Towards clean air
Are cities prepared?

Conclave
Our Right To Clean Air
Centre for Science and Environment
New Delhi April 19-20
Toxic air: Top killer in India……

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

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

Ahmedabad

Chennai

Delhi

Pune

Source: S Guttikunda, SIM Air, 2012 and IIT Kanpur 2015
Ambient air quality to integrated exposure

- Need exposure mapping across micro environment
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\textsubscript{2.5} emission apportionment](chart1.png)

![PM\textsubscript{2.5} exposure apportionment](chart2.png)

Source: S Guttikunda – SIM Air
Exposure to Vehicle Emissions

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Exposure (iF)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>21</td>
</tr>
<tr>
<td>World</td>
<td>39</td>
</tr>
<tr>
<td>China</td>
<td>45</td>
</tr>
<tr>
<td>India</td>
<td>51</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>63</td>
</tr>
<tr>
<td>Bangalore</td>
<td>68</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>69</td>
</tr>
<tr>
<td>Chennai</td>
<td>72</td>
</tr>
<tr>
<td>Mumbai</td>
<td>79</td>
</tr>
<tr>
<td>Delhi</td>
<td>100</td>
</tr>
<tr>
<td>Kolkata</td>
<td>150</td>
</tr>
</tbody>
</table>

What have we done?

Dynamic assessment of top 10 populous cities – Delhi, Chennai, Bengaluru, Hyderabad, Mumbai, Pune, Ahmedabad, Kolkata and Lucknow, Jaipur

Assessment of urban air quality management capability and capacity to implement clean air action plan to meet clean air targets

Establish base line of action in cities -- air quality monitoring and planning, Pollution source and health assessment; clean air action plan to address vehicles technology and fuels; public transport, walk and cycle, restraint on cars; industrial/ power plant sources; dust control in construction and trash burning.

Five stages of progress:
- Lowest stage I -- common minimum programme
- Top stage V: -- Going beyond best practices and norms to make impact and achieve clean air.
- Stage II to III intermediate stages based on level of progress

Indicators developed to define each stage

Transparent publicly available and those shared by departments
Selected cities represent 24% of urban population of India and none meet air quality standard.
Riders ........

National action on emissions standards are common to all and part of stage I development – unless proactive demand from states to improve

Data and information not equally robust or exhaustive for all sectors. This creates bias in detailing. Data bases are not always directly comparable across cities.

Benchmarking of stages puts great expectations on cities

Focus on assessing direction of change in cities

As air quality management has not matured equally across sectors and cities, progressive action is not uniform. Cities may have done well in one sector while languishing in others.

Positive initiative highlighted in individual sectors
**Desired clean air goals**

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>City has <strong>good ambient air quality</strong> (50% below Indian Standard); eliminated household exposure and controlled exposure from all sources; minimised health impact</td>
</tr>
<tr>
<td>IV</td>
<td>City meets <strong>Indian air quality standard</strong>; nearly eliminated household pollution; control of air pollution and exposure from all sources. Reduced health impact</td>
</tr>
<tr>
<td>III</td>
<td>City has robust system to monitor and assess air quality and implements <strong>time-bound action plan</strong> to meet standards and reduce exposure.</td>
</tr>
<tr>
<td>II</td>
<td>City has <strong>adequate capacity to monitor and assess</strong> air quality and has developed air quality action plan to reduce all exposures.</td>
</tr>
<tr>
<td>I</td>
<td>City does minimal air quality monitoring and has taken minimal action to control air pollution.</td>
</tr>
</tbody>
</table>
Monitoring capacity in cities

• All cities have a combination of manual and real time monitoring
• 34 cities have real world monitoring facilities but air quality index is reported for 22 cities.

Share of manual and real time stations

[Chart showing the number of real-time and manual monitoring stations for various cities, with Delhi having the highest number of real-time stations, followed by others like Chennai, Hyderabad, Bangalore, Kolkata, Lucknow, Ahmedabad, Jaipur, Mumbai, and Pune. The chart also notes that mega cities have 9 stations, while capital cities have criteria 6 stations.]
How clean is our air?

| V | Good air quality – 50% below the standards |
| IV | Meets the ambient air quality standards and reduce exposure |
| III | Improvement |
| II | Stabilisation |
| I | Lost gains |
Target cities have poorer air than the average of their climatic region.
Target cities have poorer air than the average of their climatic region.
Lost gains
Trend in PM10

Source: Based on parliament questions and answers on air pollution related questions
Stable trend but exceeds standards
PM10 trends

