

## How much pollution we breathe?



**Centre for Science and Environment  
New Delhi, December 11, 2014**

# City enveloped in smog, back to pre-CNG

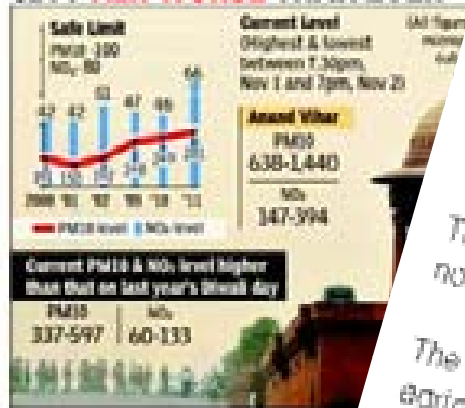
Gains Of Switch To Cleaner Fuel Frittered Away

Neeta Lachandani | 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

## CITY AIR WORSE THAN EVER



## Delhi winter smog is not an act of God

Nov 22, 2012

During the first week of November, Delhi went under a thick blanket of smog. The breeze nearly stopped, and the skies turned grey and dank. Cool and calm weather led to fumes settling close to the ground. People held masks, scarves or handkerchiefs to their faces.

The resultant outcry in the smog-hit city had officials stubbornly insisting that this was nothing new and that it happened every year.

The new twist came...

## Smog leaves Delhi gasping for breath

TNN | Nov 3, 2012, 01:33 AM IST

## Smog delays Sheila Dikshit's flight to Punjab

## Disadvantage Delhi: Smog here to stay

Darpan Singh, Hindustan Times  
New Delhi, November 08, 2012

email print

0 Comments

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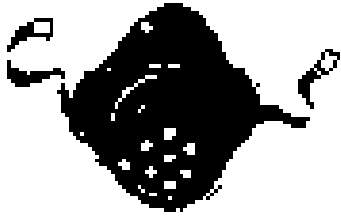
Tweet

The Centre for Science and Environment (CSE), in its latest report, has delivered a stark warning: The smog is here to stay. It has also warned that Delhi is in the grip of a multi-

10:44 AM IST

Punjab | NASA | flight | Flashpoint | AP

Ludhiana trip by Delhi chief minister Sheila Dikshit in a chartered telecom industrialist family became the flashpoint of the ongoing Delhi and Punjab when the plane was delayed by nearly three hours



## First generation reforms.....

Soft options are now all exhausted



### Delhi has fought hard to get breathing space

#### On vehicles

- Introduced low sulphur fuels and petrol with 1 per cent benzene
- Mandated pre-mix petrol to two- and three-wheelers
- Moved from Euro I to Euro IV over the last decade
- Implemented largest ever CNG based public transport programme
- Capped the number of three-wheelers
- Phased out 15 year old commercial vehicles
- Strengthened vehicle inspection programme (PUC)
- Efforts made to divert transit traffic
- Set up independent fuel testing laboratories to check fuel adulteration

#### On industry

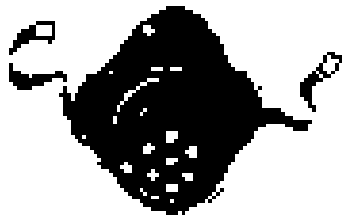
- Relocated polluting units
- Tighter controls on power plants. No new power plants.

#### Air quality monitoring

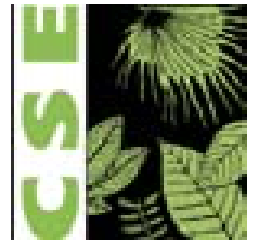
- Adopted new ambient air quality standards
- Expanded air quality monitoring and reporting

#### Other sources

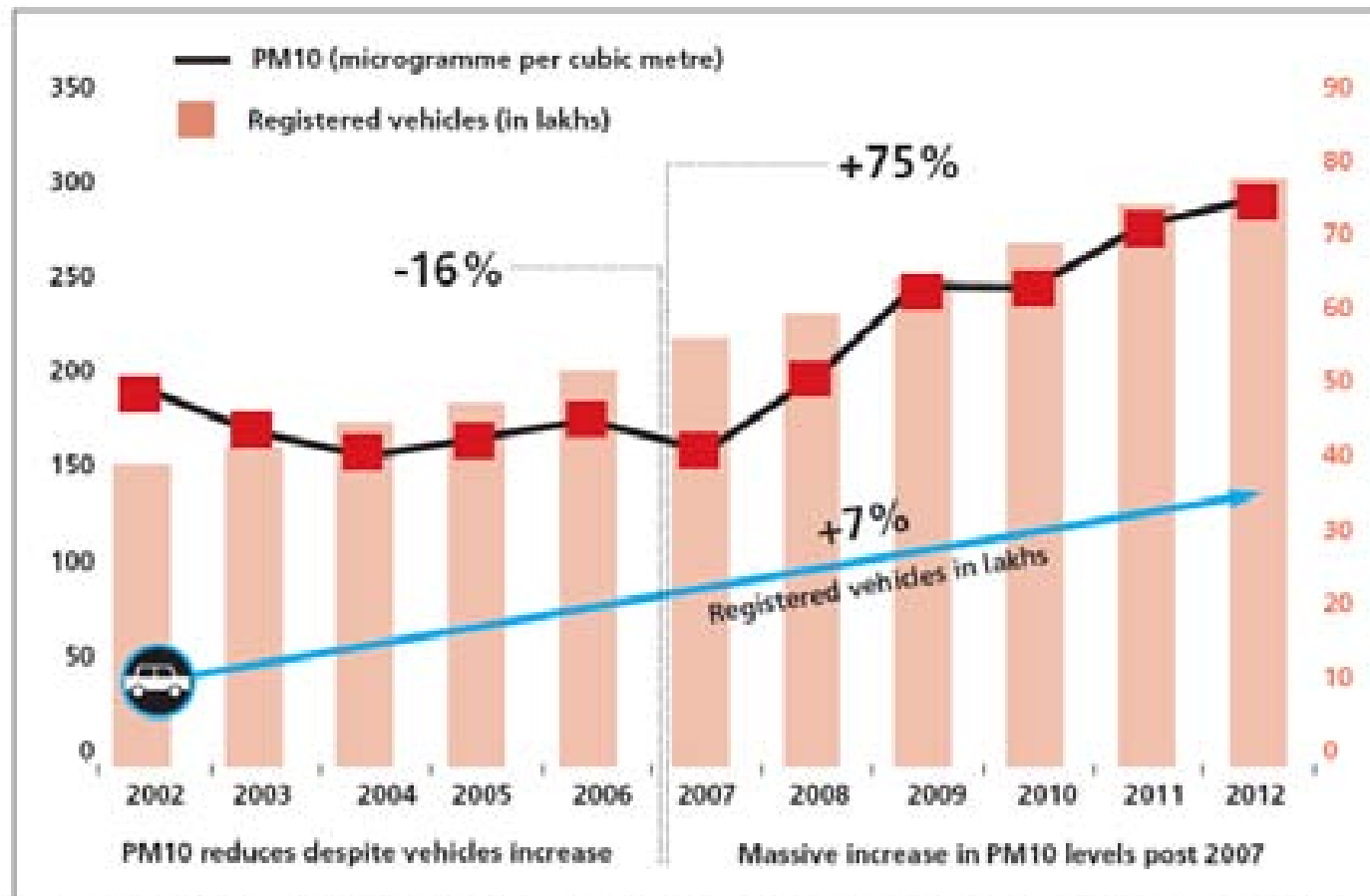
- Emissions standards for generator sets
- Ban on open burning of biomass



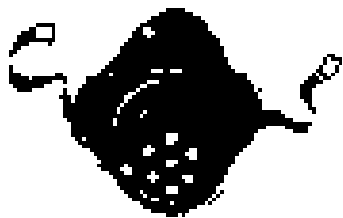
## Delhi losing the pollution battle



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



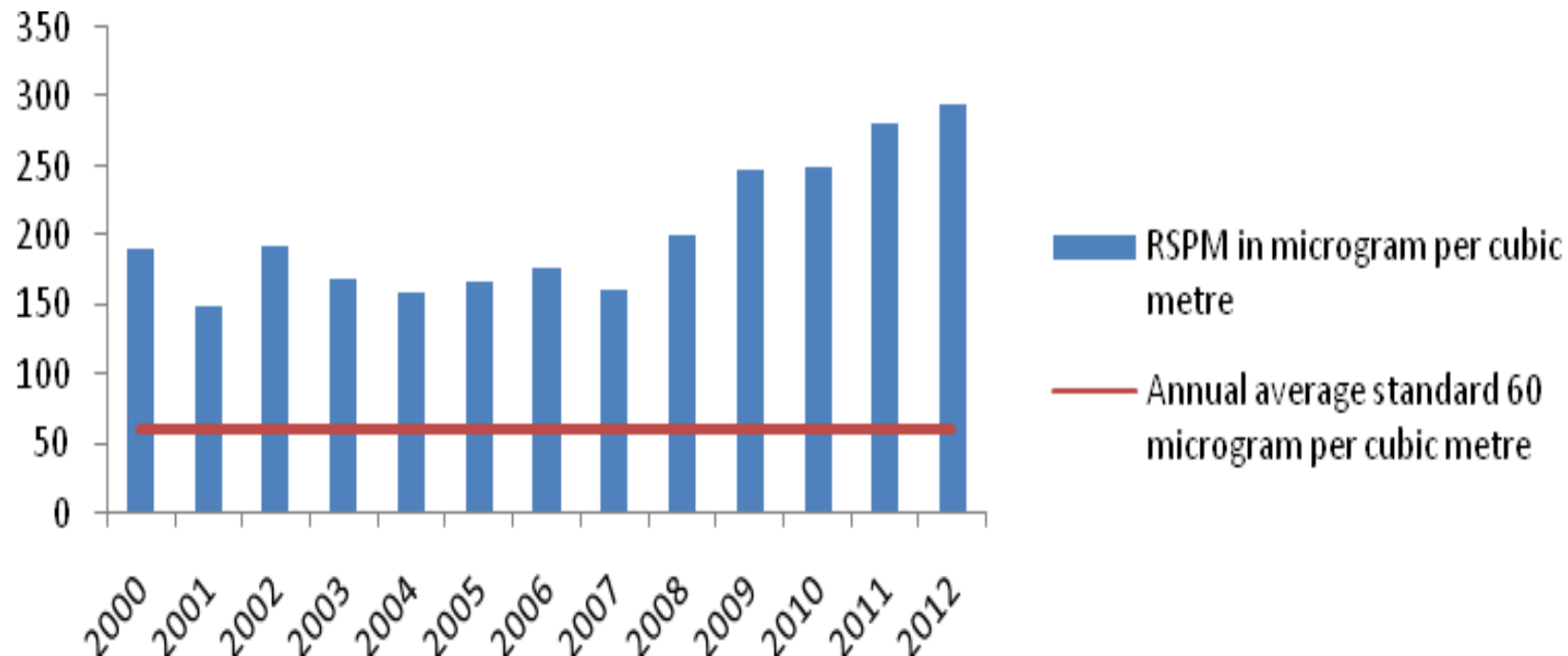
Source: Based on air quality data of Department of Environment, Delhi and motor vehicle registration data in Delhi Statistical Handbooks of different years

