CENTRE FOR SCIENCE AND ENVIRONMENT
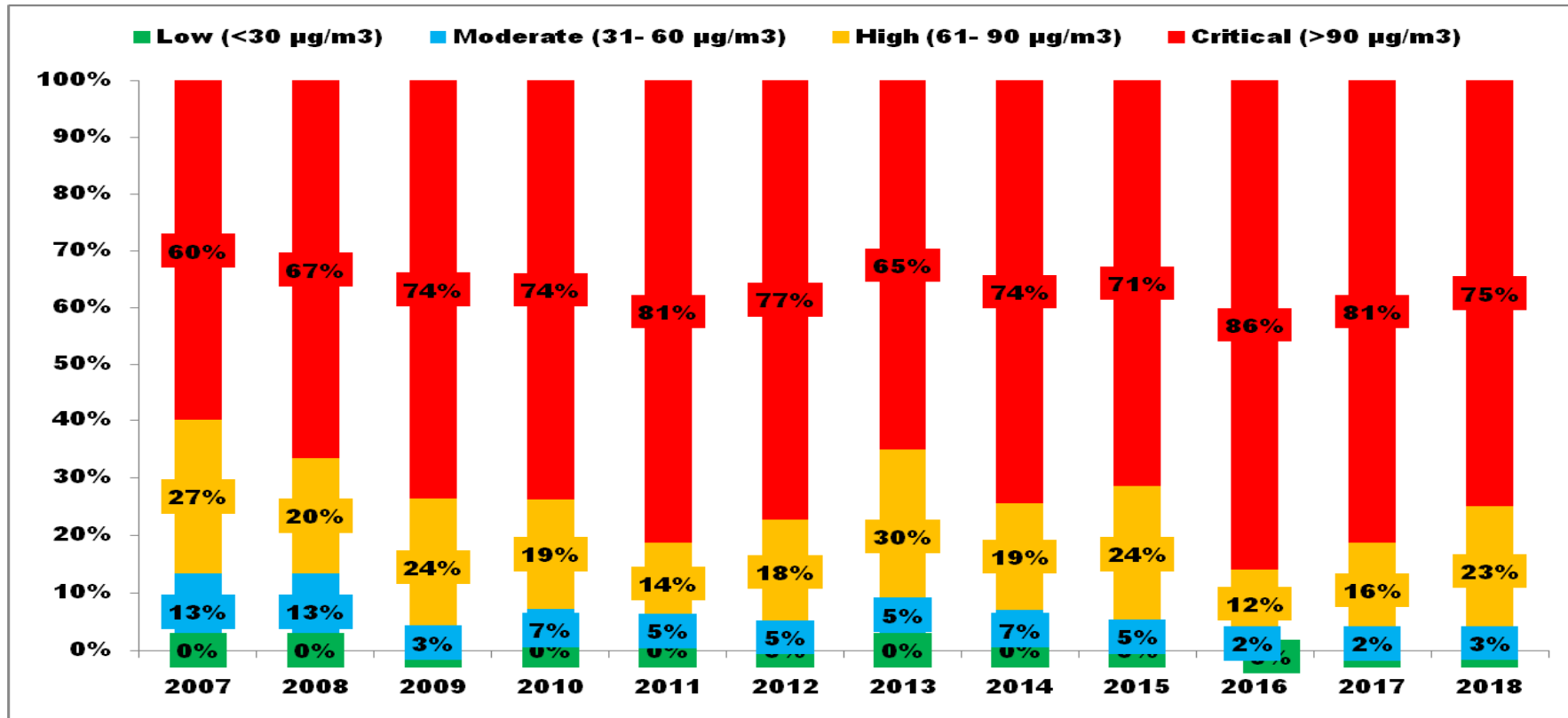
ANIL AGARWAL DIALOGUE 2 0 2 0

ANNUAL MEDIA CONCLAVE
ON THE STATE OF INDIA'S ENVIRONMENT

National air quality trends
What we know so far from the last reported NAMP data
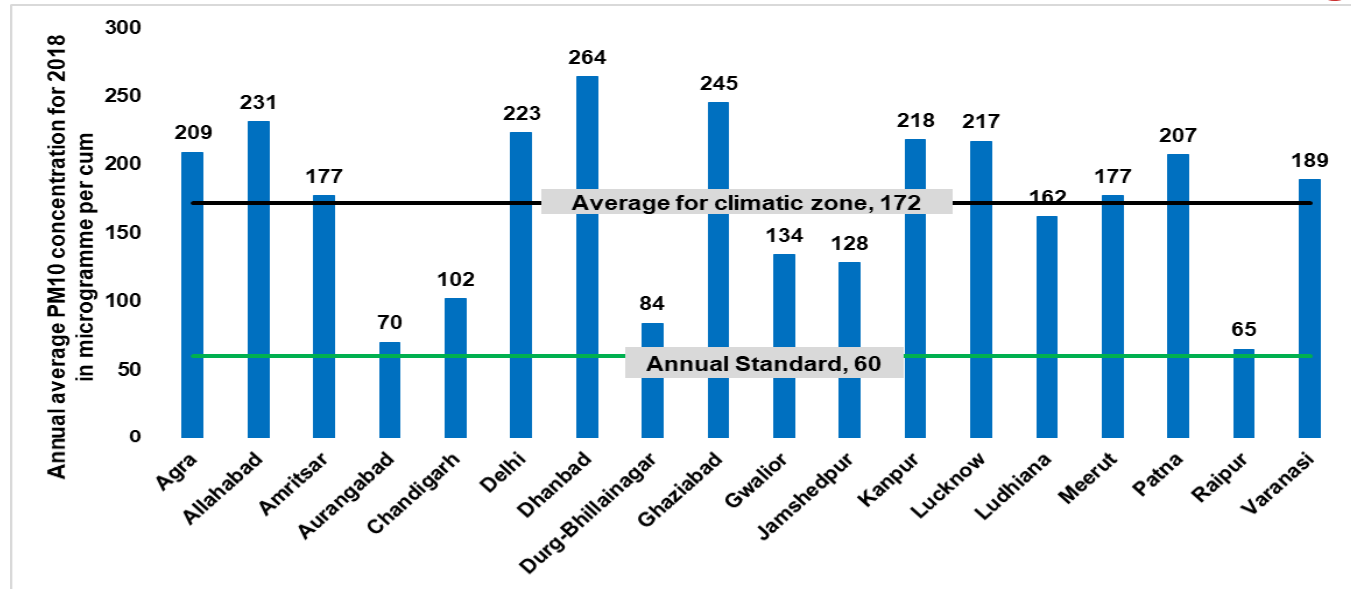### More cities in grip of critical level of PM10

Source: CSE's analysis of CPCB air quality data from ENVIS centre for million plus population cities

- Cities with critical level of PM10 (more than 1.5 times the standards) increased from 60% in 2007 to 75% in 2018.
- Cities complying with standard: 13% in 2007 -- 3% in 2018.
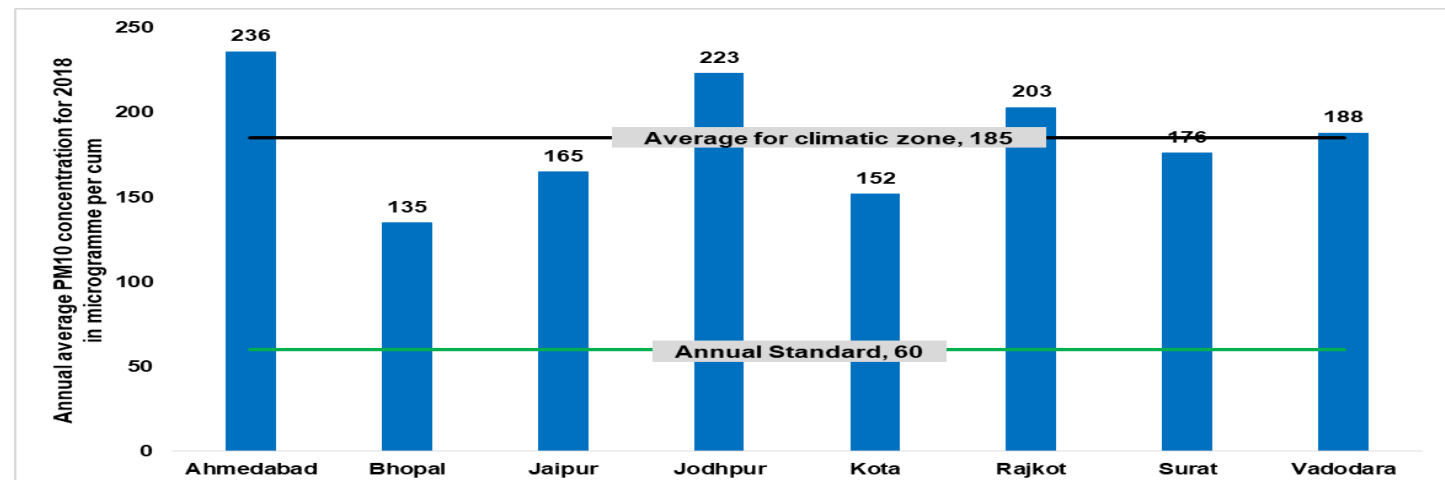- No cities in low pollution category (i.e. 50% below the standard)

2

More extensive data on PM10

Levels in different climatic regions

Indo-Gangetic plain

Annual average PM10 concentration for 2018 in microgramme per cum

- Agra: 209
- Allahabad: 231
- Amritsar: 177
- Aurangabad: 70
- Chandigarh: 102
- Delhi: 223
- Dhanbad: 264
- Durg-Bhillainagar: 84
- Ghaziabad: 245
- Gwalior: 134
- Jamshedpur: 128
- Kanpur: 218
- Lucknow: 217
- Ludhiana: 162
- Meerut: 177
- Patna: 207
- Raipur: 65
- Varanasi: 189

Average for climatic zone, 172

Annual Standard, 60

Hot & Dry (North)

Annual average PM10 concentration for 2018 in microgramme per cum

- Ahmedabad: 236
- Bhopal: 135
- Jaipur: 165
- Jodhpur: 223
- Kota: 152
- Rajkot: 203
- Surat: 176
- Vadodara: 188

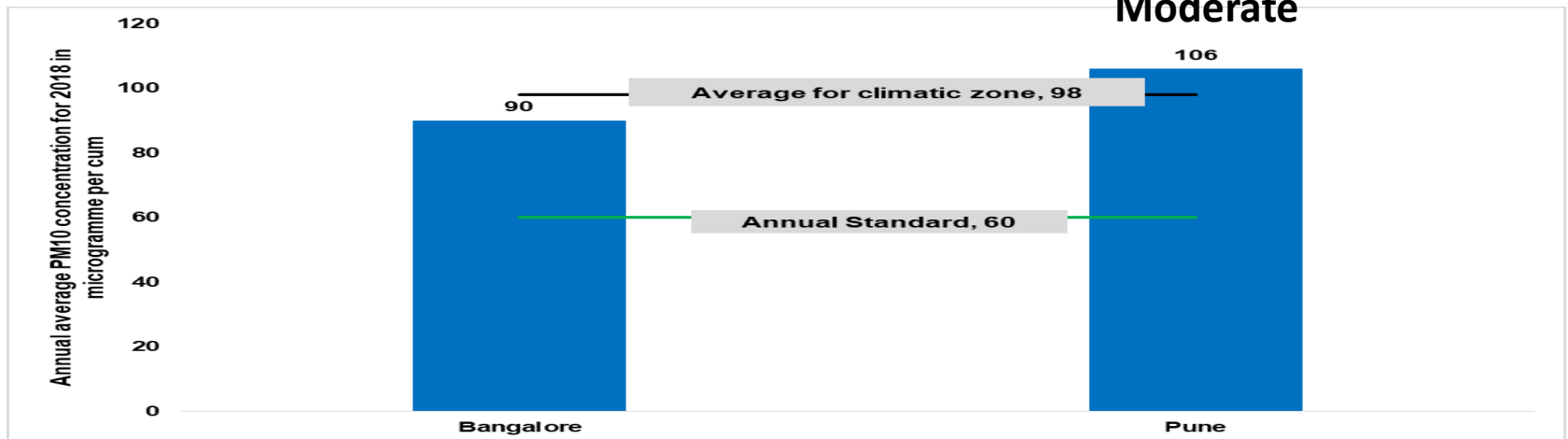Average for climatic zone, 185

Annual Standard, 60

Source: CSE's analysis based on CPCB Envis centre and data submitted to Lok Sabha

3

PM10 in different climatic regions
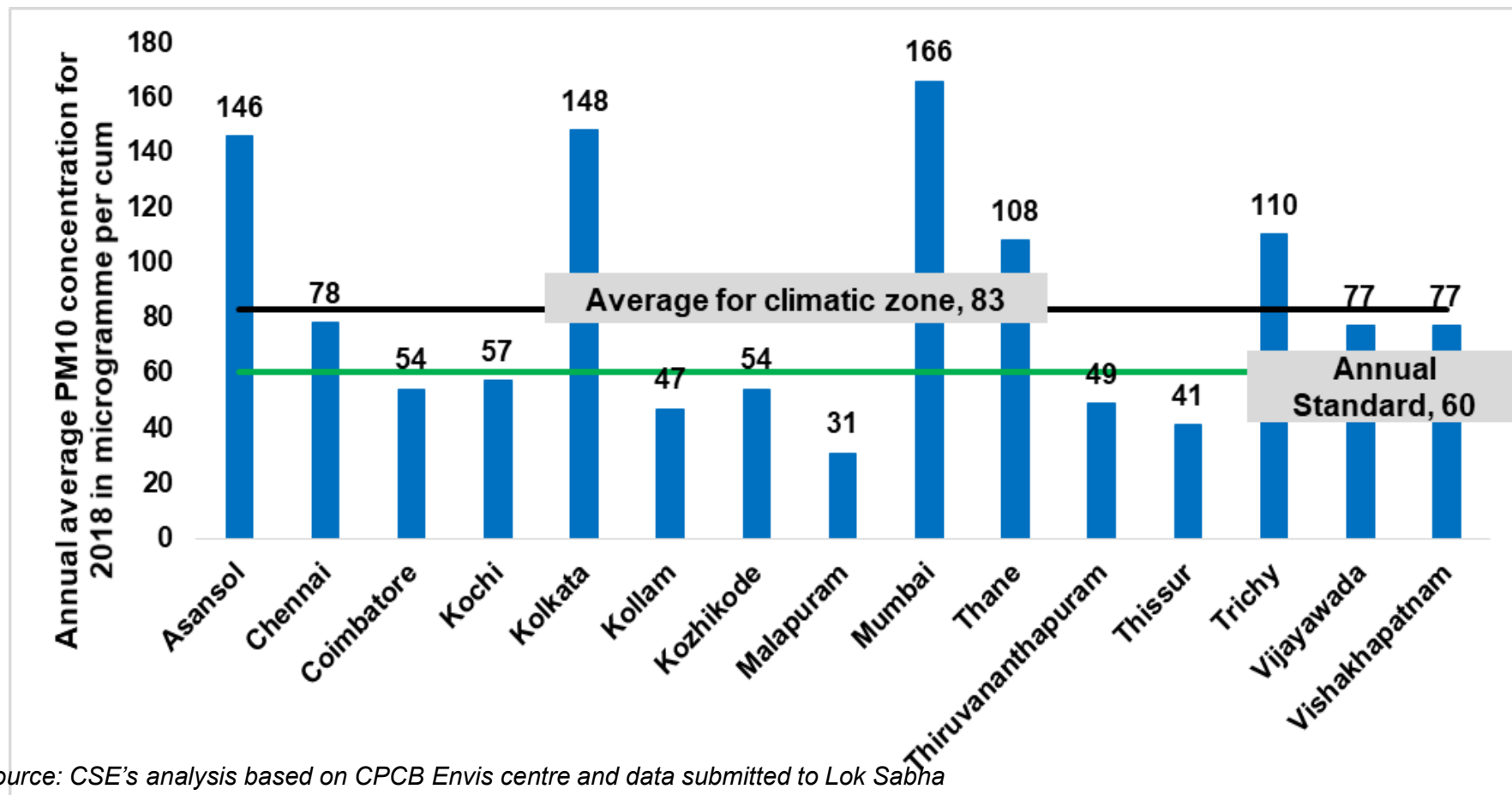
Hot & Dry (South)
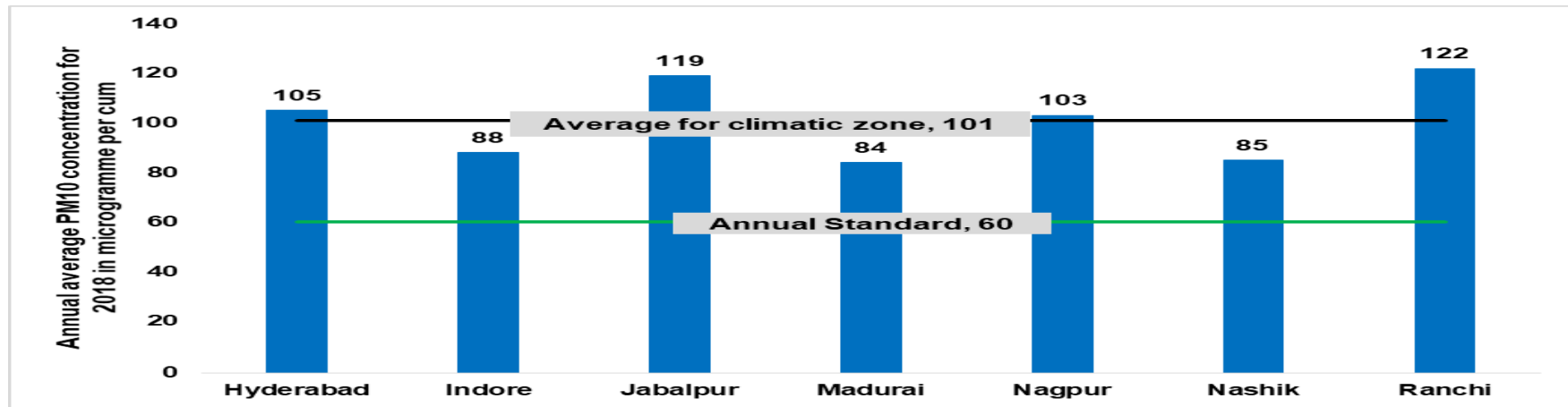
Moderate