Mumbai

Pune

Lucknow

Ahmedabad

Kolkata

Source: Based on parliament questions and answers on air pollution related questions
Twin trouble
Nitrogen dioxides rising

Source: Based on parliament questions and answers on air pollution related questions

Underestimation of problem
CSE audit of air quality monitoring has have shown how manual monitoring method of underestimates Nox pollution

CPCB and SPCB should process real time data and publish
Twin trouble
Nitrogen dioxides stable or declining

Source: Based on parliament questions and answers on air pollution related questions
Manual vs Realtime

Comparison of DPCC and CPCB data PM10 levels (Average of 2011-2014)

Manual V/s Realtime

<table>
<thead>
<tr>
<th>Manual V/s Realtime</th>
<th>CPCB Manual</th>
<th>DPCC Realtime</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM10</td>
<td>224</td>
<td>311</td>
</tr>
<tr>
<td>NO2</td>
<td>61</td>
<td>77</td>
</tr>
</tbody>
</table>

Underestimation of problem

Data reported under National Ambient Air Quality Monitoring Programme are based only on manual monitoring.

This underestimates pollution compared to real time monitoring.
Not all real time monitors utilised for reporting air quality index (assessed during Jan to Feb 2016)

Mumbai, Delhi, Chennai, Hyderabad are using only 25 to 40 per cent of their realtime station capacity for reporting AQI

<table>
<thead>
<tr>
<th>Cities</th>
<th>Number of realtime stations used for AQI</th>
<th>% of realtime stations used for AQI data during Jan to March 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Delhi</td>
<td>11</td>
<td>36</td>
</tr>
<tr>
<td>Chennai</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td>Lucknow</td>
<td>4</td>
<td>75</td>
</tr>
<tr>
<td>Bangalore</td>
<td>5</td>
<td>80</td>
</tr>
<tr>
<td>Jaipur</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Pune</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>Not used</td>
<td>NA</td>
</tr>
<tr>
<td>Kolkata</td>
<td>Not used</td>
<td>NA</td>
</tr>
</tbody>
</table>

Source: Based on data available in CPCB and state websites
Data capture for reporting AQI

Jaipur, Lucknow, Pune are ahead of other big cities

<table>
<thead>
<tr>
<th>City</th>
<th>Number of real-time stations</th>
<th>Average operational stations used for AQI</th>
<th>Number of days AQI available (Jan to March 2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jaipur</td>
<td>1</td>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>Lucknow</td>
<td>4</td>
<td>3</td>
<td>99</td>
</tr>
<tr>
<td>Pune</td>
<td>1</td>
<td>1</td>
<td>95</td>
</tr>
<tr>
<td>Chennai</td>
<td>5</td>
<td>2</td>
<td>87</td>
</tr>
<tr>
<td>Mumbai</td>
<td>4</td>
<td>1</td>
<td>80</td>
</tr>
<tr>
<td>Delhi</td>
<td>11</td>
<td>4</td>
<td>78</td>
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<td>5</td>
<td>4</td>
<td>69</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>5</td>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>1</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Kolkata</td>
<td>2</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>
Emergency Action for Pollution

Emergency Action only in Delhi

Odd and even scheme
Capacity to assess Polluters

NO2 emission sources share (in %)

PM10 emission sources share in %

Not a dynamic process
Do not lend to effective action

Source: Final emission inventory study, MOEF, 2011; * the Delhi study is conducted by the IIT Kanpur in 2015
Towards clean air action plan

- Cities under judicial scrutiny have framed clean air action plans and Task Force to monitor: - Bengaluru, Hyderabad, Chennai, Ahmedabad, Delhi

- Not a dynamic process in most cities to inform and push action in all sectors

- Guidance issued from time to time in specific sectors

- Action plan limited in scope and not linked effectively with all sectors of mitigation for effective reduction

- Several drafts in Delhi on short and medium term action

- Need implementation strategy for time bound action to meet specific targets
Air quality monitoring and management

- No city
- No city
- Delhi, Bengaluru
- Chennai, Ahmedabad, Kolkata
- Hyderabad, Lucknow
- Pune, Mumbai, Jaipur
• Air pollution control .....direction of change
Clean air and mobility

How people travel influence the quality of air.

Walking and cycling are zero emissions modes.

Bus, metro, train etc carry more people but emit less per person.

Auto and taxis are high frequency-low occupancy vehicles for connectivity.