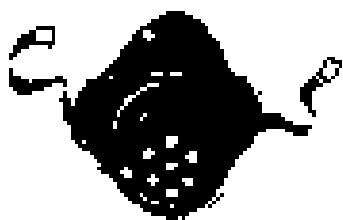


## PM10 trend in Delhi 2000-2012



Rising after initial stabilisation

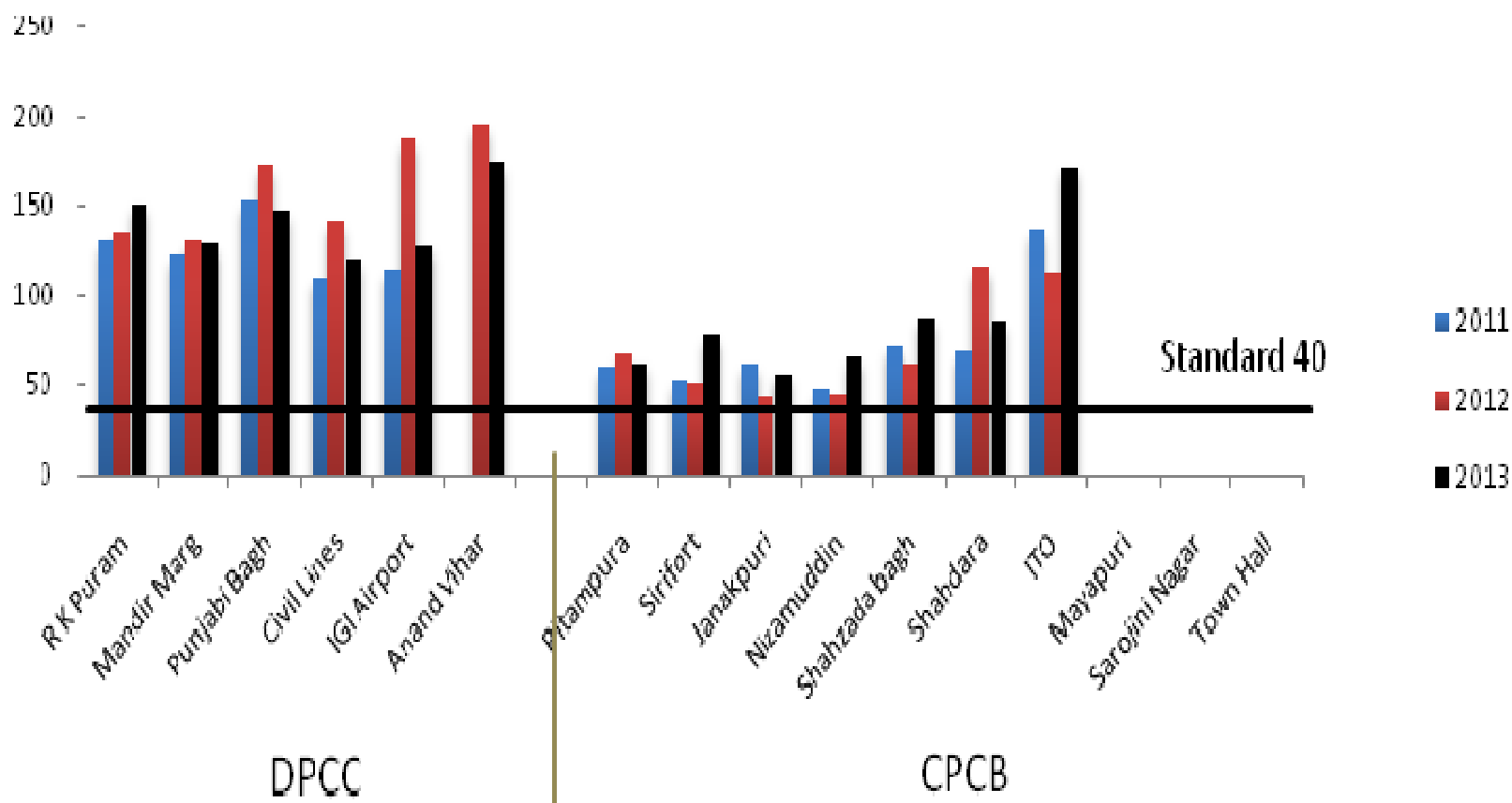


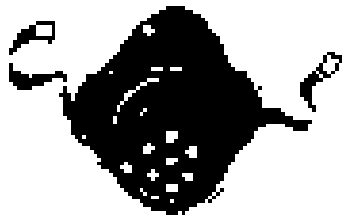


## PM2.5 trend in Delhi

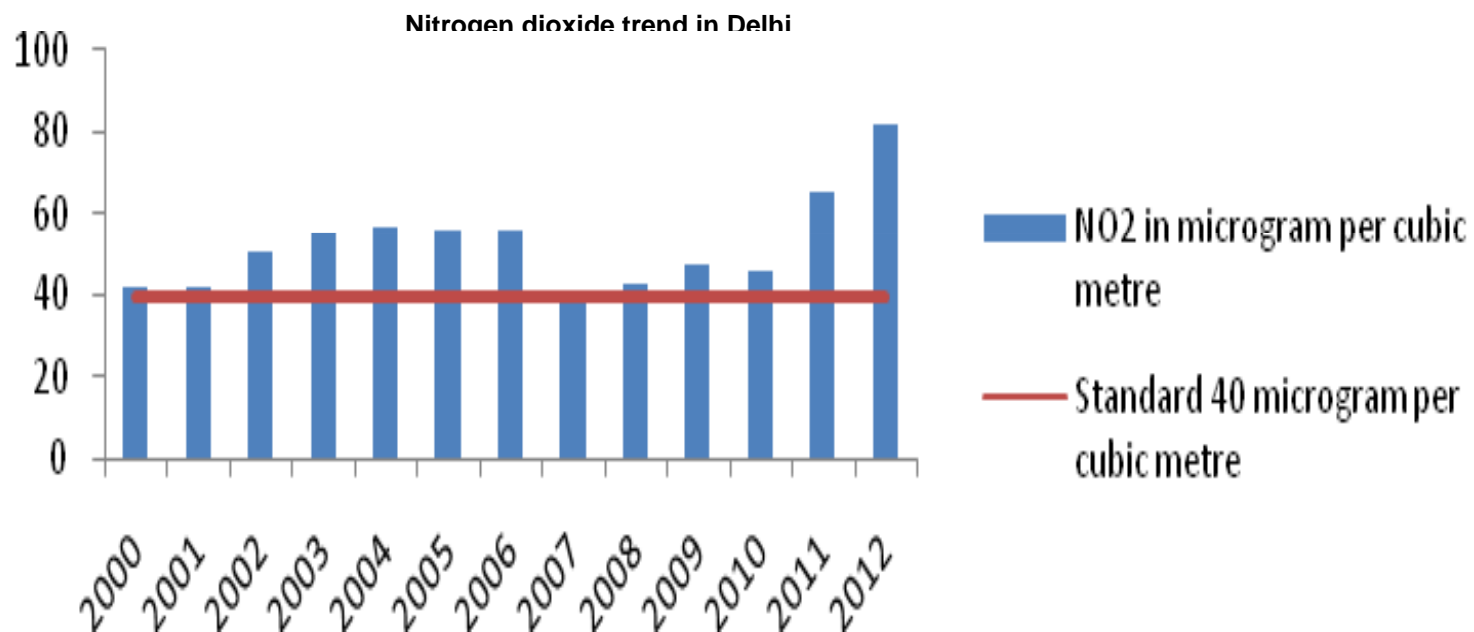


### Tiny particles rising steadily





## Nitrogen oxide: Emerging problem



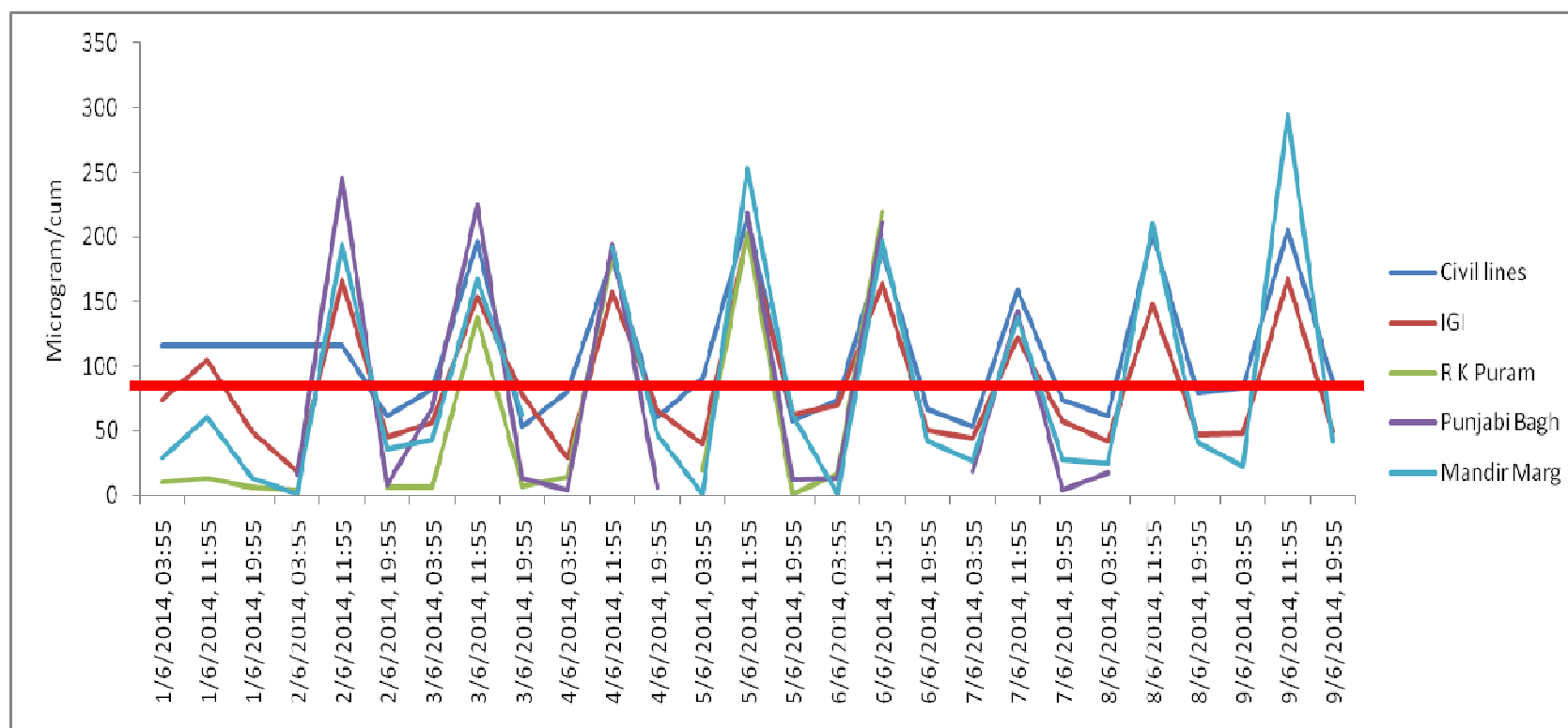
Source: Delhi Dept. of Environment



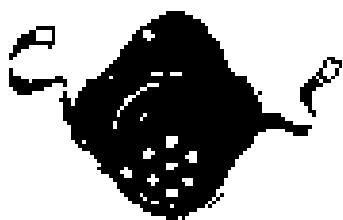
## Ozone: New threat



Ozone levels: Delhi summer of 2014



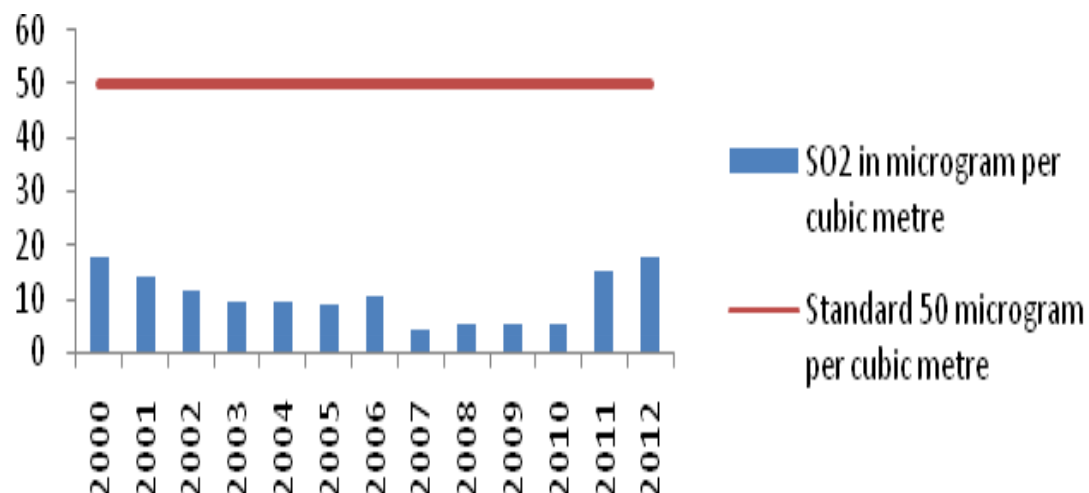




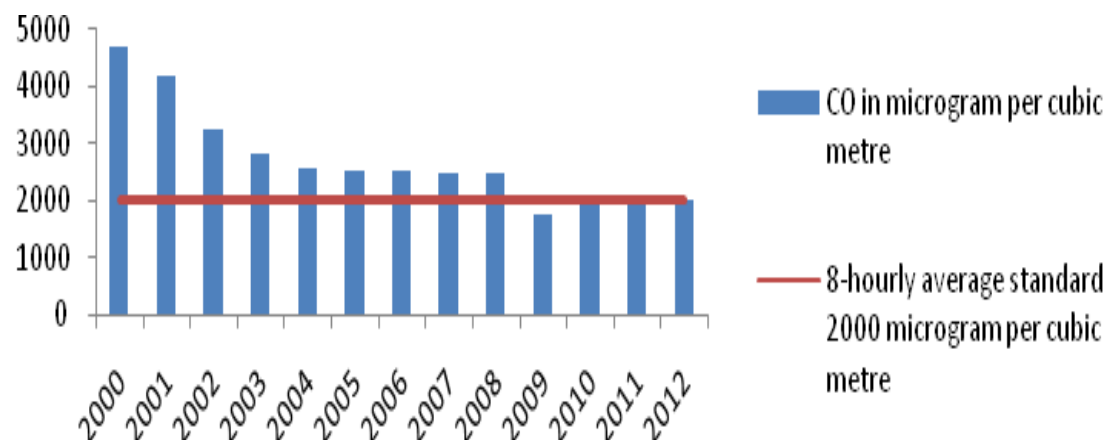
## Delhi has curbed and decoupled SO<sub>2</sub> and CO trend from vehicle growth

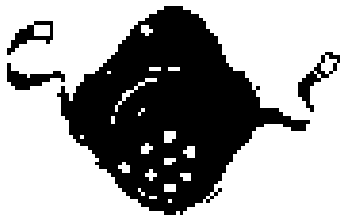


### SO<sub>2</sub> levels in Delhi

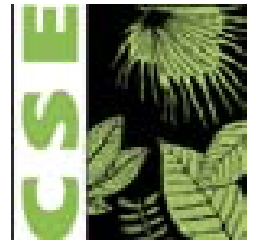


### Carbon monoxide trend in Delhi



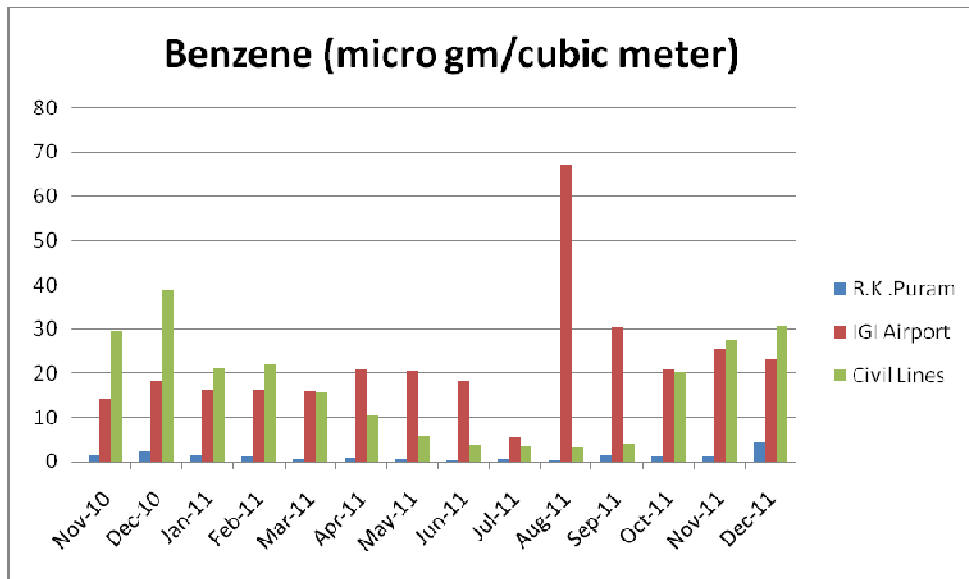


## Toxics: Dangerous at trace level Benzene and PAH: Carcinogens



### High benzene levels in Delhi

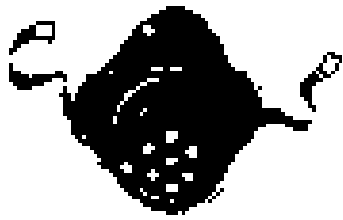
*Levels in IGI and Civil Lines exceed the annual standard by up to 2 to 5 times.*



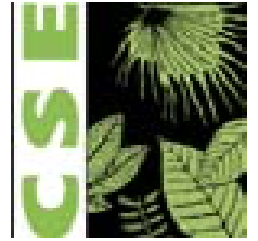
Source: Based on data provided in DPCC's real time database

### Another toxic: PAH trends in Delhi

JNU study (Khilare *et al* 2011):  
PAH level had initially declined in Delhi after first generation action. Levels rising again. Cause attributed to vehicular growth especially diesel vehicles.



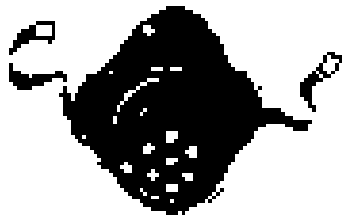
## **Winter pollution is back with vengeance.....**



**CSE has tracked winter pollution this year:**


**Almost throughout the months of November and December 2014, the levels of PM2.5,**

- have remained on an average at least 3-4 times the 24-hourly standard of 60 microgramme per cubic metre,
- higher averages reaching upto 4 to 7 times the standards and
- smog episode peaks hit 8 to 10 times the standards.



The human story....

Our health is at stake...yet  
risk perception is very  
poor.....



**Delhi lung**  
Capital punishment

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.

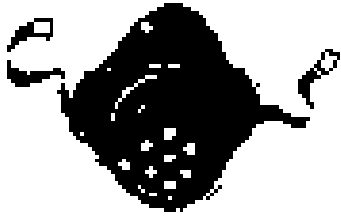
**Scary?** But those cars are so scary!

**cough  
wheeze  
suffocate**

IT'S TIME YOU  
**TAKE A STAND**  
PUT YOUR HEALTH ON THE POLITICAL AGENDA  
[Call 011-2610 1111 • June 5, 2005 • Silver Jubilee, India Habitat Centre, Lodhi Road, New Delhi, 110003]  
People for Clean Air

**CSE** CENTRE FOR SCIENCE AND ENVIRONMENT  
2005 5124, 2005 5110, 2005 5205, 2005 5206

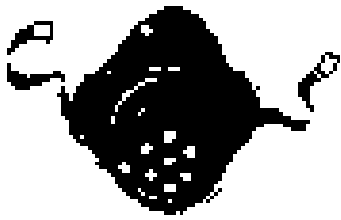
From its early stages, CSE's Right to Clean Air campaign used a variety of communication tools — such as this poster — to put out its message to the public. It built support



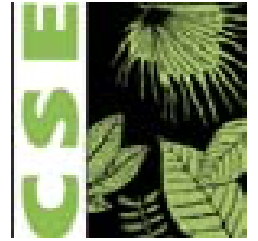
## Health evidences in Delhi.....



- **Studies from All India Institute of Medical Sciences, Vallabhbhai Patel Chest Institute, St Stephens Hospital** and others give the scary evidence.
- **The World Allergy Organisation (WAO)** Journal also published in 2013, reported high respiratory disorder symptoms in students residing in Chandni Chowk (66 per cent) in north Delhi, Mayapuri (59 per cent) in west Delhi and Sarojini Nagar (46 per cent) in south Delhi. Heavy traffic movement has been found to be the factor in the relative difference among the localities. **Allergic problems will increase further as air pollution increases.**
- **2010 study of Health Effect Institute, Boston**, estimates at least 3000 premature deaths annually due to air pollution related diseases.