Source: CSE's analysis based on CPCB Envis centre and data submitted to Lok Sabha
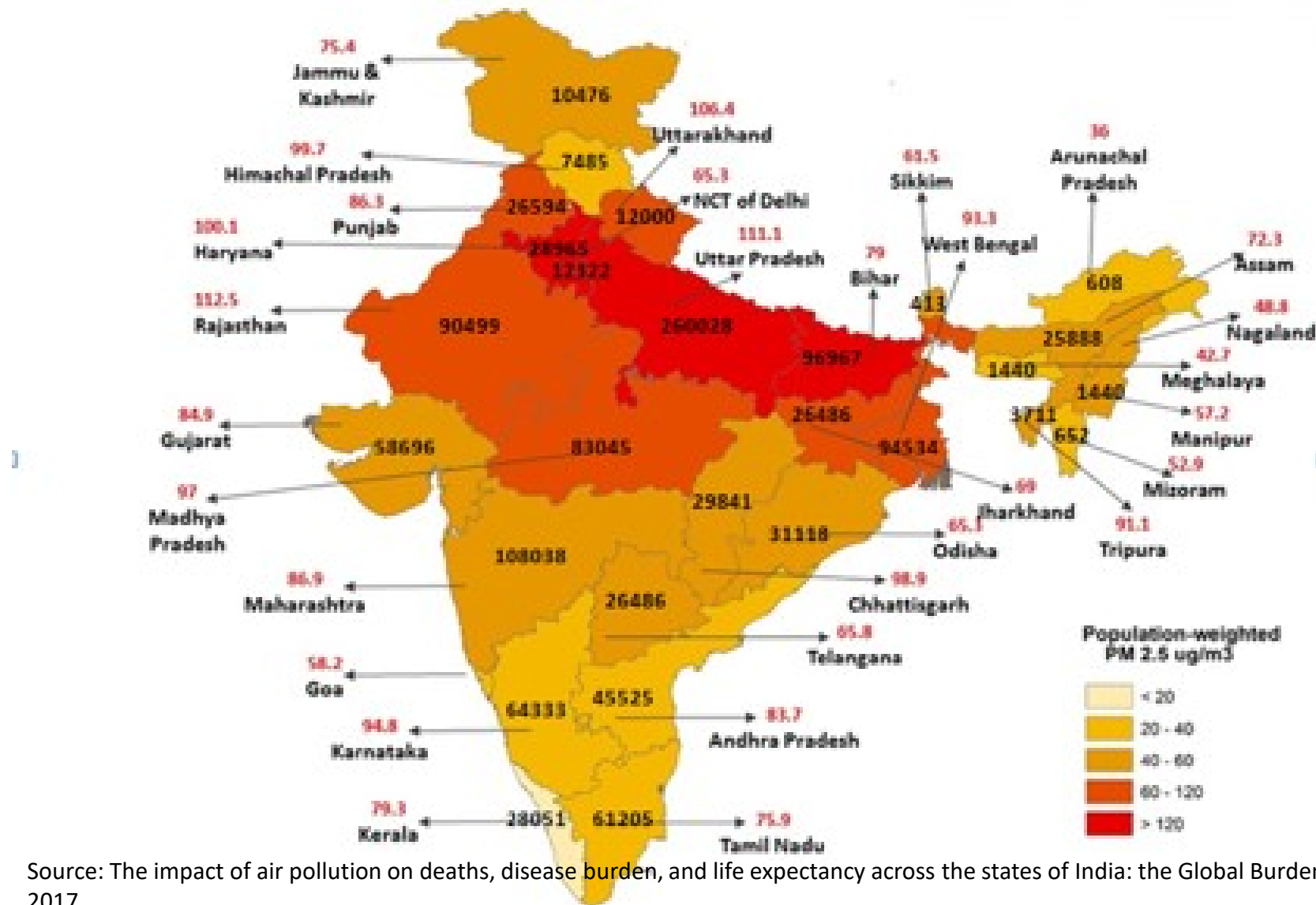
PM10 in different climatic regions

Warm and Humid (including Coastal)—
PM10 levels have gone up to 2 times the standard in case of Mumbai

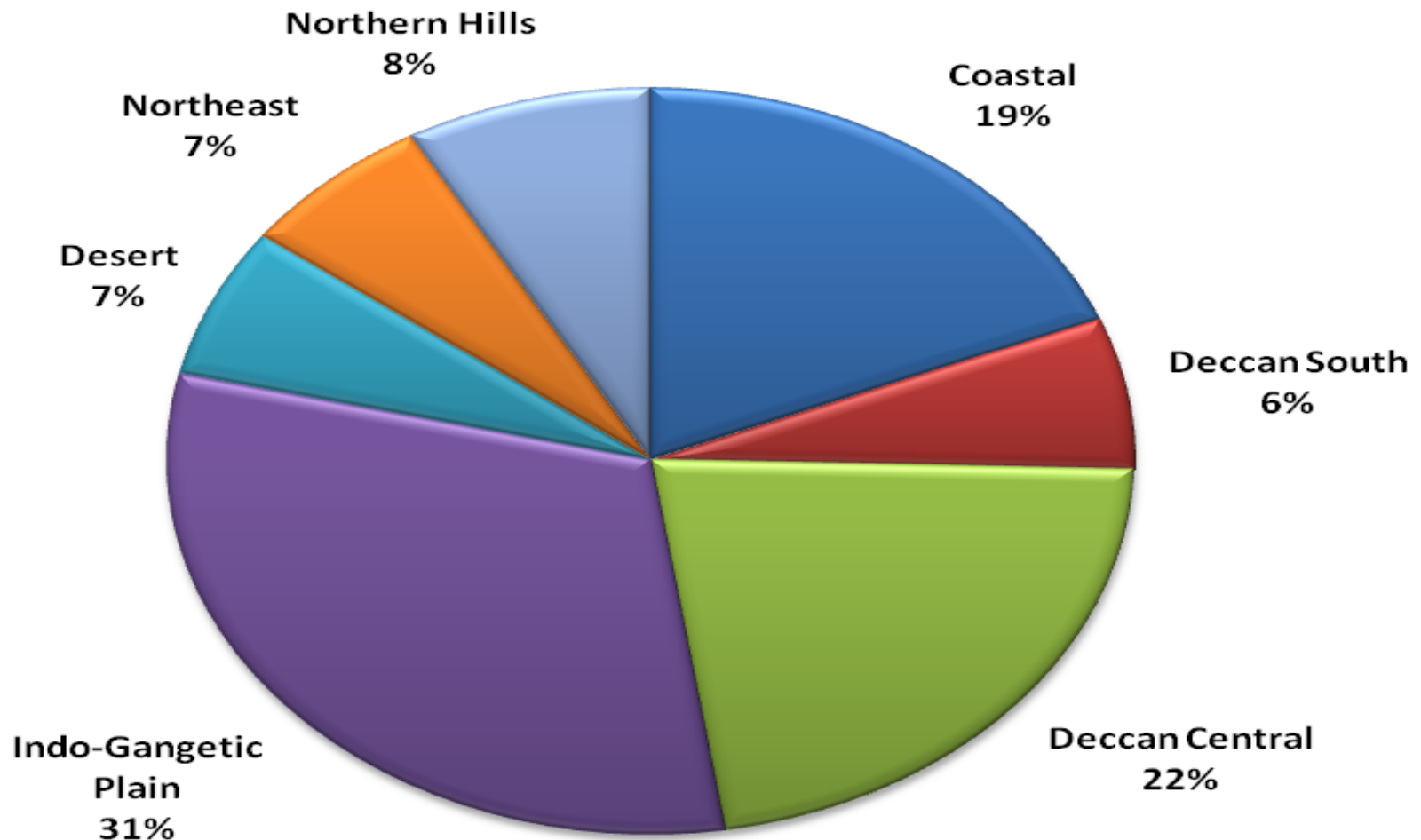*Source: CSE's analysis based on CPCB Envis centre and data submitted to Lok Sabha*

PM2.5 and health

Health is a leveler

Source: The impact of air pollution on deaths, disease burden, and life expectancy across the states of India: the Global Burden of Disease Study 2017

60% of non attainment cities under National Clean Air Programme (NCAP) in North India

Northern Hills 8%
Northeast 7%
Desert 7%
Indo-Gangetic Plain 31%
Coastal 19%
Deccan South 6%
Deccan Central 22%

Source: Based on data available with CPCB

What is our new study talking about?

National Clean Air Programme (NCAP) target for 122 cities:
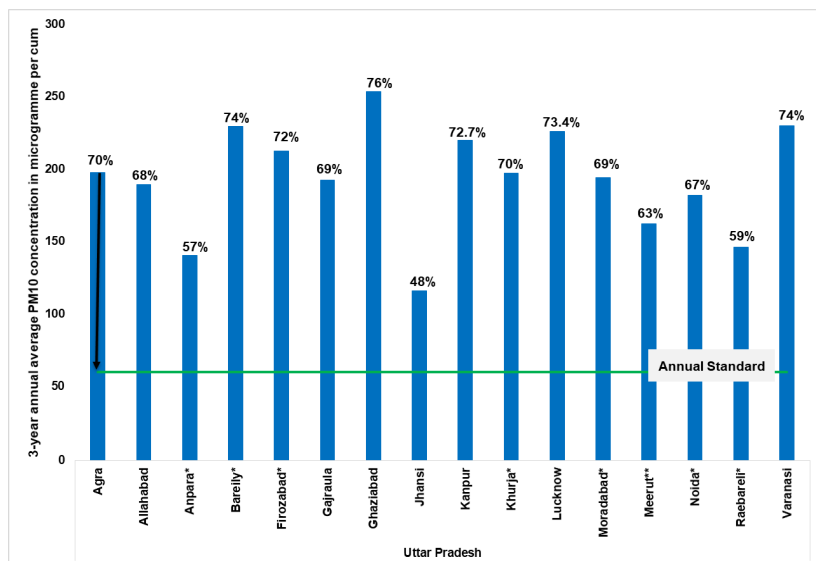
Reduce particulate pollution by 20-30 per cent by 2024 from 2017 levels…....

What does it mean?

-

PM10 reduction target

Uttar Pradesh cities

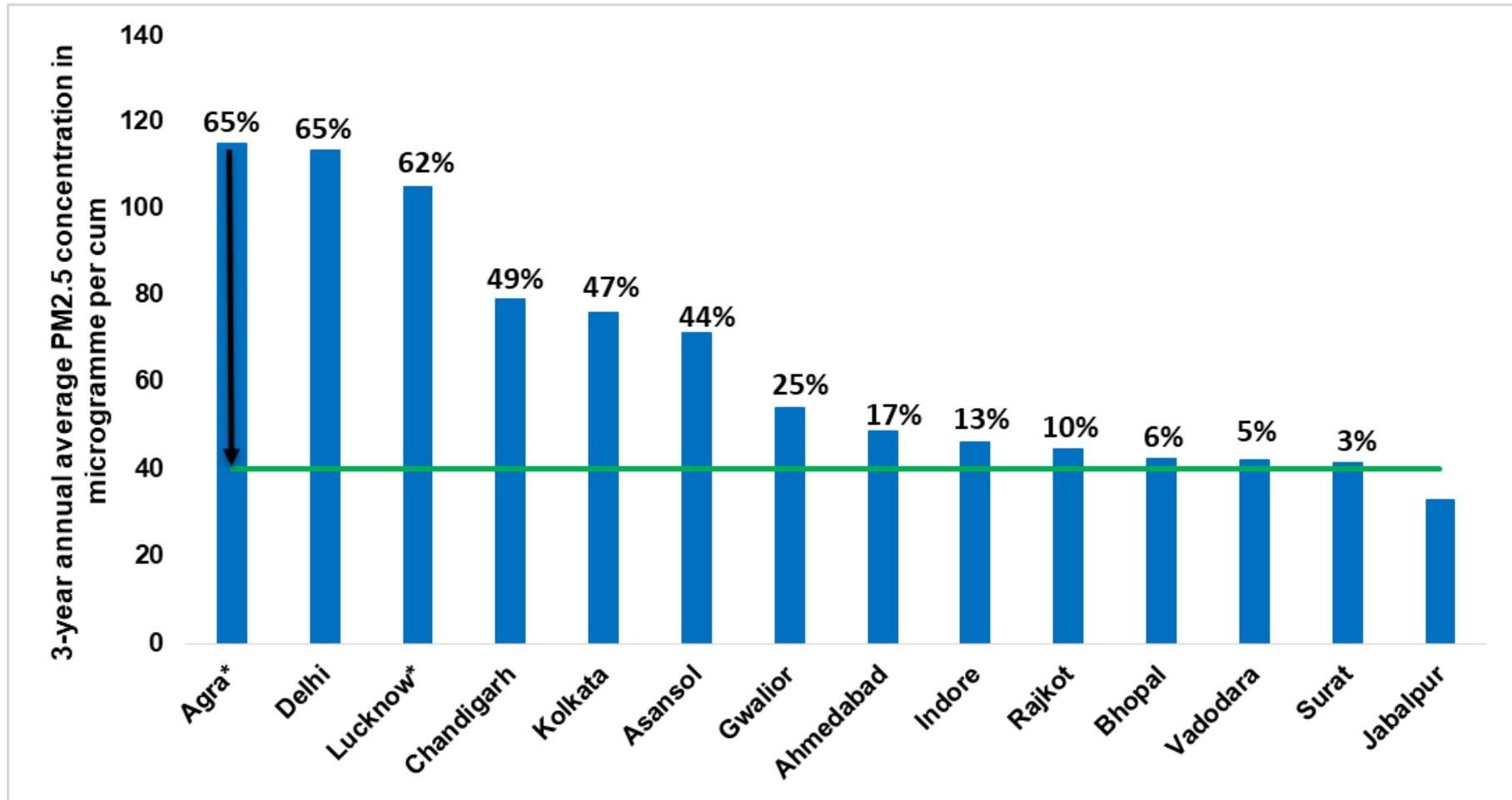## Himachal Pradesh, Madhya Pradesh and Rajasthan cities
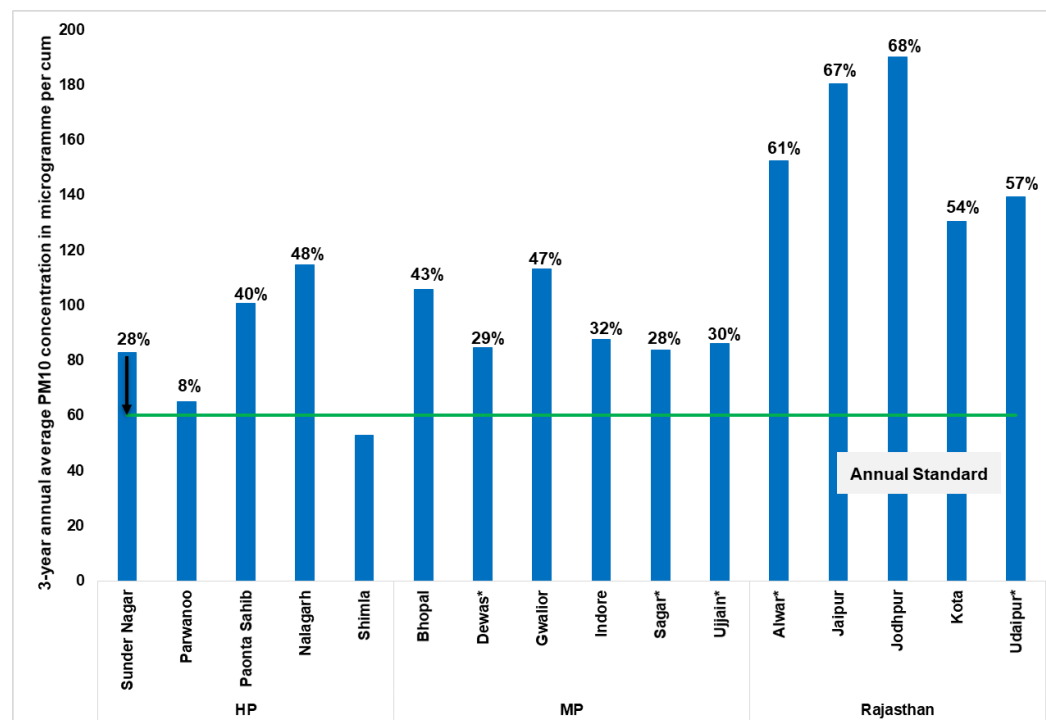
Source: CSE's analysis based on CPCB Envis centre and data submitted in Lok Sabha

Reduction target for PM2.5

Source: CSE's analysis based on CPCB Envis centre and data submitted to Lok Sabha

PM10 reduction target

Punjab and Uttarakhand cities

Source: CSE's analysis based on CPCB Envis centre and data submitted in Lok Sabha

12
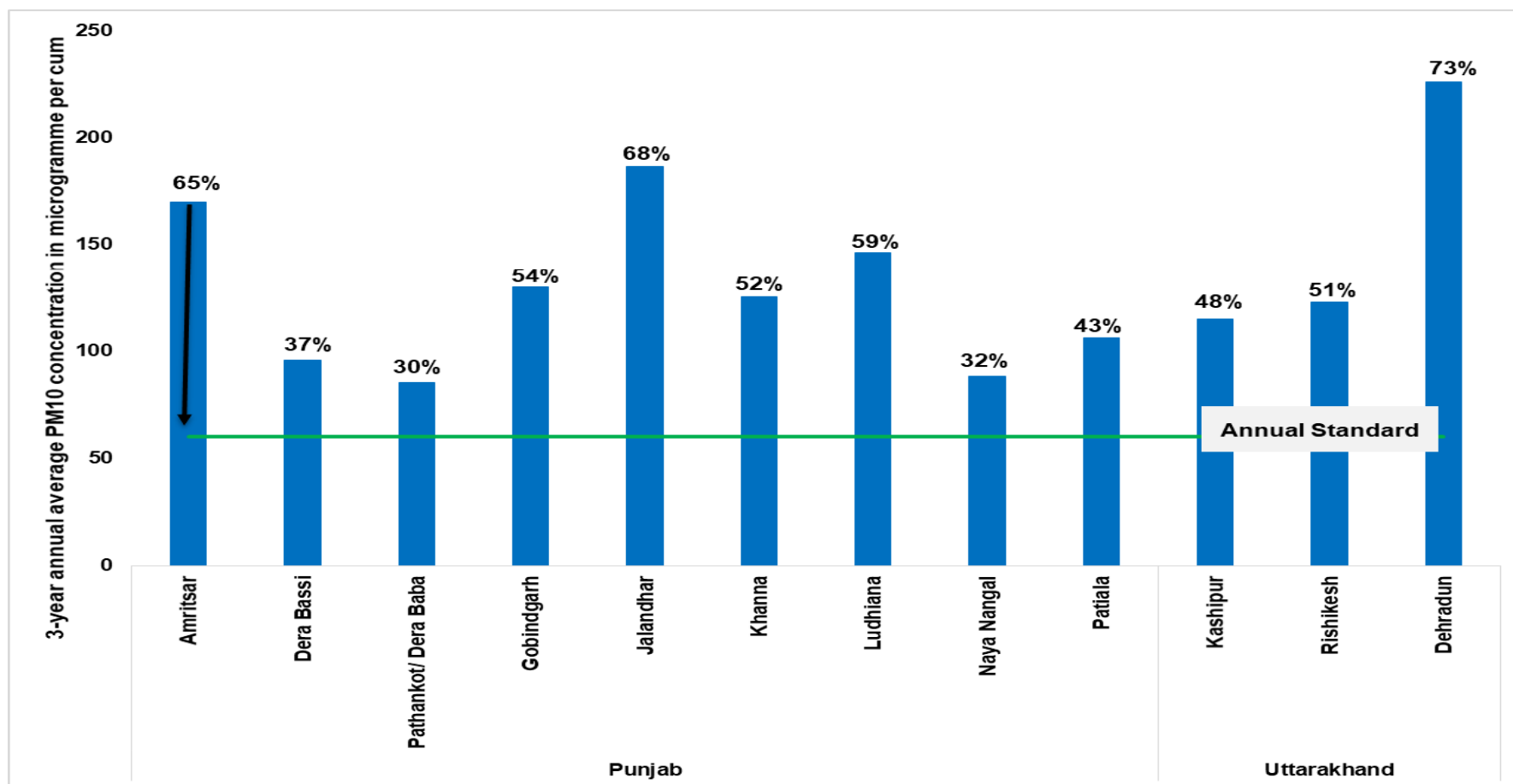
How will cities based on the ever expanding monitoring network (manual and realtime) know if pollution levels are is going up or down?