Cars and two wheelers occupy maximum road space, carry much less people and emit more per person. They edge out sustainable modes and incur huge social and health cost.
Vehicle numbers: Explosive  
(2003-2013)

(Number in thousands)

% increase in the motor vehicles from 2003 to 2013

Source: MoRTH, 2015
Environment Protection Act 1986 and Air Act 1981: Both are in the Union’s List-I. Powers of the Union are exclusive and overriding. The Motor Vehicles Act 1988 is under the concurrent list (List III, E 35) to give the Union’s Act priority. EPA asks to meet air quality standards.

Air Act – Chapter IV – Prevention and control of air pollution

20. Power to give instructions for ensuring standards for emission from automobiles -- the State Board under clause (g) of sub-section (1) of section 17 -- State Government shall, in consultation with the State Board, give such instructions as necessary to concerned authority in charge of registration of motor vehicles under the Motor Vehicles Act, 1939 (Act 4 of 1939), and such authority shall be bound to comply with such instructions.

Central Pollution Board is Advisory and to plan and cause to be executed a nationwide programme for the prevention, control or abatement of air pollution; Similar provisions for the State Governments. Central and State Government may give directions to the Central and State Board respectively.


Accountability mechanism not clear
Weak link....... 

• Rapid review of available clean air action plan and guidance from most cities show very poor linkage between clean air action and mobility action

• Lose linkage with augmentation and integration of public transport, walk and cycle

• No linkage with compact city and road design; transit oriented development practices

Think of mobility not cars
<table>
<thead>
<tr>
<th>Modal Share Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 90%</td>
<td>When a city has a combined modal share of more than 90 per cent for all forms of public transport -- buses, trains, autos/taxis, and walking and cycle.</td>
</tr>
<tr>
<td>81 - 90%</td>
<td>When a city has combined modal share of 81 - 90 per cent for all forms of public transport -- buses, trains, autos/taxis, and walking and cycle.</td>
</tr>
<tr>
<td>71 - 80%</td>
<td>When a city has combined modal share of between 71 -80 per cent for all forms of public transport -- buses, trains, autos/taxis, and walking and cycle.</td>
</tr>
<tr>
<td>61 - 70%</td>
<td>When a city has combined modal share of between 61 -70 per cent for all forms of public transport -- buses, trains, autos/taxis, and walking and cycle.</td>
</tr>
<tr>
<td>Equal to or less than 60%</td>
<td>When the city has modal share of equal to or less than 60 per cent for all forms of public transport -- buses, trains, autos/taxis, and walking and cycle.</td>
</tr>
</tbody>
</table>

Which city has highest share of public transport, walk and cycling trips?

No strategy to protect current usage of sustainable modes.
Indian cities have one of the best baselines in the world

Even today majority in our cities walk, cycle and use public transport

Most people are too poor to even use public transport

Compact city design that has reduced distances

Some cities have invested in public transport – to improve quality of service

Clean air action plan to protect and improve the modal share

- Modal Share (in %)
- Benchmark based on the goals set by Delhi, Kolkata & Pune for PT & NMT (90%)
- Benchmark based on National best practice for personal Cars & 2 Wheelers (10%)

Race to walk, cycle and use public transport

**Stage I:** Ahmedabad, Hyderabad, Pune equal or less than 60%.

**Stage II:** Bengaluru, Jaipur, Delhi, Chennai & Lucknow with 61% To 70%.

**Stage III:** Practice

**Stage IV:** Mumbai, Kolkata: global best

**Stage V:**

Clean air action plan to protect and improve baseline
Kolkata: Integrated modes

Most diverse public transit modes

### MOVEMENT OF PASSENGERS
**AVERAGE WEEKDAY PASSENGER VOLUME IN LAKHS**

<table>
<thead>
<tr>
<th>MODES</th>
<th>2001</th>
<th>2025</th>
<th>% INCREASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBURBAN RAIL</td>
<td>32.5</td>
<td>46.0</td>
<td>41</td>
</tr>
<tr>
<td>METRO RAIL</td>
<td>2.0</td>
<td>13.0</td>
<td>550</td>
</tr>
<tr>
<td>CIRCULAR RAIL</td>
<td>0.2</td>
<td>4.0</td>
<td>1900</td>
</tr>
<tr>
<td>TRAM/LRT</td>
<td>2.0</td>
<td>10.0</td>
<td>400</td>
</tr>
<tr>
<td>BUS</td>
<td>113</td>
<td>175</td>
<td>55</td>
</tr>
<tr>
<td>PARA TRANSIT</td>
<td>35.0</td>
<td>67.0</td>
<td>91</td>
</tr>
<tr>
<td>INLAND WATER TRANSPORT(Ferry)</td>
<td>2.4</td>
<td>7.0</td>
<td>191</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>187.0</td>
<td>322.0</td>
<td>72</td>
</tr>
</tbody>
</table>
Public Transport-Modal Share

- Ahmedabad, Hyderabad & Pune
- Delhi, Chennai, Jaipur, Lucknow, Bengaluru
- Kolkata and Mumbai
- No city
- No city
Don’t miss the bus

- Buses are critical as spine of city mobility – 40-60% of daily trips
- allow greater flexibility, geographic coverage, cost effectiveness, and space efficiency
- Buses move people in most cost-effective way – emits a lot less per person
Goals for good city bus service

City is providing a **integrated** bus service that is highly efficient, sufficient, reliable, affordable and segregated with advanced passenger info service.

