Killer Air and Our Health
Agenda for action

Centre for Science and Environment
New Delhi, February 19, 2015
Deadly winter...........

Throughout the winter levels have remained 3-4 times the standards. Peak levels have hit 9-10 times the standards

Source: Based on DPCC data on PM2.5 average levels at Punjabi Bagh, Mandir Marg, and R K Puram (Oct 01, 2014 - Feb 18, 2015)
CSE has applied official Air Quality Index to assess winter pollution (October 2014 – February 2015):

-- December has highest number of days with ‘severe’ levels – 65%. This has dropped to 22% in February.

-- Between October and February there were 12 smog episodes (defined as 3 consecutive days with severe levels). February – None.

-- In other countries smog episodes require pollution emergency measures - reduce car numbers, shut industrial units, and shut schools among others.

Source: CSE analysis based on DPCC data
Our health is at stake

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.

Delhi lung
Capital punishment

Scary? But those cars are so sexy!

cough
wheeze
suffocate

It’s time you TAKE A STAND
PUT YOUR HEALTH ON THE POLITICAL AGENDA

From its early stages, CSE’s Right to Clean Air campaign used a variety of communication tools — such as this poster — to put out its message to the public. It built support
Health of children compromised......

2012 epidemiological study on children in Delhi (CPCB and Chittaranjan National Cancer Institute of Kolkata):
-- Covered 11,628 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
Co-relating health evidences with air pollution in Delhi
CSE monitors how much pollution common citizens breathe when they travel by mass modes…
Our earlier study on personal exposure of prominent citizens.....

Comparison of 24 hour average personal exposure with 24 hour average ambient levels at the nearest DPCC monitoring station

Source: CSE
New study on exposure of majority citizens while travelling….

• CSE has used a state of the art portable air quality monitoring equipment to track how much pollution an individual is exposed to in Delhi while traveling. This dust track aerosol monitor measures both mass and size fraction of the particulate matter.

• Monitoring has been used in different mass modes during peak and off-peak traffic hours – buses, Metro, auto rickshaws, walking

• This exposure has been compared with the background ambient levels monitored by the Delhi Pollution Control Committee at the nearest official monitoring station.
Stunning findings
All are exposed; when we travel, walk, bus, take a car

Exposure in all transport modes very high: The average levels recorded are 2-4 times higher than the background levels reported by DPCC.

Open modes like auto rickshaws, walking and cycling have the highest exposure.

During off peak hours all modes show lower levels: Difference between peak and off-peak -- Auto 1.3 times higher; walking 1.5 times. Bus 2.5 times higher

Underground metro with sealed environment shows lower levels: About 209 microgramme per cum. Overhead Metro 330 microgramme per cum

Pollution levels peak near junctions and in traffic jams: Pollution levels increase when traffic is stationary at junctions and in traffic jams. In traffic jam on a stretch close to Paharganj levels peaked at 1170 microgramme per cum. At traffic jam near Govindpuri Metro station the peak level was 725 microgramme per cum.

Proximity to diesel trucks lead to extremely high exposure: Cycle rickshaw ride on NH24 in close proximity to truck traffic recorded a range of 651 to 2000 microgramme per cum.
Air pollution is an equalizer: Bad for all

Background levels have ranged between 191-277 microgramme per cum
13 Feb to 16 Feb: North Delhi <> South Delhi

Average exposure to PM2.5 ranged between 192 to 642 micromgramme per cum. Peaks as high as 457 to 1170. The average ambient level ranged between 191 to 277.

Source: Based on CSE exposure monitoring and DPCC data for ambient levels
16 Feb to 17 Feb: Travel South Delhi <> West Delhi
Average exposure to PM2.5 ranged between 209 to 549 microgramme per cum. Peaks as high as 361 to 2050. The ambient level between 191 to 255.

Source: Based on CSE exposure monitoring and DPCC data for ambient levels
17 Feb to 18 Feb: **Travel South Delhi <> Noida/Gzb**

Average exposure to PM2.5 - ranged between 238 to 830 microgramme per cum. Peaks as high as 296 to 2000. Average ambient level between 191 to 255.