-- Do we have explicit official method to report long term trend in air quality and to report compliance against targets and national ambient air quality standard?

PM2.5 Monitoring Network of India

EVOLUTION OF AIR QUALITY REGULATIONS IN INDIA

In India, there are 207 real-time monitoring stations spread across 114 cities, and 793 manual monitoring stations spread across 344 cities; 800 real-time and 1,250 manual monitors will be added to the network soon

38 I 10
Delhi

10 I 3
Mumbai

7 I 21
Kolkata

● Manual monitors
● Real-time monitors

PM2.5 manual monitors = **274** in 134 cities

PM2.5 realtime monitors = **215** in 114 cities

How is data reported now?

CPCB puts out annual average data based on manual monitoring stations. – latest reported for 2018 (in December 2019)

City-wise average for million plus cities reported periodically to the Parliament based on manual monitors; latest reported for 2018 (in June 2019)

Cities with both manual and realtime monitors report annual average trend based on manual monitors

CPCB has protocol for manual monitors that require minimum monitoring of 104 days or twice a week

Thus, compliance with national ambient air quality standards is assessed based on data for a minimum of 28.5% of the days in a year; This is valid

But 73% of PM2.5 manual monitors did not meet regulatory requirement of 104 days of monitoring in 2018

Massive data gaps
Manual PM₂.₅ monitoring Network in select cities

.As low as 10 days of monitoring in Kozhikode, Kerala

54% of the manual PM2.5 stations (148 stations) in the country report pollution exceeding the standard.

These stations are distributed across 66 cities (133 cities have manual PM2.5 monitors)

Number of monitoring days

(Cities listed top to bottom: Vishakhapatnam, Mumbai, Lucknow, Kozhikode, Kolkata, Hyderabad, Delhi, Chennai, Chandigarh, Bhubneshwar, Bengaluru, Ahmedabad)

16
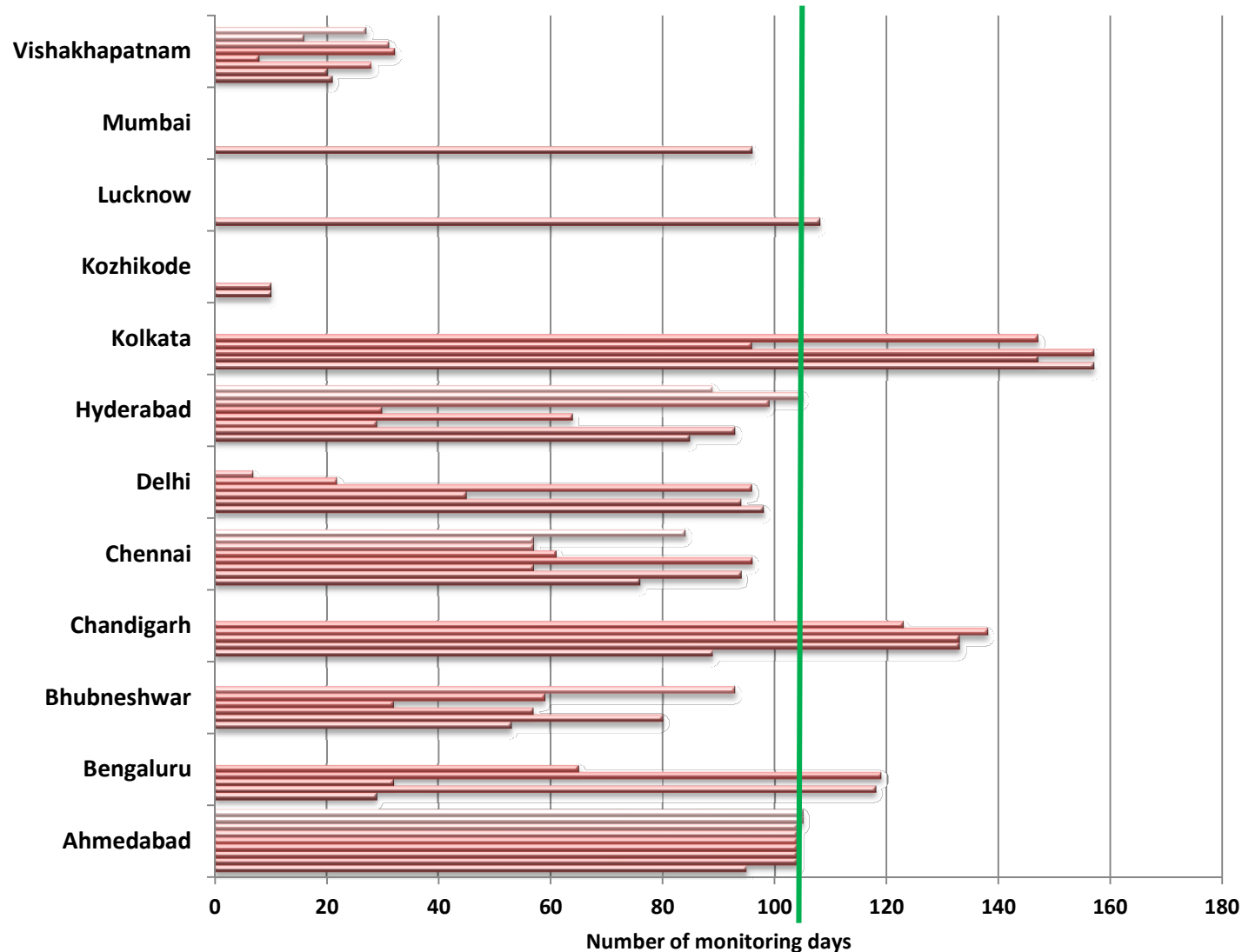
What about realtime monitoring?

Under NCAP realtime monitoring of PM2.5 is expanding: 41 cities have realtime PM2.5 monitors.

- Many cities have both manual and realtime monotors

- Cities without PM2.5 monitoring stations are setting up only realtime monitors for PM2.5

- Rajasthan does not have any manual PM2.5 monitors; only real time

- In UP new cities like Moradabad, Bagpat, Hapur, Muzaffar Nagar etc have only realtime PM2.5 monotrs

- Maharashtra – Pune, Sholapur, Nasik, Aurangabad, Kalyan, Thane etc
- West Bengal – Siliguri, Asansol, Haldia
- Karnataka – Vijaypur, Chikmagalur, Chikbadlapur, etc

How will cities report compliance based on both manual and realtime monitors? Realtime motors have high data availability

Data reporting

Protocol for manual and realtime monitoring established by CPCB

Protocol for quality control and assurance is in place

CPCB reports annual average for manual stations - averaged for cities; Will that continue?

Realtime data is used for spatial averaging of 24 hours to report against National Air Quality Index with a rider – *Spatial averaging is not the most scientific way to do such reporting*

Annual average data from realtime data can be generated from the CPCB portal

One limited reporting based on realtime data in Delhi to the Parliament; not anorm yet

No method to identify primary monitors for reporting trend and compliance

No method to address data gaps and data completeness

- CSE reviews global method for air quality trend and compliance reporting as well as method for addressing data gaps

- There is no one absolute method

Globally governments have detailed methods

USEPA – very elaborate method

For trend and compliance reporting
- **Method for reporting air quallity trend** based on spatial averaging
- **Method for reporting compliance with the national air quality** standards based on worst trend to protect vulnerable groups
- **Establish primary monitors for reporting**
- **Assess trend based on moving three year annual averages** (design value) and not one year data
- **Stations represent cities as well as air basin** - much larger than the city;
- **Compliance needed across air basin based on the worst performing station**
- **Number of air quality monitors are determined based on the gravity of the problem** – In the US number of PM2.5 monitors are not numerous – ozone monitors are expanding
- **Realtime and manual monitors treated at par** – minimum requirement of manual monitors is every sixth day – even less than India;

Globally governments have detailed methods

USEPA

Method for addressing data gaps
- **Specifying minimum data availability** – minimum 75% for each quarter
- **Specified data subsitution test for data gaps –** 50-75%; below 75% etc
- **Address data gaps based on co-located stations: Data from primary monitors augmented by collocated monitors** (if primary monitor does not produce valid value for a particular day, but value is available from colocated monitor it can be considered valid for combined site data record
- There are instances of reporting trend even when data is missing for one whole year due to emergency situation (eg Corcoran-Patterson in San Joaquin Valley)

European Union
- Minimum data availability – 90%
- Realtime and manual monitors treated at par – method for comparison
- Strong quality control and assurance regime

China – Beijing has 40 monitors – but have identified 13 stations for legal [21] reporting on trends

Applying methods to Delhi….

Delhi's air quality data

Delhi has 38 realtime stations and six manual stations

•Air quality data sourced from CPCB's online portal "Central Control Room for Air Quality Management - All India" for the period 2010-2018.

Realtime raw 15 minute average data accessed. Final cleaned dataset has 3.16 million data points (outliers and erroneous entries removed)

Applied USEPA method to address data gaps and data completeness (station-wise and quarter-wise for each year)

Oldest five stations – IHBAS, ITO, Mandir Marg, Punjabi Bagh and RK Puram – (for which realtime data is continuously available since 2012) considered for assessing long term trend

Earlier years have quarters with more noise and missing data – Accordingly data substitution method used.
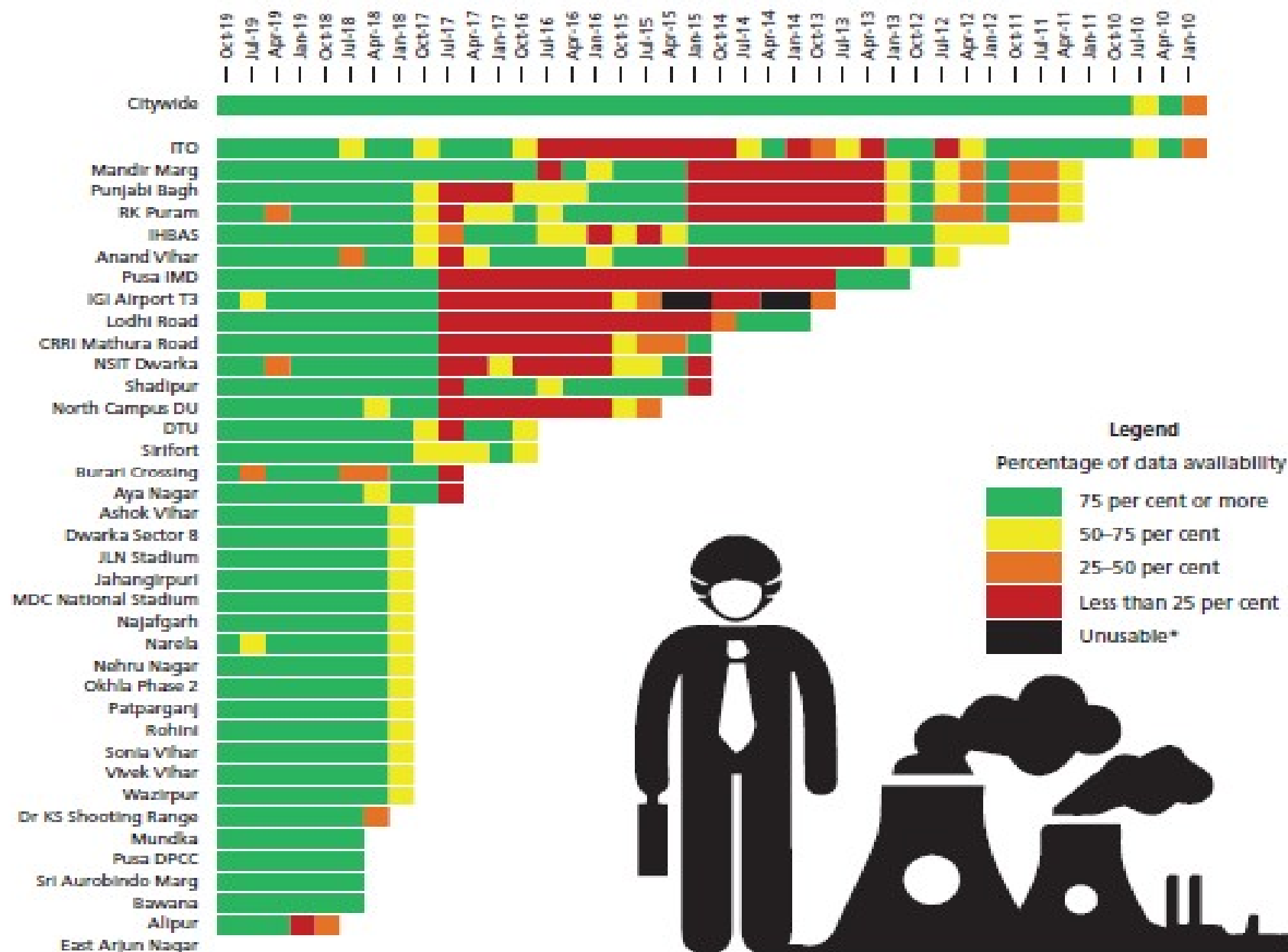
Caveats

Consultation with the USEPA:

While applying the USEPA method need to consider a few caveats as infrastructure and data availability in US is different

- Eg, when India develops its own method of data availability and completeness the thresholds may change. This will influence results. Threshold will differ between manual and realtime.

- If there is large variability in data, as in India, a statistical test on the location with more complete data is needed to establish the threshold etc.

- And more…..

Graph 1: Timeline of and data availability at air quality stations in Delhi
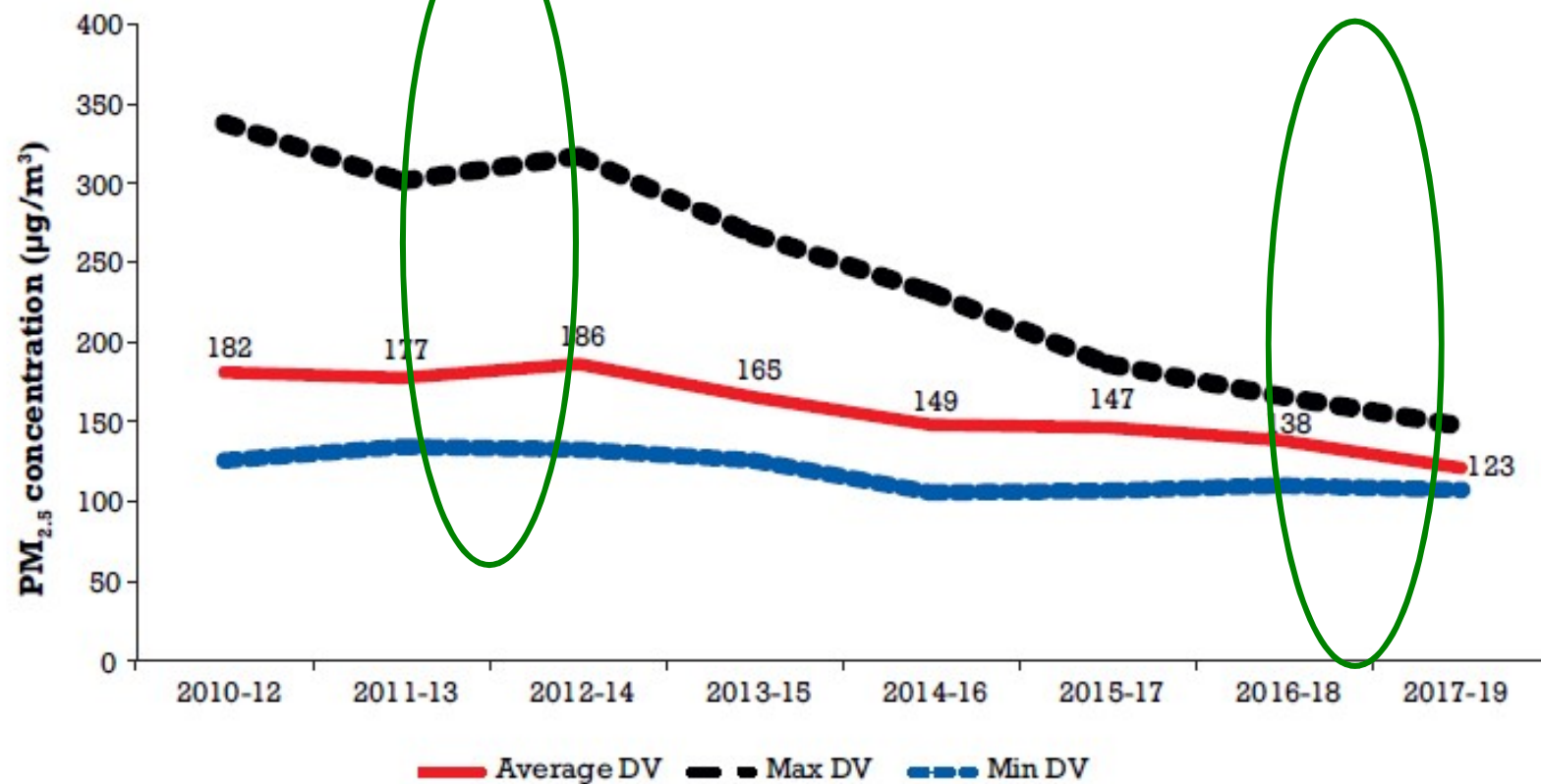
Legend
Percentage of data availability
- 75 per cent or more
- 50–75 per cent
- 25–50 per cent
- Less than 25 per cent
- Unusable*

* Data substitution cannot be done.