# Health of children compromised.....

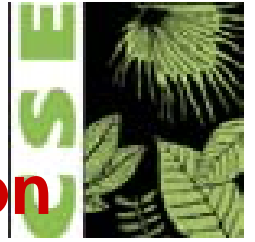


2012 epidemiological study on children in Delhi (CPCB and Chittaranjan National Cancer Institute of Kolkata):

- 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.**

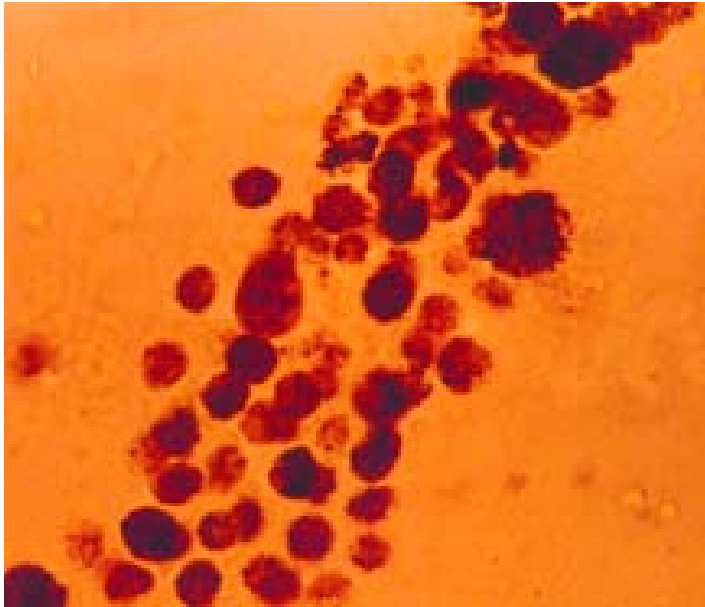






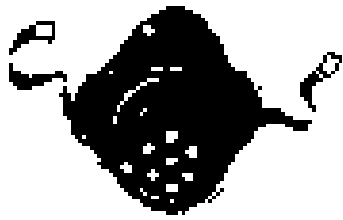
# Alveolar macrophage: the biomarker of air pollution

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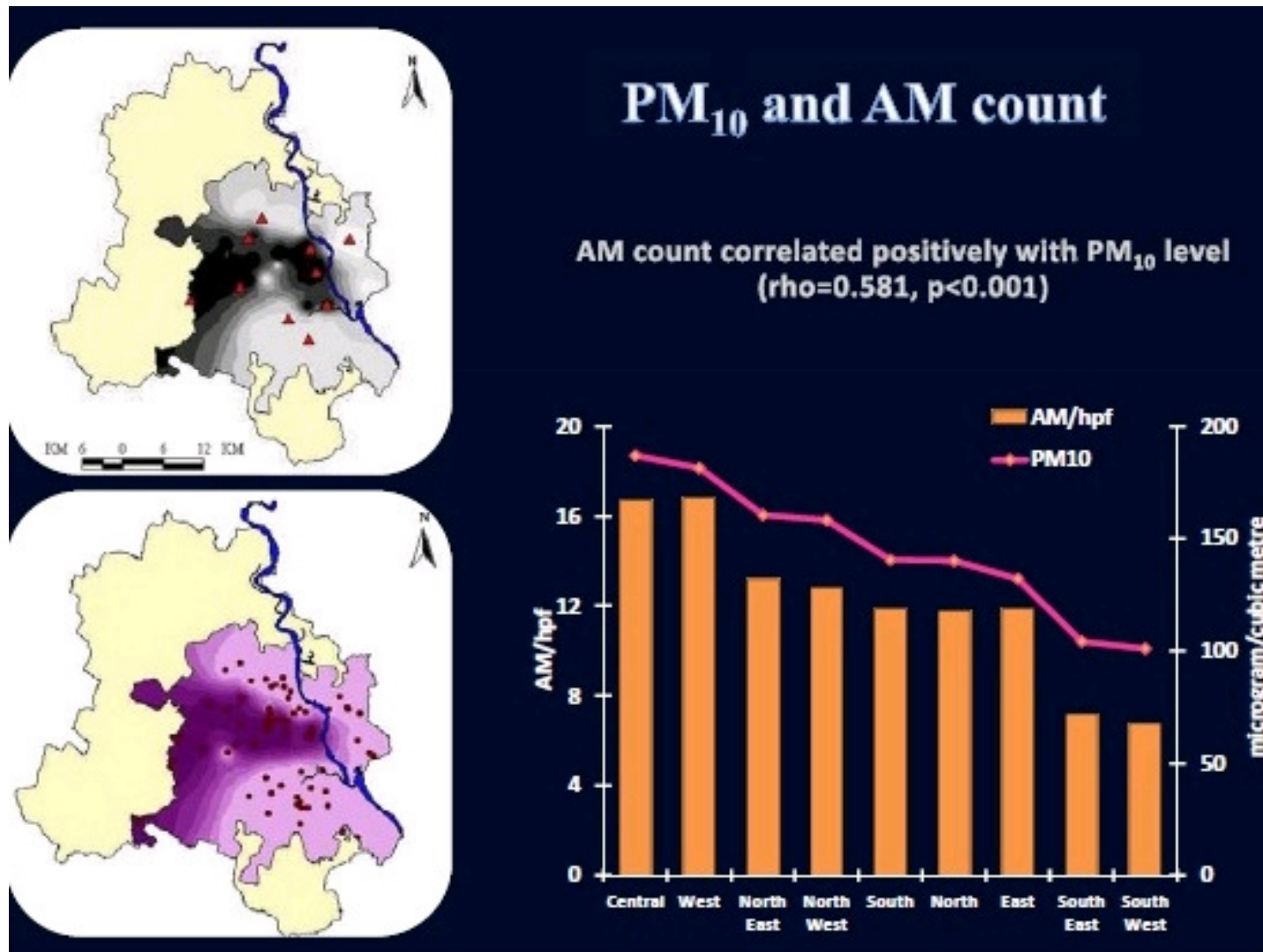
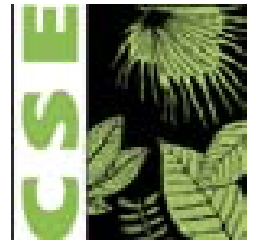


Sputum cytology of a 14-year old girl, showing abundance of particle laden AM

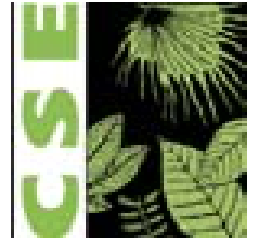
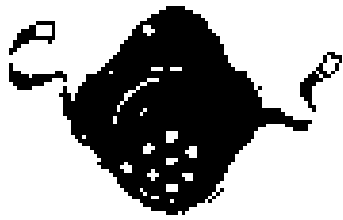




## Co-relating health evidences with air pollution in Delhi

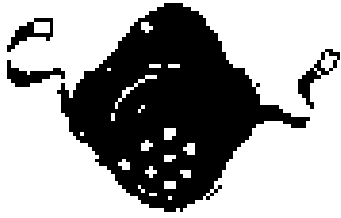






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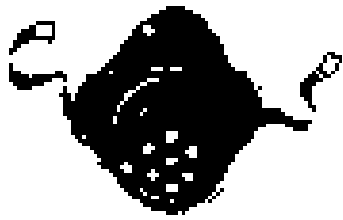
**CSE monitors how much pollution we breathe daily ...**



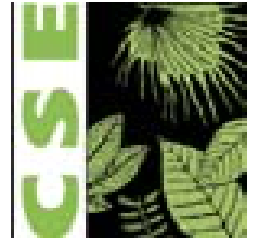
## What has CSE done?



- CSE used a state of the art portable air quality monitoring equipment to track how much pollution an individual is exposed to in Delhi while doing their daily chores. This dust track aerosol monitor measures both mass and size fraction of the particulate matter.
- A select group of prominent citizens of Delhi and also patients suffering from asthma participated in this monitoring exercise.
- One day (24 hours) realtime monitoring for each individual from the select group was carried out on assigned days within the period November 2014 and December 9, 2014.
- Their 24 hours average exposure was compared with the 24 hour standards and short term exposures with background ambient levels monitored by the Delhi Pollution Control Committee at the nearest official monitoring station.



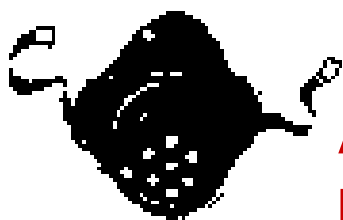
## The '*highly exposed*' group



- **Bhure Lal**, Chairperson, EPCA, resident of Lodi Estate in Lutyen's Delhi
- **Harish Salve**, Senior Advocate in Supreme Court and Amicus Curaei in air pollution case in the Supreme Court; Resident of Vasant Vihar
- **Ashok lal** a noted architect who lives in Civil Lines – a pollution hot spot in Delhi
- **Randeep Guleria**, head of the Pulmonary Department at All India Institute of Medical Science who works and lives in AIIMS;
- **William Bissell** Managing Director of Fab India and resident of Hauz Khas Enclave in South Delhi.

### **Asthma patient:**

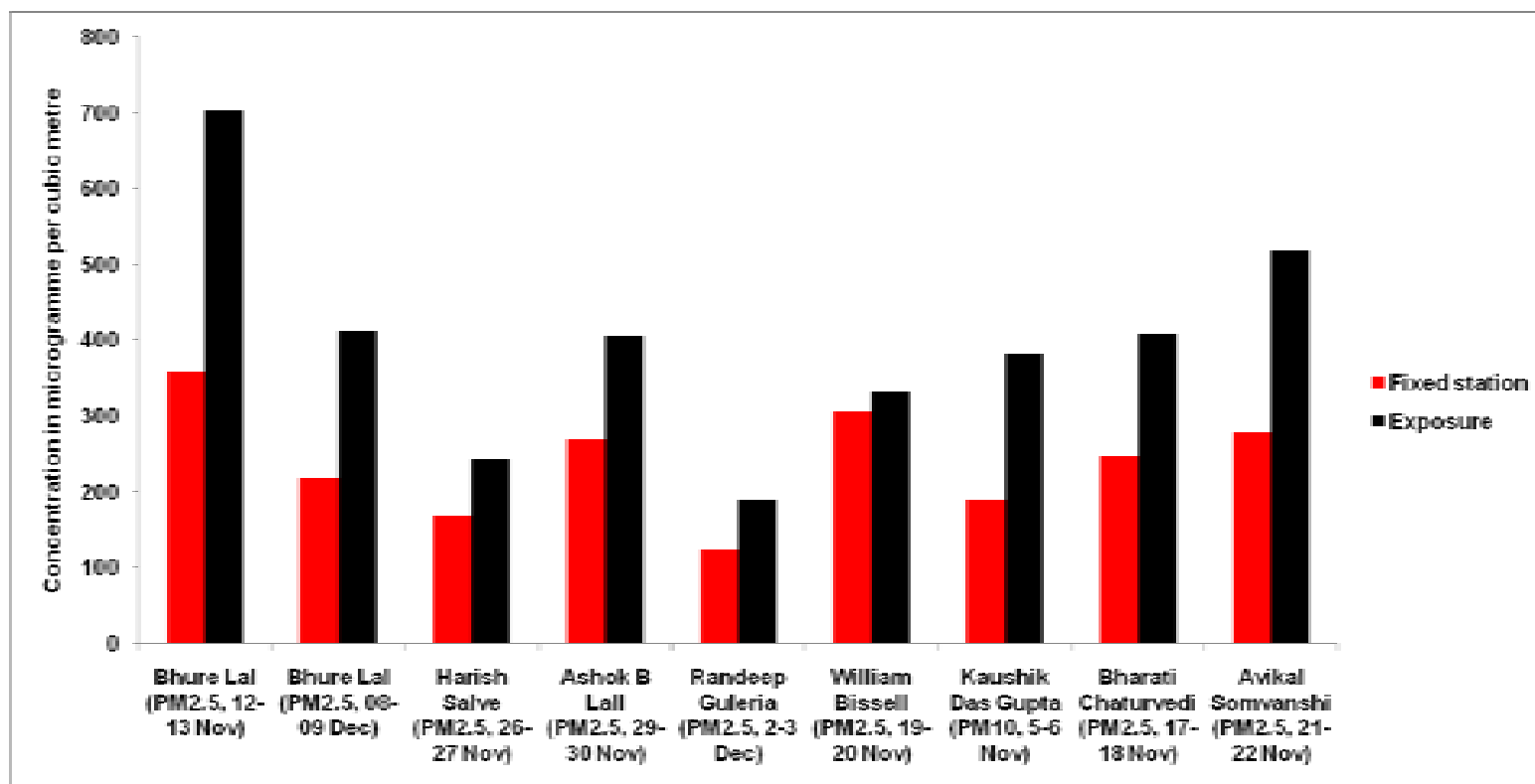
- **Bharati Chaturvedi** Head of Chintan, a prominent NGO, resident of Ravindra Nagar near Khan market
- **Kaushik Das Gupta**, Journalist, resident of Patparganj
- **Avikal Somvanshi**, Research professional, resident of Alaknanda,

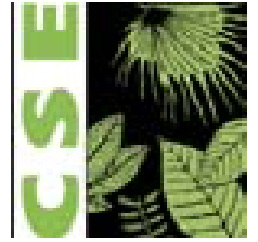
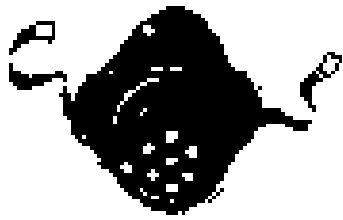


**All of them have breathed several times higher pollution.....**



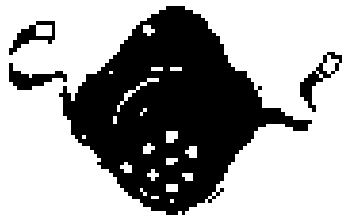
Comparison of 24 hour average personal exposure with 24 hour average ambient levels at the nearest DPCC monitoring station