Source: Based on CSE exposure monitoring and DPCC data for ambient levels
Exposure by modes on different routes

Background levels have ranged between 200-250 microgramme per cubic
Exposure by modes on different routes

Background levels have ranged between 200-250 microgramme per cum
Traffic policemen: Most vulnerable

Monitoring carried out by traffic policeman at the ITO crossing – Average levels 3 times the background level and peak exposure as high as 8 times the ambient level

Source: Based on CSE exposure monitoring and DPCC data for ambient levels
CSE presents priority action plan:

- Short and medium term measures for more lasting and durable change to meet clean air standards in a time bound manner

2nd generation reform. Needs hard action. Not time wasted in making new action plan
Agenda 1: Implement stringent emissions standards for new vehicles
Responsibility: GOI (Delhi government should demand)

Delhi’s pollution problem cannot be solved if new vehicles continue to meet Euro IV or Bharat Stage IV standards that are nearly 10 years behind Europe.

Speed up the emissions standards roadmap:
-- Euro IV (Bharat Stage IV) nation-wide by 2015.
-- Euro V (Bharat Stage V) nation-wide by 2017.
-- Euro VI (Bharat Stage VI) nationwide by 2020.
-- Create Clean Fuel Fund to produce clean fuel quickly:

Need uniform standards across the country. Otherwise the trucks and other commercial vehicles will continue to pollute Delhi.
2004: SC ordered for Western/Eastern Expressway to bypass truck traffic
2005: Work awarded by HSIIDC, completion 2009
Delays. EPCA asked for concessionaire to be removed; work expedited
2014: SC agreed; directed completion by June 2016
September 2014: Final settlement done
January 2015: New Haryana government wants agreement re-negotiated
January 30, 2015: SC given Haryana government 2 months to award tender; work to start in 3 months.

Nothing moving
Agenda 3: Control dieselisation
Responsibility: GOI+Delhi govt

WHO has branded diesel particles as class I carcinogen for strong link with lung cancer.....

-- **Impose additional tax on diesel cars** to neutralise the incentive from the cheaper diesel prices;

-- **Equalise petrol and diesel taxes** to remove differential;

-- Delhi government should increase diesel cess and put money in fund for public transport

**Globally stringent action is being taken on diesel cars:**
-- France to phase out diesel cars; Recent order from the European Court of Justice strictures to UK and member states non NOx standards violation puts diesel on spot
-- Chinese cities of Beijing, Shanghai etc do not allow diesel cars; Brazil does not allow diesel cars; Sri Lanka has discouraged diesel cars with tax measures.....
Agenda 4:
Strategies for on-road vehicles:
Responsibility: Delhi government

Tighten PUC, testing method and compliance.

Make PUC certificate and road worthiness test mandatory for obtaining annual insurance for vehicles.

Do Smoky vehicle checks.

Integrate on-board diagnostic system for in-use inspection; introduce remote sensing technology for screening on-road vehicles among others.

Implement colour coding of old vehicles of pre-Euro I, Euro I and Euro II vintage and restrict their plying during smog episodes.

Impose higher taxes on older vehicles of Euro I and Euro II vehicles.
Agenda 5: 
Need fiscal measures to keep clean fuel CNG competitive vis a vis diesel

Delhi has greatly benefited from the CNG programme.

**But CNG programme is at risk** with narrowing of price gaps between diesel and CNG.

**Government of India and the Union Ministry of Petroleum and Natural Gas** have been directed by the Supreme Court to come up with a long term favourable taxation policy -- to maintain at least 30-35 per cent price differential between diesel and CNG and also accord priority to transport sector for gas allocation in cities to address public health concerns in polluted cities.

Demand this to be implemented
Agenda 6:
Delhi needs buses and place to park
Responsibility: Delhi government

Bring all the 11000 buses within a year. Delhi needs to meet the target of 11,000 buses:

-- DTC has 4879 buses. Order for 1380 more buses placed.

-- 9 clusters Bus companies have 1371 buses. To buy 1175 more buses

-- But parking space for new buses. This has slowed down bus purchase

-- DTC has 46 depots. Sharing with cluster buses. Need parking space for another 1000 buses. But DDA is not giving land

-- Depots at distance will increase dead mileage. The current dead mileage of DTC 10 lakhs Kms daily – a serious loss
• Cluster 6-9: 1612 buses (bids opened but buses cannot come for lack of parking space)
• Cluster 10-13: 3368 buses
• Cluster 14-17: 3368 buses

8348+ buses critical to fast-track
Agenda 7: Improve and scale up public transport and last mile connectivity

Delhi Master Plan 2021 Target: 80% public transport ridership

-- Implement bus routing and service improvement plan to increase coverage and frequency of quality bus service

-- Use GPS system to introduce IT enabled public information system for all buses including DTC buses to improve ridership

-- Implement norms for multi-modal integration for metro and bus

-- Para transit should be organised and deployed efficiently to improve last mile connectivity.
Agenda 7: contd…
Scale up and implement all public transport system

This plan has been included in the revised transport chapter of the Delhi Master Plan.
Non-motorized network plan for time bound implementation

Mandate people and cycling friendly street design guidelines and standards for all roads: These should be made mandatory for approval of road network projects in Delhi.

