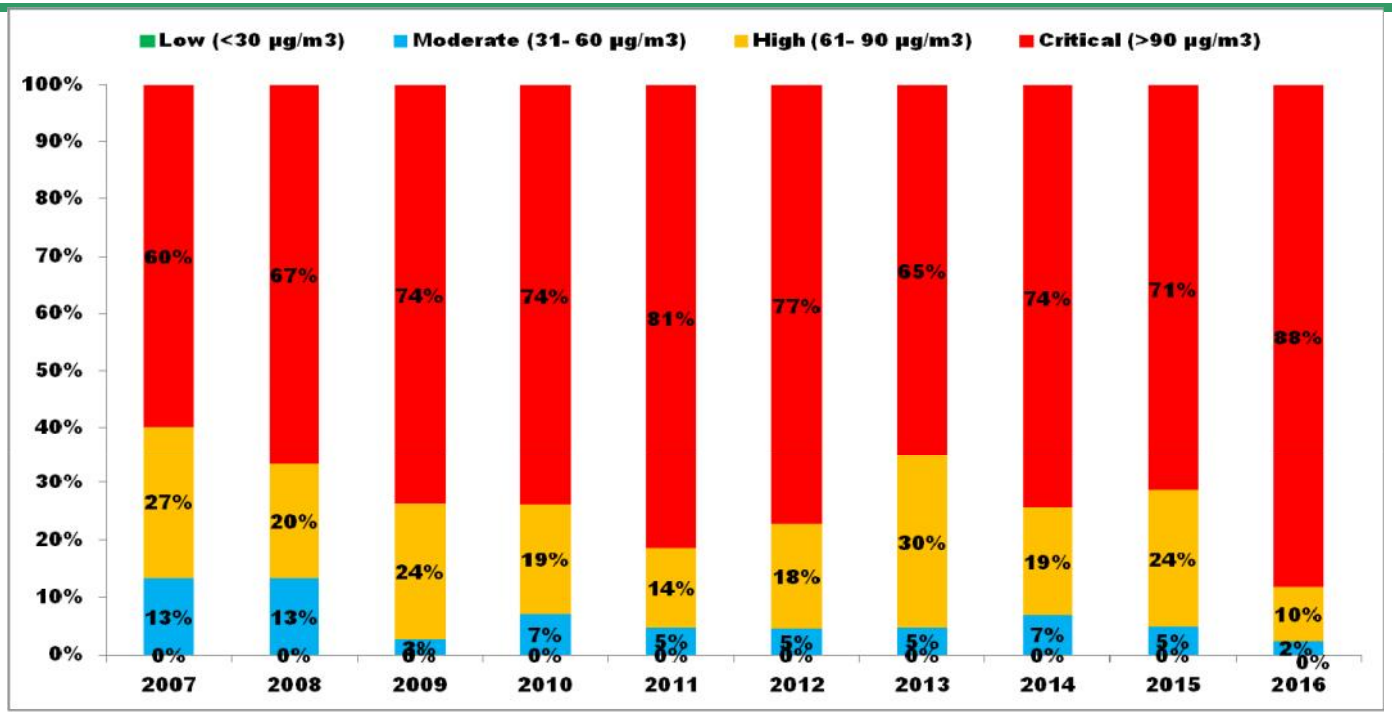
Air Quality Monitoring: Need expansion of network

-- Nearly half of urban population/ Only 303 cities covered. Total 6,166 Census cities and towns (coverage a mere 5%)

-- Limited realtime monitoring: Only 57 cities have continuous real time monitoring stations. Rest are manual that do not allow daily reporting of real time air quality data.

-- Most cities have just one station each

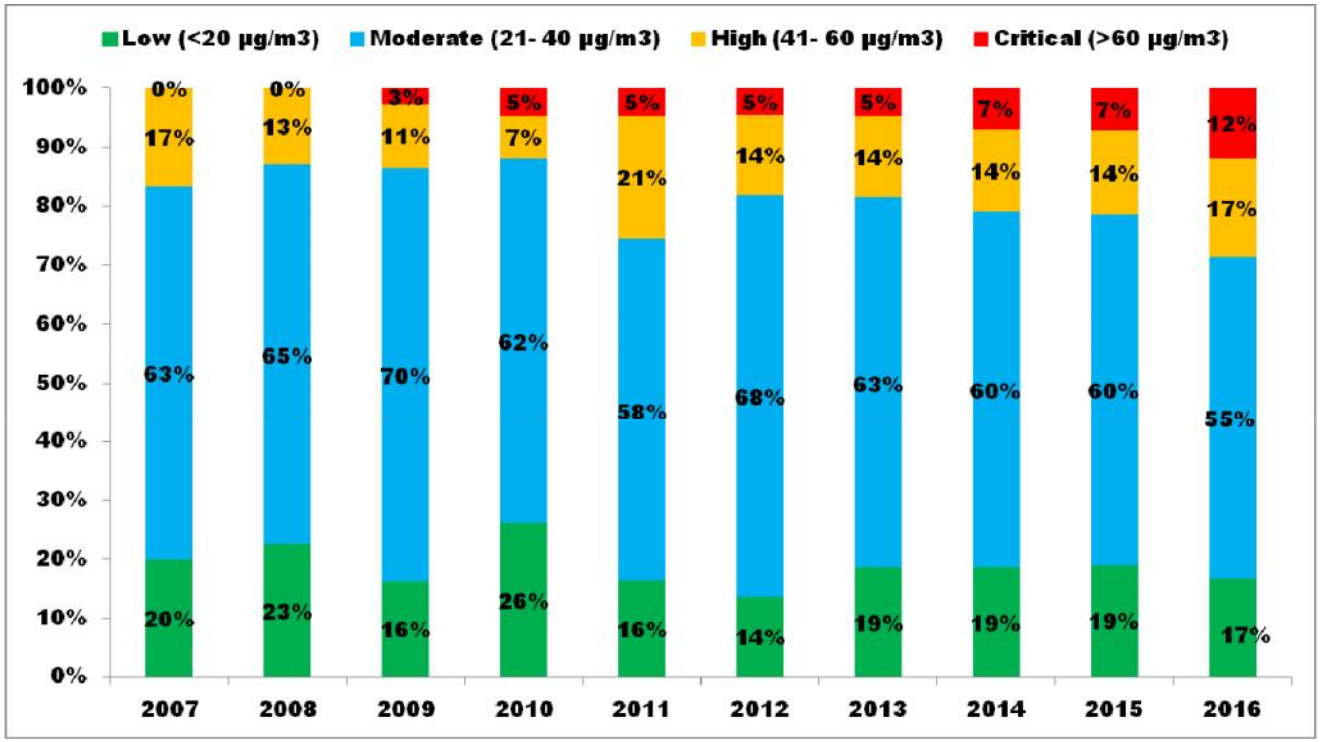
More cities in grip of critical level of PM10 (status of million plus population cities)



Source: Centre for Science and Environment of CPCB air quality data submitted to Rajya Sabha for 44 cities

- **Among the metro cities, the number of cities in the critical range of PM10 levels increased from 60 per cent in 2007 to 88 per cent in 2016.**
- **There is a drastic fall in the number of cities which comply to the standard from 13 per cent in 2007 to 2 per cent in 2016.**
- **There are no cities which are in the low category (50% below the standard) since a decade**
- **Majority of urban population exposed to unacceptable levels of pollution.**
- **95% of Indians are breathing air pollution levels above WHO guidelines**

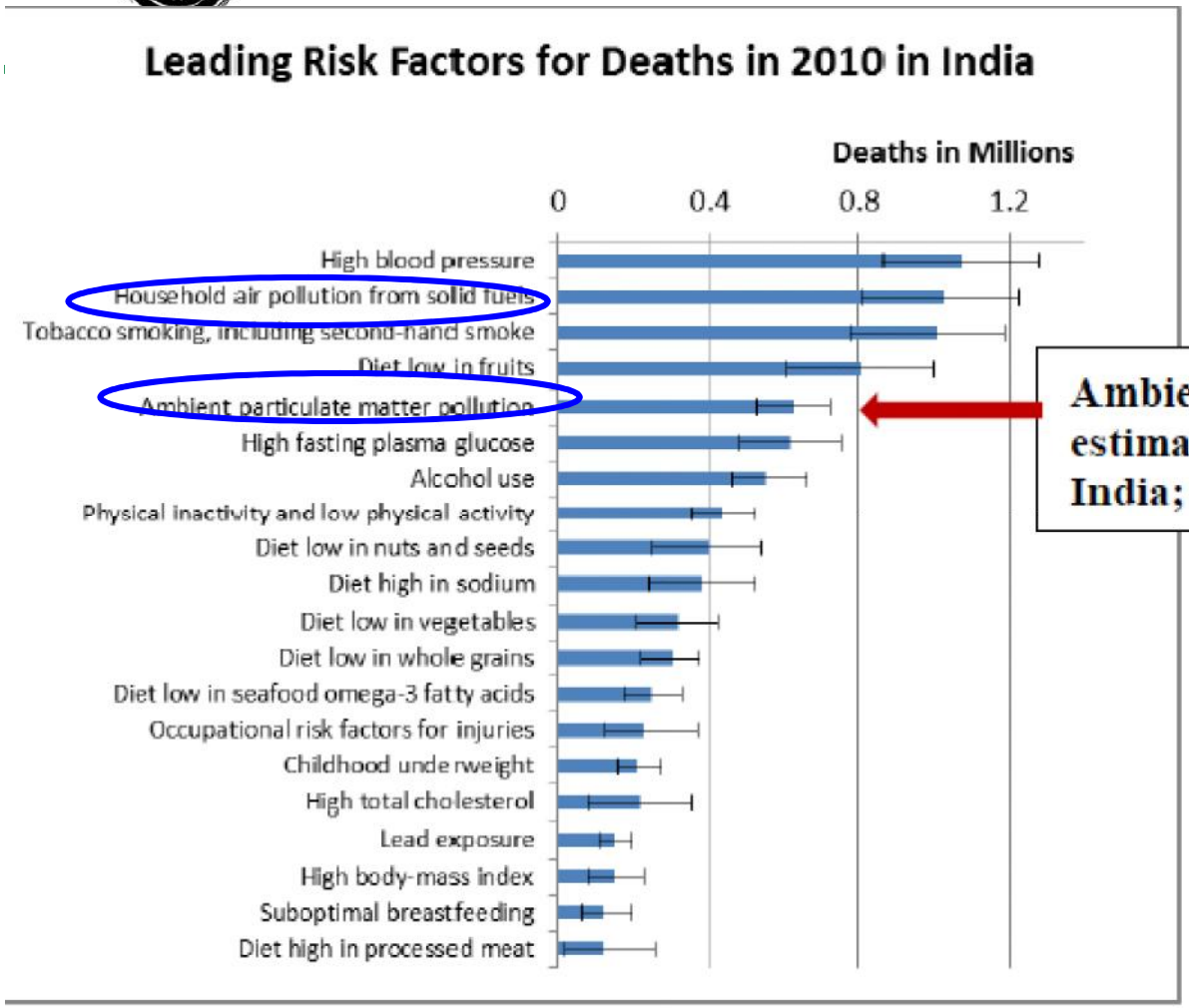
NO2 – an emerging problem



Source: Centre for Science and Environment of CPCB air quality data submitted to Rajya Sabha for 44 cities

- For NO2 annual concentration levels, the number of cities exceeding the annual standard of 40 microgramme per cum has increased from 17per cent in 2007 to 29 per cent in 2016.
- In 2007 when there was not a single city in the critical zone (when the levels are 1.5 times the standard), in 2016 it accounts for 12 per cent.