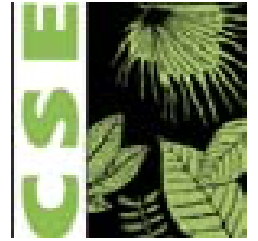


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**Stunning findings.....**

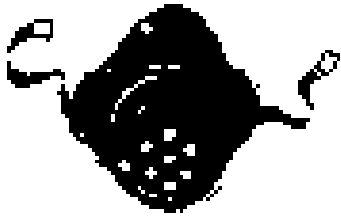


## Highest exposure during night and early morning

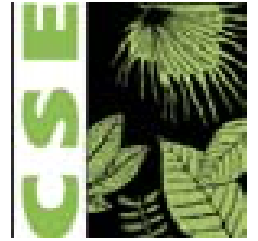


**Cool and calm nights worsen the inversion effect. To that is added high pollution from truck traffic entering Delhi.**

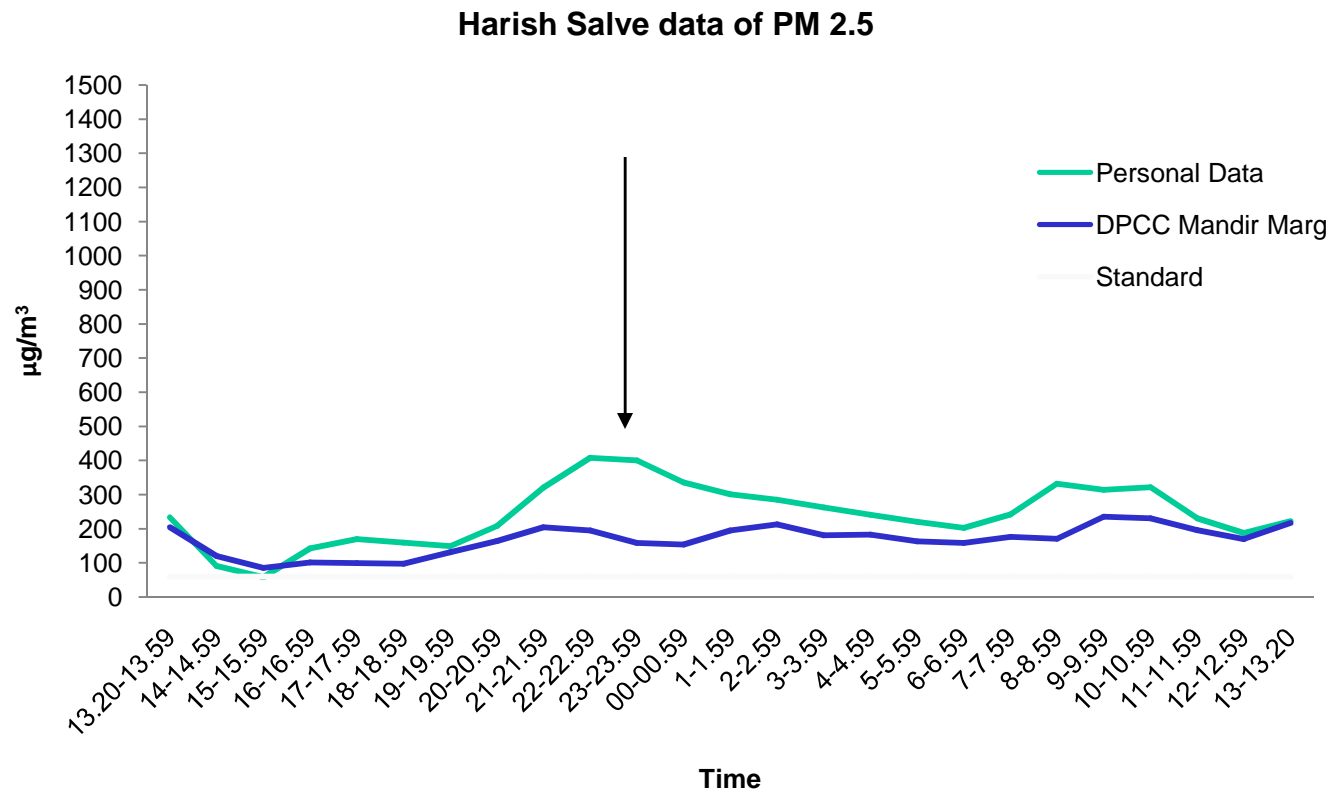
- Harish Salve who lives in Vasant Vihar, close to outer Ring Road, recorded highest exposure between 10-11 pm on November 25-26 when the hourly average of PM<sub>2.5</sub> was about **408 microgramm per cum**.
- Kaushik Das Gupta, an asthma patient: Experienced severe breathing troubles post mid-night inside his house in Patparganj on November 5-6 in East Delhi when **PM<sub>10</sub> levels** had peaked around 1 am to 2 am to **744 microgramme per cum – 3 times higher** than ambient level of 249 microgramme per cum at closest CPCB station

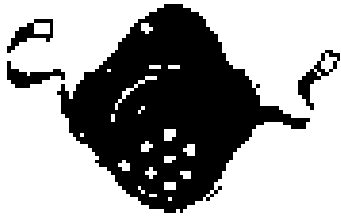


## Harish Salve: Seniour Advocate Supreme Court

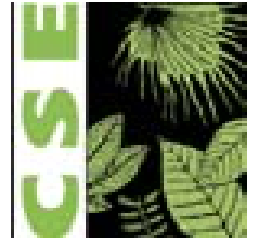


**Date: November 26-27. Maximum exposure level -  $408.25\mu\text{g}/\text{m}^3$  between 22:00 and 22:59 p.m. The 24-hour average exposure to PM<sub>2.5</sub> was 4 times higher than the safe standard and 1.4 times higher than the ambient PM<sub>2.5</sub> level at Mandir Marg.**

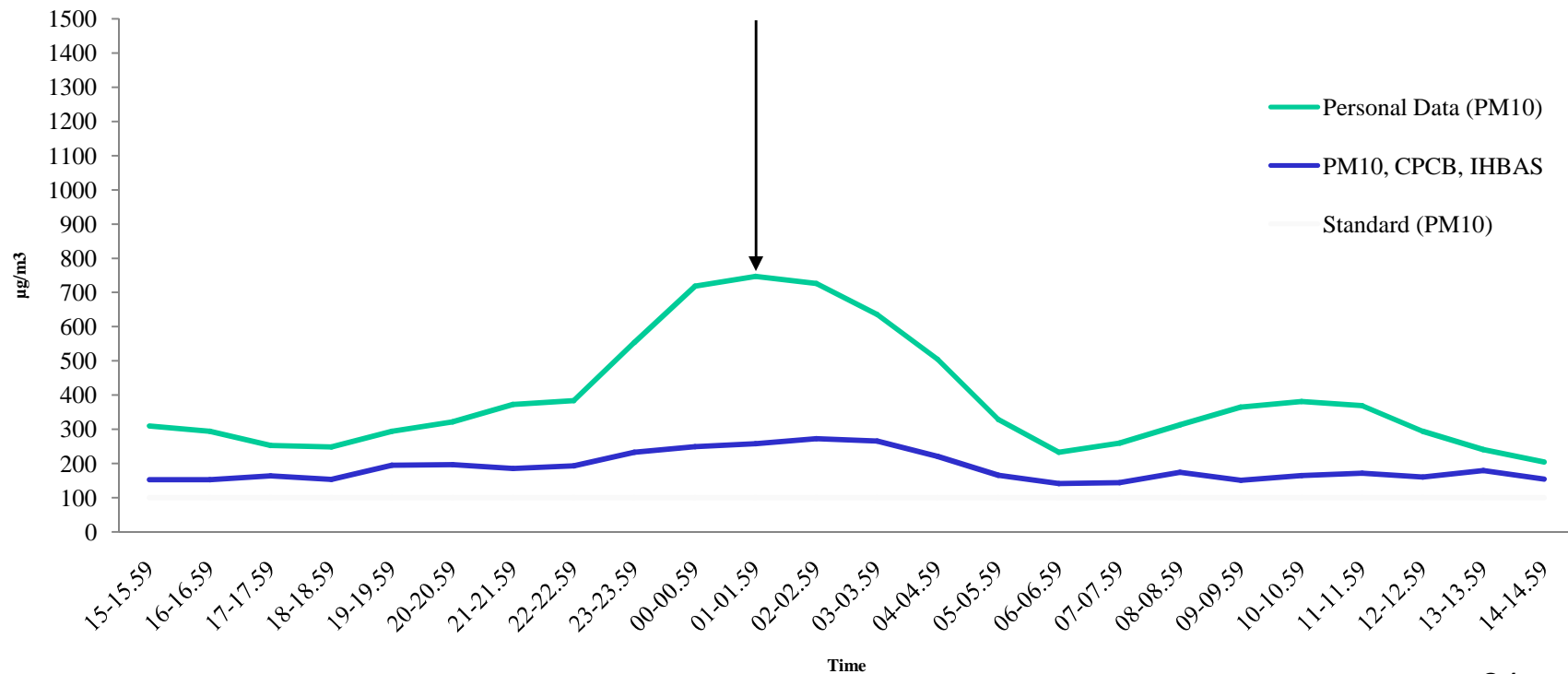




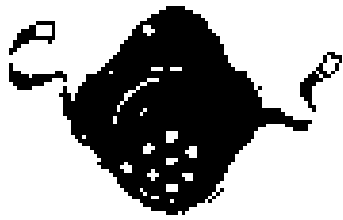
## Kaushik Das Gupta: Journalist and asthma patient



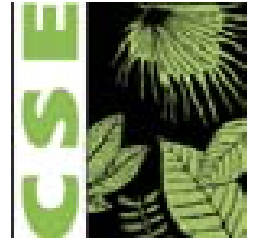
**Date: November 5-6. His peak hourly exposure level for PM<sub>10</sub> was 747 $\mu\text{g}/\text{m}^3$  when he experienced breathing difficulty between 1 and 2 a.m. His 24-hour exposure to PM<sub>10</sub> was two times higher than PM<sub>10</sub> monitored at the closest CPCB IHBAS monitoring station.**







## High pollution levels when everyone goes for morning walks:



**Air is deadly early morning when everyone expects it to be clean**

William Bissell, Managing Director of Fab India and resident of Hauz Khas Enclave went for morning walk at 7.30 am to Jahapanna Park near Greater Kailash Part II on 19-20 November.

Hourly real time average of PM<sub>2.5</sub> between 8am to 9am in that area was 705.68 microgramme per cum. More than 2 times higher than the ambient level at that hour -- 318 microgramme per cum.

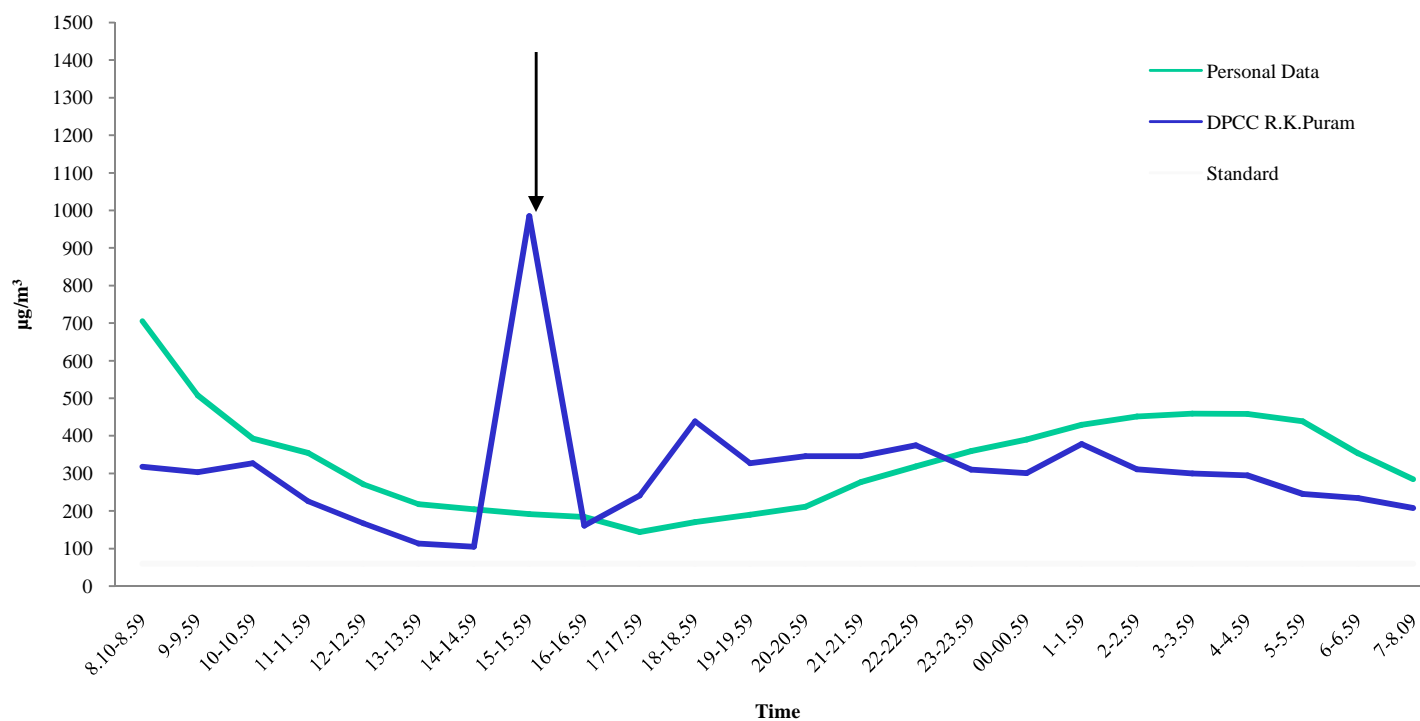
Ashok B Lall, a resident of Civil Lines who goes for walk every morning to the Ridge in North Campus of Delhi University recorded highest hourly average of PM<sub>2.5</sub> between 7 and 8 am at 895 microgramme per cum on November 5-6.

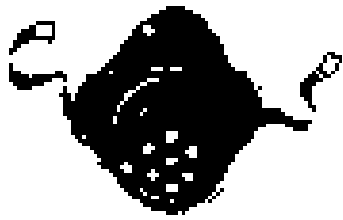


## William Bissell: Managing Director Fab India

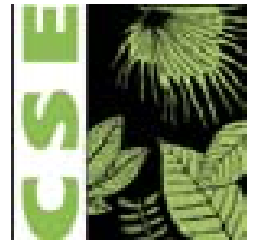


**Date: November 19-20. Peak exposure was  $705.68\mu\text{g}/\text{m}^3$  between 8.10-8.59 a.m. during morning walk at Jahapanah Forest (GK II). His 24-hour average exposure to PM2.5 was 5.5 times higher than the safe standard and almost same as measured in ambient air at RK Puram.**

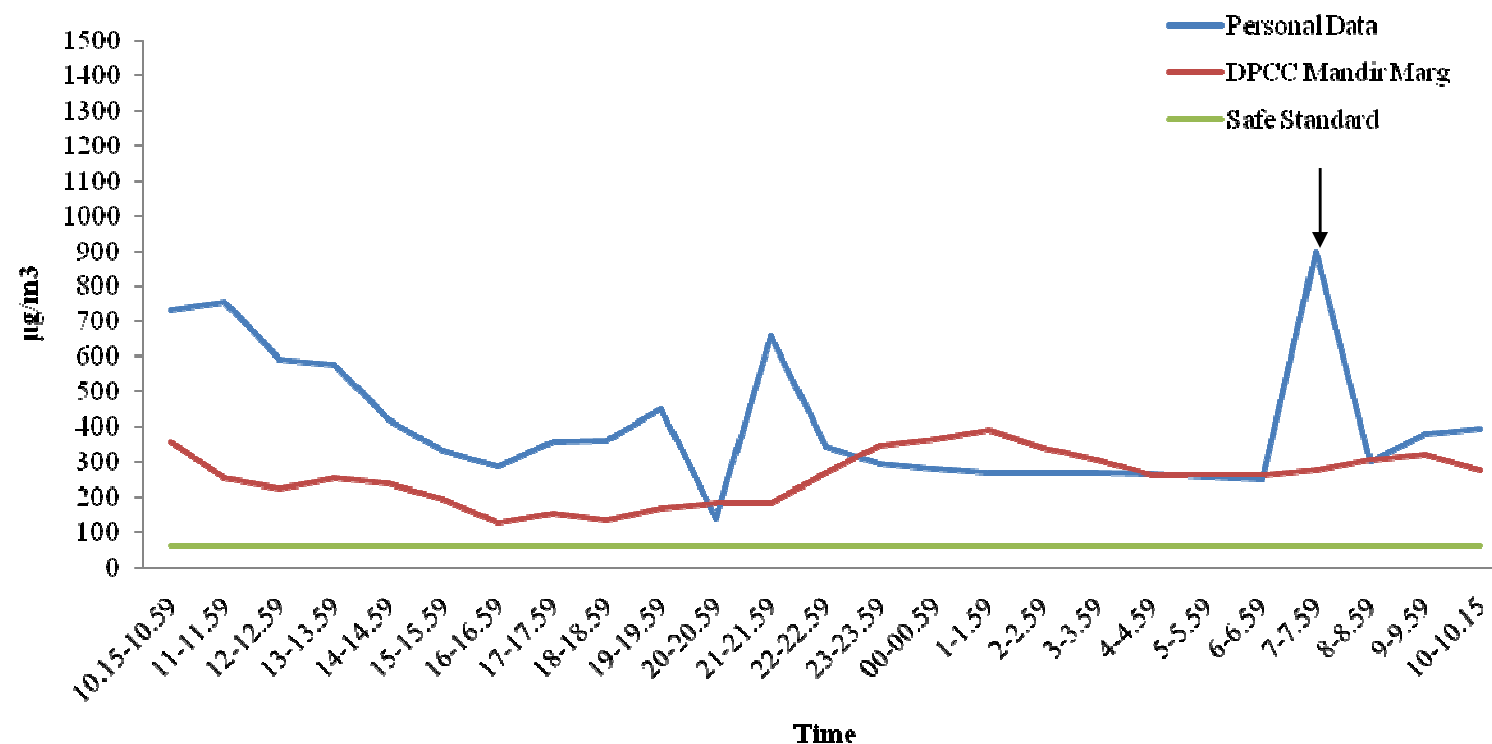


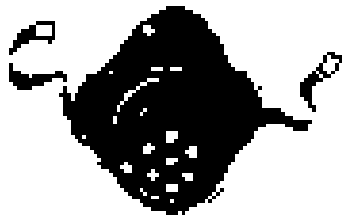


## Ashok Lall- Architect

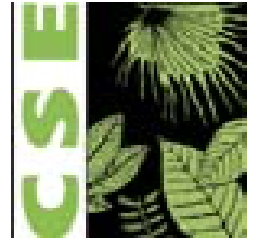


Date: November 29-30: Maximum hourly exposure level was  $895\mu\text{g}/\text{m}^3$  between 7 and 7.59 a.m. at the Ridge, North Campus while he was on his routine morning walk. His 24-hour average of PM<sub>2.5</sub> exposure was 6.5 times higher than the safe standard.