Protect walkways and cycle tracks from encroachment and ensure safe crossing: Implement the provision of Motor Vehicle Act 1988 that bars vehicles from being parked on pavements.
Agenda 8: 
Set up urban transport fund

Set up urban transport fund by tapping the revenue sources.

Only DTC and cluster buses now require **Rs 3709 crore** to take care of all the costs -- new bus purchase by DTC, gap financing of cluster buses, subsidy in bus fares, interest payment etc. This is more than the total transport budget outlay of the Delhi government for the year 2011-12 which is **Rs 3348 crore**

**Create dedicated urban transport fund:**

By tapping revenue from bus tickets, advertising on buses, a possible green tax, commercial development in bus terminals, air ambient fund, property tax along transit lines, parking revenue etc. Cumulatively this can generate substantially sizeable amount over a period of time that can make investments in sustainable transportation options feasible.
City is overrun by vehicles. Running out of space to park
Recognize that it cannot provide space to all cars to park
Already 10% of city land area needed for cars (parking spaces x number of cars x 3)
Each car occupies more public space than a low-income house
Parking policy has to be based on the following principles:
1. Demarcation of authorized parking sites and strict enforcement of contracts;
2. Building of multi-level and basement parking areas, where needed. But then ensuring that these are used (by making surface parking more expensive and not allowing security concerns to let people park outside etc)
3. Very strict and scaled up enforcement of illegal parking (Police)
4. Increased penalty charges for illegal parking
5. Enhanced parking rates – rates based on area – and real estate values
Implement seamless public transport system in the NCR

-- Implement NCR wide seamless bus system and para transit system

-- Remove tolls and tax barriers across borders for public transport within a year under reciprocal agreement

-- Implement plan for improved rail network
Agenda 10
Strong action on coal based power plants.
Augment supply of natural gas to power plants

Delhi has four power plants -- Badarpur, Indraprastha, Pragati and Rajghat. Badarpur and Rajghat are Coal based. IP and Pragati are Gas based plants.

IP gas plant not functioning for over 3; Gas supply is a major issue. Demand to convert Badarpur plant from coal to gas. But no action

Particulate matter standards for plants are very lax. Need tighter PM standards. Set norms for NOx and Sox.

Supply gas to power plants

DPCC has information on stack emissions but it is not displayed on their website. Release the data for effective monitoring and surveillance.
Agenda 11: Stop farm fires in the region. This impacts Delhi’s air quality

Paddy straw burning an offence in the region. Need stringent enforcement under the Air Act 1980 to ban farm fires. This needs be enabled with incentive and subsidy for innovative farming methods. Promote alternative uses of paddy straw for power generation.

EPCA coordinating with the concerned state governments.

Total paddy stubble burning area in ten districts of Haryana and Punjab is about 208.34 thousand hectares or 20.29 % of the total paddy area in the districts.
**Agenda 12: Implement air quality index, health advisory and pollution emergency measures**