Fifth largest killer in India……



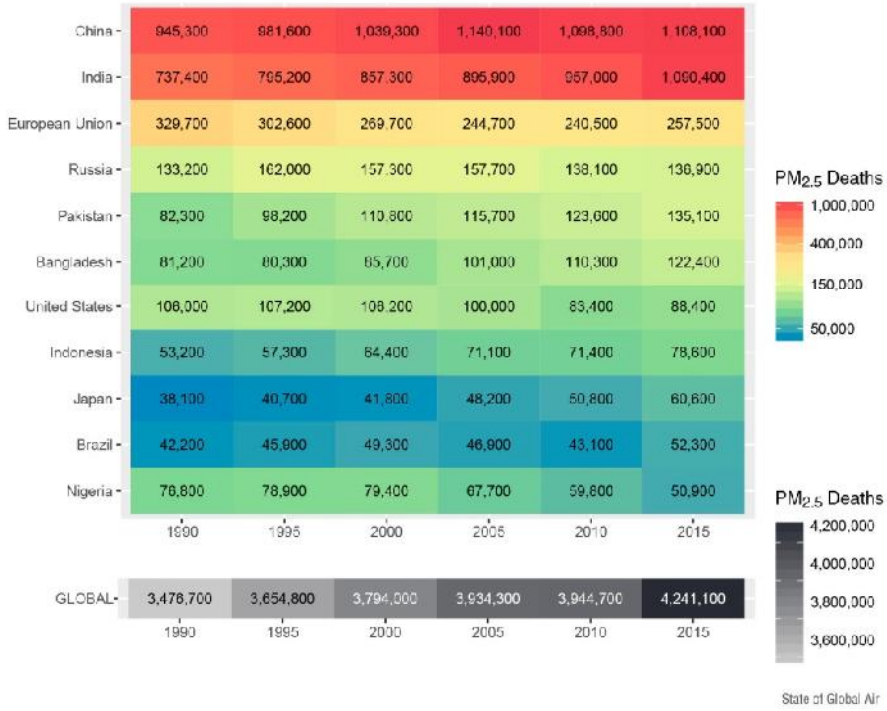
Ambient $PM_{2.5}$ caused an estimated 627,000 deaths in India; ~6% of all deaths in 2010

More than 18 million healthy life years lost due to air pollution. Air pollution triggers stroke, cardiovascular and respiratory diseases, cancer…..

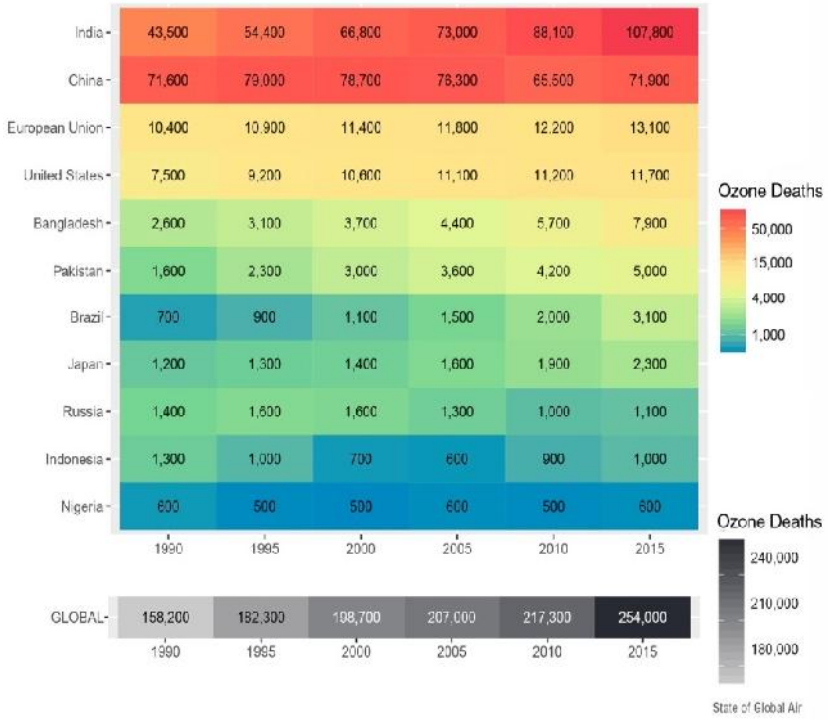
Air pollution is the 5th largest killer in India…….

Scary results from new analysis of GBD 2017

Early deaths due to PM2.5:
Second highest in India



Early deaths due to ozone:
Highest in India



48% increase in India since 1990
17% increase in China

148% increase in India since 1990
Stable trend in China

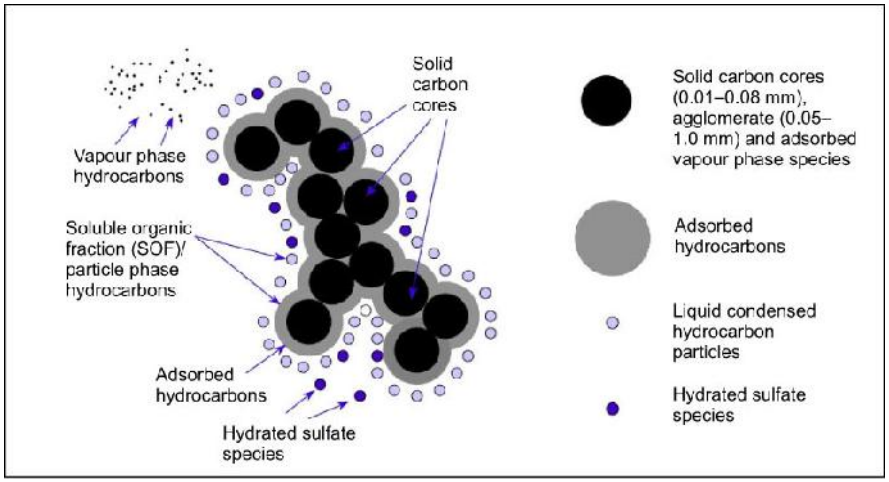
New science: Some particulates are more harmful than others

Studies are assessing differentiated health risk according to source of particulates

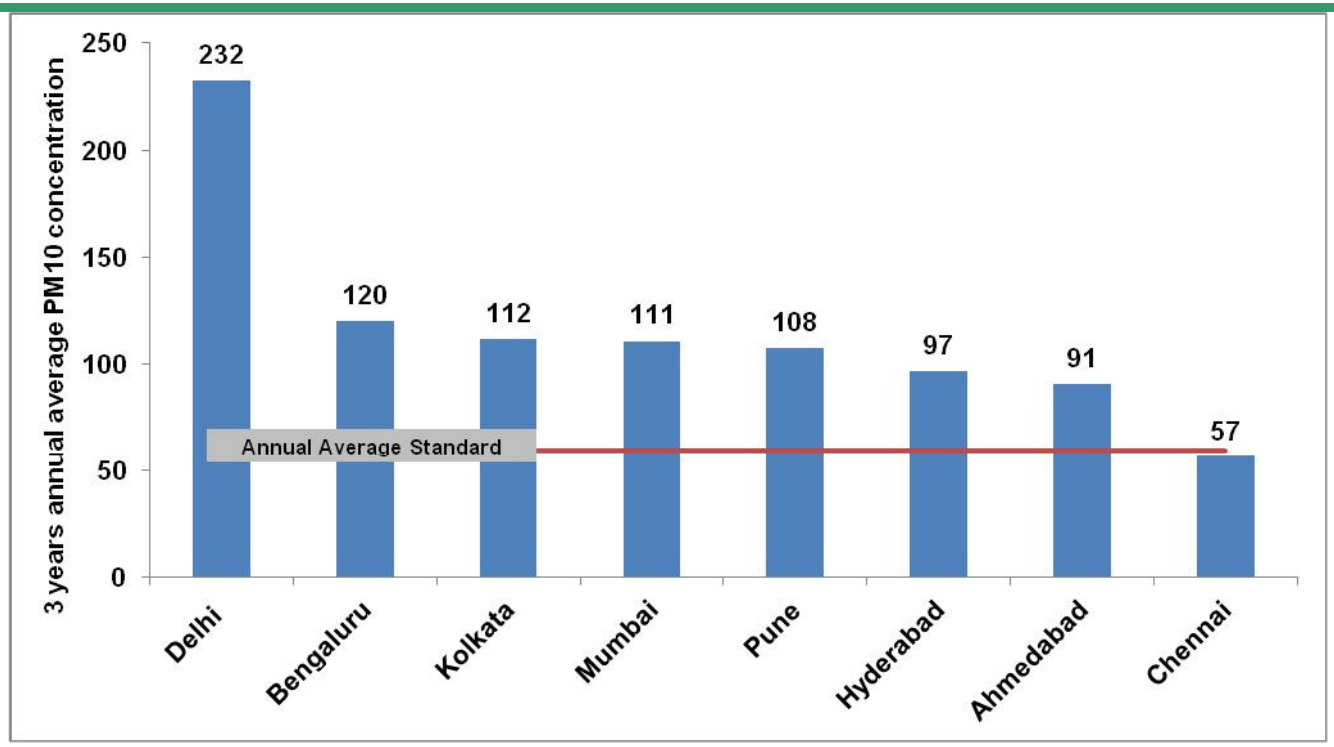
Particles from coal and diesel are more harmful than wind blown dust.

These increase ischemic heart disease related deaths. This is dangerous as GBD for India attributes half of air pollution deaths to heart disease.

(Health Effect Institute in Environmental Health Perspective recently)



Air quality goal?



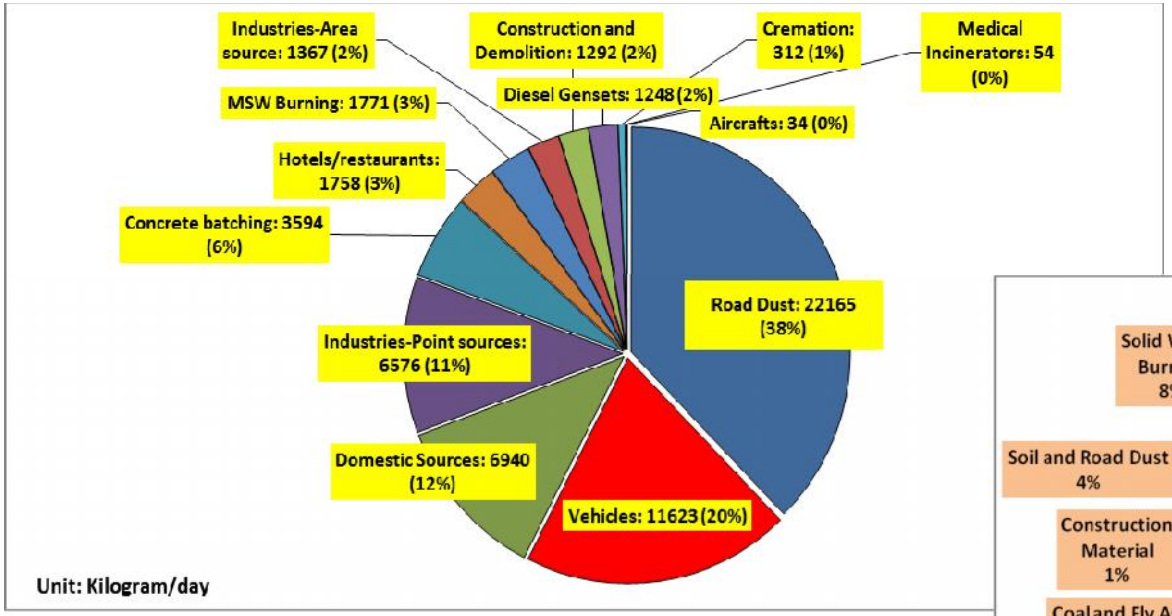
Source: Centre for Science and Environment of CPCB air quality data submitted to Rajya Sabha for 44 cities

• Cities with a population of more than 5 million, Delhi has been ranked at first for being highly polluted which is followed by Bengaluru, Kolkata

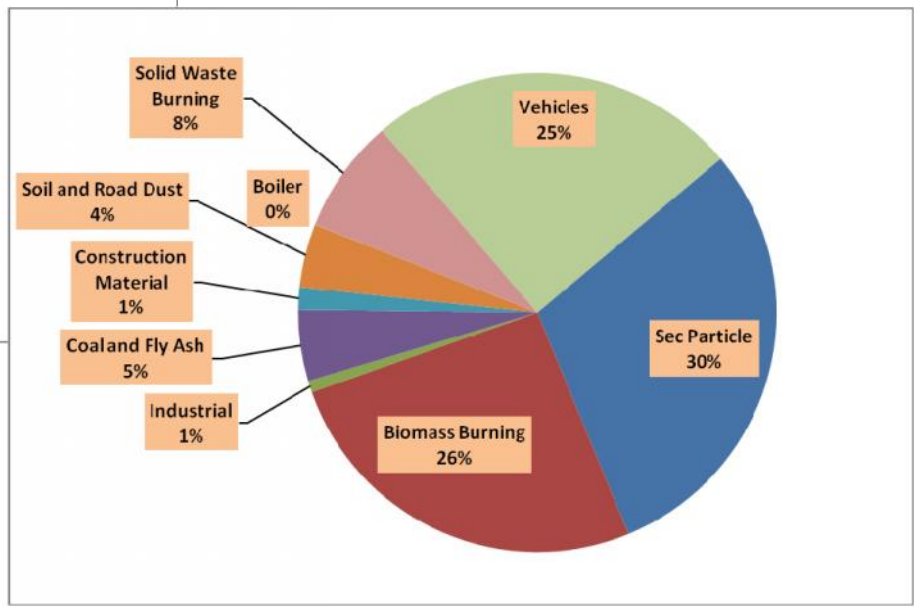
• Only Chennai is the city where the PM10 concentration is below the annual standard.