Source: CPCB

2014 cross checked with DPCC

The change
Quarter drop in spatially averaged PM2.5 level
Need another 67% cut to meet the standard
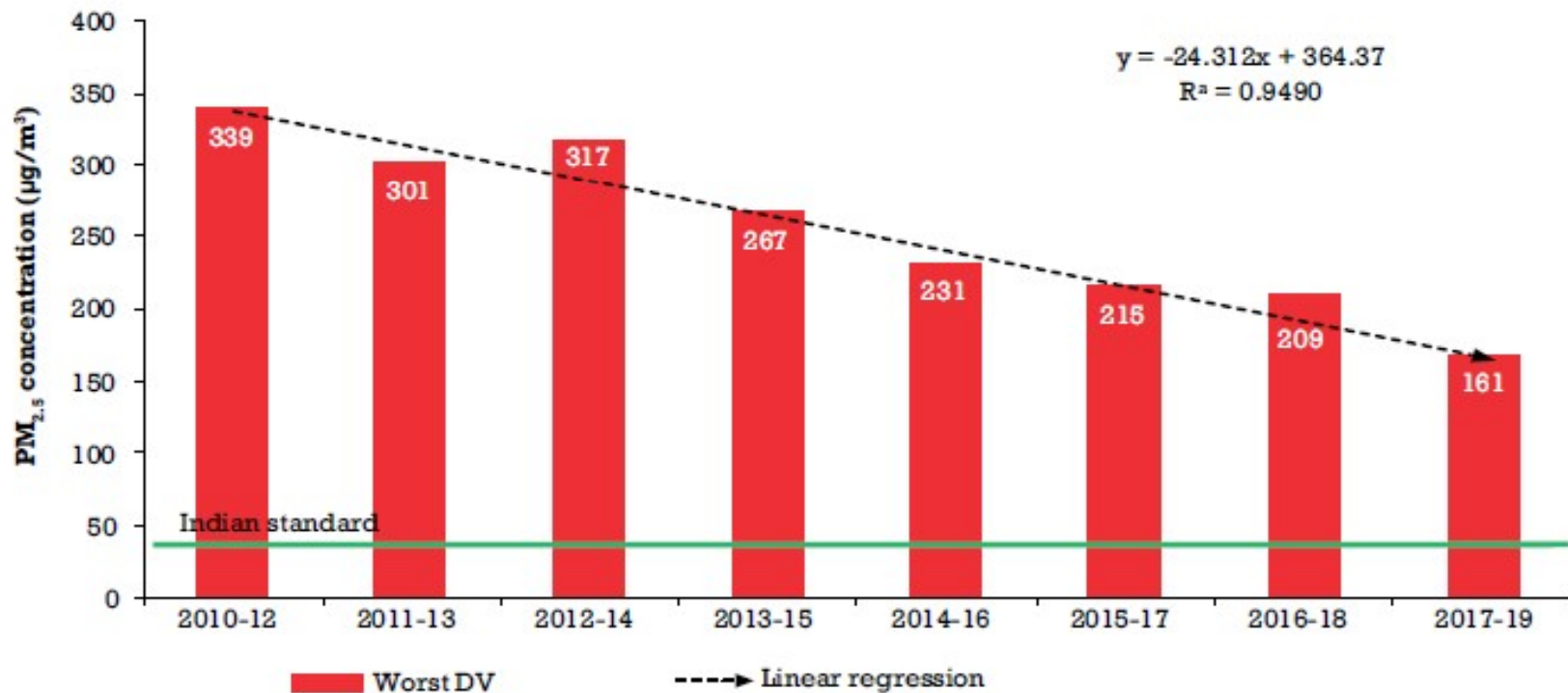## (Based on three-year rolling average)

Graph 2: Trends in PM$_{2.5}$ concentrations in the five oldest stations

Values shown on Average DV (red line): 182, 177, 186, 165, 149, 147, 38, 123

Y-axis: PM$_{2.5}$ concentration ($\mu g/m^3$) — 0, 50, 100, 150, 200, 250, 300, 350, 400

X-axis: 2010-12, 2011-13, 2012-14, 2013-15, 2014-16, 2015-17, 2016-18, 2017-19

Legend: Average DV — Max DV — Min DV

The change based on worst monitoring location
Need another 75% cut to meet the standard
(Based on three-year rolling average)

Graph 3: Long-term PM$_{2.5}$ trends based on the worst station

$$y = -24.312x + 364.37$$
$$R^a = 0.9490$$

PM$_{2.5}$ concentration (µg/m³)

2010-12	2011-13	2012-14	2013-15	2014-16	2015-17	2016-18	2017-19
339	301	317	267	231	215	209	161

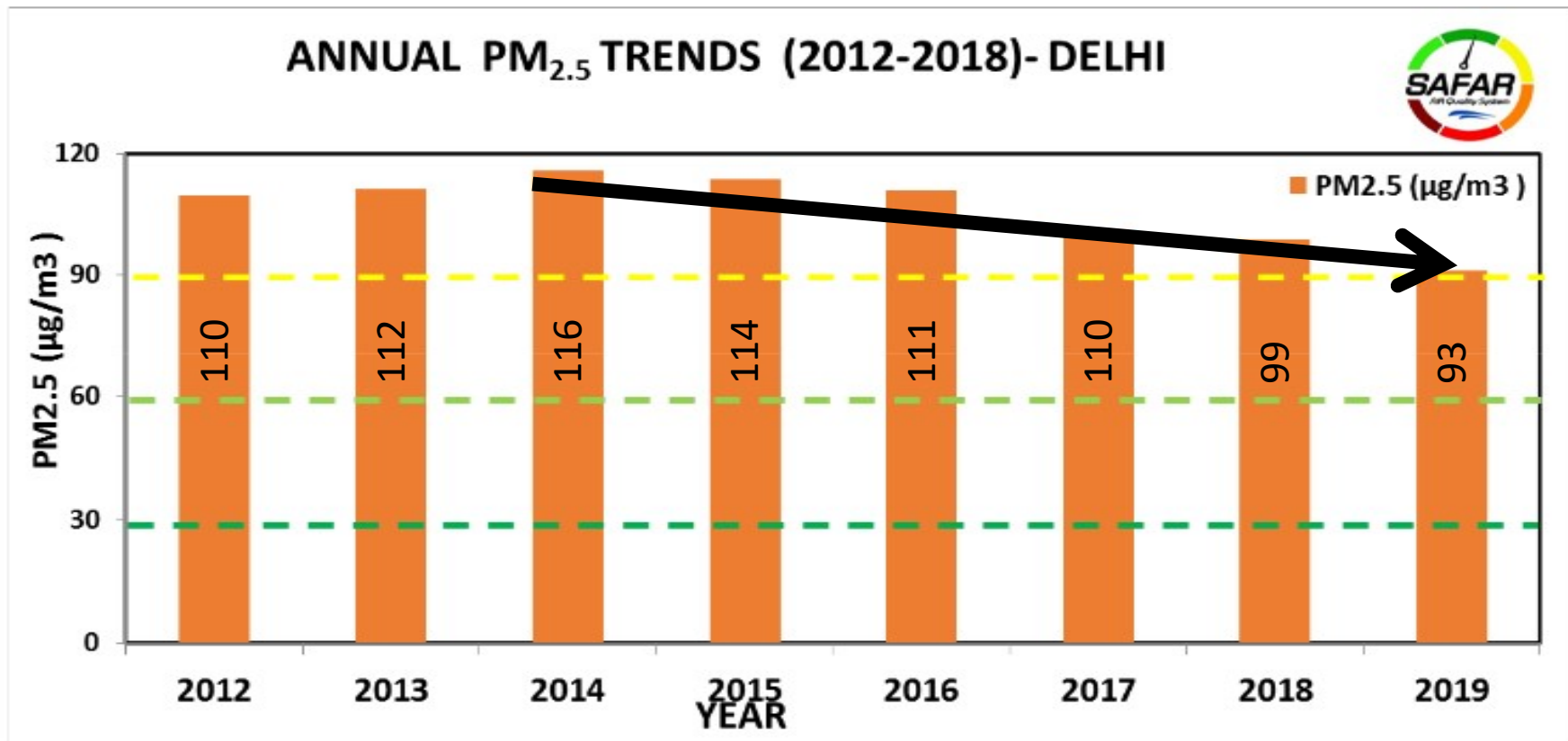Indian standard

Worst DV ----➤ Linear regression

Source: CSE analysis of CPCB real-time PM$_{2.5}$ data using the USEPA method

Change is certain:
SAFAR estimates based on realtime data from SAFAR stations
Annual PM2.5 levels have declined since 2014 - by

20%

ANNUAL PM$_{2.5}$ TRENDS (2012-2018)- DELHI

SAFAR
Air Quality System

PM2.5 (µg/m3)

Year	PM2.5
2012	110
2013	112
2014	116
2015	114
2016	111
2017	110
2018	99
2019	93

PM2.5 (µg/m3)

YEAR

Official estimate of decline based on realtime data (2016-18) MOEF&CC to Lok Sabha PM2.5 levels in Delhi have declined by
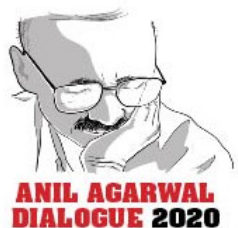
15%

Annual Average Values of CAAQMS Stations in Delhi		
Year	PM2.5 in $\mu g/m^3$	PM10 in $\mu g/m^3$
2016	135	291
2017	124	266
2018	115	243
Percentage Reduction in 2018 compare to 2016	14.8	16.5
Percentage Reduction in 2018 compare to 2017	7.3	8.6
Percentage Reduction in 2017 compare to 2016	8.1	8.6

# SAFAR: emissions reductions in key sectors of Delhi

DELHI EMISSIONS 2010 ➡ 2018

SOURCE SECTORS	PM2.5 (2018) Relative Share (%)	PM2.5 (2010) Relative Share (%)	GROWTH /DECLINE 2018 wrt 2010 (%)
Transport	41%	32%	+40% (Increase)
Industry	22.3%	17.3%	+48% (Increase)
Power	3.1%	3.0%	+16% (Increase)
Residential	5.7%	18.5%	-64% (Declined)
Re-suspended Dust	18.1%	27.8%	-26% (Declined)
Rest Others	11.7%	1.3%	NEW Sources
TOTAL (All Sectors) GROWTH in 2018 wrt 2010 (8 years) = **+15%**			
Ref.: Beig et al. (2018), SAFAR-Technical Report, MoES.			

People's perception vs results

Rapid citizen's perception survey
Is there a change in pollution trend?

0%

22% Improving

25% No change

53% Worsening
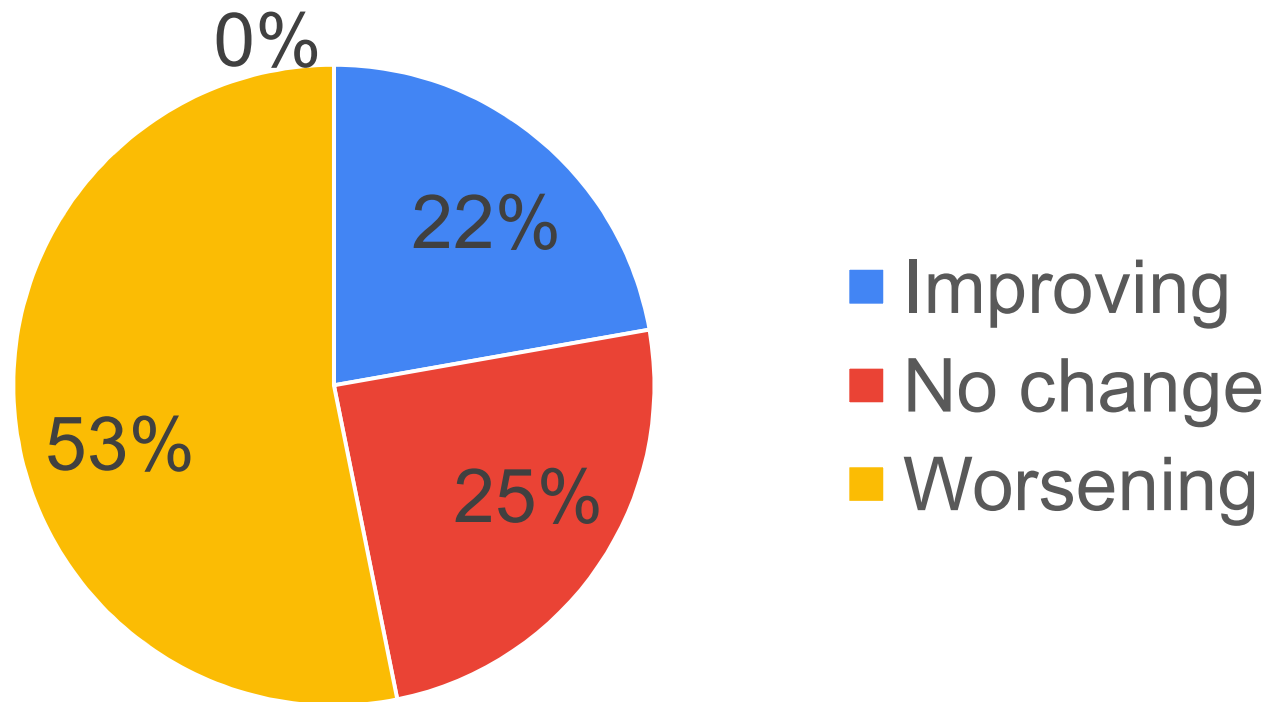
Factors influencing perception in order of importance:
1. Smog episodes during winter months – especially this winter
2. Media reportage
3. Limited mention of reported data

Citizen's perception of severe winter pollution aligns; but not perception of annual trends

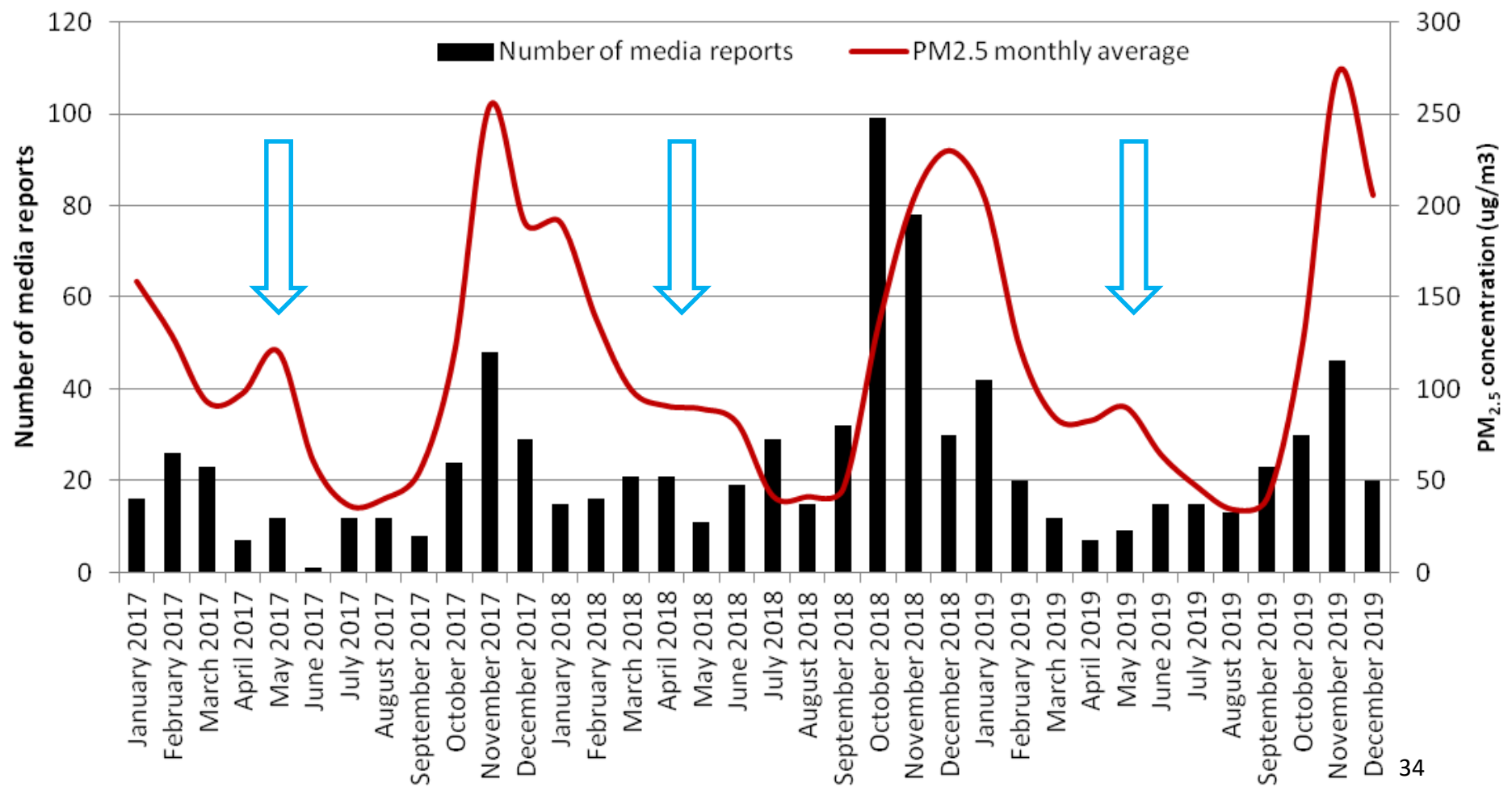Graph 4: Classification of 24-hour PM$_{2.5}$ average based on AQI
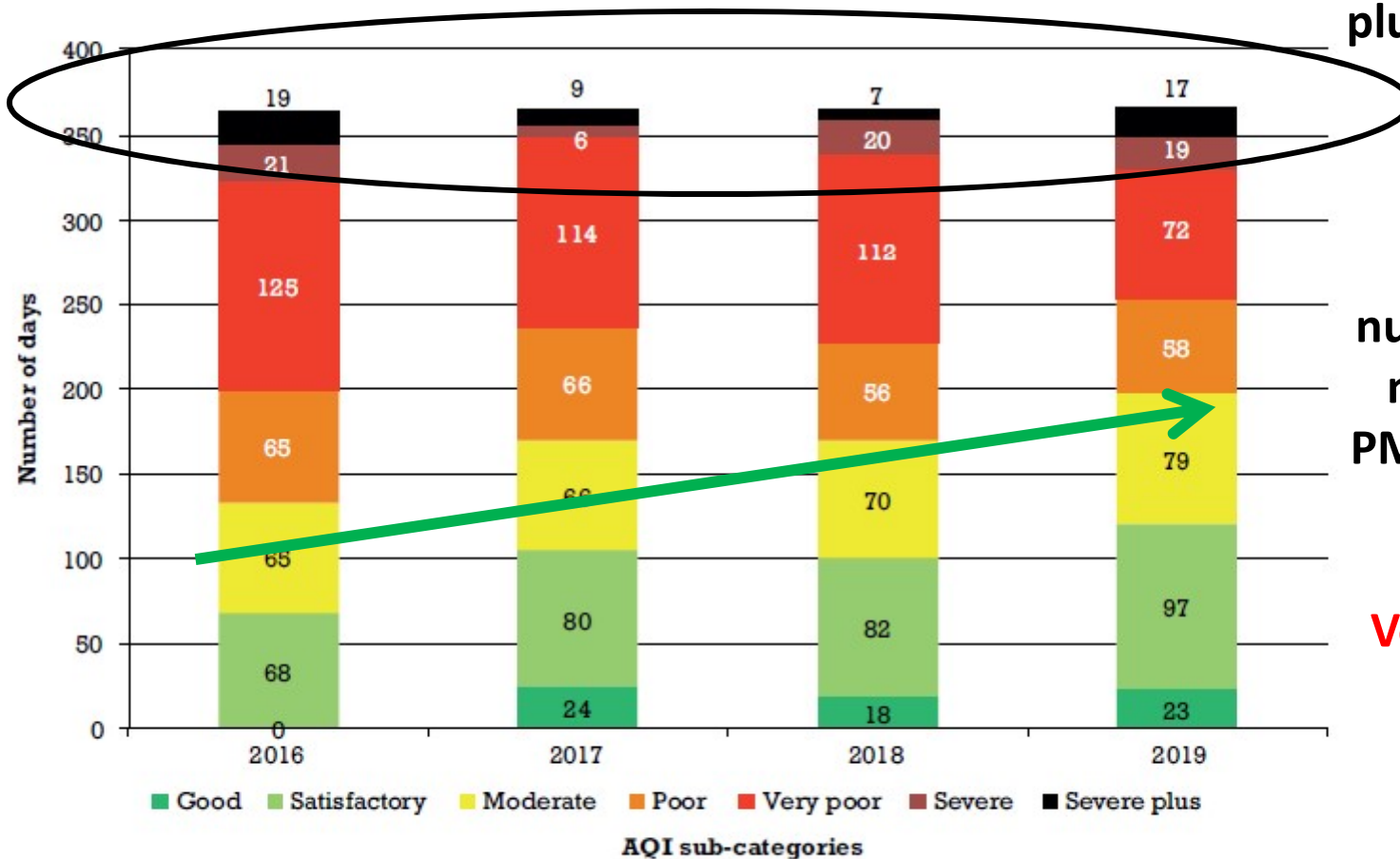
severe and sever plus days nearly constant