## Even Lutyen's Delhi, expected to be cleanest and greenest in Delhi has high exposure levels



**Bhure Lal, resident of Lodi Estate:**

**Day 1: November 12-13.**

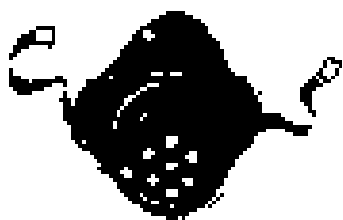
The hourly average PM2.5 level was highest between 5.50 am and 6.50 am at **1195.83 microgramme per cum** when he had gone for walk in Lodhi Garden. That was 2.7 times higher than the background ambient level

**Day 2: Monitoring was repeated on December 8-9:**

Showed comparatively lower levels. But still very high.

During **5am to 6am** and **6am to 7 am** the hourly average PM2.5 levels were **672 microgramme per cum** and **762 microgramme per cum** respectively – **more than two times higher** than the background ambient levels

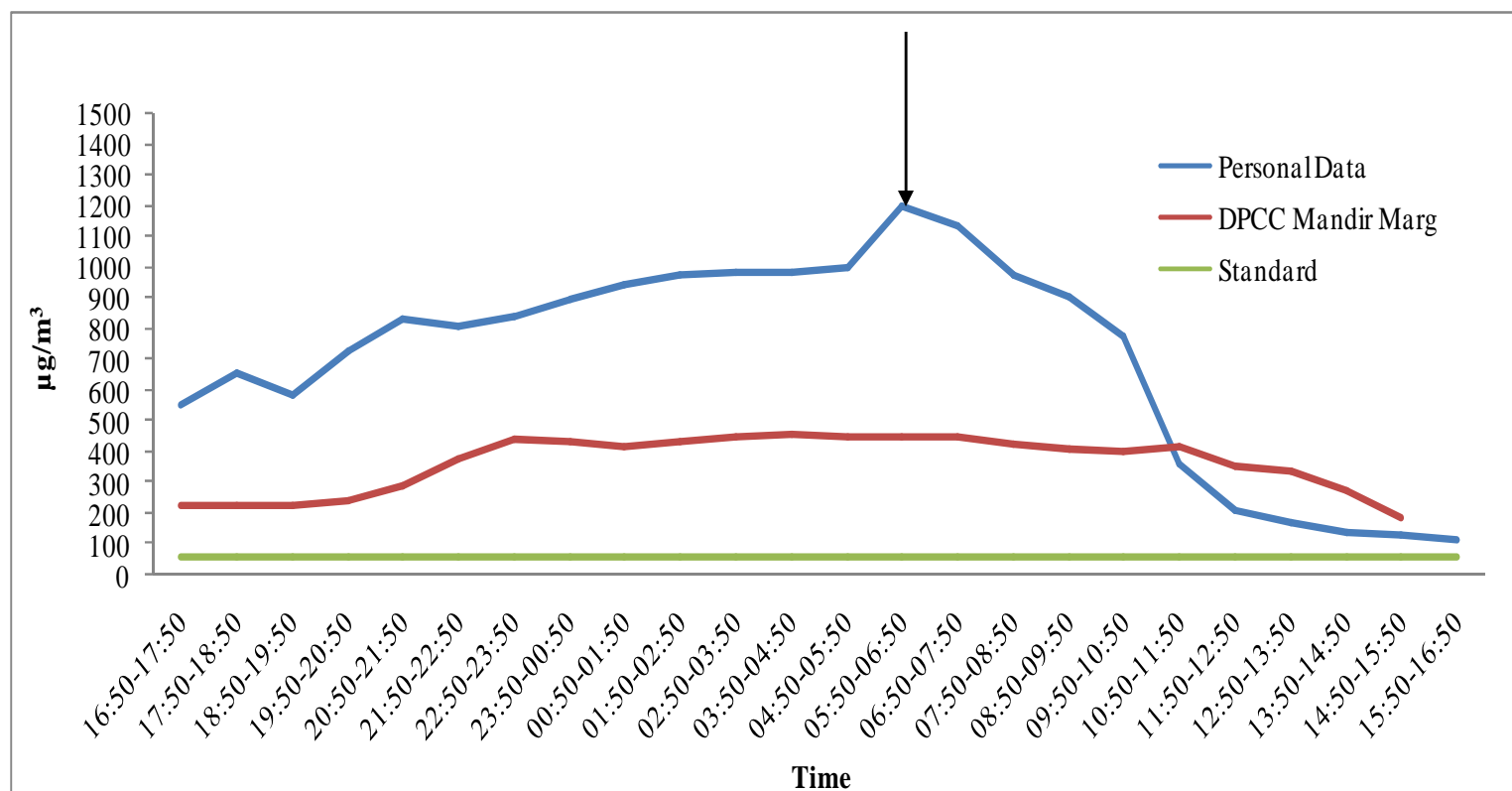
**This is the place where rich and the powerful of Delhi come for walk.**

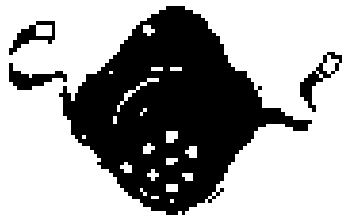


## Bhure Lal: EPCA Chairperson

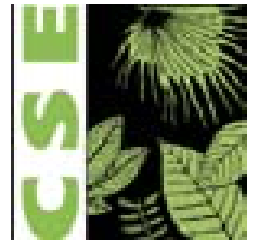


Date: Dai 1: November 12-13. His peak hourly exposure level was  $1196\mu\text{g}/\text{m}^3$  between 5.50-6.50 when he goes for his morning walk to Lodhi Garden. His 24-hour average exposure to PM<sub>2.5</sub> was almost 12 times higher than the safe standard and almost two times higher than PM<sub>2.5</sub> measured at Mandir Marg

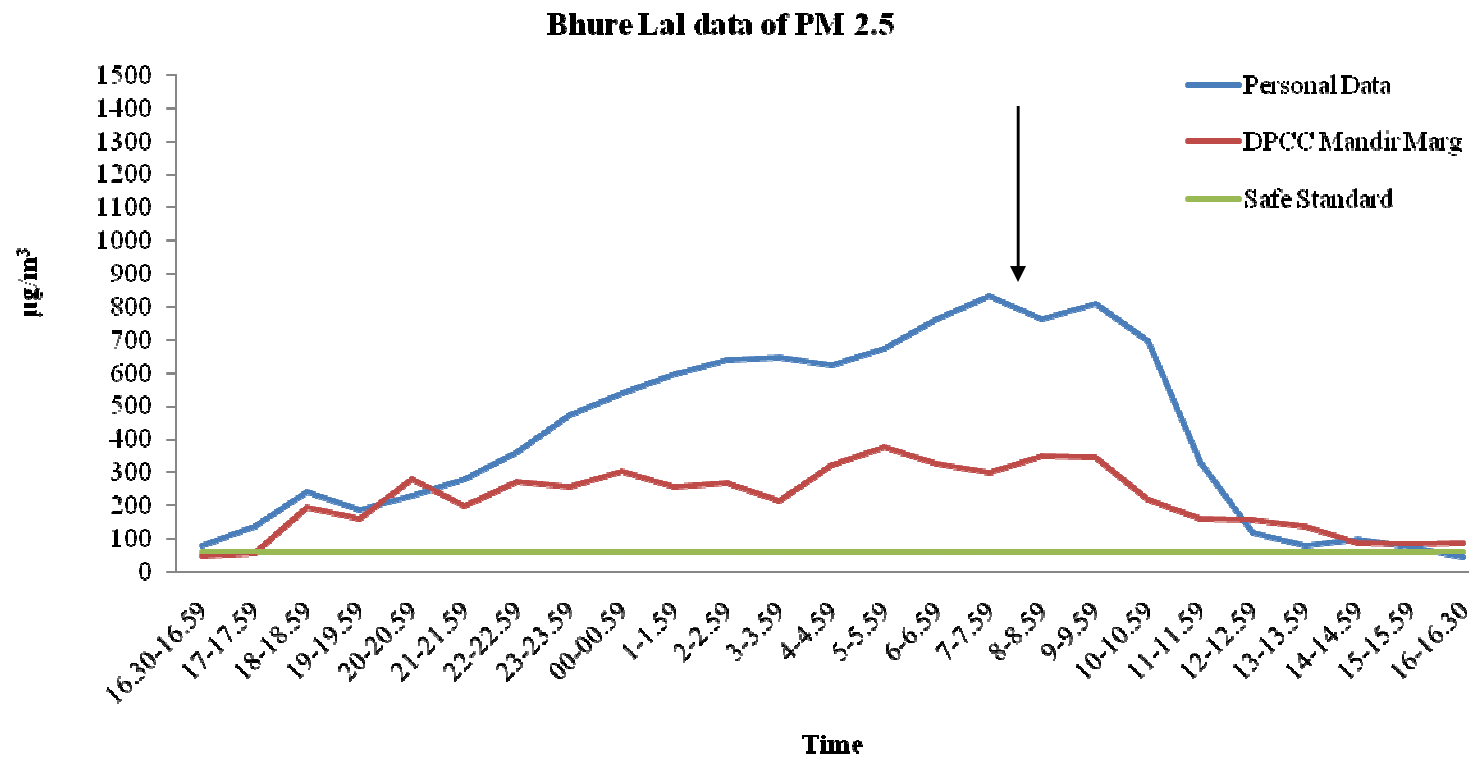


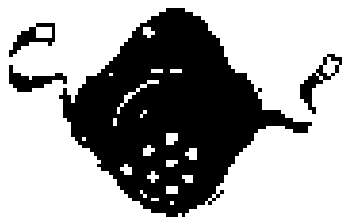


## Bhure Lal: EPCA Chairperson



Day 2: Date: December 8-9. Peak hourly exposure level was  $832\mu\text{g}/\text{m}^3$  between 7.00-7.59 a.m. His 24-hour average to PM<sub>2.5</sub> was almost 7 times higher than the safe standard and about four times higher than the PM<sub>2.5</sub> measured at Mandir Marg station





**Better days: Smog lifts up too..**



Warmer days with good wind speed can have lower levels than smoggy days.

On December 2 Dr Randeep Guleria of AIIMS was monitored for 24 hours. He spent his time in the hospital and also traveled to North Campus. But his overall exposure and 24 hour average was much less than other participants in the programme.

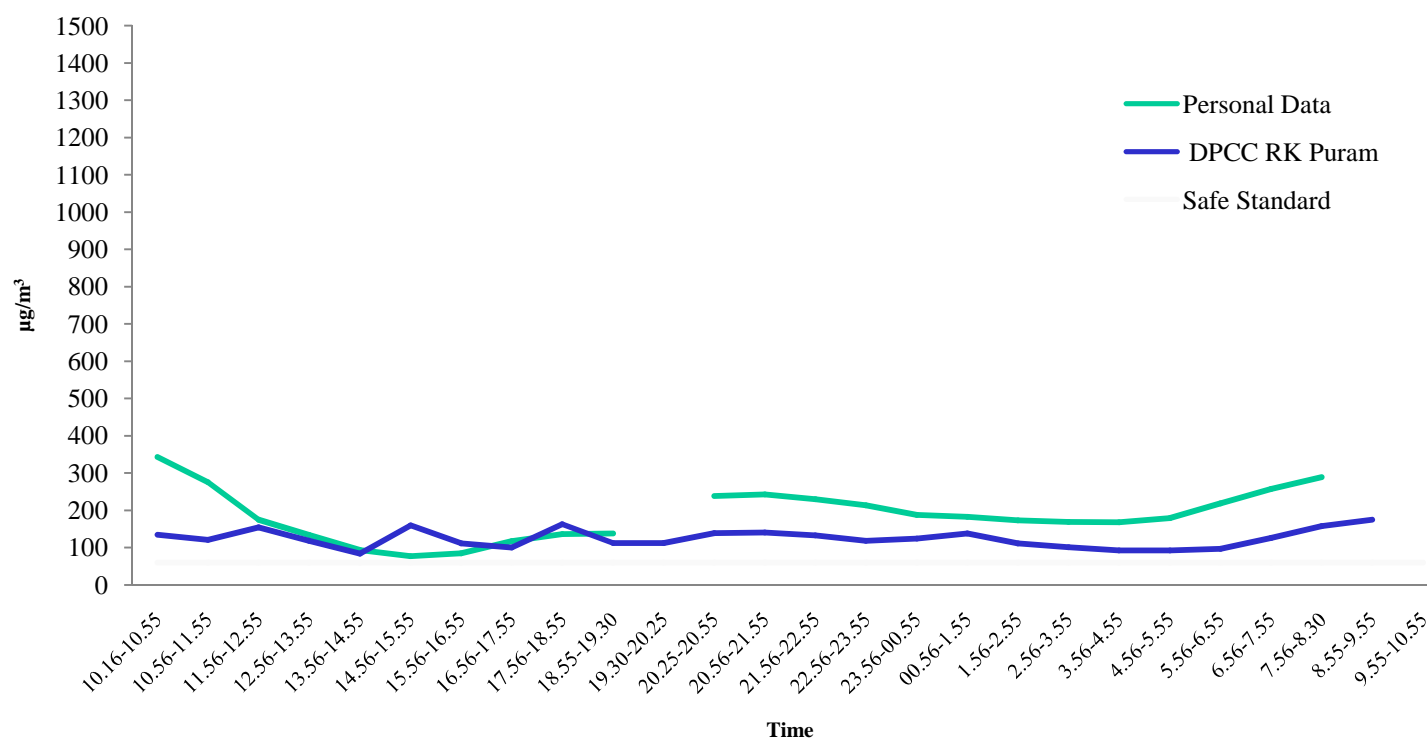
The 24 hour average recorded by him was **188 microgramme per cum**. That day the nearest monitoring station at RK Puram also recorded lower levels of 24 hour average – 124 microgramme per cum.