What is being emitted in Delhi?

Pollution sources PM2.5



What we breathe during winter in Delhi?



Source:IIT Kanpur

Ambient air quality vs Exposure

Union Ministry of Health and Family Welfare Report of *Steering committee on air pollution and health related Issues'*,

More important to know 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.

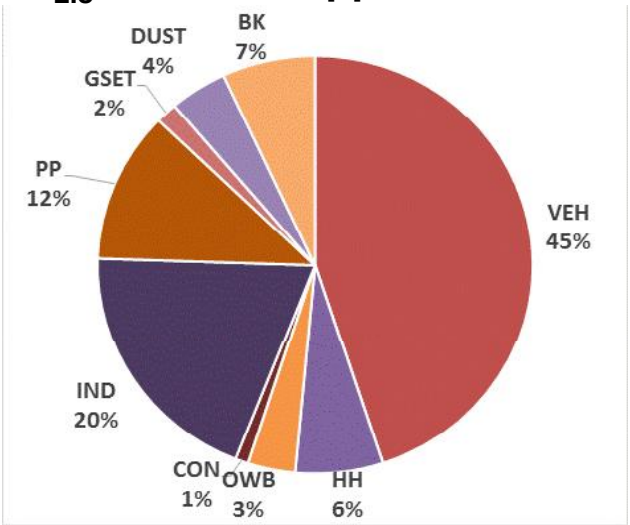
Shift from concentration management to exposure management

Ambient concentrations do not always well represent human exposures,

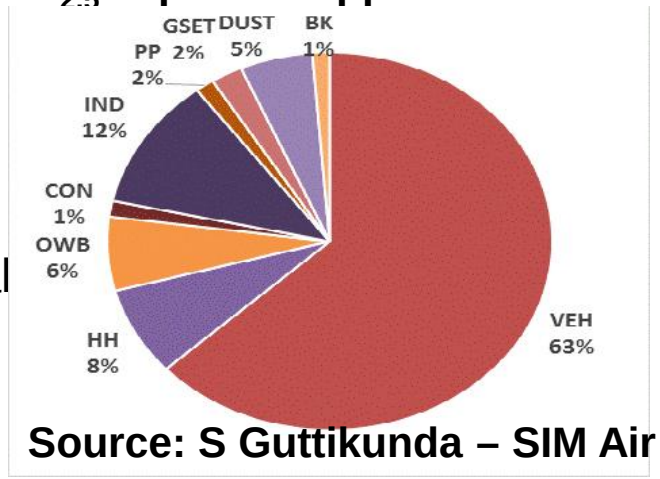
Ambient concentration is not a good surrogate for total air pollution risk, -- cannot indicate exposure and health outcome

Chennai

$PM_{2.5}$ emission apportionment

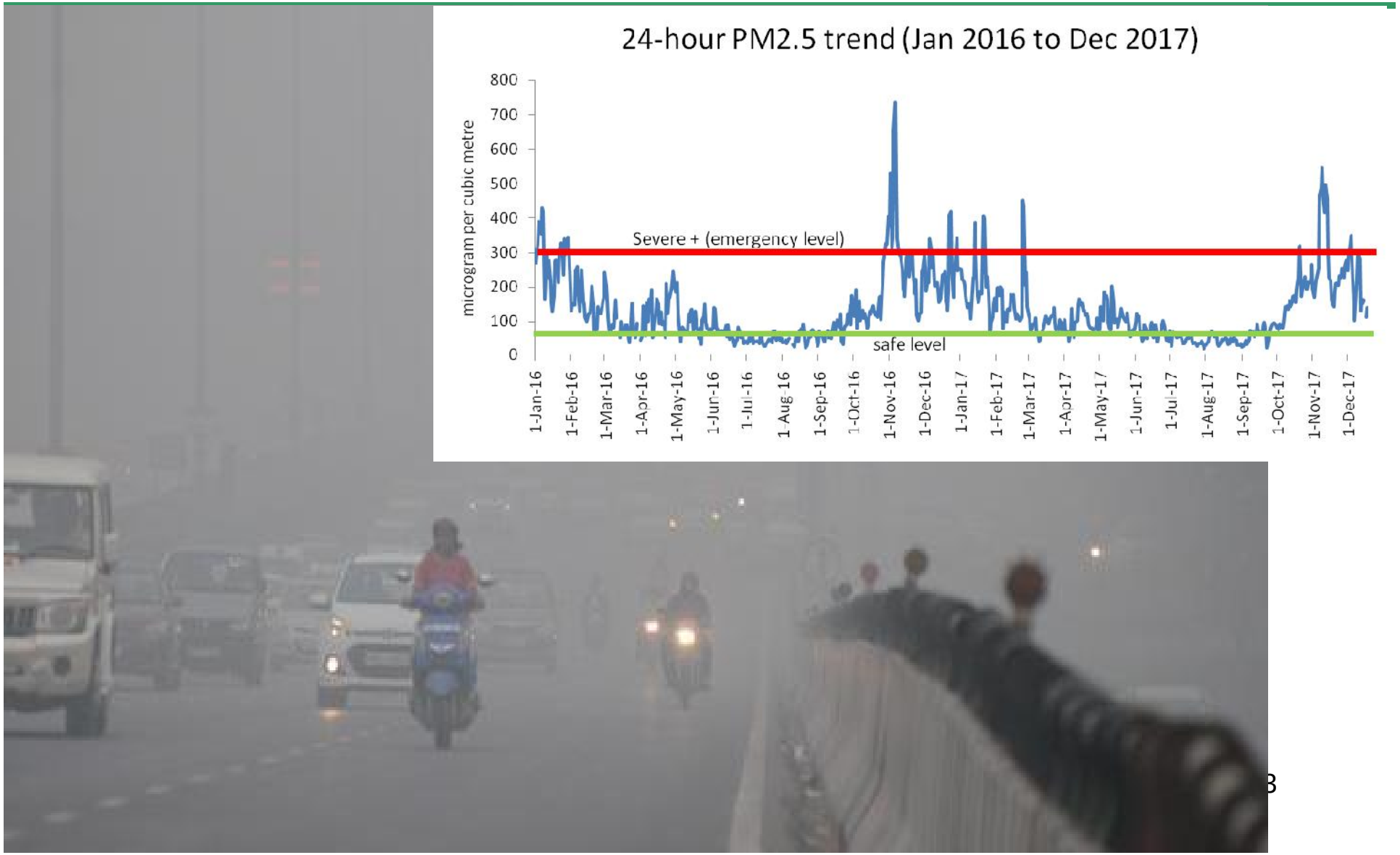


$PM_{2.5}$ exposure apportionment



Source: S Guttikunda – SIM Air

Deadly winter smog



Supreme Court asks Government: *"Do you have a plan before city shuts down?"*

National Air Quality Index and Health advisory

AQI Category (Range)	PM_{10} 24-hr	$PM_{2.5}$ 24-hr	NO_2 24-hr	O_3 8-hr	CO 8-hr (mg/m^3)	SO_2 24-hr	NH_3 24-hr	Pb 24-hr
Good (0-50)	0-50	0-30	0-40	0-50	0-1.0	0-40	0-200	0-0.5
Satisfactory (51-100)	51-100	31-60	41-80	51-100	1.1-2.0	41-80	201-400	0.5 –1.0
Moderately polluted (101-200)	101-250	61-90	81-180	101-168	2.1- 10	81-380	401-800	1.1-2.0
Poor (201-300)	251-350	91-120	181-280	169-208	10-17	381-800	801-1200	2.1-3.0
Very poor (301-400)	351-430	121-250	281-400	209-748*	17-34	801-1600	1200-1800	3.1-3.5
Severe (401-500)	430 +	250+	400+	748+*	34+	1600+	1800+	3.5+

AQI	Associated Health Impacts
Good(0–50))	Minimal Impact
Satisfactory (51–100)	May cause minor breathing discomfort to sensitive people
Moderately polluted (101–200)	May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor (201–300)	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease
Very Poor (301–400)	May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
Severe (401-500)	May cause respiratory effects even on healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

Graded response action plan notified

Graded Response Action Plan

Moderate – When PM2.5 is between 61-90 µg/m3 or PM10 is between 101-250 µg/m3	1. Stringently enforce/stop garbage burning in landfills 2. Close/stringently enforce all pollution control regulations in brick kilns and industries 3. Stringently enforce pollution control in thermal power plants through PCB monitoring 4. Do periodic mechanized sweeping on roads
Poor – When PM2.5 levels are between 91-120 µg/m3 or PM10 levels are between 251-350 µg/m3	5. Strict vigilance and no tolerance for visible emissions 6. Strict vigilance and enforcement of PUC norms 7. Stringently enforce rules for dust control in construction activities and close non-compliant sites 8. Deploy traffic police for smooth traffic flow at identified vulnerable areas 9. Strictly enforce Supreme Court order on diversion of non-destined truck traffic 10. Strictly enforce Supreme Court ban on firecrackers 11. Information dissemination Social media, mobile Apps should be used to inform people
Very Poor - When PM2.5 levels are between 121-250 µg/m3 or PM10 levels are between 351-430 µg/m3	1. Stop use of diesel generator sets 2. Enhance parking fee by 3-4 times 3. Increase bus and metro services by augmenting contract buses and increasing frequency of service 4. Stop use of coal/firewood in hotels and open eateries 5. Residential Welfare Associations and individual house owners to provide electric heaters during winter to security staff to avoid open burning by them 6. Alert in newspapers/TV/radio to advise people with respiratory and cardiac patients to avoid polluted areas and restrict outdoor movement.
Severe - When PM2.5 levels are above 250 µg/m3 or PM10 levels are above 430 µg/m3	1. Close brick kilns, Hot Mix plants, Stone Crushers 2. Shut down Badarpur power plant 3. Intensify public transport services. Introduce differential rates to encourage off-peak travel. 3. Increase frequency of mechanized cleaning of road and sprinkling of water on roads. Identify road stretches with high dust generation.
Severe + or Emergency - When PM2.5 levels cross 300 µg/m3 or PM10 levels cross 500 µg/m3 (5 times above the standard) and persist for 48 hours or more	1. Stop entry of truck traffic into Delhi (except essential commodities 2. Stop construction activities 3. Introduce odd and even scheme for private vehicles based on license plate numbers and minimize exemptions 4. Task Force to take decision on any additional steps including shutting of schools