Almost **50% increase** in number of days meeting 24-hr PM2.5 standard
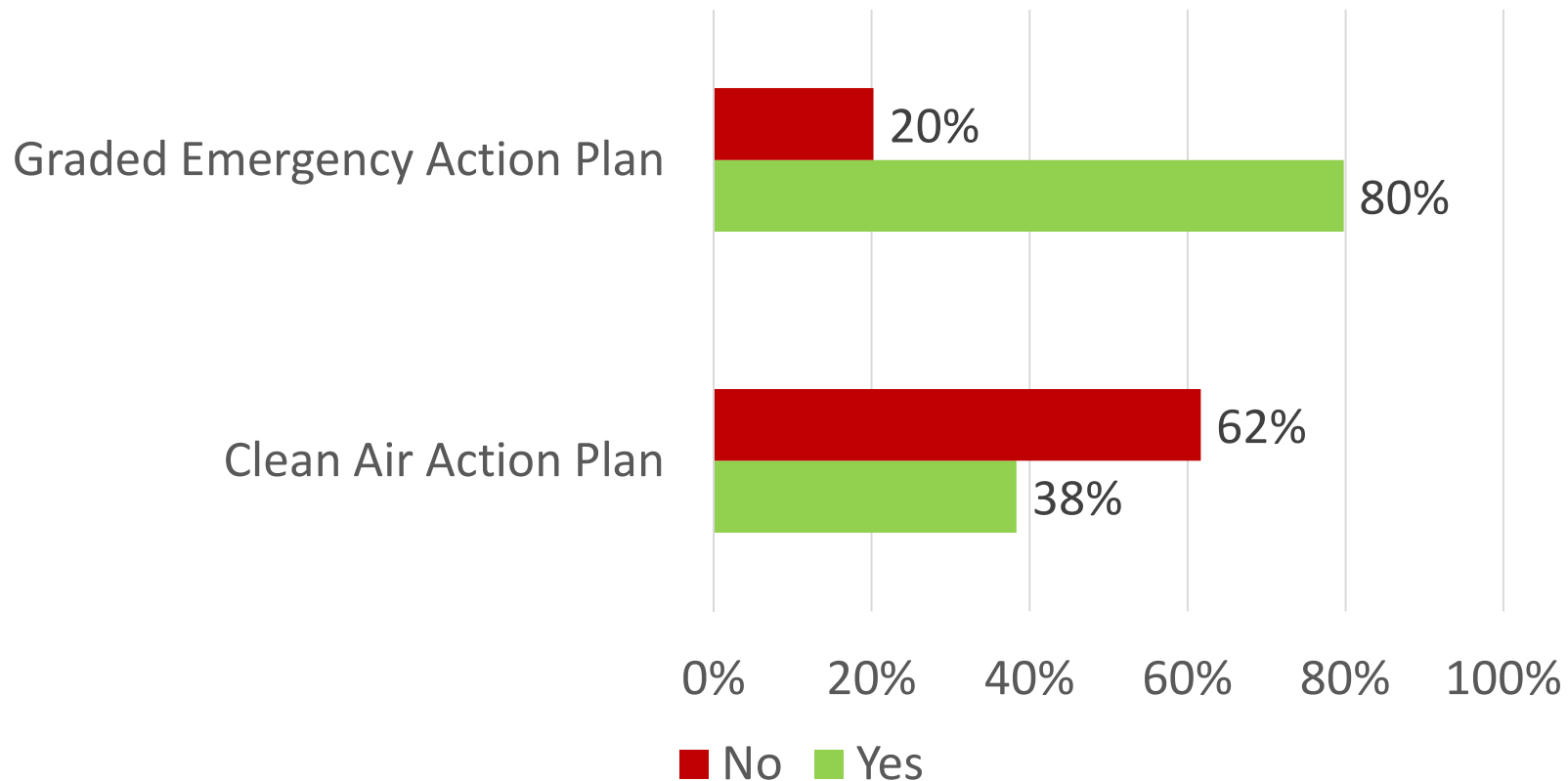
Number of **Very poor days declined**

Source: CSE analysis based on real-time data from CPCB online portal

Media attention to air pollution aligns with pollution levels

Are people aware of action in Delhi?

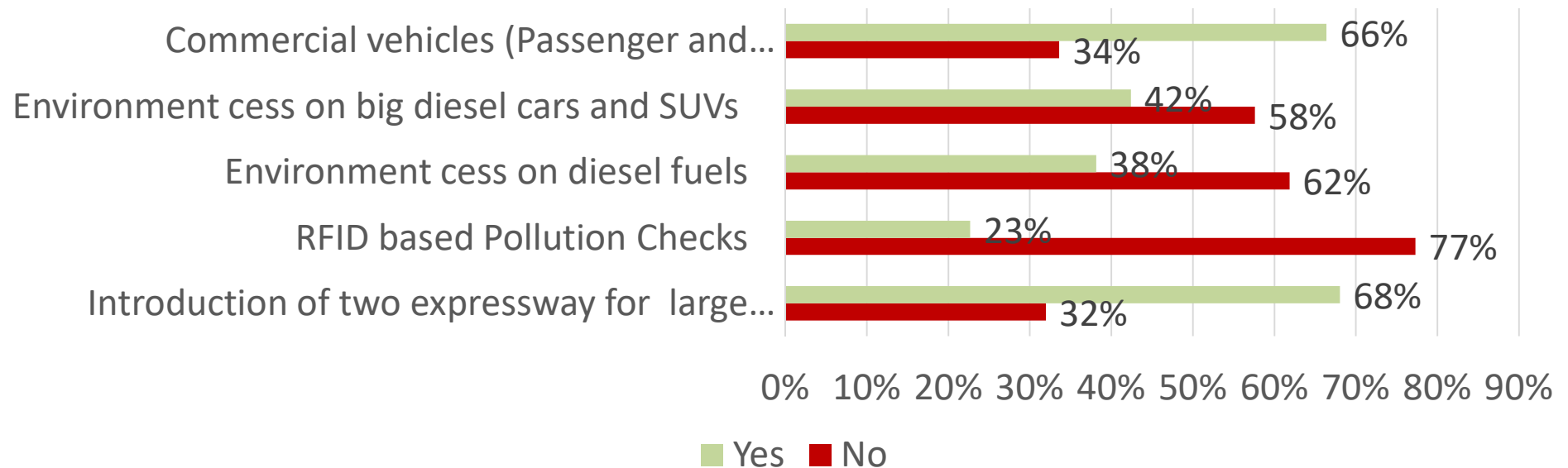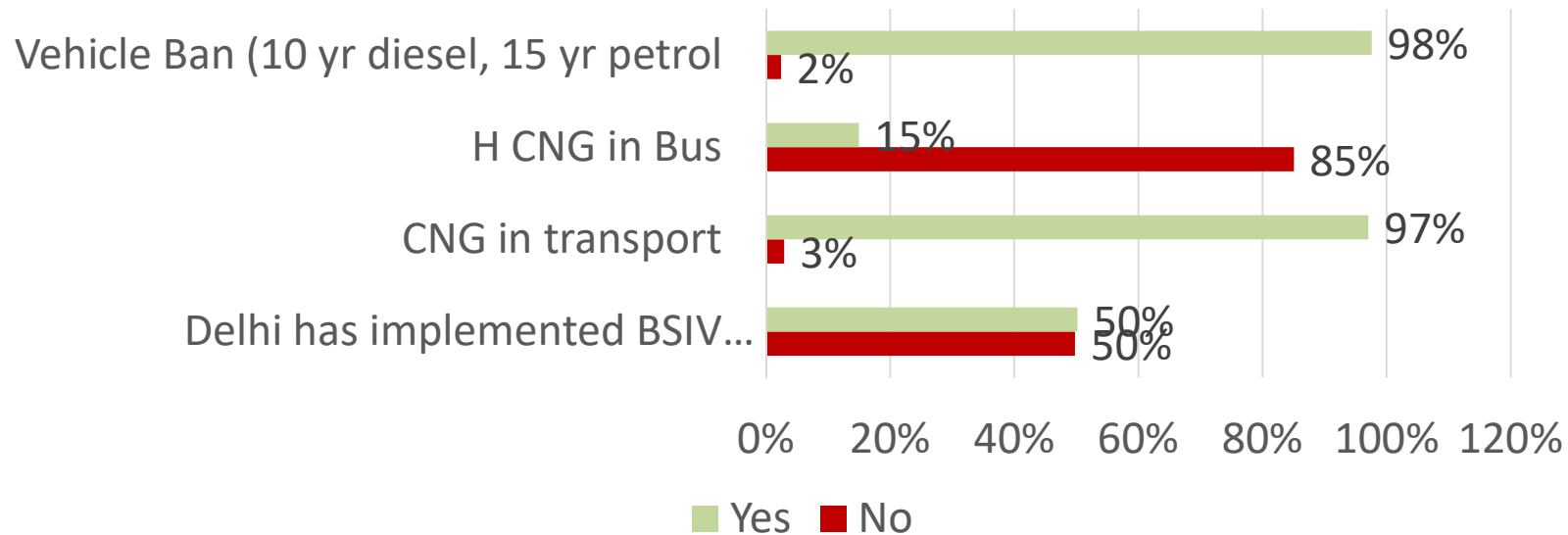# Does Delhi have "Clean Air Action Plan" and "Graded Response Action Plan (GRAP)"

Graded Emergency Action Plan

- No: 20%
- Yes: 80%

Clean Air Action Plan

- No: 62%
- Yes: 38%

0% 20% 40% 60% 80% 100%

■ No ■ Yes

More awareness about short term action

Action on vehicular pollution

Chart 1 (Yes/No):

Action	Yes	No
Vehicle Ban (10 yr diesel, 15 yr petrol	98%	2%
H CNG in Bus	15%	85%
CNG in transport	97%	3%
Delhi has implemented BSIV…	50%	50%

Chart 2 (Yes/No):

Action	Yes	No
Commercial vehicles (Passenger and…	66%	34%
Environment cess on big diesel cars and SUVs	42%	58%
Environment cess on diesel fuels	38%	62%
RFID based Pollution Checks	23%	77%
Introduction of two expressway for large…	68%	32%

Industry and Power plant

Transport Contd....

	Yes	No
Pedestrianisation of...	25%	75%
Notification of Parkng rules...	34%	66%
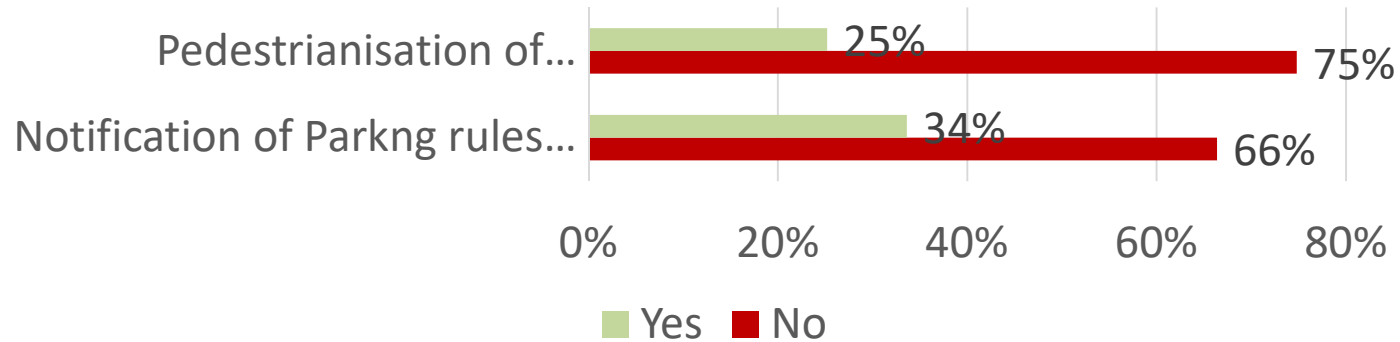
INDUSTRIAL AND POWER PLANT EMISSIONS

	Yes	No
Delhi has shut down coal based power...	41%	59%
Approved Fuel Notified and Dirty Fuel...	65%	35%
Expansion of natural gas in industry	29%	71%
Big polluting industries taken out of the...	72%	28%
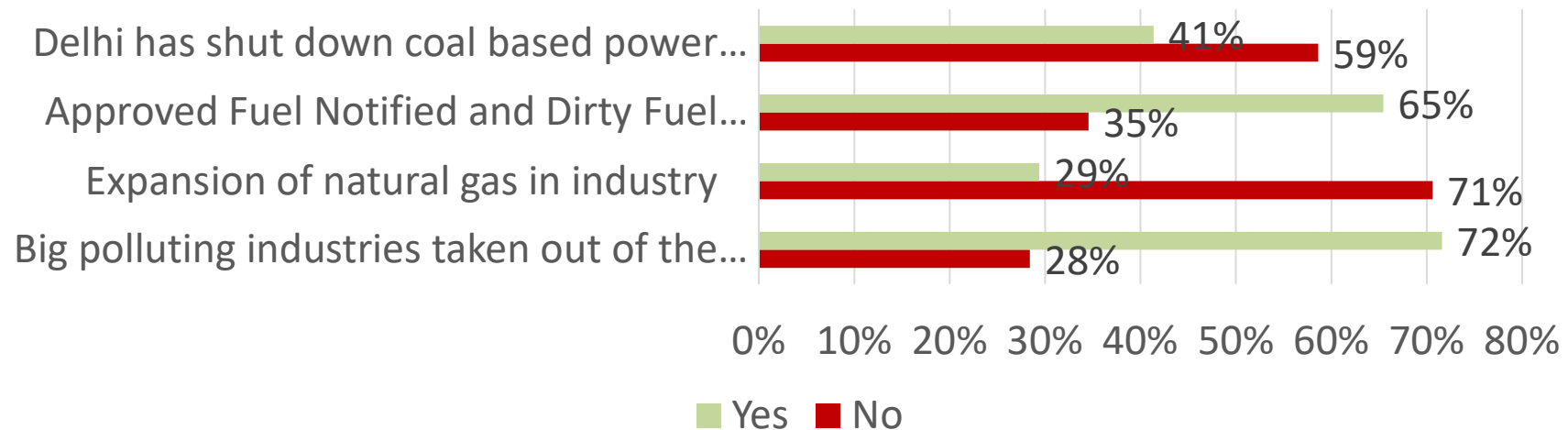
One year after NCAP:

To achieve 30% reduction in particulate pollution by 2024, 122 cities need to report at least 6% cut annually for five years

Lesson from Delhi: Needed decade long change to cut pollution by about 20-25%

What more will Delhi do? Can we even guage the scale of action needed?

Action across sectors

-- Air quality management and monitoring strategies

-- Industry

-- Power plants

-- Vehicle and transportation strategies

-- Open burning

-- Construction activities

-- Diesel Generator Sets

-- Solid fuel burning (cooking and open eateries)

-- Road dust

-- Greening

Air quality monitoring and assessment

Delhi: Status of air quality monitoring

Delhi: 38 real time monitoring stations, daily AQI reporting

Forecasting system in place for emergency action

Source assessment done

Need scale across NCR

National: What more needs to be done

- Expansion of air quality monitoring grid (including rural monitoring)

- National Air Quality Index (AQI) for public information system

- SOP for source apportionment and emission inventory studies

- Satellite monitoring

- Need method to establish air quality trends and compliance with national ambient air quality standards or NCAP targets

Action on industry

❖ **Delhi**
- **Approved fuel notification** (29.06.2018) lists clean fuels that can used
- **Bans dirty fuels of coal, petcoke, furnace oil**, -- Petcoke and furnace oil banned in 4 states. November 17, 2017, Petcoke import also being restricted.
- **SOx and NOx standards for industry**: SC order of May 2, 2017, directed NOx and SOx standards for 34 groups of industries. MoEF&CC and CPCB issued Notification on January 29, 2018, for 16 groups of industries. Needs implementation
- **Expansion of piped natural gas (PNG) network to industrial places in Delhi**. Out of 1467 units 1150 moved to gas. Incentives given to move to gas and removing tax on gas.
- **50% of brick kilns in NCR moved to zigzag technology**
- **Challenge:** Small scale units, unauthorised units, access to clean fuels etc

National
- National CEPI programme being reformed; CAP detailing pollution action on stack emissions, fugitive emissions, load based management, Fuel change in small scale industry;
- CPCB's 2017 notification on improved kiln for brick kilns
- Smart monitoring of industries etc. Need implementation

Challenge of enforcement

CAG review of several SPCBs show several challenges:

- Failure to take action against polluting industrial units
- No database on pollution sources and pollution load in the state
- No mechanism to monitor validity period of consent and operation
- Consent for establishment and operations to highly polluting industries without mandatory inspections – even to red and orange categories
- "Ease of doing business" policy subvert environmental governance: Automatic consent is supposed to prevent halting of industrial operations – inspection and audit not carried out for deemed consent
- Weak inspection: Massive shortfall in number of inspection (could range from 41 to 49%). This weakens enforcement
- Action on approved fuels very weak
- Not exercising available powers

Pollution hotspots in Delhi
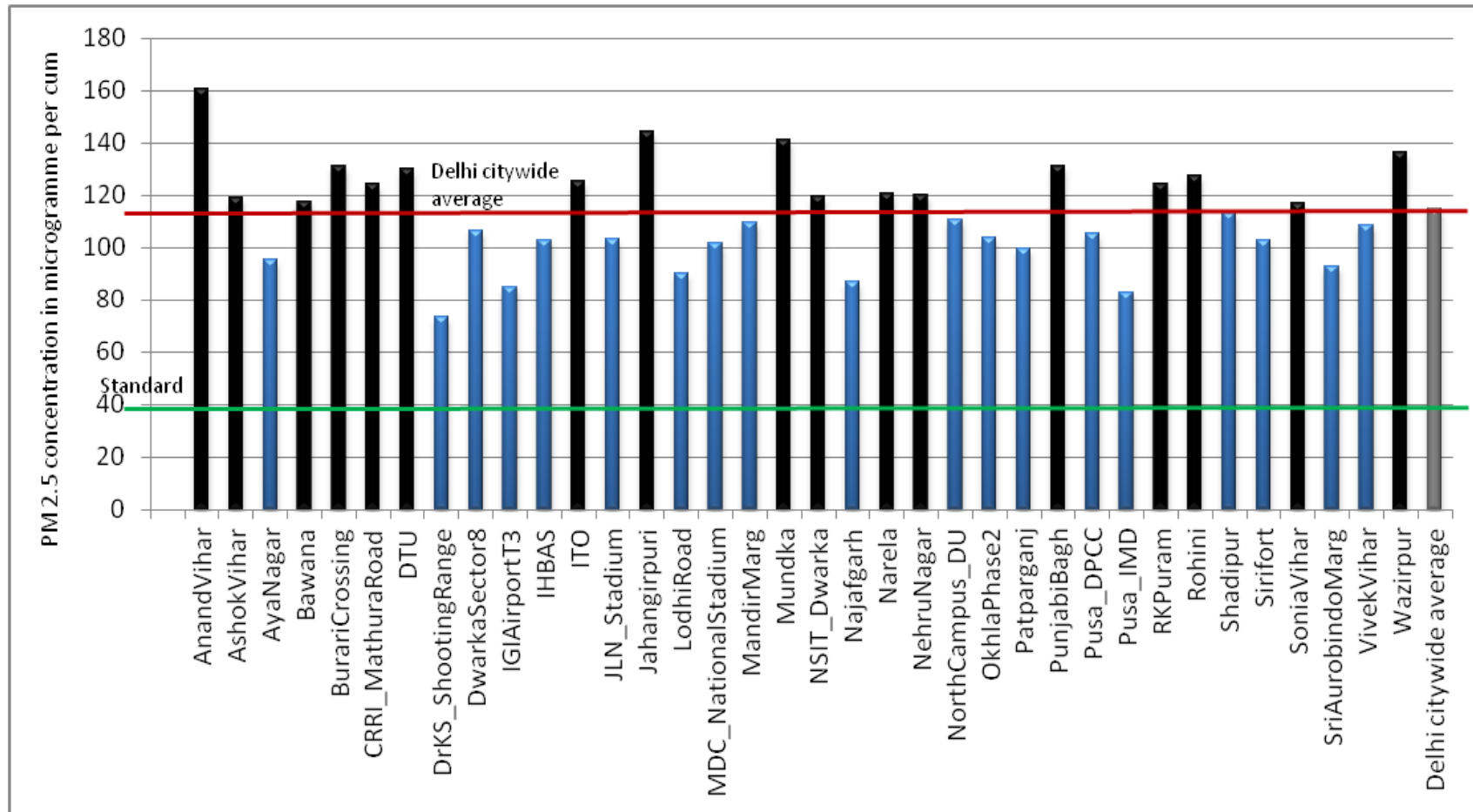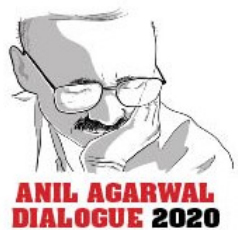
Delhi: Seeking local solutions

Mundka Plastic recycling plants: massive plastic burning
Immediate action to link with controlled incineration

Industrial pollution control

- **Kolkata**: Boiler standard tightened eight times; industries converted coal fired boilers and ceramic kilns to oil or gas fired; State reimbursed 50% cost of conversion. About two third of coal fired boilers and coal fired ceramic kilns converted in small-scale units reduced emission by 98%.