City provides bus service that is **sufficient**.

Innovation in augmenting quality of bus service, reserving right of way, optimal use of **infrastructure**. Scope of improvement in quality.

City provides bus service that is **insufficient but optimally utilizes its existing infrastructure**.

Efficiency and reliability can be improved.

City provides bus service that is **insufficient and sub-optimally utilizes its existing infrastructure**.

Overall the service is stressed and unreliable.

City provides bus service that is **insufficient and poorly utilizes its existing infrastructure**.

The service is inefficient and unreliable.
City Bus Service: Indicators

Efficient bus operations
Number of buses and route planning to serve the population with reliable service
Fleet utilisation
Kilometre Efficiency and load factor
Distance travelled and trips /day
Average age of bus
Fuel Efficiency
Staff per bus
Dead mileage
Infrastructure optimisation

Planning and policy – regulatory and fiscal – Innovations – Management strategies
Service guarantee programme
Dedicated urban transport fund etc.
What matters most -- Bus Service

Bus service per 3 minutes during peak hour and 5-7 minutes during non-peak hour; serves entire population effectively; uses advanced passenger information system for reliable services; quality service, dedicated right of way, well integrated with other modes; affordable; runs on clean fuels.

Demonstrates substantial improvement from baseline on fleet utilisation; utilisation of passenger carrying capacity; route rationalisation for geographical and population coverage; improves operated kilometer; starts enforcing bus lanes and provide dedicated right of way, passenger information and ITS application.

Demonstrates improvement from baseline on fleet utilisation; utilisation of passenger carrying capacity; route rationalisation for geographical and population coverage; improves operated kilometer; starts enforcing bus lanes.

Inadequate and unreliable services. Poor fleet utilisation; underutilisation of passenger carrying capacity; no route rationalisation and poor geographical and population coverage; Operated kilometer are much less than scheduled kilometer; no dedicated right of way for buses.
**Trend of bus fleet (2010-2015)**

- **DTC** – 80% of city bus service
- **BEST**, Mumbai – 100%
- **BMTC** Bengaluru: 100%
- **AMTS** Ahmedabad: 100% of conventional bus system
- **Pune** Mahamandal – 100%
- **MTC** Chennai – 100%
- **CSTC**, Kolkata – 11% of bus fleet
- **Hyderabad**: No data

Source: MoRTH February 2016
How many buses per lakh population?

- Bengaluru with 68 buses /lakh population is at Stage IV.
- All other cities at Stage I with less than 40 buses per lakh population.

The share is only of Culcutta STC which is 11 % of the total buses (Source: Kolkata CMP-2008)
City Bus Service

Trend in passengers carried by city bus services (2010-2015)

- Only BMTC shows increase
- Delhi shows imixed trend -- mprovement and decline
- Pune stable
- Rest – consistent decline

Source: MoRTH
Fleet utilisation of buses

- Most cities are at Stage IV
- Lucknow & Pune at Stage III

Source: MoRTH, CSE
Distance travelled by a bus per day

- Stage IV: Chennai with highest kilometers -- 226-275 kms a day.

Source: MoRTH, CSE
How much of passenger carrying capacity is utilised

- Stage IV: Chennai, Delhi & Pune

Source: MoRTH, CSE
Some initiatives

• Bengaluru Metropolitan Transport Corporation
  • Scraps old buses that covered 8.50 lakhs Kms or 10 years of age. Replacement with BS-IV buses. Planning CNG bus programme
  • Stratified bus service according to affordability
  • Revenue generation model
  • Bus Day

• Delhi: Renewed bus fleet twice – once to CNG; the to urban buses; age cap on buses; moved to CNG; to increase bus numbers by 3000 this year

• Ahmedabad: Bus rapid transit network
# City Bus Service

## Where cities stand?

<table>
<thead>
<tr>
<th>Rank</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bengaluru</td>
</tr>
<tr>
<td>2</td>
<td>Ahmedabad, Delhi, Mumbai, Pune, Chennai, Kolkata</td>
</tr>
<tr>
<td>3</td>
<td>Hyderabad, Jaipur, Lucknow</td>
</tr>
<tr>
<td>4</td>
<td>No city</td>
</tr>
<tr>
<td>5</td>
<td>No city</td>
</tr>
</tbody>
</table>
Without right to walk we cannot take a bus

We cannot cross the road
Walking and cycling

City provides safe and dedicated infrastructure for NMT with zero pedestrian and cyclist fatalities. 50% of the daily trips are NMT.