Implementation of Graded Response Action Plan (GRAP) begins

- **Action for very poor category to prevail throughout winter –** Badarpur power plant and brick kilns closed; diesel generator sets not allowed in Delhi; stringent action on waste, construction and road dust

- **November 7-13 smog episode:** Action for severe category kicks in – trucks and construction activities stopped; stone crushers and hot mix plants shut; parking charges increased 4 times; solid fuels not allowed in open eateries and resturaunts

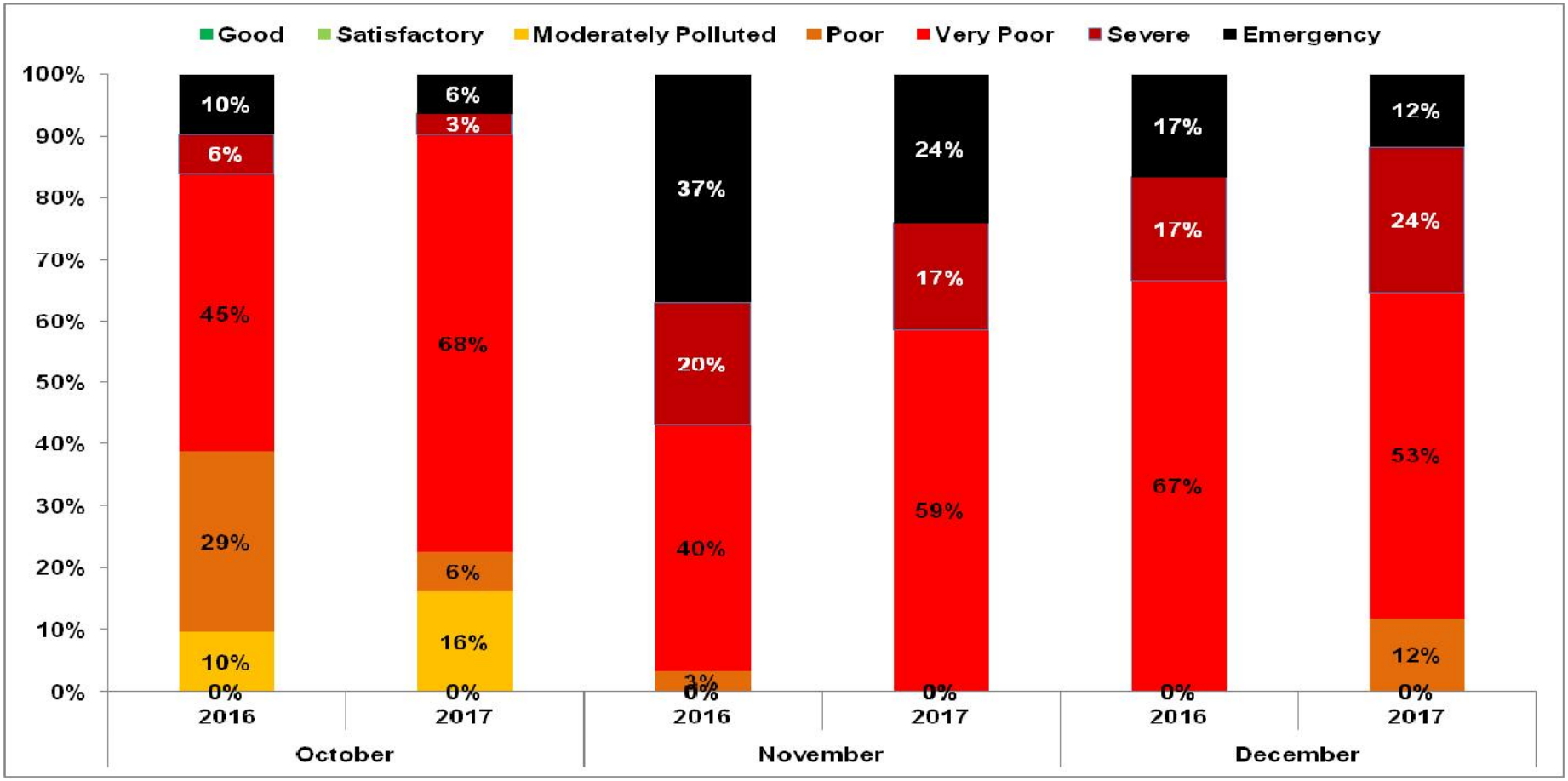
- **Ongoing action – part of comprehensive action plan:**

  -- Environment compensation charge to be paid by each and every truck entering Delhi

  -- Ban on dirty industrial fuels of petcoke and furnace oil

  -- Environment pollution charge on large diesel cars and SUVs.

GRAP has made a difference



Source: CSE's analysis of CPCB air quality data, based on 4 stations Mandir Marg, RK Puram, Punjabi Bagh and Anand Vihar

Comprehensive Action Plan

- First ever mandatory plan with short, medium and long term measures for all key pollution sources --- vehicles and fuels; public transport and mobility, industries and brick kilns, power plants, waste burning, construction activities, diesel generator sets, road dust, crop burning, domestic fuels etc.

- Action with deadlines, and makes agencies responsible for implementation

- According to this plan, Delhi-NCR needs to reduce annual average PM2.5 levels by at least 74 per cent to meet clean air standards

Action initiated to tackle different sources– Industries

Source: **Industrial emissions**

Action taken:

• In past several industrial units relocated from Delhi
• Delhi has 32 notified industrial areas and 17 redevelopment areas. Units use PNG, diesel, and coal is permitted for thermal power plants which have ESPs.
• Pet coke, furnace oil are banned
• Supreme Court has asked Govt. to fix standards for SOx and NOx for 35 industrial sectors
• DPCC keep regular check of industries in conforming industrial areas through Consent mechanism under Air Act and inspection. Despite efforts several small industrial units illegally operate from non confirming areas – so authorities are taking action, EPCA and LG-Task Force monitoring implementation

Furnace Oil and Petroleum Coke

(Left) Sample of Fuel/ Furnace Oil

(Bottom) Sample of Petroleum Coke

EPCA-CSE investigation: Extremely high sulphur levels -- more than 20,000 ppm to 74,000 ppm in contrast to only 50 ppm sulphur in BS-IV transport fuels

Import of Petcoke increased more than 14 times, since 2010-11 -- Compounded Annual Growth Rate of 45.92%.

Lower prices incite its use. Under GST, these fuels are in 18% slab. But Input tax under GST is credited back to the industry, -- effective tax rate is 0%

Cleaner alternatives such as Natural Gas and Electricity are taxed high – as high as 26% in some states.

National spin off from Delhi action – national emissions standards

Supreme Court Directive October 24, 2017

- Banned use and sale of these fuels in Haryana, Rajasthan and Uttar Pradesh from November 1, 2017, in addition to Delhi, where it has been banned since 1998.
- Directed MoEFCC to notify national standards for NOx and SOx for 34 groups of industries. To be implemented by December 31, 2017.
- MoEFCC has been fined an amount of Rs 2 lakh for consistent inaction in this regard
- Excerpt from Supreme Court Order dated November 17, 2017 –

  "…*We may note that pollution caused by pet coke and furnace oil is not a problem confined only to the NCR region but appears to be a problem faced by almost all the States and Union Territories in the country… we request all the State Governments and Union Territories to consider taking similar measures …"*

Action initiated to tackle different sources– Power Plants

Source: **Power Plant emissions**

Action status:

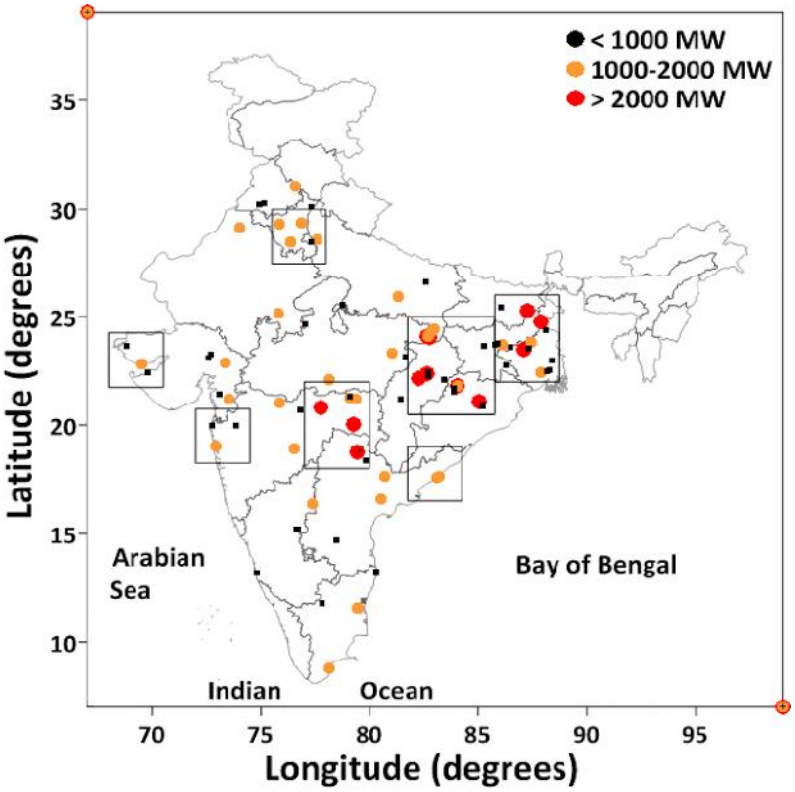
• The TPPs in the country are required to meet new emission standards notified by government on December 2015 which came into force from 07.12.2017.

• However, Despite agreeing to a two-year compliance period now it is argued that so many power plants cannot comply soon and there are efforts to push the deadline to 2022.

• According to government sources, 60% of identified 196 GW capacity in respect of independent power producers is in compliance with respect to particulate matter. Independent sources say several units are not in compliance to norms.

•Unacceptable. Pollution will increase by 50 percent in the next 10 years if delayed

• Delhi closed old thermal power plants, expansion of gas based units in NCR planned.



Action initiated – Crop residue burning

Source: **Crop residue burning**

Issues and action:

- More than half of this burning happens in 3 states – Punjab, Haryana and Uttar Pradesh. 40% of all crop residue burning is attributable to Paddy Straw, 22% to Wheat Residue and 20% to Sugarcane.
- Apart from air pollution, burning crop residue in one year alone results in the loss of 1.43 million tonnes of nutrients from the topsoil layer.
- Govt has begun supporting agri-implements such as the Happy seeders, choppers and bailers can process crop residue to prepare it for utilization – either on the field or in industries
- However, the cost of agri-implements needed to reduce. As these implements are used only for two to three weeks a year, farmers do not consider these worth investing.
- Augment subsidy and making it accessible to larger number of farmers , promoting co-ownership models and encouraging usage in power plants, bio-fuels, etc are needed. Intensive and continued action is must for lasting impact in this sector

Solutions are known. Implementation requires scale and support

In field solution

Mulch and mix with soil; Can reduce fertiliser cost for farmers

Provide subsidy for agricultural implements and promote co-ownership of implements

Ex-situ solution

Utilize crop-residues fuel in biomass-based power plants

Use of crop residues for production of biofuels and fertilizers

Utilize as raw material for biomass pellets and other uses

R&D and crop diversification

Create a uniform decentralized mechanism for the collection, storage and commercial sale of crop residue

Action initiated to tackle different sources in Delhi-- Road Dust

Source: **Road Dust**

Action taken:

•The Supreme Court had directed the Delhi government to repair the pavements and also to procure vacuum cleaning machines.

•The Delhi government has bought mechanized cleaners, ensuring dust disposal

• Water sprinkling

• Government needs to devise wide spread green coverage

Action taken on other sources

Source: Waste burning and construction & demolition waste

Action Taken:

•Delhi government imposed a penalty of Rs. 5000/- for open waste burning and Rs. 50,000/- for not covering the construction sites.