   Free distribution of LPG to open eateries to replace stoves on solid fuels

- **Bhiwadi and Alwar Panipat:** Agro based boilers reducing SOx, NOx emissions.

- **Jhajjar China Light and Power Plant, :** Low NOx burner, full fly ash utilisation, compact plant, FGD installed, also plans to use *parali*

- **Patna:** Almost 80% brick kilns adopted cleaner kiln technology with much lower emission levels

- **State of the art coal handling technology in Maharashtra: (**TATA Power etc)

Power plant

❖ **Delhi:**

Shut down all coal power plants
- Indraprastha (405MW): Closed in September 2009
- Rajghat (135 MW): Closed in May 2015
- Badarpur thermal power station (705MW): Closed in October 2018
- **Total generation capacity of 1245MW shut down**
- Flyash utilization initiative underway including ecopark on flyash yard.
- **Natural gas made available for Bawana power plant**

❖ **NCR and National**
- Comply with the new power plant standards by 20202; earlier in NCR
- Effective penal action for non-compliance
- Retire old plants
- Fly ash management
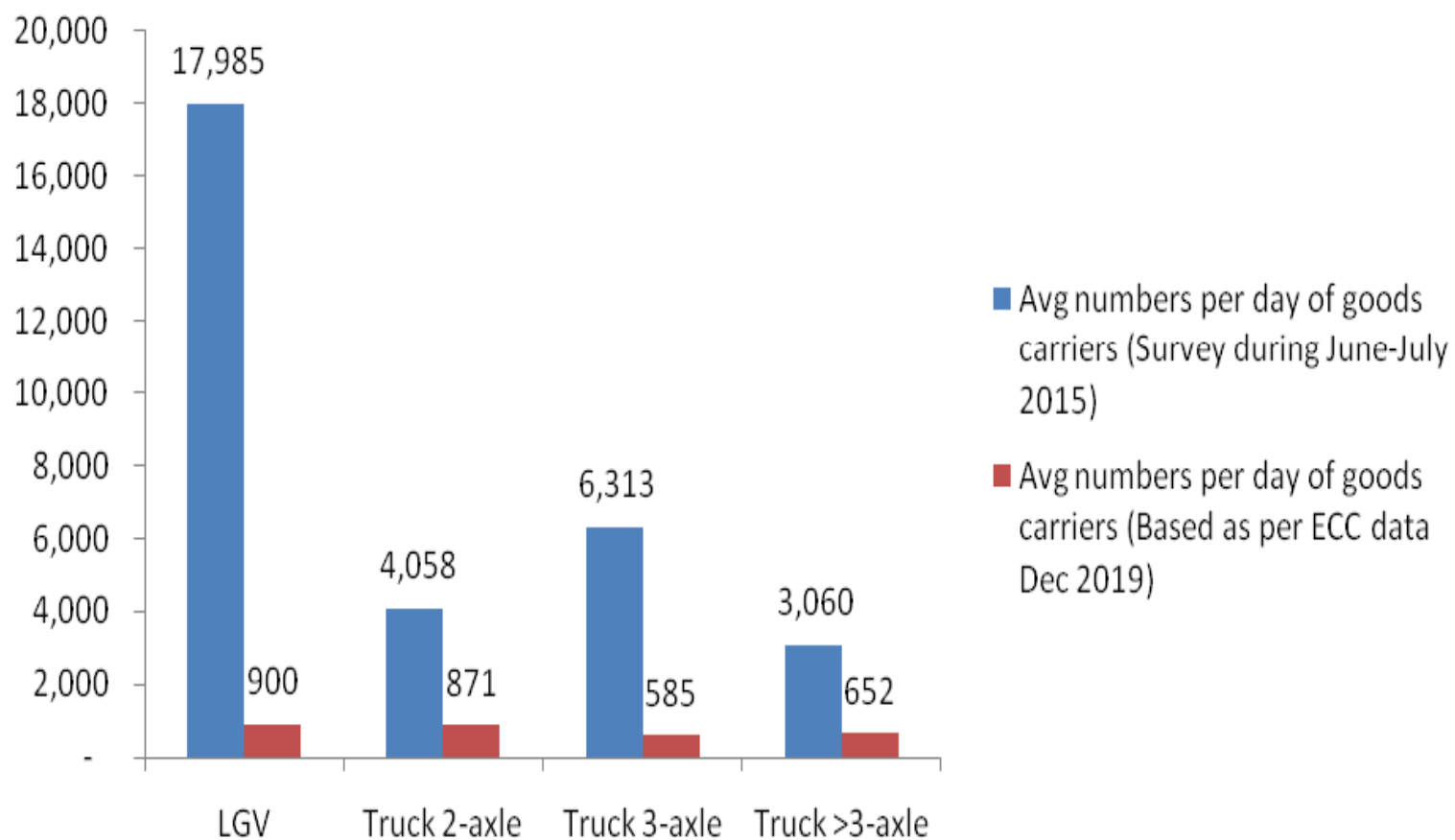- Transition to clean fuels – address fuel pricing

Vehicular emissions

❖ **Vehicular emissions**
- **CNG** for public transport expanded
- **BS VI fuels** with 10 ppm sulphur introduced in 2018
- **Old vehicles ban:** 10 year old diesel & 15 year-old petrol vehicles banned
- **Favourable taxation for clean fuel** introduced; also expansion of CNG stations. About 500 CNG stations have been opened
- **EPC on big diesel cars and SUVs** (more than 2000 cc). Diesel cars sales dropped
- **Pilot on Hydrogen-CNG buses** (CNG with 18 per cent Hydrogen blend)
- **Pilot on remote sensing technology** for on-road emissions monitoring **Enforcement of PUC improved across NCR.**
- **Installation of stage I and Stage II vapour recovery system** expanded. Environmental compensation of Rs 1 crore imposed on oil companies: IOCL, HPCL and BPCL for non-compliance with directions on vapour recovery
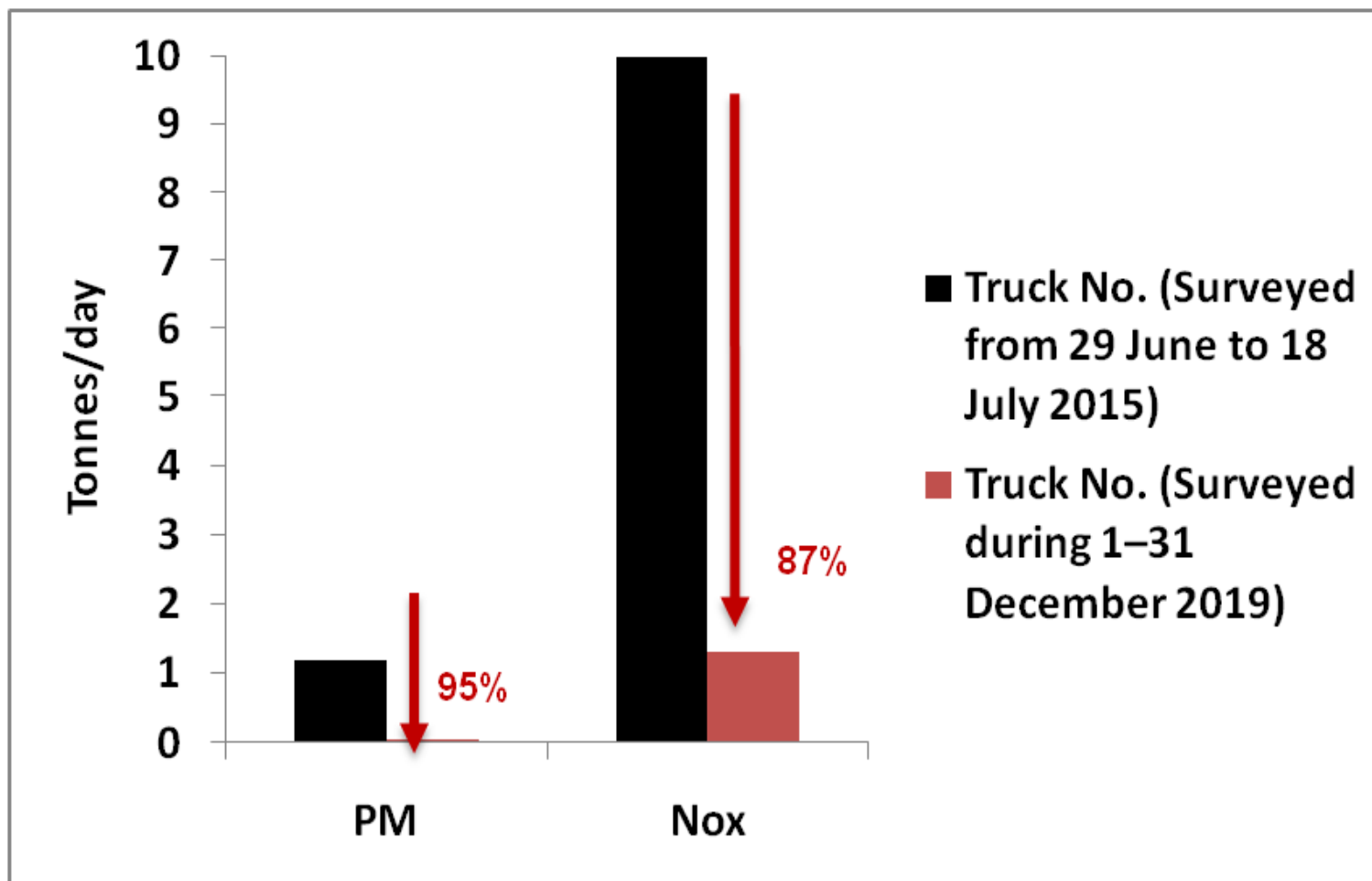
❖ **Trucks**
- **EPE-WPE,** 60,000 trucks have been diverted from Delhi.
- **ECC** (2015) on - to deter non destined trucks
- **Restriction on entry of 10 year old trucks**
- **Introduction of RFID at 13 entry points for cashless payment**

Impact on truck numbers

Chart legend:
- Avg numbers per day of goods carriers (Survey during June-July 2015)
- Avg numbers per day of goods carriers (Based as per ECC data Dec 2019)

Category	Survey June-July 2015	ECC data Dec 2019
LGV	17,985	900
Truck 2-axle	4,058	871
Truck 3-axle	6,313	585
Truck >3-axle	3,060	652

Impact of action on pollution load

Legend:
- ■ Truck No. (Surveyed from 29 June to 18 July 2015)
- ■ Truck No. (Surveyed during 1–31 December 2019)

Chart: Y-axis "Tonnes/day" (0 to 10). X-axis categories: PM, Nox. PM shows 95% reduction; Nox shows 87% reduction.
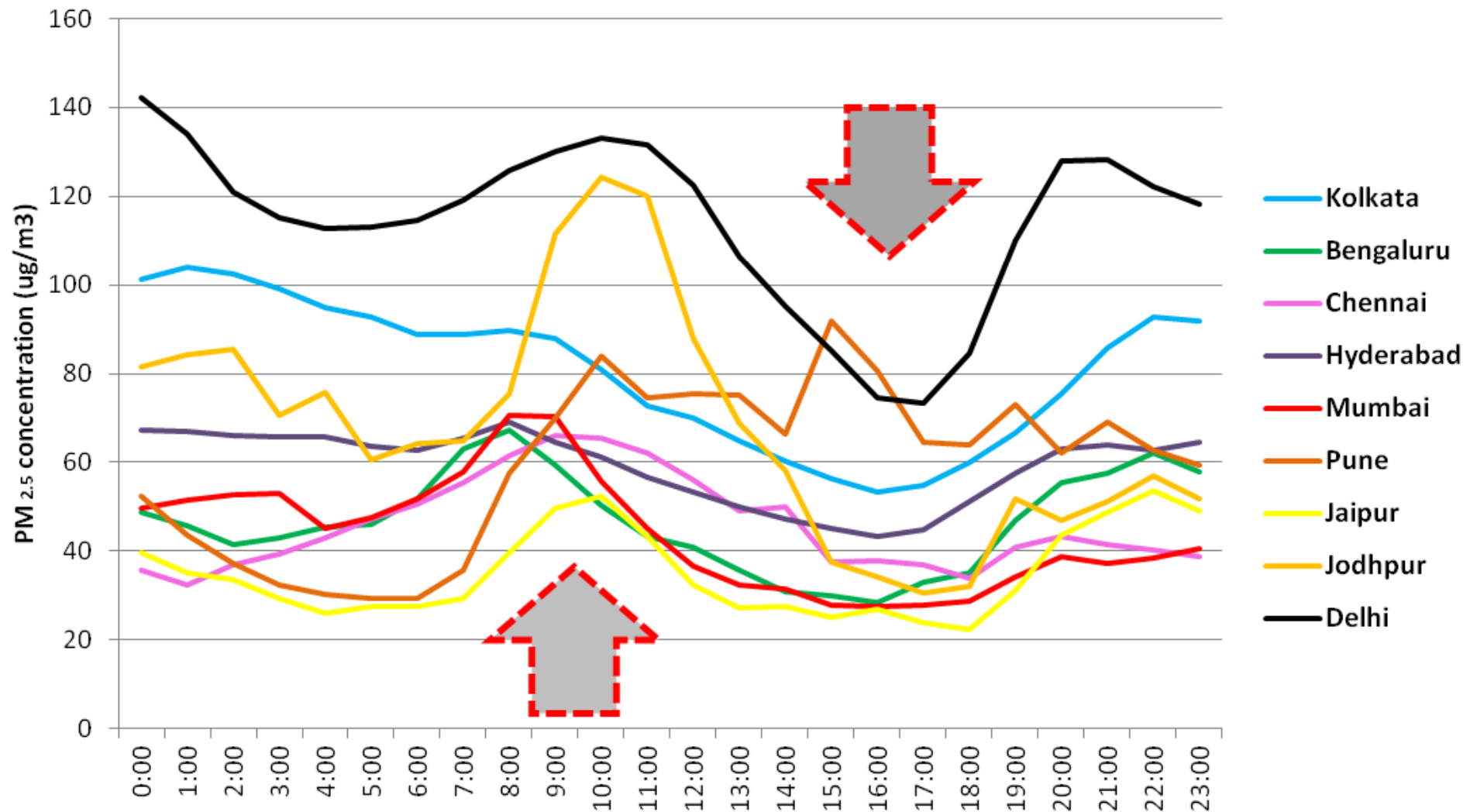
Remote sensing monitoring in Kolkata

Delhi: ICAT pilot; MORTH-ARAI to develop guidelines
To develop threshold limit to pull out gross polluters
How to use this for compliance

Source: CSE field visit

Big gap: Mobility transition
Hourly pollution pattern follows traffic pattern irrespective of the city

Average weekday (27-31 January, 2020)

Public transport: The big gap

❖ **Public Transport**

- **Average daily ridership of DTC buses- initially stagnated and then increased by** two lakhs compared to 2016-17. The average ridership of DTC buses is 42.03 lakh.
- **Ridership in the metro increased** from 1259000 in 2010-11 to 2708376 in 2018-19. **The operational route has increased** from 165.5 km in 2010-11 to 373 km in 2018-19; Rolling stock has increased from 844 in 2010-11 to 2194 in 2018-19.