City has dedicated NMT infrastructure and has increased it NMT modal share over last 5 years.

City has advance NMT infrastructure with pedestrian rights while stabilising its NMT modal share.

City is improving its NMT infrastructure and has adopted pedestrian and cycling friendly schemes.

City provides minimal NMT infrastructure and has high pedestrian and cyclist fatalities.
Initiatives

NMT modal share
Safe access
Integrated NMT policy
NMT initiatives

(Street design guidelines, bike sharing, street audits, mandatory implementation of NMT guidelines of IRC, bicycle master plan, car free days, NMT as part of clean air action plan, any dedicated dept./cell and fund for NMT)
Modal share for walk and cycle in cities

Stage V
Stage IV: Lucknow, Ahmedabad & Kolkata
Stage III
Stage II
Stage I

Source: Census 2011
How safe are the roads in these cities
Road accidents reported (2011 to 2014)

- Delhi and Kolkata showing increasing trend
- Bengaluru, Mumbai & Chennai declining trend.
- Others stable trend.

Source: 2011-2014, Accidental Deaths & Suicides in India, NCRB, Ministry of Home Affairs, GoI
Chennai

Only city to notified comprehensive non-motorised transport policy

Mandates a minimum of 60% of Corporation’s transport budget to NMT infrastructure.

Chennai Street Design Manual.

City corporation selected 448 bus routes (358 km) for improvement. With grants from the Tamil Nadu Road Infrastructure Funds, the corporation has begun work on footpaths of 71 bus routes, approximately over 49 km.

Reclaimed space from carriageway

To prohibiting encroachments on footpaths etc. Car free streets

In contrast to the old footpath on Police Commissioner Street which was narrow, with utility boxes obstructing pedestrian activity; the new footpath (right) is wide with utility boxes moved to provide a continuous pedestrian realm that is accessible to all.
Good news from cities

Delhi

• New state budget allocates funds for redevelopment of PWD roads with walk and cycling facilities
• Delhi’s ‘Green Bike’ initiative
• Car Free Days every 22nd of the month.
• Supreme Court directive – invest revenue from pollution tax on trucks on public transport as well as walking and cycling infrastructure
• Street design guidelines
• More than 40 km of dedicated walking and cycling tracks near games venues
Good news from cities

**Bengaluru**
City government with Bangalore City Connect Foundation has initiated a public-private initiative named Tender SURE. Redesigned footpaths.

DULT organises Cycle Days in Bengaluru.

**Kolkata**
**Redesigning footpaths.** Pedestrian friendly design

**Pedestrianisation:** Pedestrianising Humayun Place and Bertram Street
Good news from cities

Jaipur
Johari Bazaar and Chaura Rasta in Walled city

- Walkable and shaded verandah is unique to the old city; The verandah is covered all along, -- a continuous and shaded space for walking.
- Shopkeepers display but keep clear width of 1-1.5 metre for walking
- PPP model for bike sharing for 1,000 cycles and 72 cycle stands.
- Footpath redesign in other areas
Walking and cycling
How cities fare?

- No city
- No city
- Chennai, Bengaluru
- Mumbai, Delhi, Pune, Ahmedabad, Hyderabad, Jaipur, Lucknow, Kolkata
- No city
bad news
Kolkata

Banned on 174 roads between 7 AM and 11 PM.
MMRDA had planned **50 skywalks** in Mumbai Metropolitan Region to connect railway stations or commercial areas. The Bandra (E) station and Kalanagar (Bandra-Kurla Complex) skywalk -- actual usage couple of hundred in peak hour. **81.4 per cent say skywalks are unsafe** (survey of St Xavier’s College).
Most roads less than 4 lanes wide are designated one-way.

Bengaluru has best bus service but worst accessibility to bus according to MoUD

One-ways limit access to bus stops: pedestrian can’t cross roads

Jaanagraha survey: Only 0.33% of 238 kms of footpaths surveyed have good walkability
Delhi: flyover capital

Flyovers make people drive longer; destroy walk and cycling trips; increase emissions

Case Study – Outer Ring Road (Nehru Place Flyover)
Travelling from Nehru enclave to Pamposh has turned 1.9 km drive from a 30 M walk.