•DPCC had done around 120 challans for above 20,000 sqm projects by March 31,2016 and have collected from Rs. 1.03 Cr.

•For plots under 20,000 sqm, 1700 have challans have been issued and collected Rs. 2.4 Cr.

Source: Brick kilns

Action Taken:

•Only zig-zag natural and induced draft allowed

•About 400 brick kiln owners have submitted affidavits to EPCA undertaking commitment to shift to improved zig zag kiln technology by April 2018. After that all conventional and polluting brick kilns will be shut in the NCR.

Action taken —on road trucks

Source: Trucks

Action Taken:

•SC imposed ECC on trucks

•Number of trucks has reduced by 50-60% after the doubling of ECC.

•Reduction in pollution by – after the ECC imposed.

•The entry of pre-2006 registered trucks stopped entering Delhi.

•The non-destined are being diverted by the Haryana and UP government with an average of 6,300 trucks daily.

•Installation of WIM at 7 toll plazas by Sep,2016

Next Steps:

•Installation of **RFID and Weigh in motion bridges.**

•Up-gradation of bypasses available to divert the entry of non-destined trucks into Delhi.

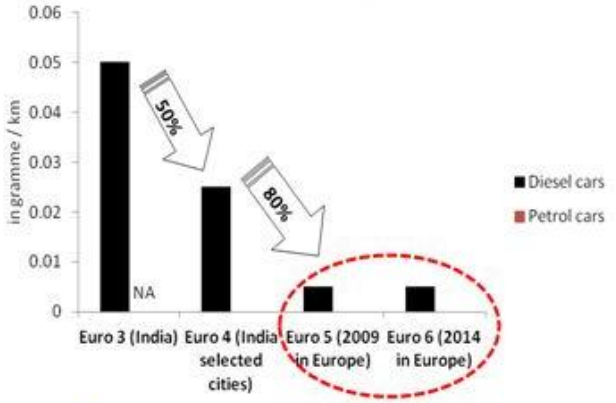
Action taken on vehicles—emission norms

Source: **Vehicles**

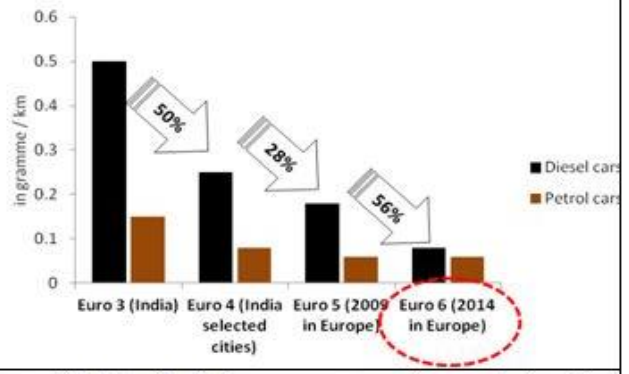
Action Taken:

•**April 1, 2017** entire country switched to BS IV. In 2016,Government has agreed to skip BS V and leapfrog directly to BSVI for all vehicles in **April 2020.** It has agreed to advance the original proposed date of 2026 for Euro VI to 2020. Delhi also advanced the BSVI fuel supply date to 2018.

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)

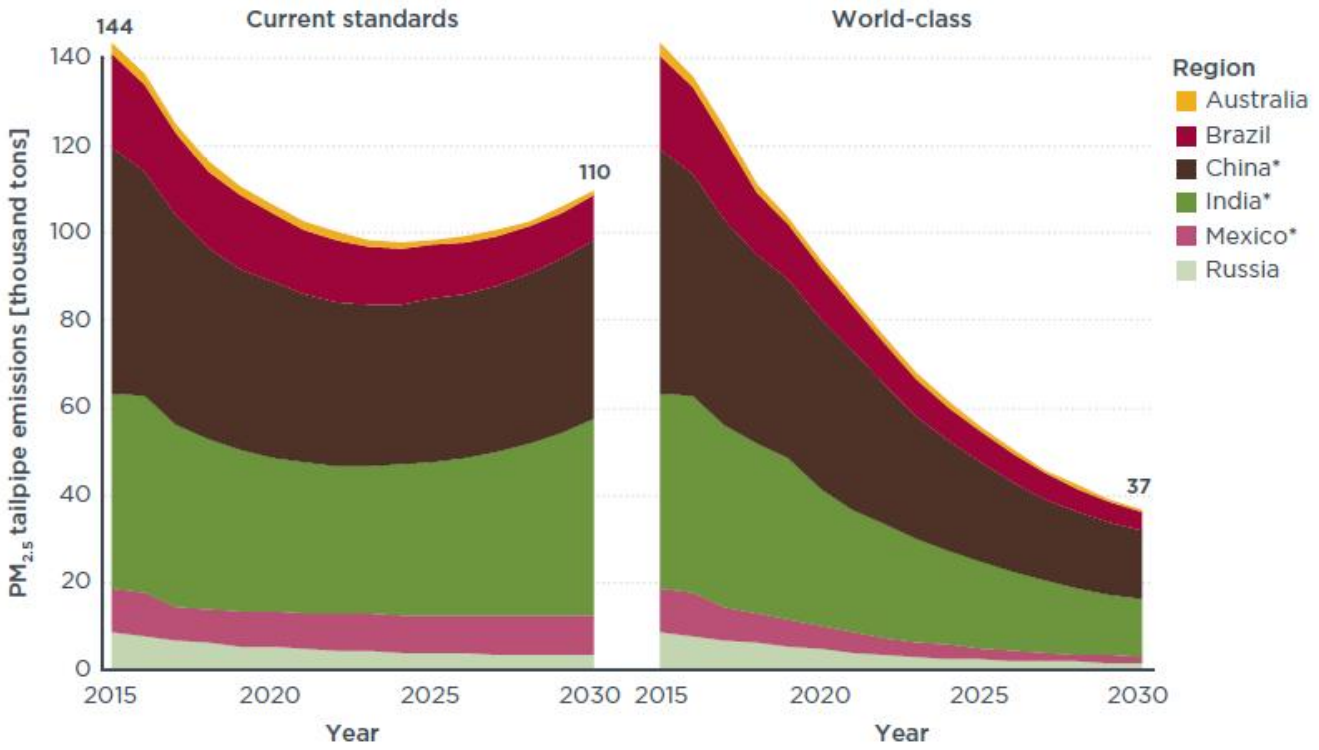


Note: PM emissions from petrol vehicles are so negligible that these are not regulated in petrol vehicles

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

India heading towards global best standard and clean vehicle market

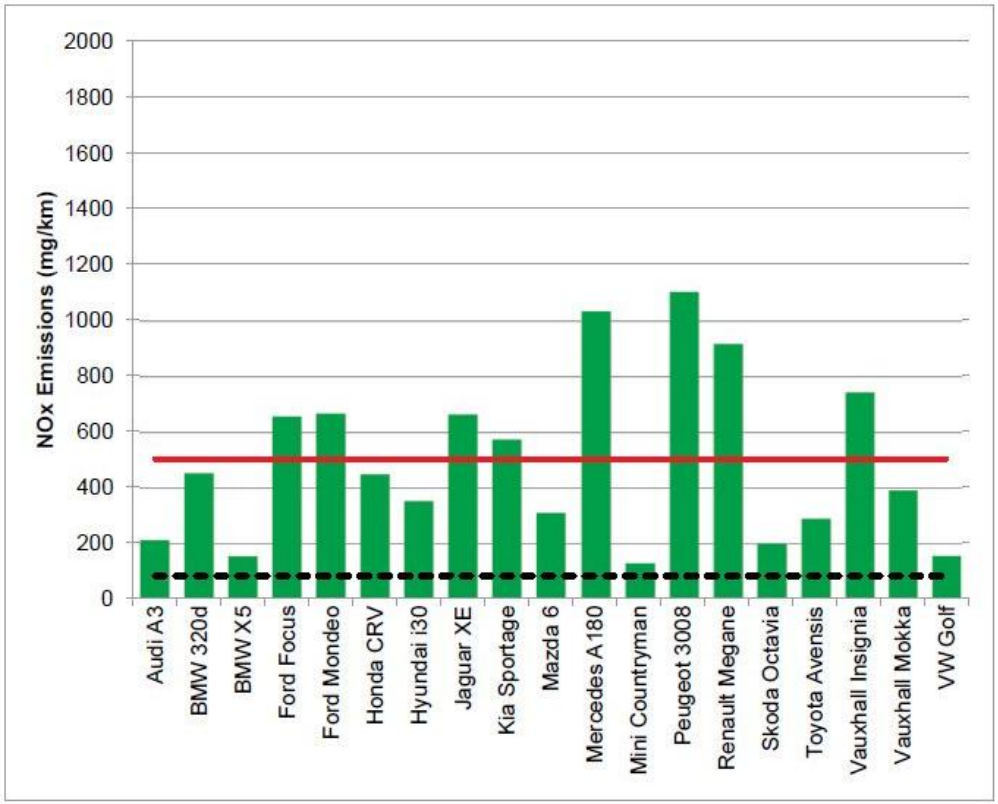
- Euro VI norms will reduce tailpipe PM2.5 emissions by 74% from 2015 levels by 2030.
- Once implemented across the G-20, nearly 90% of new LDVs and HDVs sold worldwide will meet world-class emissions standards, compared to only half of new vehicles sold today.



Source: ICCT 2017, impacts of world-class vehicle efficiency and emissions regulations in select G20 countries

Clean diesel is a myth: Popular diesel cars fail to meet real emissions limits in Europe/ US

Real world NOx emissions of Euro 6 vehicles in Europe



British, German, French authorities have released emissions results

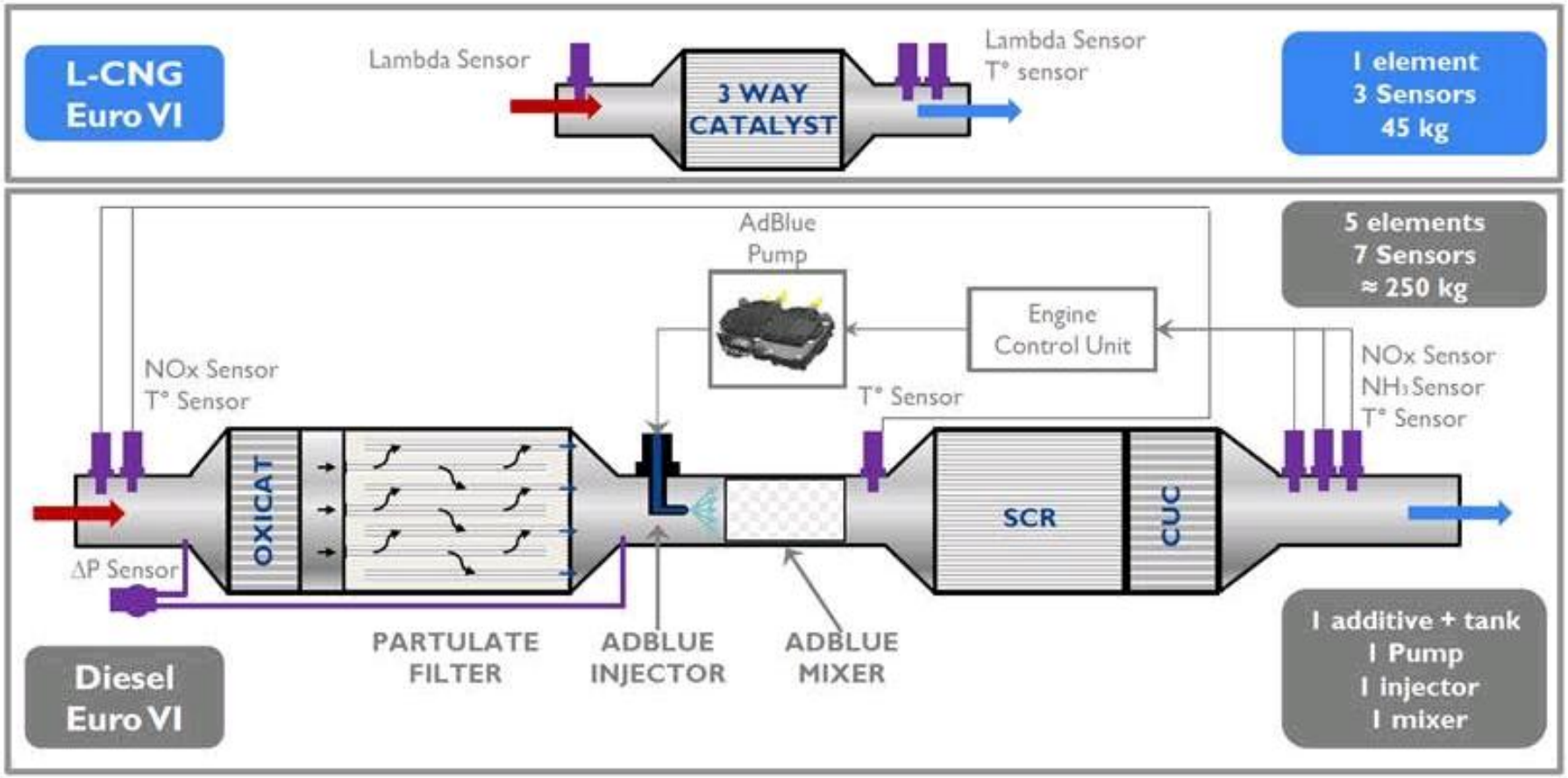
Large number of popular diesel car models have failed to meet the official limit and are emitting 6 to 12 times higher on road in real world conditions