Vehicle restraint
- Parking policy as a demand management tool has been notified.
- Pilot schemes on parking area management plans initiated.
- Multi-modal integration plan for 70 stations
- Street pedestrianisation started (Ajmal Khan etc)
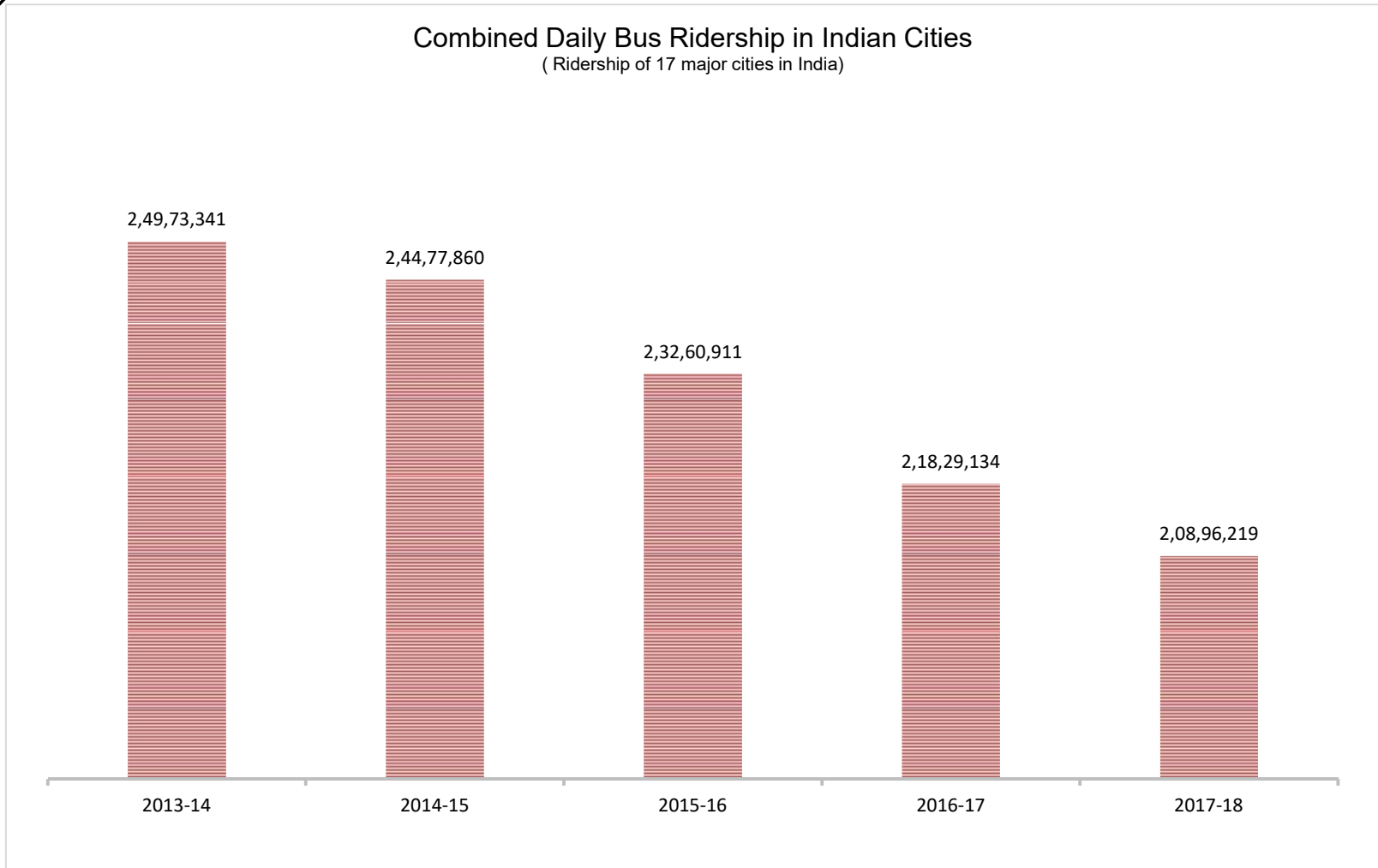
Move towards pedestrianisation

Car-free Ajmal Khan Rd of Delhi: Exposure to PM2.5 on nearby heavy traffic) road 35% higher than pedestrian street
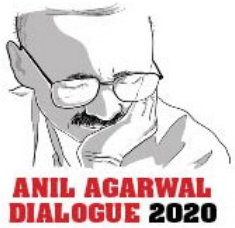
Spurs decision to pedestrianise 22 commercial streets/areas in Delhi

How will other cities augment public transport ridership?
CSE investigates falling bus ridership in 17 cities

Combined Daily Bus Ridership in Indian Cities
(Ridership of 17 major cities in India)

Year	Ridership
2013-14	2,49,73,341
2014-15	2,44,77,860
2015-16	2,32,60,911
2016-17	2,18,29,134
2017-18	2,08,96,219

(source: CSE/RTI)

Sign of schange only in a few cities

Bus reforms

- **Bhubaeswar**: Bus reforms, One - single unified web-portal for the city including the transit information.Smart Janpath - 5 km road network of Complete Street Principle.Public Bicycle Sharing System

- **Hubli-Dharwad** BRT, Hubli-Dharwad,) – 2018

- ✓ **Amritsar** BRT, Amritsar, Punjab – 201

  Kolkata: Largest EV bus fleet

  Pune Mahanagar Parivahan Mahamandal Limited, Pune, Maharashtra

- ✓ **Himachal** Road Transport Corporation (HRTC) – EV buses

- **Guwahati** first in NE to operate EV: first NE state to operate EV bus.

- NMRCL - Bus Services, Noida, Uttar Pradesh - Jan' 2019

Intelligent Public Transit System (IPTS):

Sitilink, Surat, Gujarat (Fare integration among BRT and City Buses)

Traffic Management: Hyderabad, Telangana for Hyderabad Traffic Integrated Management System (H-TRIMS)

Parking as a restraint measures in other cities

Kolkata: Demand management strategies: Restricted legal on-street

Punjab Public Parking Policy (2017): All municipal towns of Punjab. For Municipal Corporation Towns Of Punjab Government Of Punjab (Department Of Local Government)

Restricted parking provision, Aizwal, 2019:

Proof of Parking, 2010, Sikkim and Mizoram, Rajasthan cities

National action: Vehicles

Vehicle technology

- BS-VI norms from April 2020
- PUC revised norms –
- Faster Adoption and Manufacturing of Electric Vehicles in India (FAME-II) scheme to be implemented over a period of three years, with effect from April 1, 2019.

Public transport

- Reform based funding for public transport – Funding for electric buses for selected cities; Metro funding linked to reforms
- Transit oriented development policy
- No strategy for smaller towns

Waste burning

Big gap in action

- Solid Waste Management Rules and Regulations 2016 notified
- Delhi byelaws amended based on these rules and notified in January 2017. To be implemented
- The city has over 2,300 waste dumps.
- The status of segregation in the city is not more than 10 per cent and is restricted to a few institutions and colonies only. 12 wards from different MCDs in Delhi have been selected as model wards. To prevent littering 6,000 roadside twin bins have been procured.

- **Need immediate steps to strengthen action on waste**
- **Challenge of developments outside municipal governance**

Construction and demolition waste and constructuoin dust

- **Checklist for dust control at construction sites**. According to the latest Economic Survey, DPCC has since January 2018, has imposed fine to the tune of Rs 3,55,50,000 in respect to dust control. Fines on construction projects who have taken environmental clearance (for built up area more than 20,000 sq meter).
- **The Construction and Demolition Waste Management Rules, 2016 notified and BIS rules modified in 2014 to allow use of recycled C&D waste in building construction**
- **Environmental compensation of Rs 1 crore has been imposed on Municipal bodies** (New Delhi, South, East, North and Cantonment Board) over open dumping/ burning of garbage and C&D waste vide directions dated January 16, 2019
- **City has expanded recycling capacity of it's C&D waste recycling** plant at Burari from 500 MTD to 2,000 MTD.
- **City has also added two more recycling plants to combined capacity** of 650 MTD
- There are 60 mechanized road sweeping machines in Delhi

Implementation – a big challenge
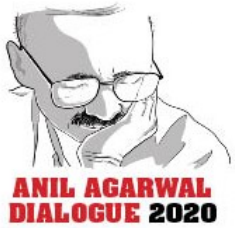
Desperate measures during winter

October 12, 2018 to March 15, 2019 - Very Poor category action implemented

- Badarpur coal power plant closed (Now permanently)
- Diesel generator sets not allowed
- Industrial units on coal and biomass shut; Brick kilns shut

November 1-12, 2018

- Ban on construction activities, hot mix plants and stone crushers

November 4-12, 2018

- Industries using coal and biomass as fuel shut
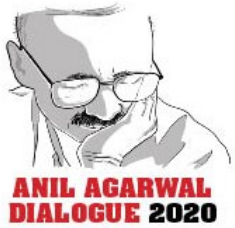
November 8-12, 2018

- Truck entry ban

December 24-26: Emergency action

- Industries closed in hotspots
- Construction ban
- Enforcement on waste burning and construction (enforcement challenges)

January 4-5, 2019

- Truck entry ban

Strengthen national action area sources

Waste

- **Solid waste management**: **Notifications for management of six wastes streams** -- solid waste, plastic waste, e-waste, bio-medical waste, C&D waste and hazardous wastes issued in 2016.

- Notifications for dust mitigation measures during construction and demolition activities.

Clean household fuels

- Pradhan Mantri Ujjwala Yojana launched in 2016, under this scheme LPG connections given to BPL families

Stubble burning

- Central Sector Scheme on 'Promotion of Agricultural Mechanization for in-situ management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi' 2018-19 and 2019-20
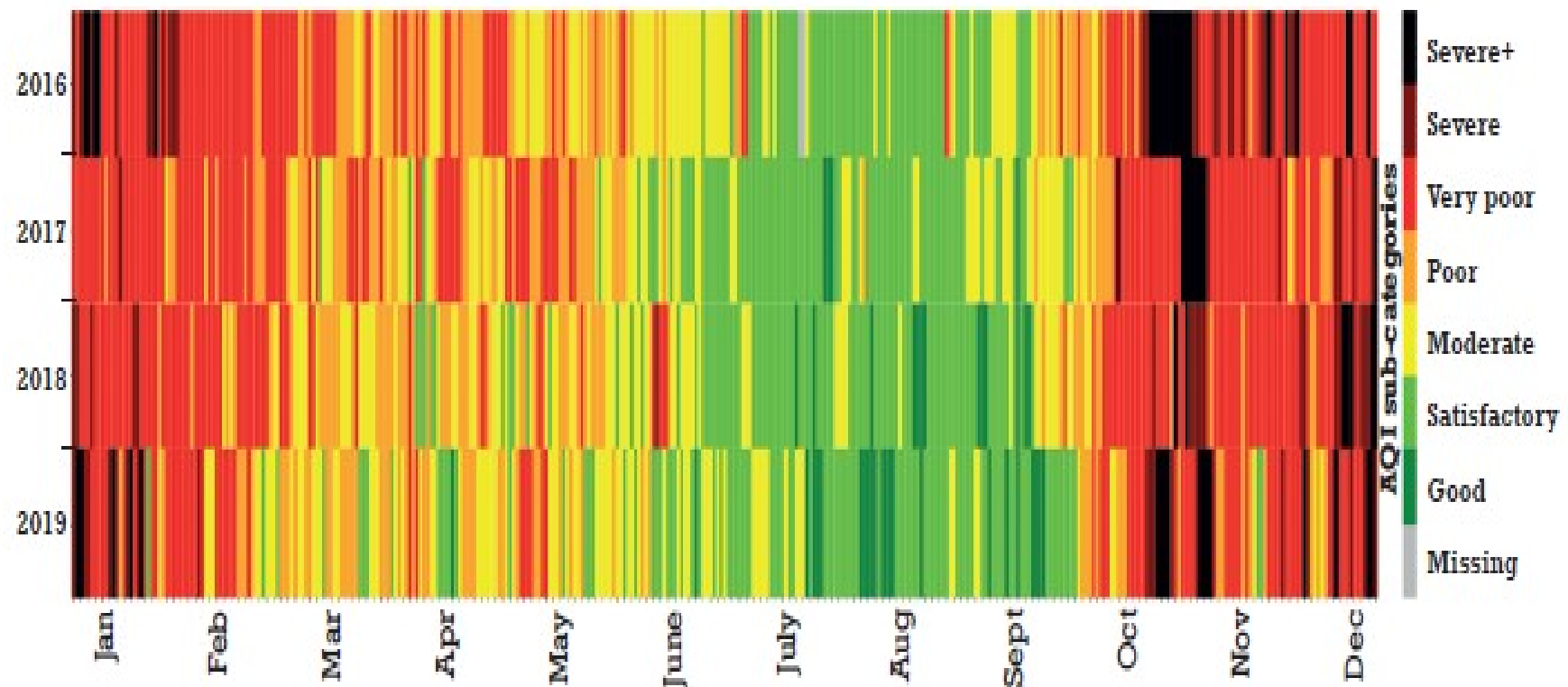
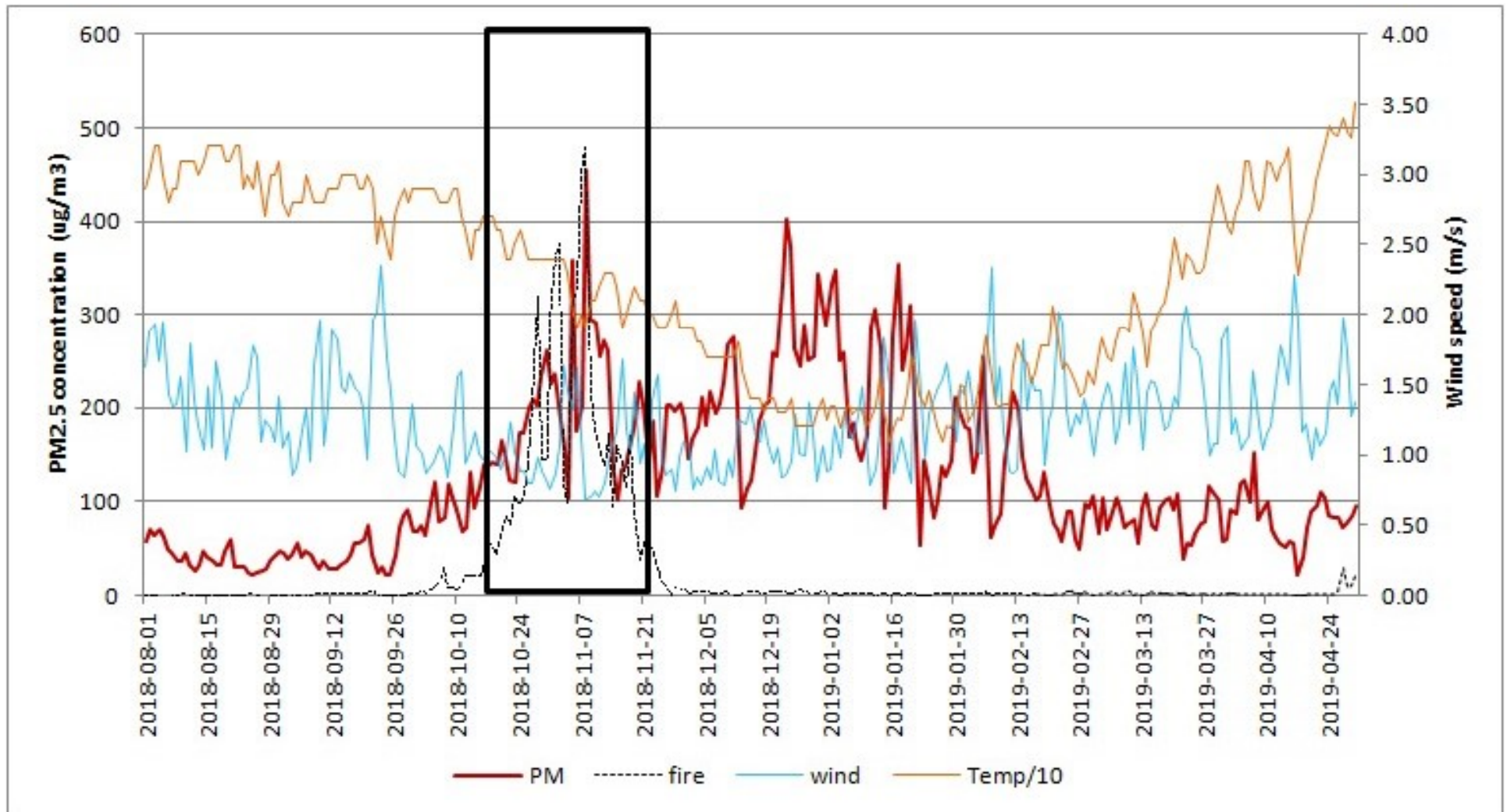# Towards regional air pollution control
Why Delhi will not see clean winter?

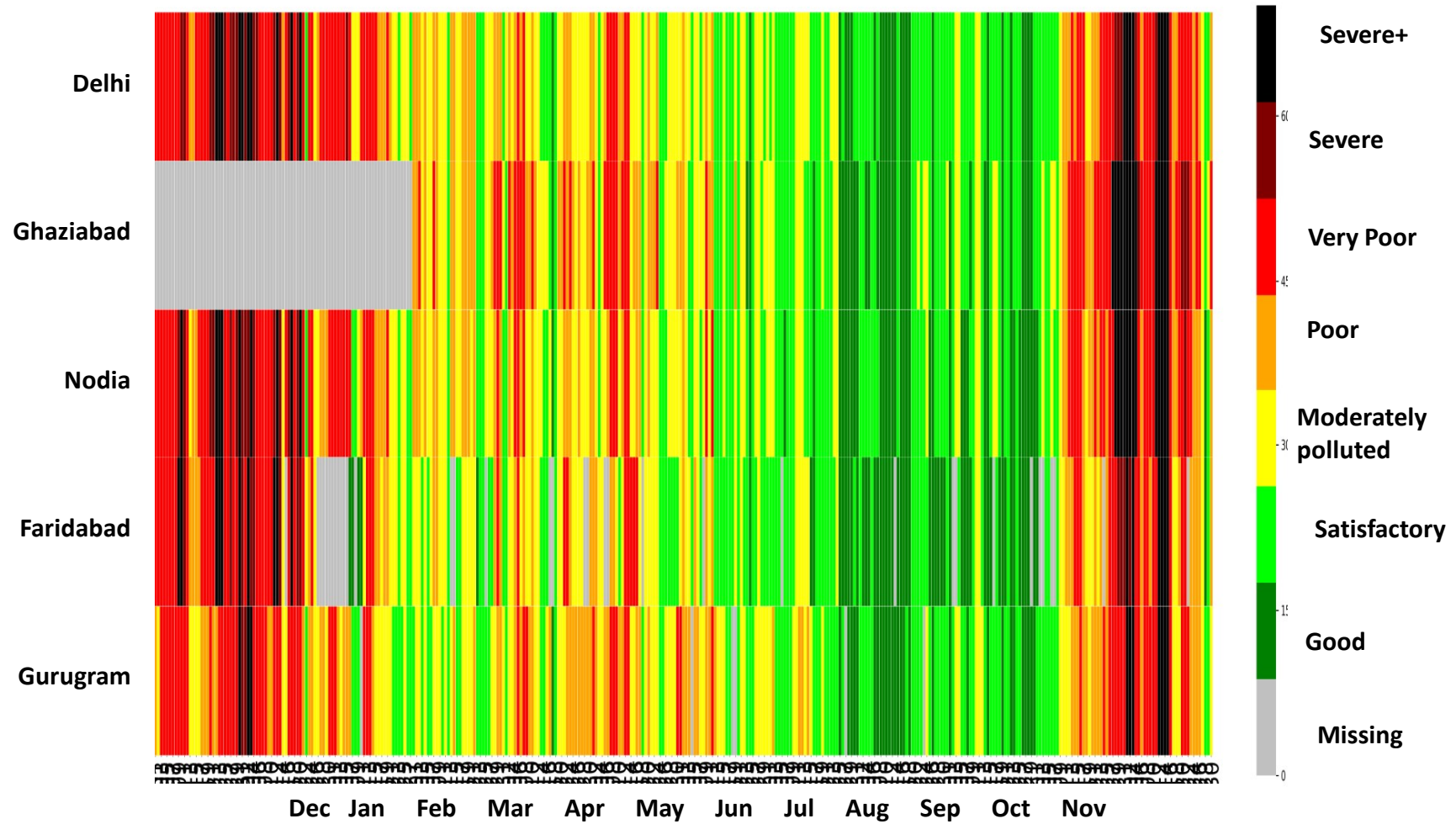# Graph 5: Heat map of pollution—annual trends in daily PM$_{2.5}$ levels