Source: CSE
• Need restraint...........
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
Why are we wasting so much valuable space for parking?

A 100 sqm plot built to the full allowable FAR (315 sq m) needs 161 sq m of parking space by Law - more than half. This is equal to one and half storey or space of 4 EWS dwellings....
Parking charges in Indian cities are some of the lowest in the world.
Parking policy to restrain car usage

City provides limited legal parking with a cap and prices it effectively to reduce car ridership and ownership.

City limits creation of legal parking and prices it based across all land uses on the actual social and environmental cost associated with parking and motorisation.

City allows legal parking caps and it is regulated and priced. Some parking restraint like proof of parking is available.

City allows minimum parking and prices it high and variably. There is a fine for illegal parking.

City provides unlimited parking and it is free or minimally priced to cater to increasing vehicular population. Illegal parking is unregulated.
Acceptance of demand management principles

National Urban Transport Policy: 2006

- Urban land is valuable. Levy high parking fee that represents value of land occupied. Graded parking fee should recover the cost of the land. Make public transport more attractive.
- Public transport vehicles and non-motorised modes of transport be given preference in parking space allocation.
- Park and ride facilities for bicycle users with convenient interchange are a useful measure.
- In residential areas byelaws need changes to free the public carriageway.

Supreme Court/EPCA:
“Land is limited and there is a limit to the additional parking space that can be created in the city. This will also require …. pricing policy to control the demand for parking.”
- The provision of parking for personal motorised vehicles cannot be considered as a matter of public good.
- The ‘user pays’ principle should govern the pricing of parking.
- Government should not subsidise this cost
Other countries are using parking policy to restraint car use

Boston has frozen parking requirements at 10 per cent higher than the 1973 levels. This has helped Boston to meet the federal clean air standards.

Portland, Oregon set an overall cap of 40,000 parking spaces downtown. This increased public transport usage from 20-25 per cent in the 1970s to 48 per cent in mid 1990s.

Seattle allows a maximum of one parking space per 100 square metres of downtown office space.

San Francisco limits parking to seven per cent of a downtown building’s floor area.

New York: Very high parking fees and limited parking supply have lowered car ownership far below the average rates in other US cities.

Amsterdam -parking fees expanded to meet NO2 and PM10 standards.

Zurich considers total NO2 emissions when determining the amount of parking to be allowed.

Bogota has removed limit on the fees that private parking companies can charge. The additional revenue is dedicated to road maintenance and public transit service improvement.
Step towards restraint

• **Bengaluru: Stage II**- Has a notified parking policy.

• **Jaipur: Stage II**- Introduced proof of parking system for purchase of car.

• **Kolkata: Stage II**- Introduced parking charges in residential areas and has restrictions on night time parking on narrow streets.

• **Ahmedabad, Chennai, Delhi, Mumbai, Pune, Hyderabad & Lucknow:**
  • **Stage I**- All have minimum parking standards and supply unlimited & free parking.
Parking as a restraint measure

Ahmedabad, Chennai, Delhi, Mumbai, Pune, Hyderabad & Lucknow

Jaipur, Kolkata & Bengaluru

No city
Fiscal measures to control pollution

Think and do differently

• Correct what we are doing so wrong:
  • Tax car more than bus
  • Charge for parking
  • Charge/tax diesel use in private cars

• Use all this to create facilities for all; convenient modern and accessible to take the bus or cycle or walk
Fiscal Measures to bring change

City applies polluter pay principal to change citizen behaviour and commuting choices. Cleaner technology and commute options are the cheapest.

City has advance fiscal system based on polluter pay principal and has removed perverse incentive to dirty technologies.

City has aggressive environmental tax on polluting technologies and commute options and has minimised skewed distortion in technology pricing.

City has green tax on dirty fuels and dedicated funds to incentivize cleaner technologies and modes of commute.

City has no fiscal intervention with skewed distortion in fuel and commute option prices providing perverse incentive to dirty technologies.
Indian style socialism
buses pay more taxes annually than cars

Buses in all cities pay more than cars

Ahmedabad – smallest differential

Kolkata: Minimal difference

Bangalore – Highest tax on buses
Tax on petrol higher than diesel

- Lowest tax differential between petrol and diesel in Ahmedabad & Mumbai -- 2%
- Highest differential in Bengaluru & Lucknow -- more than 9%
- Lowest tax on diesel in Delhi

Source: MoPNG
Polluters Pay Principle: small beginning

- Delhi
  - **Air ambience fund** -- environment cess on per litre of diesel sold, to create an air ambience fund to finance pollution control activities.
  - **Environment compensation charge on trucks.** Dedicated fund for public transport, walk and cycle

- Maharashtra: **Green tax** under Bombay Motor Vehicles Tax (Amendment) Ordinance, 2010. Public and private vehicles over eight and 15 years old pay a green tax every year.