Expectations from fuel efficient diesel cars not delivered -- black carbon emissions more warming than CO2; higher life cycle emissions of heat trapping carbon dioxide emissions; rebound effect of more driving

Next generation emissions control systems need advanced I/M
Diesel and CNG pathways to meet Euro VI norms
Diesel emissions control route more complicated
Ensure on-road performance

IVECO Stralis Natural Power

Environmental benefits – Simple EATS



Future of diesel cars uncertain...

London: Pre Euro VI cars not to be allowed inside the ultra low emissions zone in Central London.

France: Euro VI diesel cars not to be included in the new category 1 colour coding scheme that classifies vehicles according to how much they pollute. French government to “progressively” ban diesel vehicles. **Paris**: To phase out pre-2011 diesel cars by the end of the decade.

Madrid: To ban polluting diesel cars from the city centre from 2020.

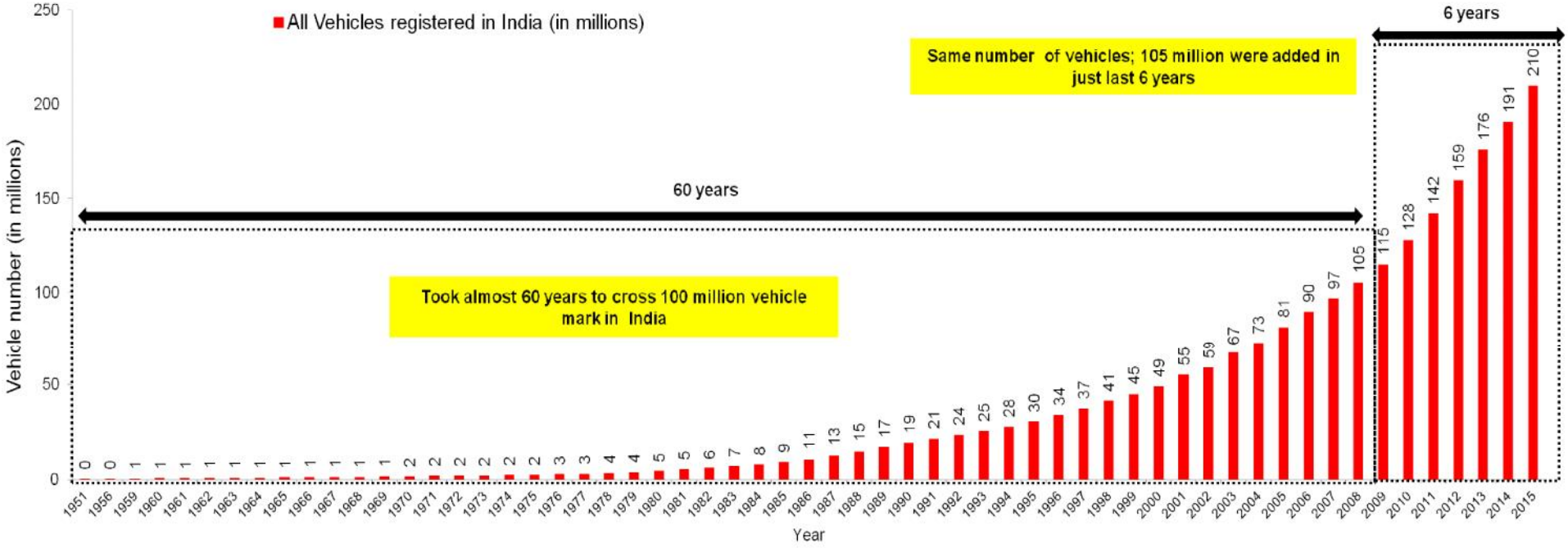
Netherlands: In 1998 the Third National Environment Policy targeted to reduce diesel chare to only 5% in 2010. Dutch registration and circulation taxes for diesel cars are close to prohibitive. Kept share of diesel cars in Netherland lower than EU average.

Brazil Sales of diesel passenger cars and commercial vehicles below 1,000 kg are banned since the 1970s

Beijing has banned diesel cars as a pollution control measure. China has the lowest diesel car penetration at less than 1%. China taxes do not differentiate between petrol and diesel fuel.

Sri Lanka has imposed several times higher duties for diesel cars compared to petrol cars and have reduced diesel car sales.

Ever increasing vehicles in India...

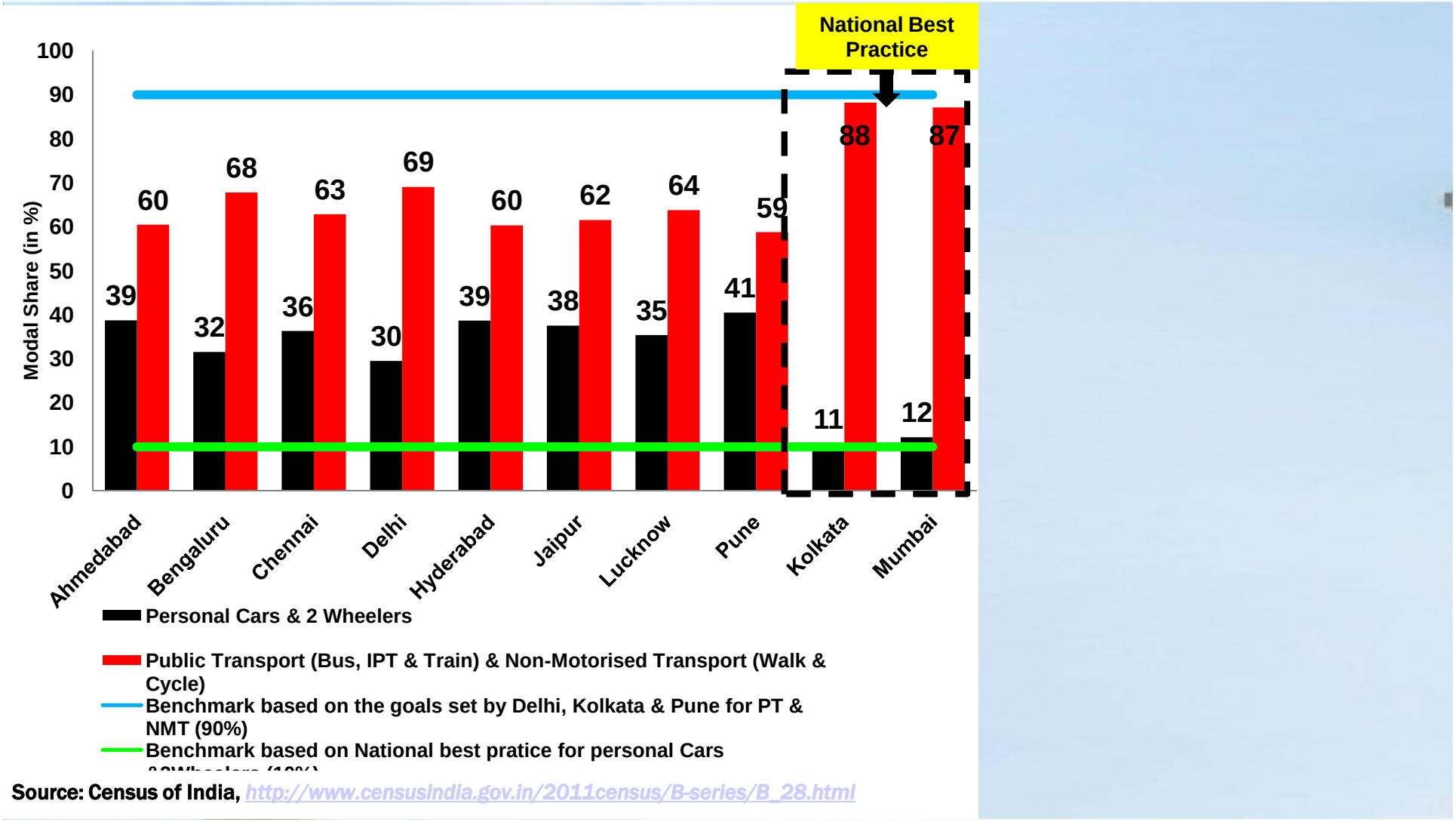


Source: 2016, Road Transport Yearbook, MoRTH

- **The number of vehicles registered in India from 1951 to 2008 (almost 60 years) is 105 million. However, the same number got registered in just last 6 years (2009-2015).**

- **The number of vehicles in India increased from 0.3 million in 1951 to 210 million in 2015.**

Clean air action plan to protect and improve the modal share



Source: Census of India, http://www.censusindia.gov.in/2011census/B-series/B_28.html

Public transport and Integration: The game changer

Cities need to augment and improve public transportation

Integrating transport systems – metro and bus for last mile connectivity

Ensuring pedestrian facilities as without this public transport will not work

Each intersection point – there are many needs to be planned and executed carefully – the metro stop and bus stop; the parking space for intermediate transport (3-wheelers etc).