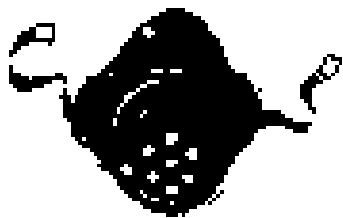
## Randeep Guleria: Head of Pulmonary Medicine at AIIMS



Date: December 2–3. His maximum hourly exposure was  $343 \mu\text{g}/\text{m}^3$  between 10:16 and 10:55 a.m. His daily average exposure to  $\text{PM}_{2.5}$  was  $188 \mu\text{g}/\text{m}^3$  which is 3 times higher than the safe standard and 1.5 times higher than the  $\text{PM}_{2.5}$  measured in ambient air at RK Puram. However, this was lower than the recorded data for other people as this was a warmer and sunny day with good wind speed





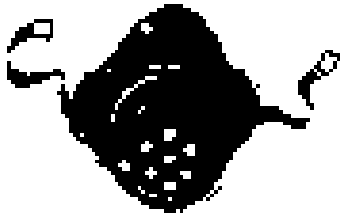


## Asthma patient at high risk



Bharati Chaturvedi, resident of Ravindra Nagar near Khan market and also an asthma patient:

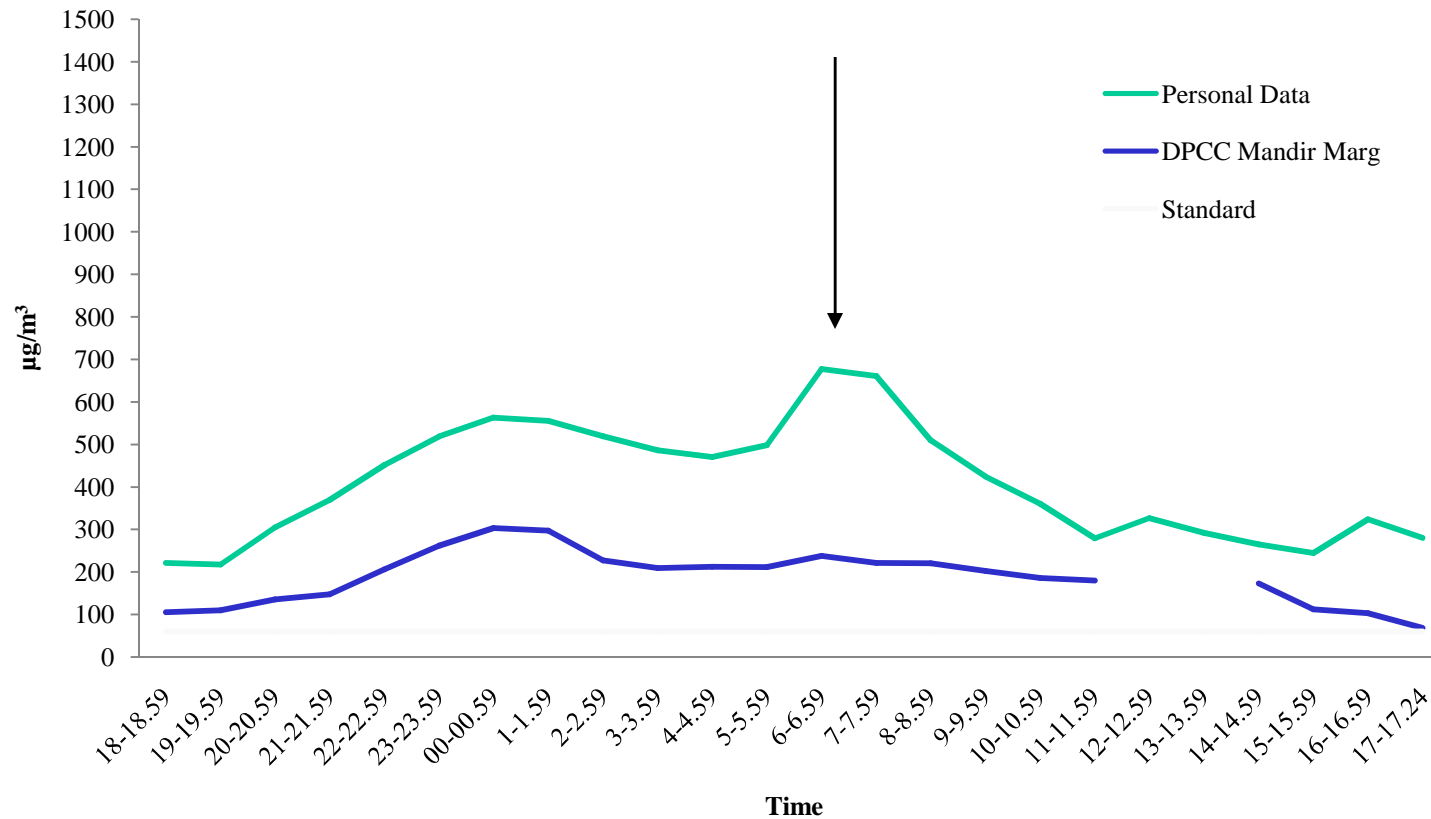
- Highest hourly average PM2.5 exposure levels during morning walk between 6am and 7 am
- The hourly average ranged between 677.65 (6am to 7am) and 660.9 microgramme per cum (7am-8am). – Three times higher than the background ambient level...

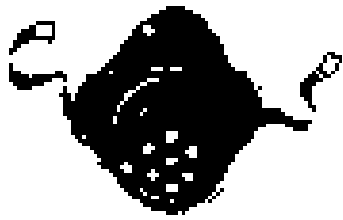


## Bharati Chaturvedi: Head of Chintan and asthma patient

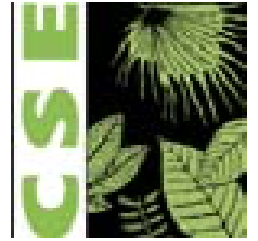


Date: November 17-18. Her maximum hourly exposure was  $678\mu\text{g}/\text{m}^3$  during her morning walk around Rabindra Nagar between 6 and 6.59 a.m.





## Walkers, cyclists and athletes: Highly vulnerable

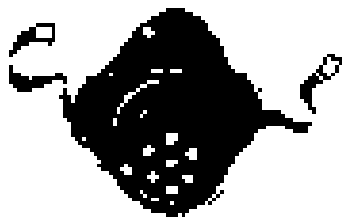


**Asthma patient Avikal Somvanshi** followed the pollution trail on November 20-23.

**High pollution exposure during Delhi Half Marathon in India Gate:** At 7 -8 am at the levels were as high as **815 microgramme per cum** -- **2.4 times higher** than the background ambient level. Very high level near President's estate (Mother Teresa Crescent Road) –hourly average of **1029 between 8-9 am** -- 3.4 times higher than the ambient levels Massive traffic jam due to traffic diversion.

**Rahagiri - morning hours in Connaught Place:** The hourly average level between 9-10 am in that smoggy morning was **1050 microgramme per cum**. -- **close to 3 times higher** than the ambient levels. While traffic was closed in inner circle there was traffic on the outer circle of Connaught Place.

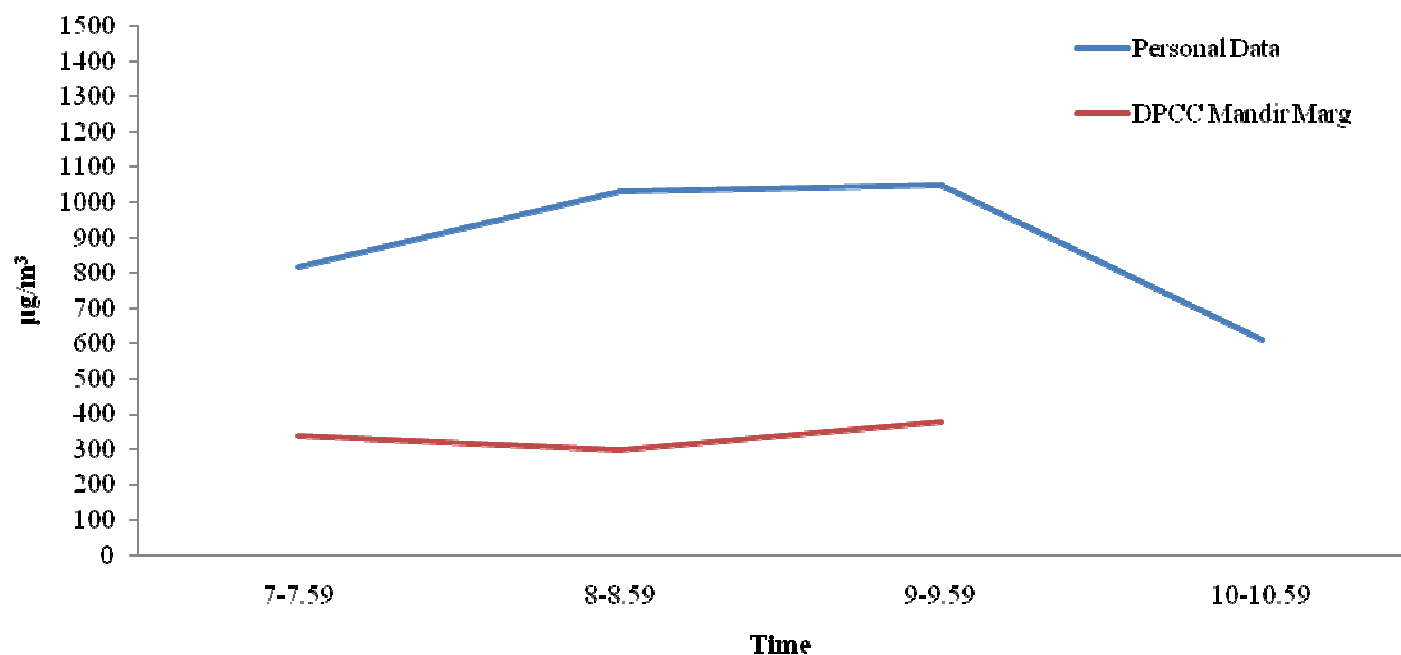
**Monitoring was repeated** in late afternoon when it was warmer with improved wind speed, levels had reduced to **200 microgramme per cum**.

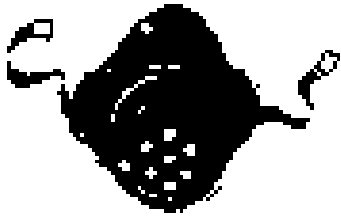


## At Delhi Half Marathon and Rahagiri

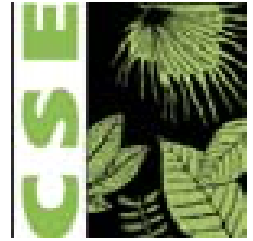


Date: November 23: Delhi half marathon and Rahgiri Day between 7:00 a.m. and 11:00a.m. on his bicycle. His maximum exposure level was  $1050\mu\text{g}/\text{m}^3$  between 9 and 9:59 a.m. which is substantially higher than that of the ambient level. This dropped to  $200\mu\text{g}/\text{m}^3$  in the afternoon in Connaught Place

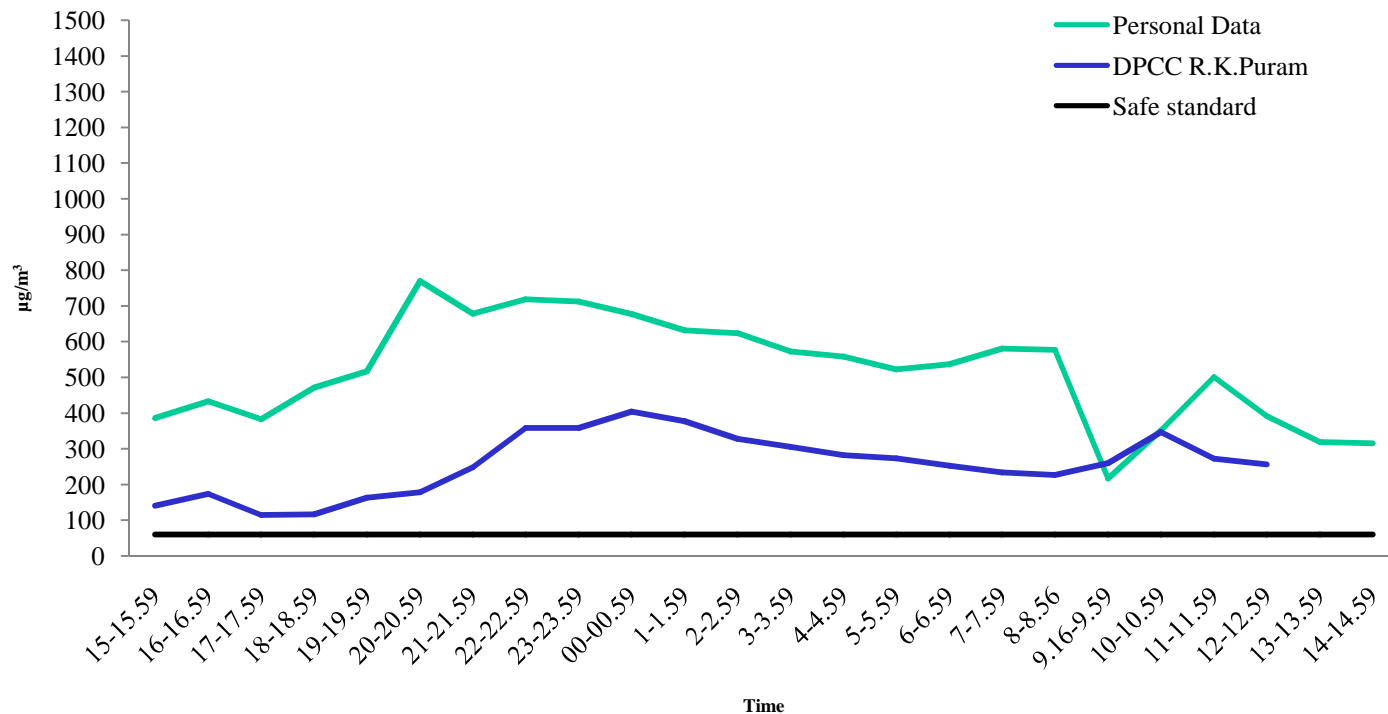


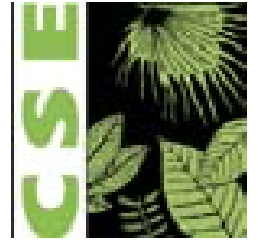
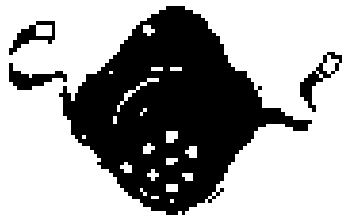


## Avikal Somvanshi Research Professional tracks Rahagiri and Delhi Marathon



Date: 21- 22. Asthma patient and cycled his way through Alaknanda to Connaught Place via AIIMS and India Gate. His maximum exposure level was  $769\mu\text{g}/\text{m}^3$  between 20:00 and 20:59 p.m. His 24-hour average exposure to PM<sub>2.5</sub> was about 9 times higher than the safe standard and about 2 times higher than the PM<sub>2.5</sub> measured in ambient air at RK Puram.

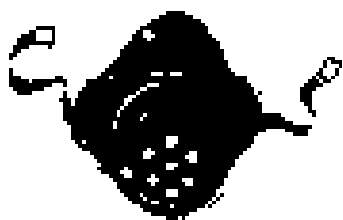




**Delhi has already exhausted all soft options.  
Action in Delhi needs to gather momentum.**

**CSE presents priority action plan:**

- Pollution emergency action for smog episodes,
- Short and medium term measures for more lasting and durable change to meet clean air standards in a time bound manner.