- Karnataka: State Level Urban Transport Fund

- Rajasthan: State and city level urban transport fund
**Fiscal measures**

<table>
<thead>
<tr>
<th></th>
<th>Ahmedabad, Pune, Mumbai, Kolkata</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[V] No city</td>
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<tr>
<td></td>
<td>[IV] No city</td>
</tr>
<tr>
<td></td>
<td>[III] No city</td>
</tr>
<tr>
<td></td>
<td>[II] Delhi, Chennai, Bengaluru, Hyderabad, Jaipur, Lucknow,</td>
</tr>
</tbody>
</table>
Emissions from on-road vehicles

City ensures that in-use vehicle do not emit more than their designed maximum emission and has completely weeded out gross polluting vehicles.

City has advance pollution monitoring and control system with real world testing facility and has majorly weeded out gross polluting vehicles.

City has advance pollution monitoring system (advanced emissions testing, on board monitoring) and adopted polluting vehicle management.

City has improved upon mandatory pollution control infrastructure and has adopted additional measure like cleaner fuel.

City does minimum required as per the national law and standards to restrain emissions from in-use vehicles.
Strategy of alternative fuels

- **Delhi**: has the largest refuelling network
- **Public transport entirely on CNG**
- **Mumbai**: Large CNG bus and taxi fleet and large pvt vehicle fleet.
- **Chennai, Hyderabad, Bengaluru and Kolkata**: Limited LPG uptake in small vehicles like autos
Alternate fuels strategy

- **Mumbai**: Highest share of vehicular fleet on alternative fuels
- **Delhi**: Second in rank
- **Ahmedabad**: Has seen low adoption in spite of wide availability of CNG
Initiatives to control emissions from in-use vehicles

- Environment compensation charge on truck entry
- Entry of pre-2006 trucks banned
- Truck diversion
- Introduced RFID technology and for electronic monitoring and payment
- All PUC testing centres are connected to a centralised server in real-time. Lambda test introduced
- Upgraded vehicle fitness testing facility for commercial vehicles
Initiatives taken for in-use vehicular management – Mumbai and Bangalore

- **Mumbai:**
  - Has one of the largest city-bus fleets running completely on CNG
  - Also autos and taxis on CNG
  - Incentivise a large no. of private cars to convert to CNG
  - Transit-oriented travel network which enables high efficiency for its public transit network
  - Overall dependence on MRTS has meant that the vehicular fleet in the city is one of the smallest

- **Bangalore:**
  - Restricted old, polluting vehicles and does not let them into the city
  - Restricted 2 stroke vehicles
  - Established a real-time monitored pollution under check network
  - Supported by a robust bus network that is used by commuters, and supported by enterprises as well as civil society organisations in the city
In-use Vehicle emissions

- Kolkata, Chennai, Pune, Jaipur
- Bengaluru, Hyderabad, Ahmedabad, Lucknow
- Delhi, Mumbai
- No city
- No city
Dust Control from Construction, Demolition and Roads

Fugitive dust from mismanaged construction and demolition (C&D) waste form a major portion of air pollution attributed to construction activities and road dust.
On 29 March, 2016 MoEFCC notified India’s first ever rules construction and demolition waste management. Challenge now is to have these rules implemented and reduce generation and littering of this waste which is a major source of fugitive dust pollution in cities. As part the study each city's preparedness to adopt and implement the new rules was assessed.
Dust Control from construction and demolition waste

City has **developed a circular economy of waste.** It has minimised generation, effectively collects, recycles and uses all the generated waste.

City has dedicated C&D waste management system and infrastructure in place. It **collects and recycles most of the waste generated.**

City has developed a dedicated system of collection and disposal of C&D waste and **it is implemented as pilot in some portion of the city.**

City has initiated a dedicated system of C&D waste collection and disposal. But it has **not piloted the system.**

City does not have a dedicated C&D waste policy and its **infrastructure to effectively handle and utilize C&D waste is minimal.**
C&D Waste Management - Indicators

1. Quality of C&D waste quantification
2. City’s existing and proposed C&D waste recycling capacity
3. Qualitative assessment of the city’s existing and proposed C&D waste policy
4. Assessment of the city’s C&D waste handling initiatives
Stage IV: Delhi with installed capacity to recycle 50-60% of 4,000-5,000 TPD waste

Stage III
Ahmedabad – 42% Bengaluru – 37%
Delhi: Pioneered recycling

- Municipal corporations of North Delhi and East Delhi have a 2000 TDP and 500 TDP capacity **C&D waste recycling plant** respectively.