Common ticketing

Delhi: wrong road design force people to cross in unsafe manner. This compromises public transport usage

Public transport needs safe walk access

In Delhi accidents near foot over bridges have increased

Source: Delhi Traffic Police

Street design norms can make streets safe and accessible

Connaught Place

- Implement street design guidelines

Source: CSE

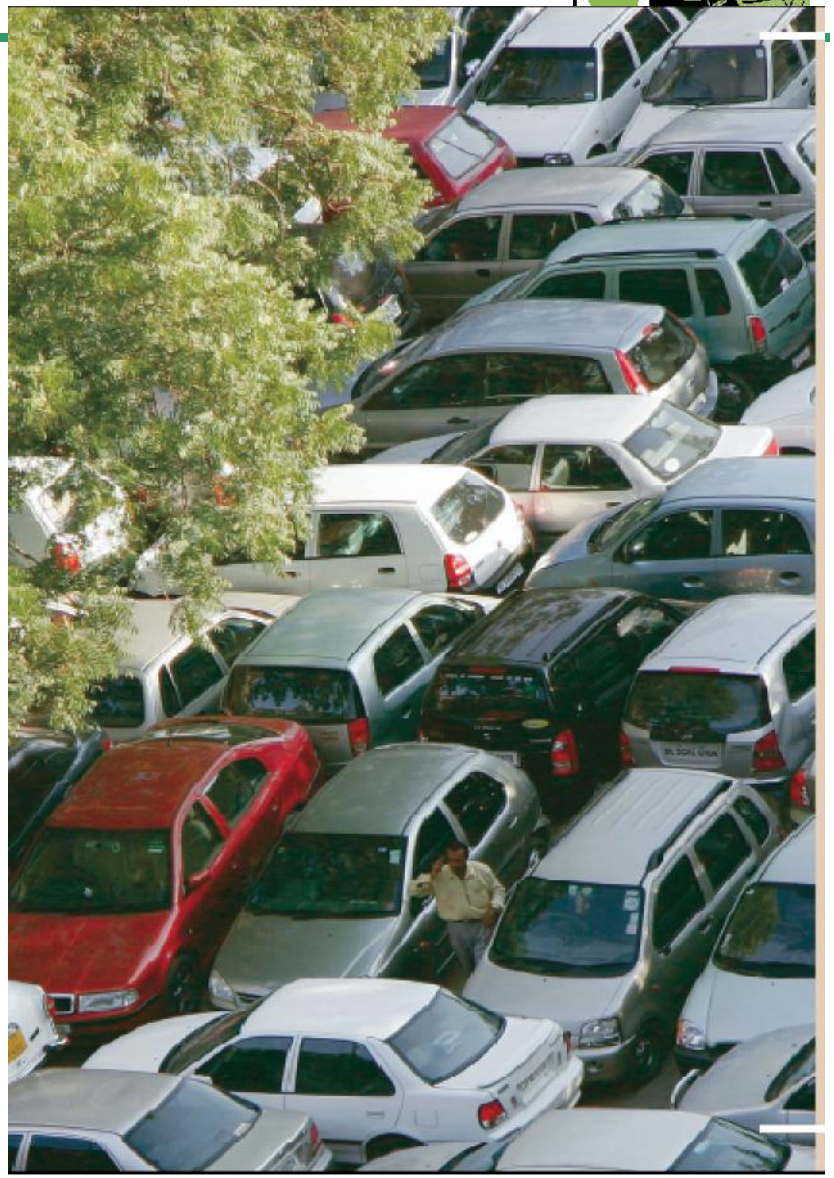
Why current parking policy will lock in more air pollution?

Unlimited and free parking incites more car ownership and usage that cause more pollution

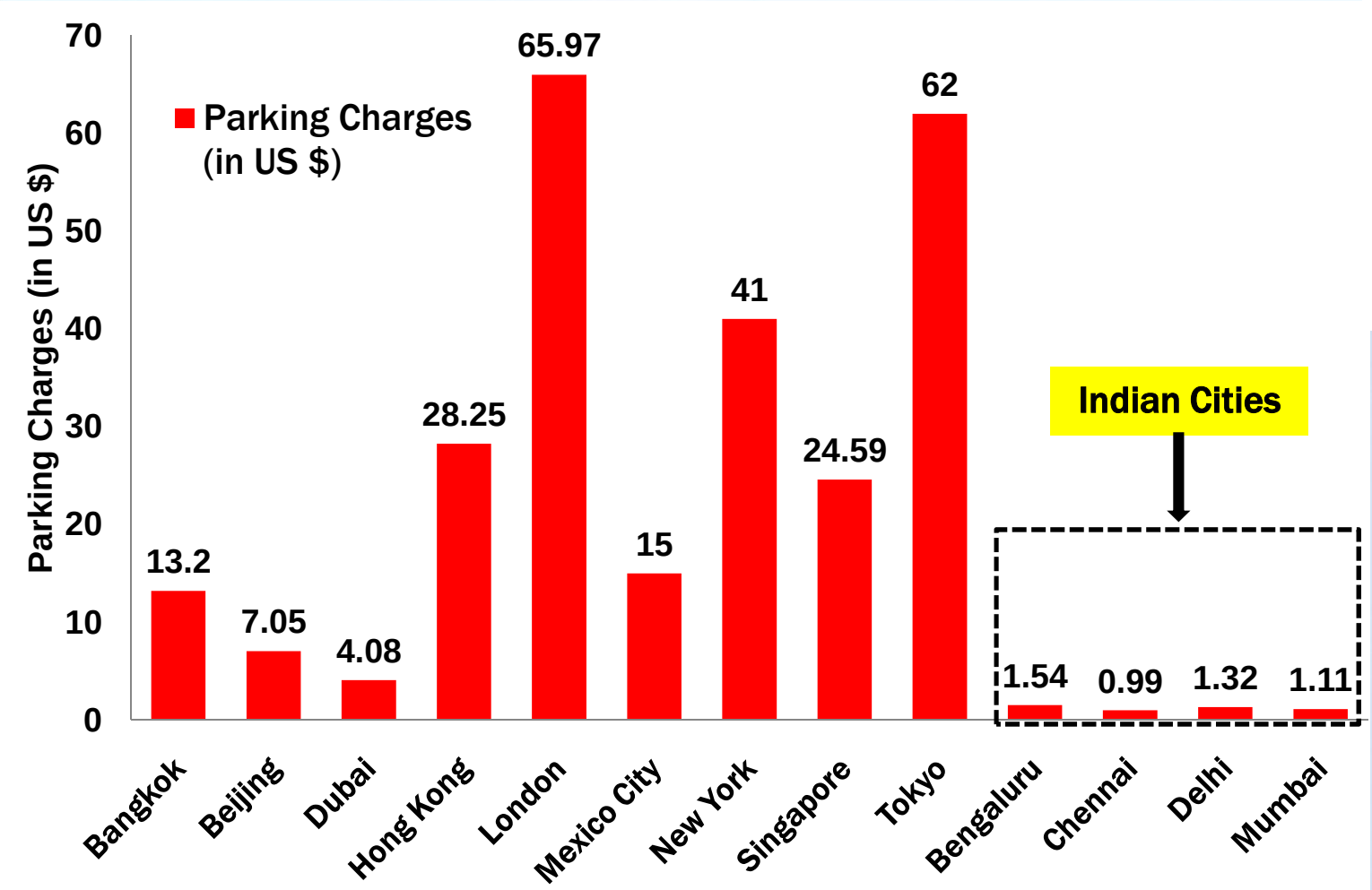
Wasteful use: 90 to 95% of the time a car is parked and makes enormous demand on land

Inequitous use of land A car gets more space (23-26 sqm) to park than poor households get land to make houses (18-25 sq m).

Parking takes away space from other important development, walkways from pedestrians, and green areas



Parking is cheapest in Indian cities



Source: Handbook of Urban Statistics 2016, MoUD

Parking charges in Indian cities are some of the lowest in the world.

Need priced parking.....

No meters

Meters

Prices quadrupled

India

Cities of Rajasthan, Gangtok, Aizawl, Shimla – Proof of parking for car purchase

Grosvenor square, London

Source: TRL in ITDP (2011): Europe‘s Parking U-Turn

Cities are moving away from car centric infrastructure…….Let us not repeat the mistake

Before

After

Seoul's Cheonggyecheon restoration project

Cities that have destroyed roadways

San Francisco

Milwaukee

New York

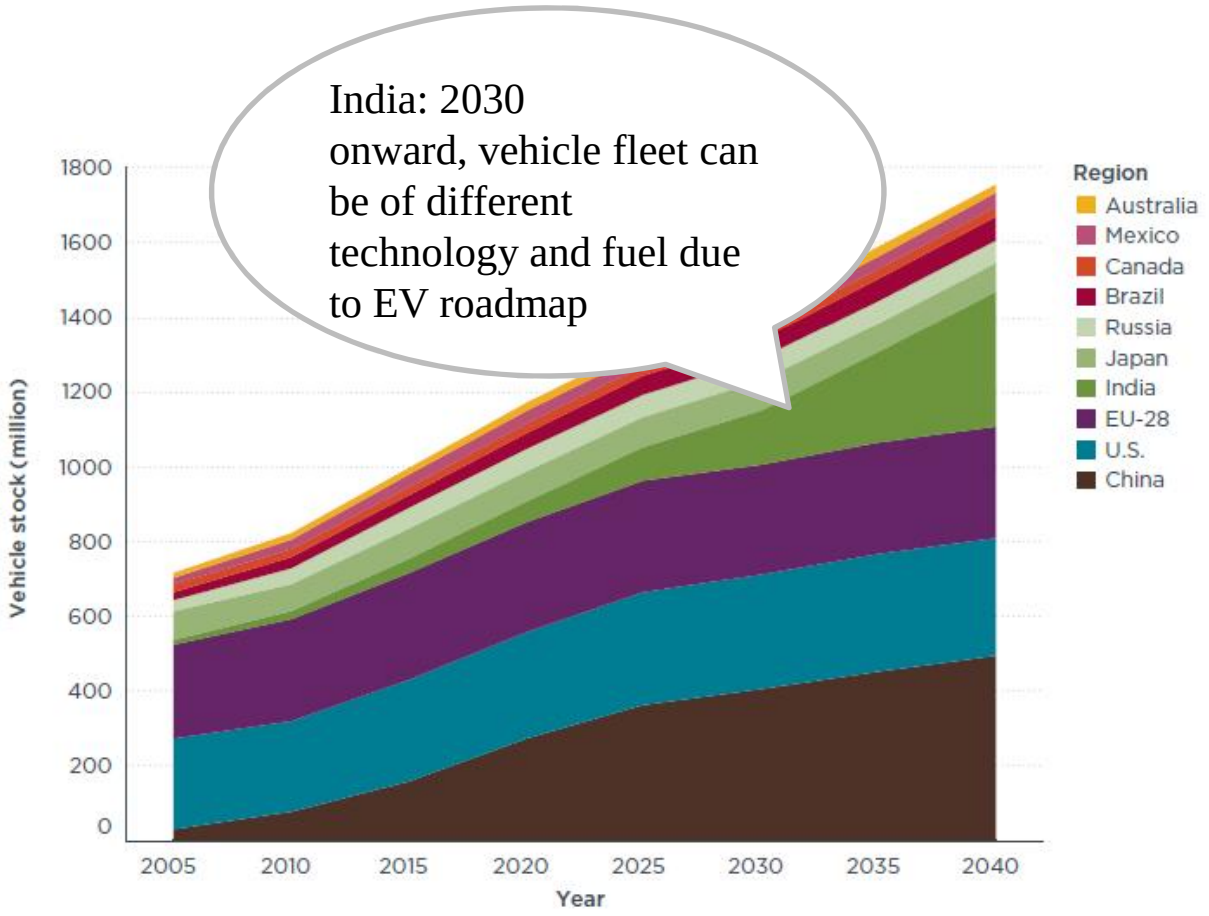
Portland

Toronto

Seoul

India also heading towards massive motorisation

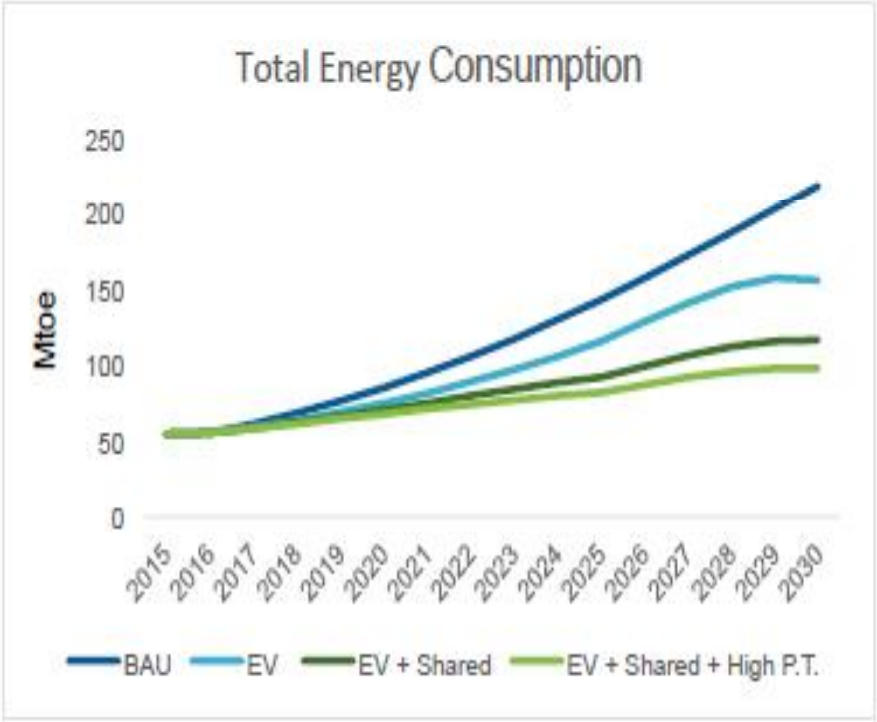
➢Historical and projected light- and heavy-duty vehicle stock (two wheelers not included) 2005–2040