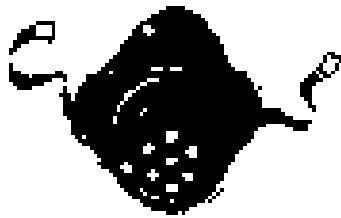
# Agenda 1: Implement air quality index, health advisory and pollution emergency measures



## National Air Quality Index and Health advisory

Proposed Breakpoints for AQI Scale 0-500 (units:  $\mu\text{g}/\text{m}^3$  unless mentioned otherwise)

AQI Category (Range)	PM <sub>10</sub> 24-hr	PM <sub>2.5</sub> 24-hr	NO <sub>2</sub> 24-hr	O <sub>3</sub> 8-hr	CO 8-hr (mg/m <sup>3</sup> )	SO <sub>2</sub> 24-hr	NH <sub>3</sub> 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+



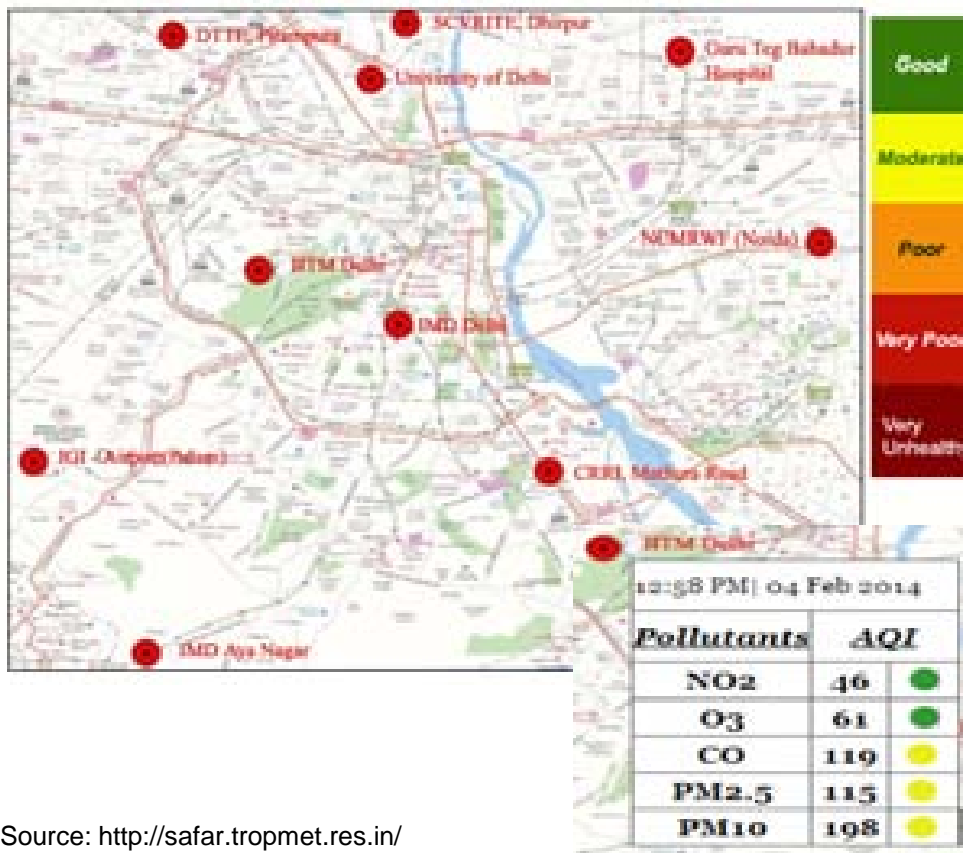
**Close to 20 monitoring stations in Delhi.  
But online realtime data available only for 6  
DPCC stations.....**



#### Online Visualization

[AQI Current](#) Daily AQI attributes are shown below in terms of [Tomorrow's Forecast](#)

#### Air quality Now



**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.**

#### [Air Quality Forecast](#)

#### [Current Weather](#)

PM: 24-Hr Avg.; O3: 8-Hr Avg.

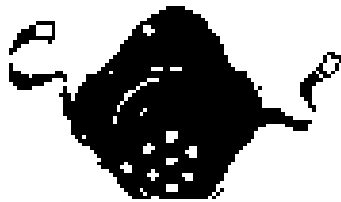
#### Delhi Air Quality - 1 - 3 days advance forecast

Pollutants	Delhi Today	Attribute	Tomorrow's Forecast	Attribute	After 3 days Forecast	Attribute
PM <sub>10</sub> (µgm <sup>-3</sup> )	305	Poor	324	Poor	336	Poor
PM <sub>2.5</sub> (µgm <sup>-3</sup> )	117	Poor	126	Poor	132	Poor
O <sub>3</sub> (ppb)	28	Good	31	Good	34	Good

Gaseous Pollution: Good

Particulate Pollution: Poor





## Real time air quality data reporting in Delhi: DPCC and CPCB



— Air Quality / Public Advisory



Day Tuesday Date February 04, 2014 Time 5:11 PM

**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.**

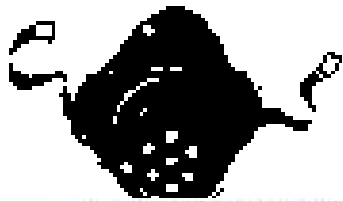
### Stations

#### CPCB

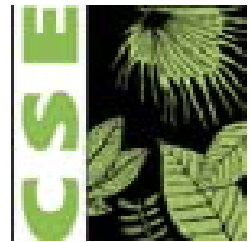
- Income Tax Office
- Delhi College Of Engineering
- Shadipur
- NSIT Dwarka
- IHBAS

#### DPCC

- IGI Airport
- Civil Lines
- Anand Vihar
- R K Puram
- Mandir Marg
- Punjabi Bagh



# Delhi Pollution Control Committee: best reporting so far...

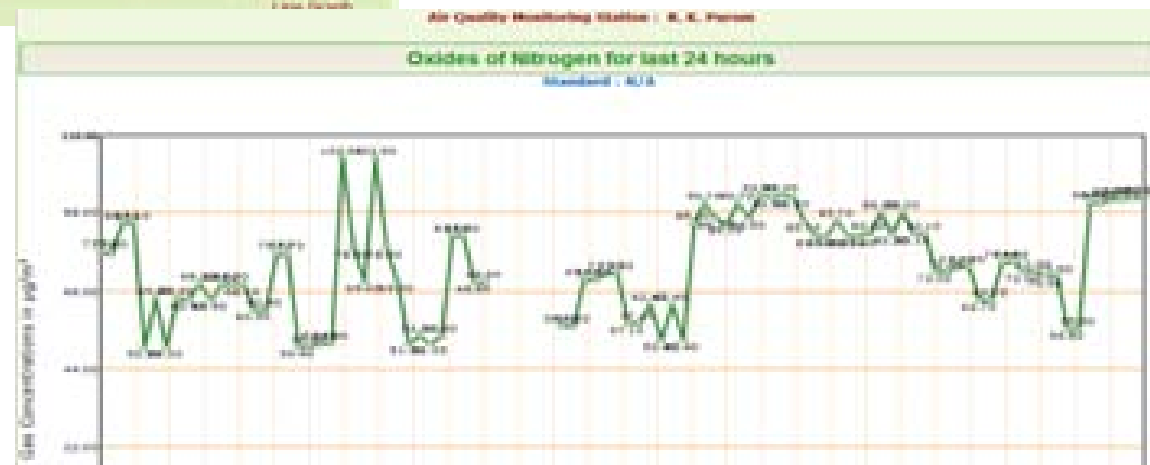


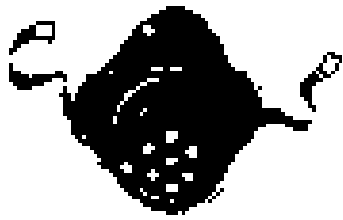
REAL TIME AMBIENT AIR QUALITY DATA						
Anand Vihar    Mandir Marg    Punjabi Bagh    R.K. Puram    IGI Airport    Civil Lines    Mayapuri Date : Wednesday, September 25, 2013 Time (IST) : 06:09 PM						
GAS CONCENTRATIONS						
Air Quality Monitoring Station : R. K. Puram						
Parameters	Date	Time (IST)	Gas Concentration	Prescribed Standard	Remarks	View Status of last 6 hours
Ammonia	Wednesday, September 25, 2013	17:40:00	27.8 $\mu\text{g}/\text{m}^3$	400 $\mu\text{g}/\text{m}^3$		Line Graph Bar Graph
Benzene	Wednesday, September 25, 2013	17:40:00	1.6 $\mu\text{g}/\text{m}^3$	1 $\mu\text{g}/\text{m}^3$		Line Graph Bar Graph
Carbon Monoxide	Wednesday, September 25, 2013	17:40:00	1.2 $\text{mg}/\text{m}^3$	9 $\text{mg}/\text{m}^3$		Line Graph Bar Graph
Nitrogen Dioxide	Wednesday, September 25, 2013	17:40:00	66.4 $\mu\text{g}/\text{m}^3$	80 $\mu\text{g}/\text{m}^3$		Line Graph Bar Graph
Nitrogen Oxide	Wednesday, September 25, 2013	17:40:00	26.8 $\mu\text{g}/\text{m}^3$	-		Line Graph Bar Graph
Oxides of Nitrogen	Wednesday, September 25, 2013	17:40:00	76.3 $\mu\text{g}/\text{m}^3$	-		Line Graph Bar Graph
Ozone	Wednesday, September 25, 2013	17:40:00	34.3 $\mu\text{g}/\text{m}^3$	180 $\mu\text{g}/\text{m}^3$		Line Graph Bar Graph
p-Xylene	Wednesday, September 25, 2013	17:40:00	2.2 $\mu\text{g}/\text{m}^3$	-		Line Graph Bar Graph
Sulfur Dioxide	Wednesday, September 25, 2013	17:40:00	23.2 $\mu\text{g}/\text{m}^3$	80 $\mu\text{g}/\text{m}^3$		Line Graph Bar Graph
Toluene	Wednesday, September 25, 2013	17:40:00	7.6 $\mu\text{g}/\text{m}^3$	-		Line Graph Bar Graph

- User friendly
- Station wise Continuous realtime hourly update
- 24 hour average data
- Back data available

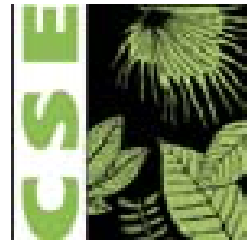
-- However, some hotspot stations (IGI, Civil Lines, Anand Vihar) show chronic maintenance issues

-- **Continuous data is available for R K Puram, Mandir Marg and Punjabi Bagh for the winter months**

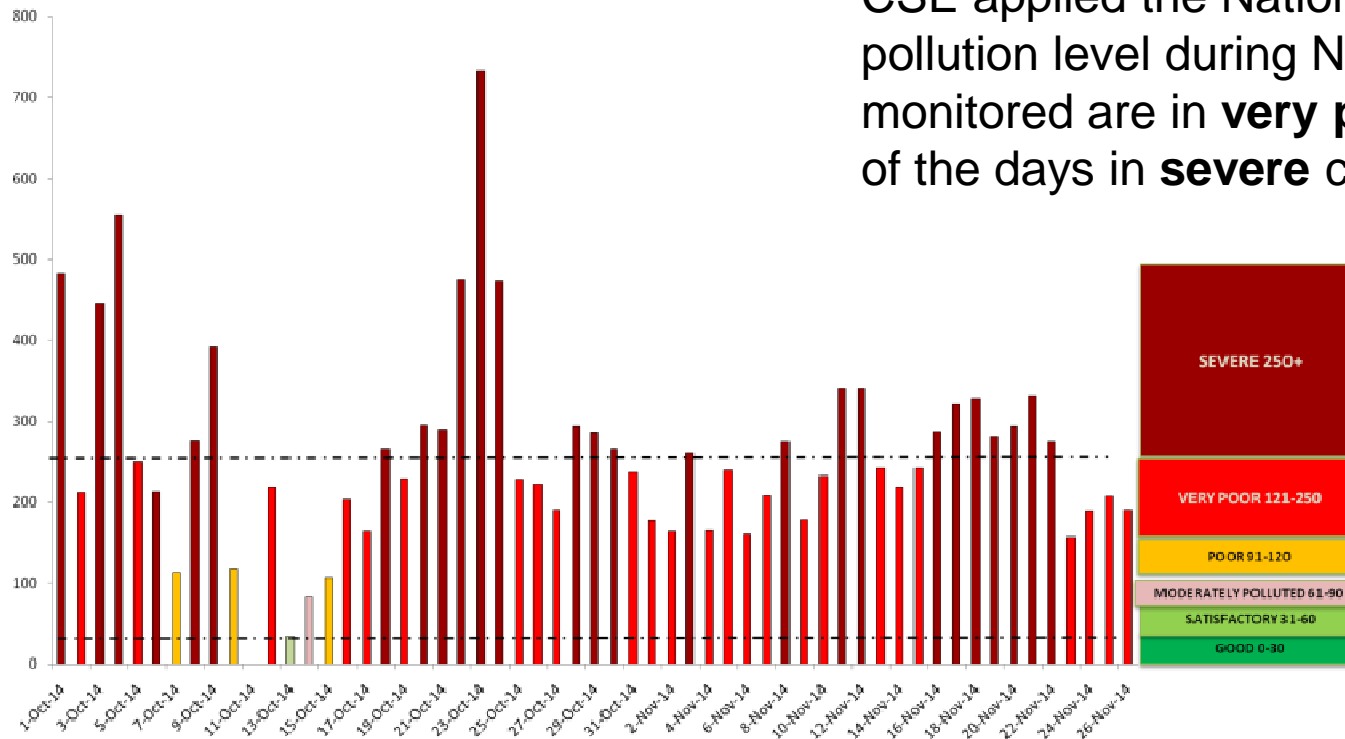




# Winter pollution is back with vengeance.....



PM2.5 in microgram/cubic metre (Delhi average of 4 sites\*)



CSE applied the National Air Quality Index to pollution level during November: 53% of days monitored are in **very poor** category and 47% of the days in **severe** category.

**Severe:** 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

**Very poor:** May cause respiratory illness to the people on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases

**Poor:** May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease

**Moderately polluted:** May cause breathing discomfort to the people with lung disease such as asthma and discomfort to people with heart disease, children and older adults

**Satisfactory:** May cause minor breathing discomfort to sensitive people

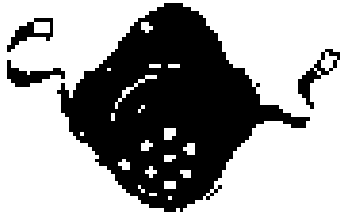
**Good:** Minimal impact

\*Four stations: Punjabi Bagh, Mandir Marg, R K Puram, Civil lines

Data availability for this period: Punjabi Bagh - 39 days, Mandir Marg - 46 days, R K Puram - 47 days, Civil lines - 44 days

Source: Compiled from DPCC realtime data, CPCB's proposed NAQI applied

Source: Based on data provided by DPCC website. CSE has applied the proposed NAQI to classify the levels.



## 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.



## Other governments clamping down with harsh measures..... There is no other option



### **Beijing: Pollution emergency measures on red alert days:**

- Kindergartens, primary and middle schools will close;
- About 80 per cent of government-owned cars have to be taken off the roads;
- Private cars will be allowed on alternate days according to numbers plates;
- Freight vehicles and those transporting material for construction sites will be barred;
- Polluting factories have to cut emissions or shut down when the orange warning signal is issued;
- Construction sites will have to halt excavation and demolition operations;
- Ban on barbeques and fireworks on heavily polluted days.

### **US cities: Rule 701 of air pollution emergency contingency actions (for PM and ozone):**

- Industrial units reduce combined emissions by at least 20 per cent of normal weekday operations.
- For vehicles, it asks to reduce fleet vehicle miles;
- Promotes ridesharing and telecommuting.
- Liquid or solid fossil fuels cannot be burned in electric power generating systems unless a force majeure natural gas curtailment is in effect.
- It also recommends all non-emergency driving be discontinued.

### **Paris: red alert day**

- Restricts vehicle entry into the city
- Does not allow diesel cars inside the city during smoggy days



### **Agenda 3: Implement stringent emissions standards for new vehicles**

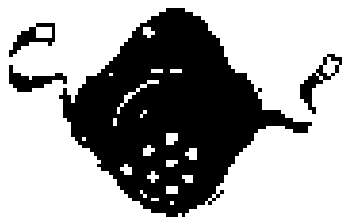


Delhi's pollution problem cannot be solved if new vehicles continue to meet Euro IV or Bharat Stage IV standards that are nearly 10 year behind Europe.

Same standards should be implemented across the country. Otherwise the trucks and other commercial vehicles will continue to pollute Delhi.

#### **Priority action**

- 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:**  
impose additional cess on fuels; impose environment tax on diesel cars; and equalize excise on petrol and diesel fuel.



