Compliance programme
Current practice and future plans in India

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Can we prevent another dieselgate?

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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.

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 correlate with motorisation and dieselisation

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)

Look at these black spots on the lung. The unfortunate owner lives in Delhi and has been breathing polluted air. Air full of carbon particles which accumulate in the lungs (black spots). What you can’t see is a cocktail of gases and tiny particles, even smaller than carbon that get into our bodies.

Actually, you are getting polluted.

Scary? But those cars are so sexy!
Delhi: After a short respite, pollution curve turns upward

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

NO2 levels rising steadily

PM10 levels in microgramme per cubic metre

Registered vehicles in lakhs


PM10 reduces despite vehicles increase
Massive increase in PM10 levels post 2007

Based on CPCB data
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.....

Diesel car PM norms in g/km

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

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.

Source: Based on market data
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
Pollution profile of Delhi and number game of pollution

- Vehicles: 11623 (20%)
- Road Dust: 22165 (38%)
- Domestic Sources: 6940 (12%)
- Industries-Point sources: 6576 (11%)
- Concrete batching: 3594 (6%)
- Hotels/restaurants: 1758 (3%)
- MSW Burning: 1771 (3%)
- Industries-Area source: 1367 (2%)
- Construction and Demolition: 1292 (2%)
- Diesel Gensets: 1248 (2%)
- Aircrafts: 34 (0%)
- Cremation: 312 (1%)
- Medical Incinerators: 54 (0%)

Unit: Kilogram/day

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 matters 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**

- VEH: 45%
- IND: 20%
- CON: 1%
- OWB: 3%
- HH: 6%
- DUST: 12%
- GSET: 4%
- BK: 7%

**PM$_{2.5}$ exposure apportionment**

- VEH: 63%
- IND: 12%
- CON: 1%
- OWB: 6%
- HH: 8%
- DUST: 5%
- BK: 2%
- PP: 2%

Source: S GuttiKunda – SIM Air
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.

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

- <1400 cc
- 1401 to 2000 cc
- >2001 cc

Diesel car 2009-10 Sales

Diesel car 2010-11 Sales
Hard selling diesel

Rapid proliferation of diesel models

![Bar chart showing fuel-wise number of car models by engine displacement.](image)
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**

- Petrol cars (> 1400cc)
- Diesel cars (< 1600cc)

**PM**

- Petrol cars (> 1400cc)
- Diesel cars (< 1600cc)

**Toxics**

- Petrol cars (> 1400cc)
- Diesel cars (< 1600cc)

**CO2**

- Petrol cars (> 1400cc)
- Diesel cars (< 1600cc)

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

**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).

Source: IIT Kanpur Study, 2015
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.
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

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

Source: CSE
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
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

lambda value of 1± 0.03

Make-wise lambda result

Share of different makes in the sample
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 of 10 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

More certain and consistent trend in response to action

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

No data available for PM2.5 for 1-10 April, 2015

Punjab & Haryana Farm Fire in April

Source: CSE analysis based on realtime data of DPCC
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