- Government mandates use of a minimum of two per cent recycled products from **construction waste** in all future contracts for building works and **10 per cent recycled products for road works** undertaken by its agencies.
Bengaluru


• Comprehensive guidelines linked the C&D waste management with the building construction permit system.

• BBMP notified six abandoned queries as designated C&D waste dump sites.

• City also plan to setup three C&D waste recycling plants with combined recycling capacity of 2,250 TPD.

• Private recycling facility with 1,000 TPD capacity run by Rock Crystals, a BBMP empanelled vendor.
C&D Waste Management

- Chennai, Hyderabad, Jaipur, Kolkata, Lucknow, Pune, Mumbai
- Ahmedabad
- Delhi, Bengaluru
- No city
- No city
• Big problems … uncertain data…
## Power plants and industry

<table>
<thead>
<tr>
<th>City</th>
<th>Number of plants</th>
<th>Installed Capacity in MW</th>
<th>Reported PM levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>2</td>
<td>840</td>
<td>50-70</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>1</td>
<td>422</td>
<td>40-90</td>
</tr>
<tr>
<td>Mumbai</td>
<td>1</td>
<td>750</td>
<td>20-60</td>
</tr>
<tr>
<td>Chennai</td>
<td>3</td>
<td>4980</td>
<td>50-150</td>
</tr>
<tr>
<td>Kolkata</td>
<td>4</td>
<td>925</td>
<td>14-250</td>
</tr>
</tbody>
</table>

**Delhi:** shut down Rajghat plant and scales down generation at Badarpur plant.

**Kolkata** 4 plants -- three are Old. Approved shutting down of one at New Cossipore; Southern Thermal Plant restricted.

**Challenge of tracking small scale industrial pollution**
Trash and Biomass Burning

Highly toxic

Improper management of landfills and frequent fire

Municipal Waste (mis) Management and urban poverty
**NCR: Court ruling penalising open burning**

Delhi NCR: NGT order of penalty of Rs. 5000/- for each violation.

Supreme Court directed strict compliance with the order.

Implementation process started

Over Rs. 8,00,000 have been recovered in fines this winter.

<table>
<thead>
<tr>
<th>State</th>
<th>Number of challans</th>
<th>Amount recovered</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>326</td>
<td>Rs. 7,37,600</td>
<td>No challan was issued by NDMC and North-DMC</td>
</tr>
<tr>
<td>Haryana</td>
<td>27</td>
<td>Rs. 52,000</td>
<td>Faridabad: awareness campaign; watsapp based violation reporting system, but no challan till date</td>
</tr>
<tr>
<td>UP</td>
<td>8</td>
<td>Rs. 20,000</td>
<td>Only Greater Noida Authority has issued challans</td>
</tr>
</tbody>
</table>
Solid fuel burning: most neglected areas

Need energy transition

Shifting LPG subsidy to poor households

Kerosene free cities

CPCB 2014 Draft Indoor Air Pollution Monitoring Guidelines

Missing link in clean air action plan
<table>
<thead>
<tr>
<th>Sector</th>
<th>Stage</th>
<th>Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air quality monitoring and management</td>
<td>III</td>
<td>Delhi, Bengaluru</td>
</tr>
<tr>
<td>Clean air and mobility - Public transport</td>
<td>III</td>
<td>Kolkata, Mumbai, Bengaluru</td>
</tr>
<tr>
<td>Clean air and mobility - Walking and cycling</td>
<td>III</td>
<td>Chennai, Bengaluru</td>
</tr>
<tr>
<td>Restrain on usage of personal vehicles</td>
<td>III</td>
<td>Kolkata, Jaipur, Bengaluru</td>
</tr>
<tr>
<td>Controlling emissions from in-use vehicles</td>
<td>III</td>
<td>Delhi</td>
</tr>
<tr>
<td>Dust control from construction and roads</td>
<td>III</td>
<td>Delhi, Bengaluru</td>
</tr>
</tbody>
</table>
Stand behind change

• Recognise the actions – small as they may seem – which change this trajectory

• Cities that recognise that they must grow differently

• No big answer yet: **but this is the second coming**
Our health is non-negotiable

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.
Thank You