## **Agenda 4: Control dieselisation: WHO has branded diesel particles as class I carcinogen for strong link with lung cancer.....**



### **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.....

### **India needs to act....**

### **Priority action**

- Impose additional tax on diesel cars to neutralise the incentive from the cheaper diesel prices;
- Equalise petrol and diesel taxes to remove differential;
- Create clean fuel fund from revenue from tax on diesel cars and cess on fuels to fund the cost of refinery upgrade to produce clean diesel;



## **Agenda 5: Strategies for old and on-road vehicles**



**Banning of old vehicles:** Supreme Court has banned 15 year old commercial vehicles.

**Is banning 15 year old private vehicles a way to go?** Studies in Delhi (TRIPPS of IIT Delhi), show average age of personal vehicles in Delhi is much shorter – 4-7 years. Banning them may have limited impact on air quality. Poor data on vehicle vintage

**Need variety of strategies for old vehicles**

**Rider -- Scrappage of old vehicles will need:**

**Need cleaner emissions standards for new vehicles to replace older vehicles.**

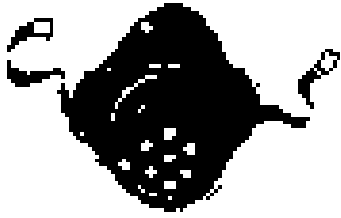
**Formal scrappage policy is needed to ensure** infrastructure to scrap and recycle at least 95 per cent of scrapped material

**Implement end of pipe regulations for the vehicle manufacturers to ensure more than the 90 per cent of the material used in cars are recyclable.**

**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: Contd...

### Old vehicles need variety of strategies



**Tighten PUC, testing method and compliance:** Grossly polluting vehicles can occur at any age group or vintage and these will have to be weeded out with a good inspection programme and smoky vehicle checks.

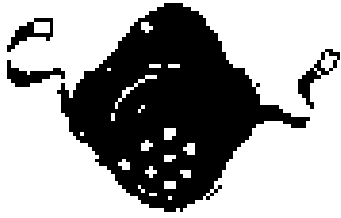
**Deploy more advanced in-use monitoring strategies.** Integrate on-board diagnostic system for in-use inspection; introduce remote sensing technology for screening on-road vehicles among others.

**Make PUC certificate conditional requirement for obtaining annual insurance for vehicles.**

**Need road worthiness tests for private vehicles.**

**Divert non-destined trucks and check overloading**

**Stringent action on visibly polluting vehicles:** Smoky vehicle inspection based on spot check and on-road surveillance, high penalty and instant removal from road can make a difference inside the city as well as along the borders.



**Agenda 6:**  
**Need fiscal measures to keep clean fuel CNG competitive vis a vis diesel**

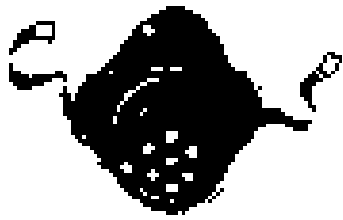


**Delhi has greatly benefited from the CNG programme.**

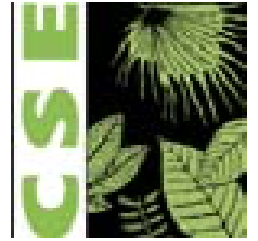
**But CNG programme is at risk** with narrowing of price gaps between diesel and CNG.

**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.

**This will have to be implemented.....**

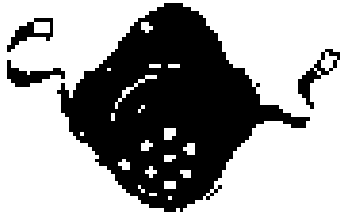


## **Agenda 7: Improve and scale up public transport and last mile connectivity**



### **Delhi Master Plan 2021 Target: 80% public transport ridership**

- Bring all the 11000 buses within a year.
- 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.



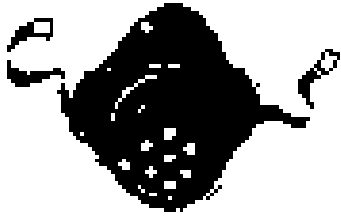
## **Agenda 8: Need infrastructure and regulations for safe walk and cycling**



**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 9: Restrain growth of cars with parking restraints and taxes**



### **Need parking restraints and disincentives for usage of personal vehicles**

- Eliminate free parking; introduce high and variable parking charges; introduce residential parking permits with fees;
- Implement parking management area plans to plan; implement legal parking; ban and penalise illegal parking; rationalise on-street and off-street parking; Prohibit parking in green areas and in neighbourhood parks
- Ban parking on footpaths under the provision of the Motor Vehicle Act 1988

### **No option to restraint: Learn from Beijing**

- 800,000 cars were sold in Beijing in 2010.
- In 2012 Beijing capped car sales at 240,000 cars a year – 30 per cent of what was sold in 2010
- The current actual demand is a staggering number of 1,515,449



## **Agenda 10**

### **Need NCR-wide plan**



#### **Expand realtime air quality monitoring in the NCR and implement daily realtime data reporting:**

- Immediately expand real time air quality monitoring in key towns of NCR. A minimum of three real time monitoring stations in each city and key towns of the NCR region should be set up within a year.
- State Pollution Control Boards should create a public website for reporting of daily air quality data that will indicate real time data, latest 24 hour average data as well as historical data. This should be easily accessible and understood by the public.

#### **Implement seamless public transport system in the NCR**

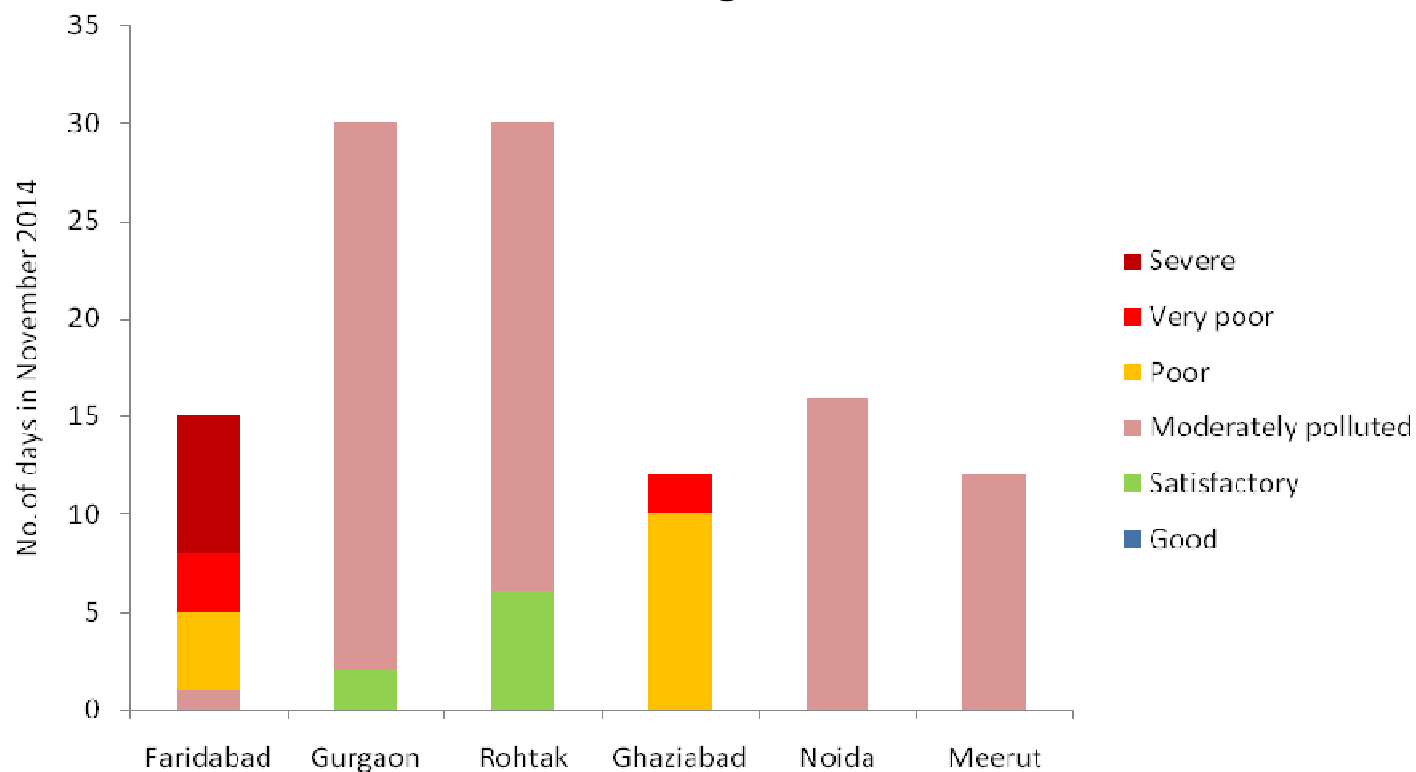
- Implement NCR wide seamless bus system and para transit system and remove tolls and tax barriers across borders for public transport within a year under reciprocal agreement
- Implement plan for improved rail network



## Air pollution in NCR towns



### Classification of PM10 levels in NCR towns during November 2014

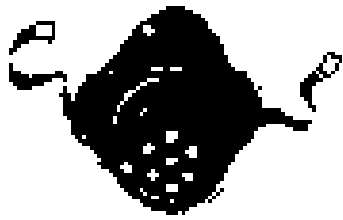


Note: Faridabad: Continuous data for PM10 is reported for 15 days and for the rest of 15 days PM2.5 data is reported

Gurgaon and Rohtak: only PM10 data is available

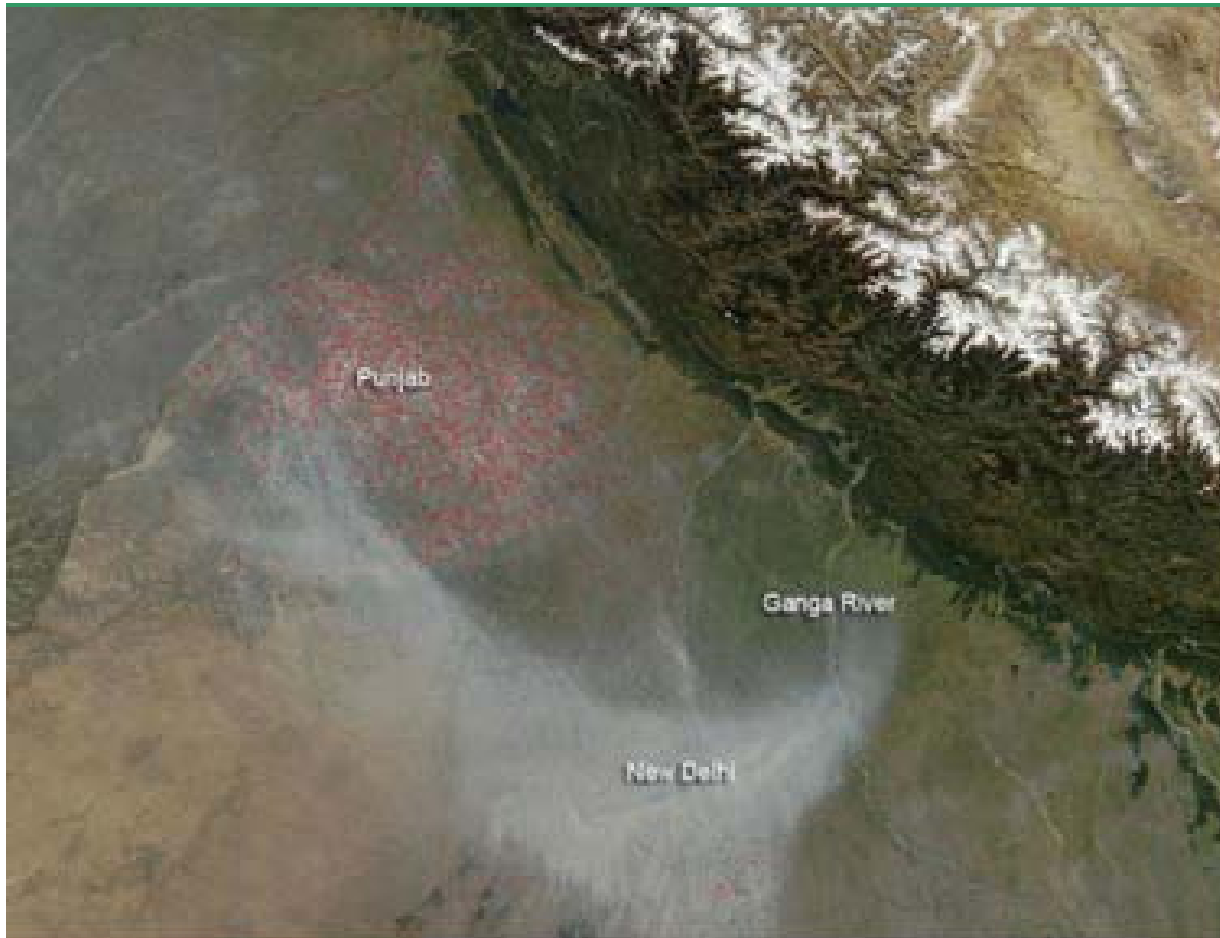
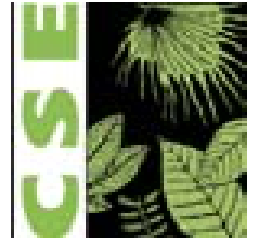
Ghaziabad, Noida, Meerut are reporting intermittently for their locations, as these are manually monitored.

Source: Compiled and analysed based on data provided in the websites of UP PCB and Haryana PCB for November 2014



## Agenda 10: Contd....

### Need NCR-wide plan



### **Stop farm fires in the NCR**

Make paddy straw burning an offence in the region.

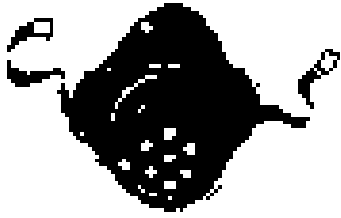
Need stringent enforcement under the Air Act 1980 to ban farm fires.

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





## Agenda 11: Set up urban transport fund



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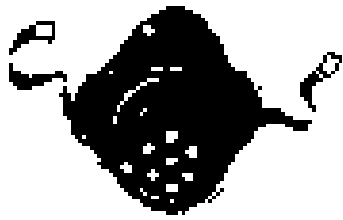
### Set up urban transport fund by tapping the revenue sources.

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 can generate at least **Rs 1300 crore** a year.

Cumulatively this can generate substantially sizeable amount over a period of time that can make investments in sustainable transportation options feasible.



## **Agenda 12:** **Priority action for power plant, open burning, generator sets and construction**

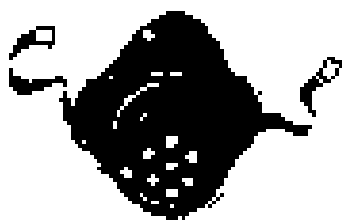


**Power plant:** Tighter emissions standards for power plants and stack monitoring

**Generator sets:** Tighten emissions standards; improve access to electricity; energy efficiency measures in buildings; roof top solar power programme; incentivise energy efficient appliances etc

**Open burning:** Stringent enforcement, public awareness as well as innovative methods of waste disposal are needed to minimize this problem.

**Construction activities:** Formally adopt dust control regulations and techniques for construction industry, roads and vehicular traffic; recycling of construction material; Regulations for material handling and construction demolition; street design guidelines for footpaths and roads with adequate vegetative barrier; dust suppressant techniques etc



## The Last Word..... For public health security focus on personal exposure...



**Need exposure monitoring to complement ambient monitoring:** A few static stations for ambient monitoring cannot assess human exposure as pollution levels associated with traffic vary widely within the city.

**India must innovate and leapfrog air quality monitoring:** Exposure monitoring based on new emerging low cost but advanced sensor based monitoring equipments can become a game changer globally. Needed to bridge the gap in data availability to citizens and assess personal exposure

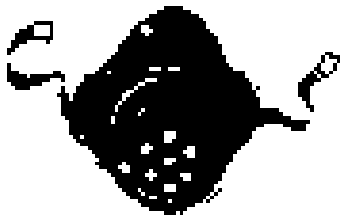
**USEPA:** Near-road NO<sub>2</sub> monitoring network to monitor target roads rather than ambient levels, and most of them have come online in the last year or so  
EPA staff research on near-road exposure gradients.

The USEPA to support development and use of new monitoring technologies and develop guidelines for it to meet requirements of regulatory monitoring.

**California Air Resources Board:** Assessed evidences on exposure on road, near roads and in vehicle. A number of other studies considering gradients and microenvironment exposure (Air pollution concentrations and gradients in in Los Angeles using a mobile platform, Truck traffic on freeways etc)

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**The European Union** is also discussing these options.



Thank You