<table>
<thead>
<tr>
<th>AQI Category (Range)</th>
<th>PM$_{10}$ 24-hr</th>
<th>PM$_{2.5}$ 24-hr</th>
<th>NO$_2$ 24-hr</th>
<th>O$_3$ 8-hr</th>
<th>CO 8-hr (mg/m$^3$)</th>
<th>SO$_2$ 24-hr</th>
<th>NH$_3$ 24-hr</th>
<th>Pb 24-hr</th>
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</thead>
<tbody>
<tr>
<td>Good (0-50)</td>
<td>0-50</td>
<td>0-30</td>
<td>0-40</td>
<td>0-50</td>
<td>0-1.0</td>
<td>0-40</td>
<td>0-200</td>
<td>0-0.5</td>
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<tr>
<td>Satisfactory (51-100)</td>
<td>51-100</td>
<td>31-60</td>
<td>41-80</td>
<td>51-100</td>
<td>1.1-2.0</td>
<td>41-80</td>
<td>201-400</td>
<td>0.5-1.0</td>
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<tr>
<td>Moderately polluted (101-200)</td>
<td>101-250</td>
<td>61-90</td>
<td>81-180</td>
<td>101-168</td>
<td>2.1-10</td>
<td>81-380</td>
<td>401-800</td>
<td>1.1-2.0</td>
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<tr>
<td>Poor (201-300)</td>
<td>251-350</td>
<td>91-120</td>
<td>181-280</td>
<td>169-208</td>
<td>10-17</td>
<td>381-800</td>
<td>801-1200</td>
<td>2.1-3.0</td>
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<td>Very poor (301-400)</td>
<td>351-430</td>
<td>121-250</td>
<td>281-400</td>
<td>209-748*</td>
<td>17-34</td>
<td>801-1600</td>
<td>1200-1800</td>
<td>3.1-3.5</td>
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<tr>
<td>Severe (401-500)</td>
<td>430+</td>
<td>250+</td>
<td>400+</td>
<td>748+*</td>
<td>34+</td>
<td>1600+</td>
<td>1800+</td>
<td>3.5+</td>
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<td>AQI</td>
<td>Associated Health Impacts</td>
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<tr>
<td>Good (0–50)</td>
<td>Minimal Impact</td>
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<tr>
<td>Satisfactory (51–100)</td>
<td>May cause minor breathing discomfort to sensitive people</td>
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<tr>
<td>Moderately polluted (101–200)</td>
<td>May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults</td>
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<tr>
<td>Poor (201–300)</td>
<td>May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease</td>
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<tr>
<td>Very Poor (301–400)</td>
<td>May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases</td>
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<tr>
<td>Severe (401–500)</td>
<td>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</td>
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Need pollution emergency measures

Implement national air quality index with health advisory.

On days with very poor and severe levels:

-- There should not be any tolerance for visible smoke-emitting vehicles.

-- Only Euro III and Euro IV vehicles allowed. On very severely polluted days make public transport free.

-- Double the parking charges, ban diesel vehicles, cut down on construction activities.

-- Schools should be shut down, and ban entry of commercial vehicles inside the city.

-- All agencies need to upgrade their monitoring stations to enable daily reporting of realtime data of all pollutants including PM2.5 to enable reporting of AQI and health advisory.
Close to 20 monitoring stations in Delhi. But online realtime data available only for 6 DPCC stations.

IMD/SAFAR has 10 monitoring stations around the games venues. Do not put out real time concentration. Only air quality index and daily aggregate for PM10, PM2.5 and ozone.

Source: http://safar.tropmet.res.in/
Real time air quality data reporting in Delhi: DPCC and CPCB

CPCB has 5 stations. But do not put out realtime PM2.5 data. There is time lag in reporting

Only DPCC that monitors in 6 locations relay real time data for all pollutants.
Action Agenda for Air Pollution Control

Meet ambient air quality standards
   Strengthen air quality monitoring – PM2.5, ozone and air toxics
   Implement public information system

Reduce vehicular emissions
   Introduce Euro IV in 2016, advance Euro V and Euro VI emissions standards
   Revamp PUC so that it is annual and integrated with insurance
   Implement truck bypass by completing Western Peripheral by June 2016

Public transport and mobility strategies to reduce vehicle numbers
   Complete 17 bus clusters
   Augment bus numbers to 11,000
   Monitor bus performance
   Integration – metro-bus-autos-nmt; Common ticketing, ITS etc
   Infrastructure for walking and cycling; make it mandatory

Reduce demand for travel and vehicle usage
   Area-wise parking management, enforcement Parking pricing

Urban transport fund: reduce tax on buses; tax private vehicles

Think NCR wide plan for public transport:
Action Agenda for Air Pollution Control

Reduce emissions from power plants
   Tighter control on coal based power plants
   Set new standards for NOx and air toxics
   Shift to natural gas for power – insist GOI provides clean gas

Reduce emissions from air polluting industry
   Review the challenges of industrial emissions and control measures

Reduce emissions from generator sets
   Tighter emission standards for generator sets
   Siting and acoustic measures for big gen sets
   Energy efficiency measures to reduce electricity demand

Action on open burning
   Monitoring and awareness campaign

Road dust and construction activities
   Adopt dust control measures for construction industry, roads, and traffic