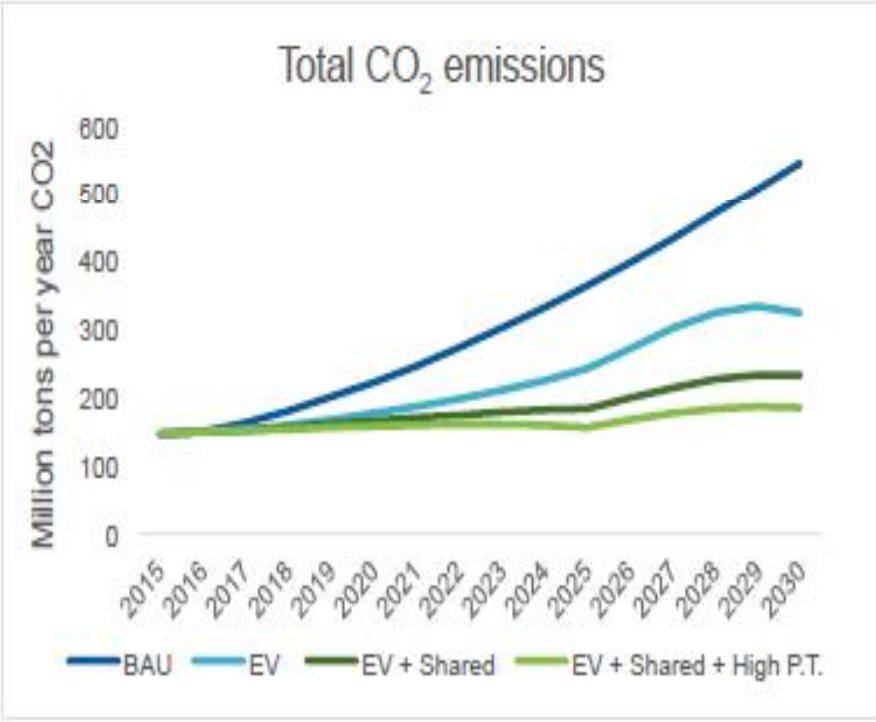


Source: ICCT 2017, impacts of world-class vehicle efficiency and emissions regulations in select G20 countries

India EV future is expected to bend the CO2 emission curve

➢**Niti Aayog / RMIAnalysis:** Compared to BAU, total energy consumption in 2030 is ~ 55% lower in Scenario when a large percentage of vehicles are shared and electrified, and public transit maintains a high share of mobility demand. With this total carbon emissions are also lower by roughly 66% in this scenario.



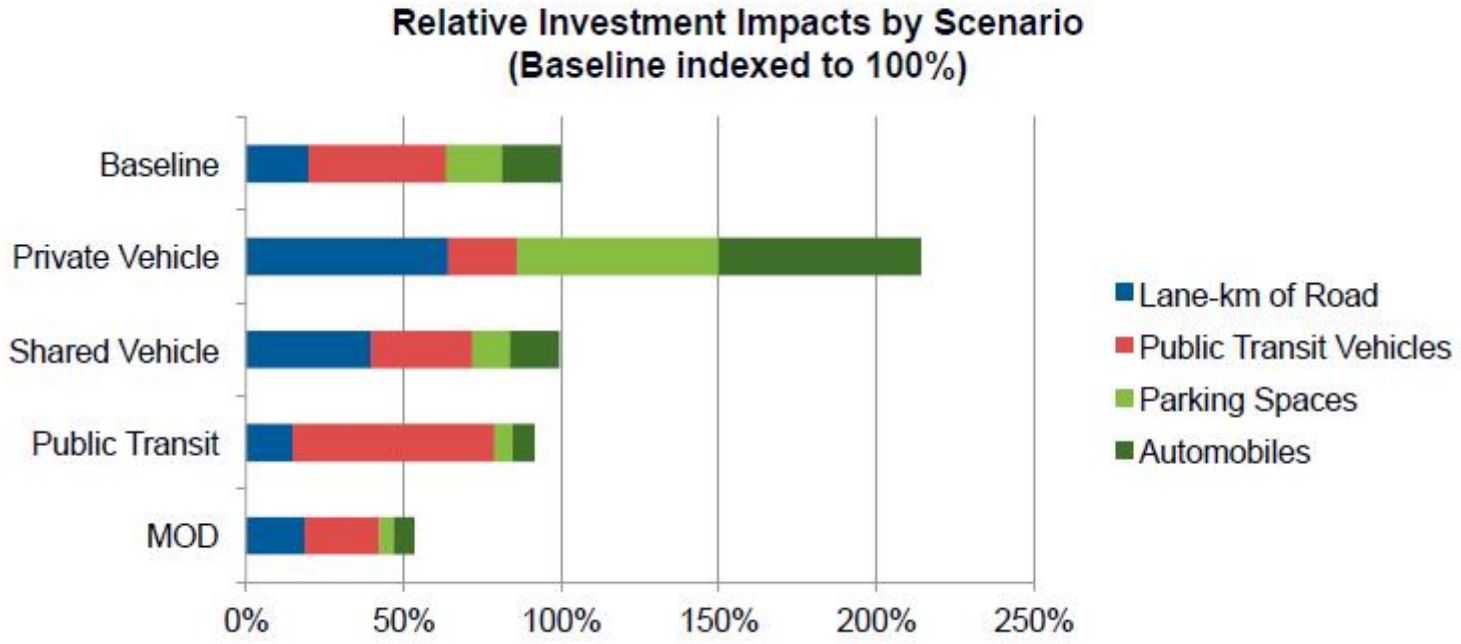


Source: RMI/ NITI AAYOG

India can have a different future mobility

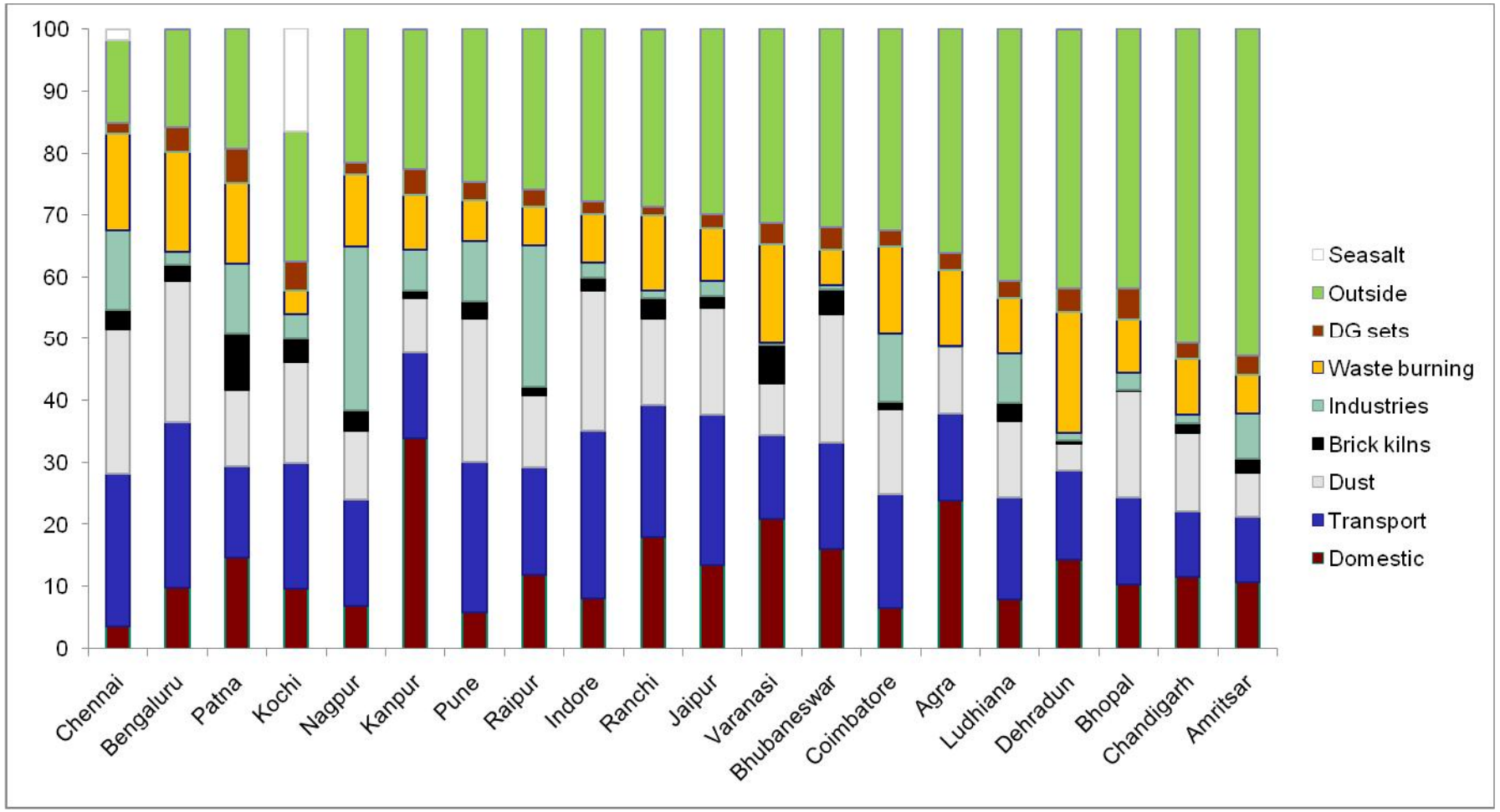
➢**Niti Aayog / RMI Analysis:** Study has analysed implications on cost and benefits for a city travel distance of 10 km/citizen/day this is expected to double. For comparison, U.S. urban transport demand is 40 km/citizen/day (80% by private vehicle).

➢ **Conclusion:** Private vehicle scenario will require the largest investment in roads, parking infrastructure and vehicles



Source: RMI/ NITI AAYOG

All cities need action plans, cities are also interdependent to reduce overall air pollution



Source: Urban Emissions

Need national comprehensive plan and stringent action

Improve air quality monitoring ; Implement smog alert & emergency action

Reduce emissions from vehicles

Complete transition to BSVI emissions standards by April 2020

Scale up public transport, walking and cycling; restrain car usage

Reduce emissions from power plants

Implement new emissions standards without delay

Shift to natural gas for power – insist GOI provides clean and cheaper gas

Reduce emissions from air polluting industry

Ban pet coke and furnace oil; implement industrial NOx and SOx standards

Reduce emissions from generator sets

Tighter emission standards for generator sets

Improve electricity access; Energy efficiency measures

Action on open burning

Decentralised segregation, reuse, recycling and zero landfill approach

Road dust and construction activities

Adopt dust control measures for construction industry, and roads

Control episodic pollution from crop residue burning

Need legal compliance frame work to meet clean air


THE SPIRIT OF FREEDOM
YOU DESERVE IT!


Dutch Minister visits the queen on a bicycle

Thank You