Source: CSE analysis based on real-time data from CPCB online portal
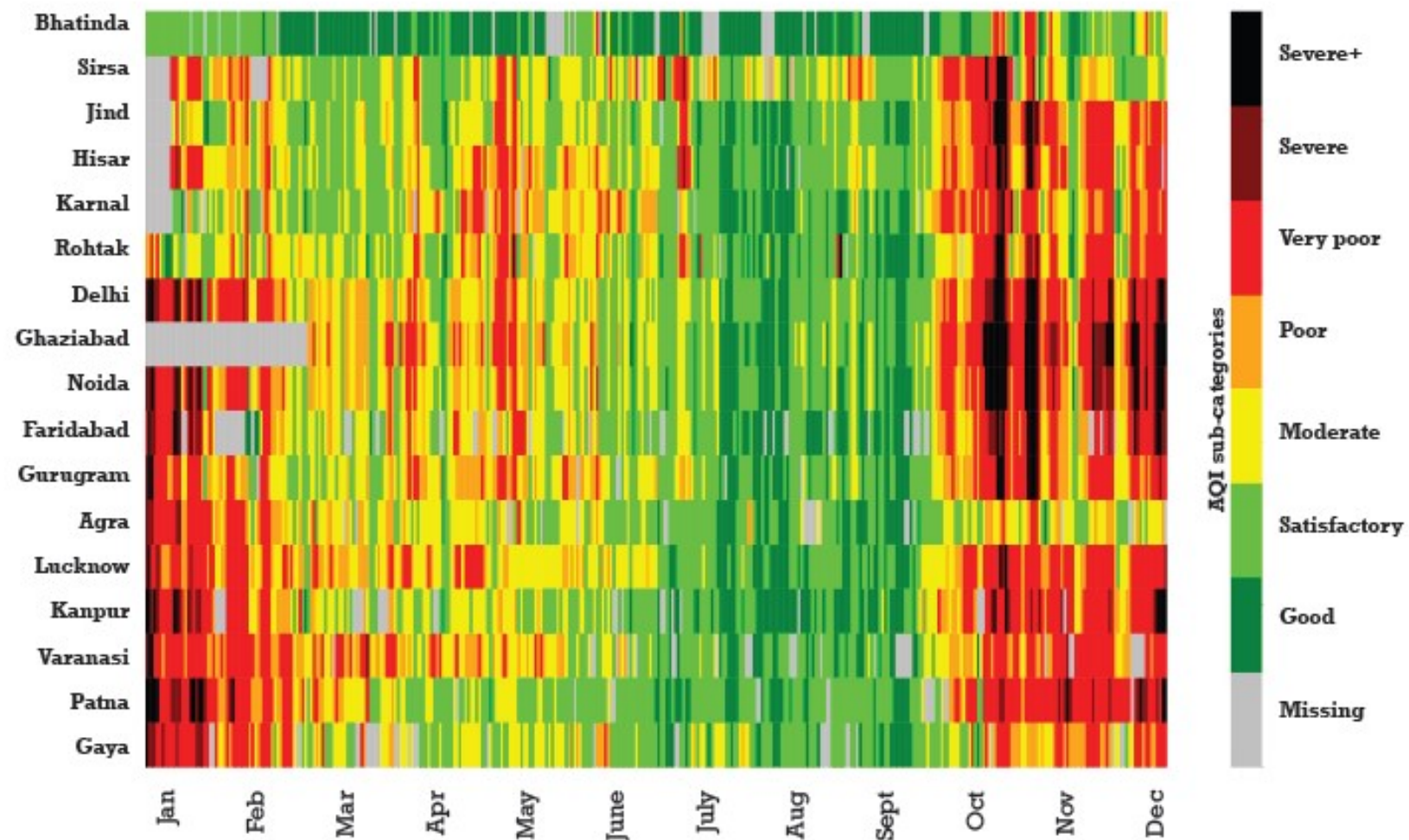
Winter pollution says different stories

Source: CSE analysis of PM2.5 data from CPCB, meteorological data from IMD and fire count data from NASA

NCR Pollution:
Well synchronised
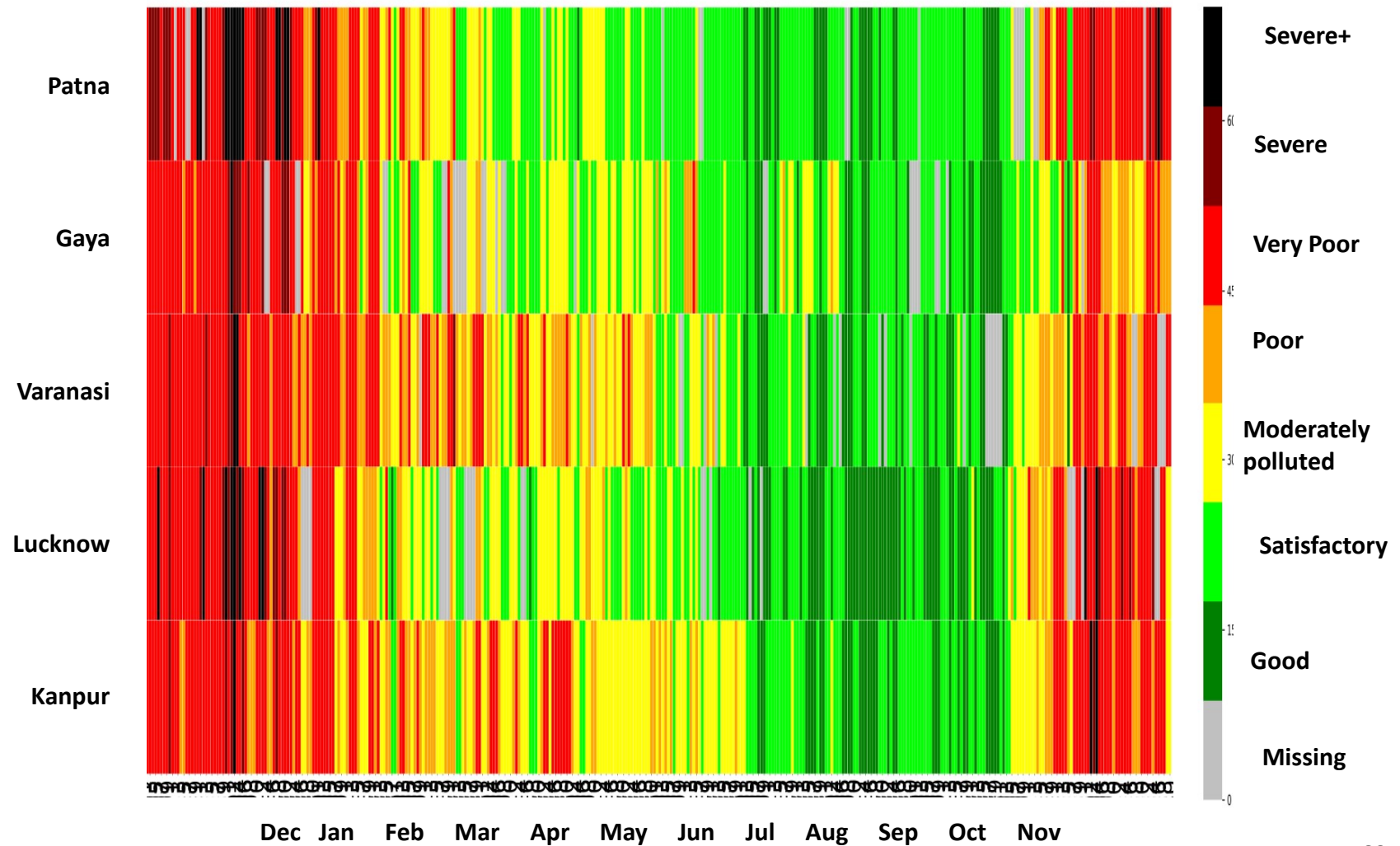## (Dec 2018-Nov 2019)

Source: Based on data available on CPCB

Graph 12: Heat map of pollution—daily $PM_{2.5}$ in select urban centres in the Indo-Gangetic Plain (2019 figures)

Source: CSE analysis based on real-time data from CPCB online portal

Selected cities from UP and Bihar

Source: Based on data available on CPCB

Kolkata-Howrah have winter high pollution problem

Howrah on average looks more polluted than Kolkata, but high pollution episodes are synchronised.

Ghusuri in Howrah is the worst among the twin-city network.
Bidhannagar, Jadavpur and Rabindra Sarobar look relatively cleaner but
these are new stations and don't have enough data

69
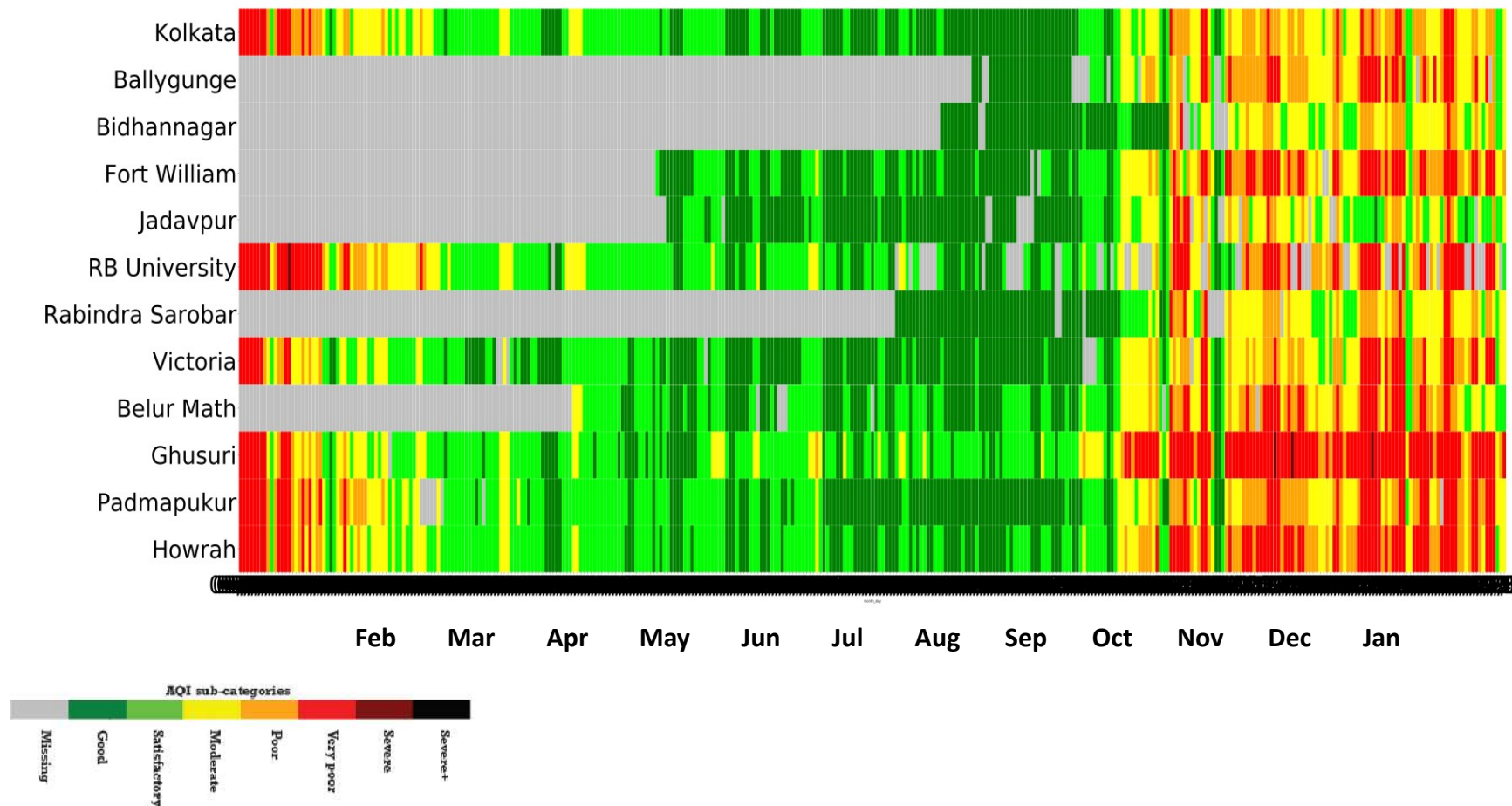
Rajasthan has no specific high pollution season, whole year is polluted outside monsoon

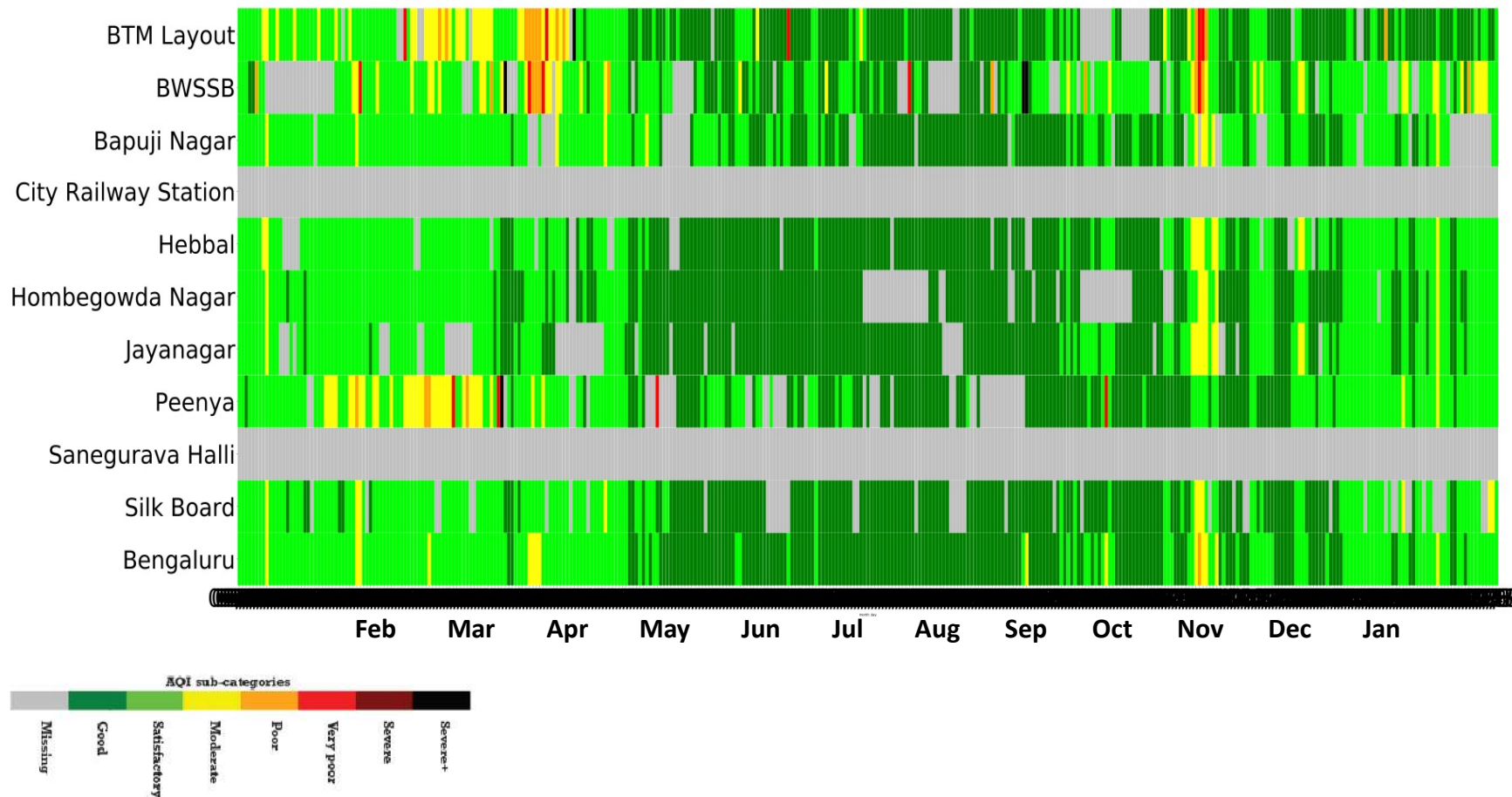**Jodhpur and Bhiwadi have most high pollution days in the state.**
Within Jaipur station at Police Commissionerate recorded most number of high pollution days.

70
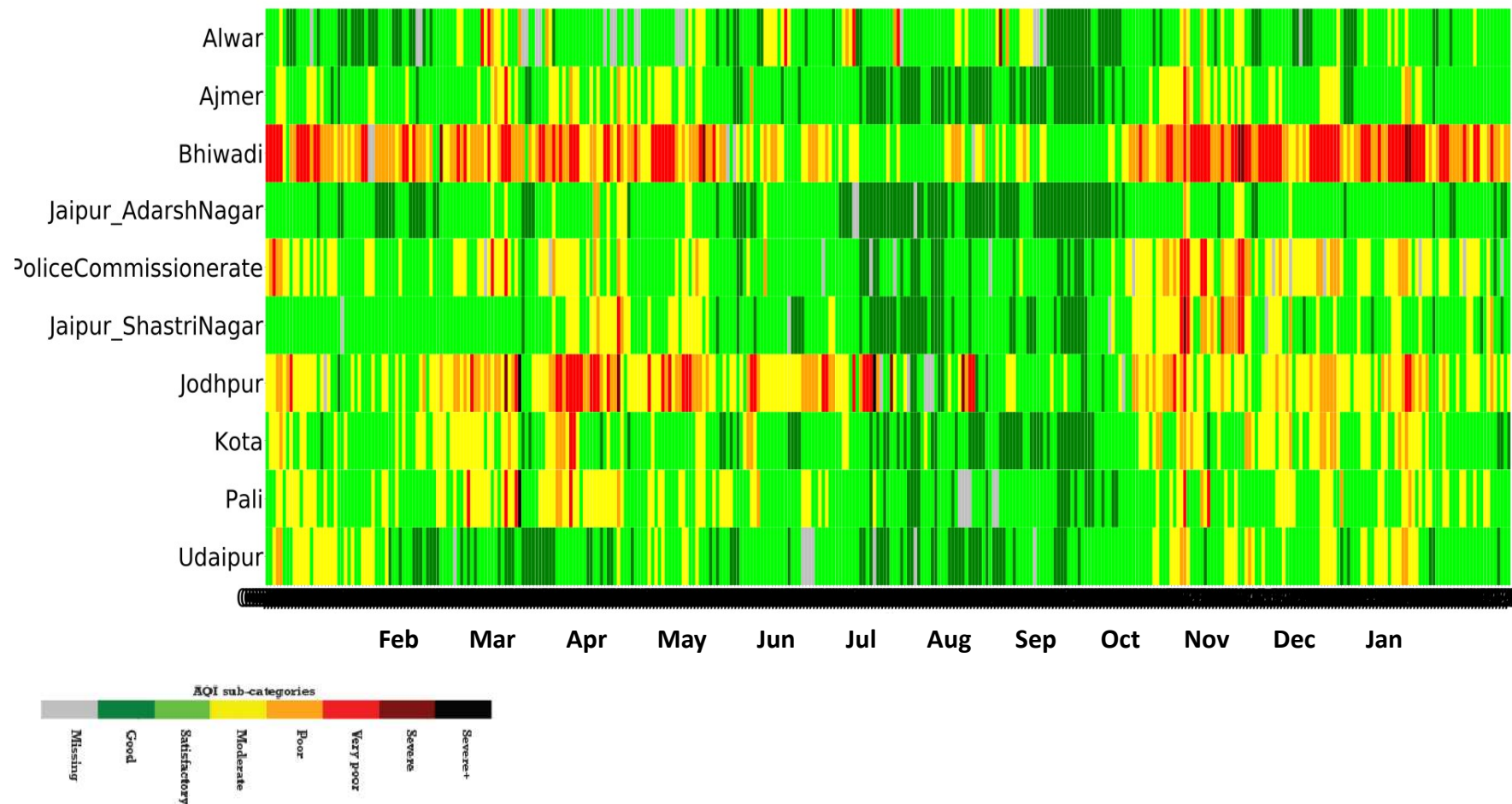
Bengaluru has no specific high pollution season

High pollution sporadic and localised in nature.
BMT Layout, BWSSB and Peenya have recorded most polluted days among the city network

71

Chennai has no specific high pollution season but experienced city-wide episode in Nov 2019

High pollution sparse but citywide in nature.

Manali is the most polluted station among the city network

AQI sub-categories

| Missing | Good | Satisfactory | Moderate | Poor | Very poor | Severe | Severe+ |
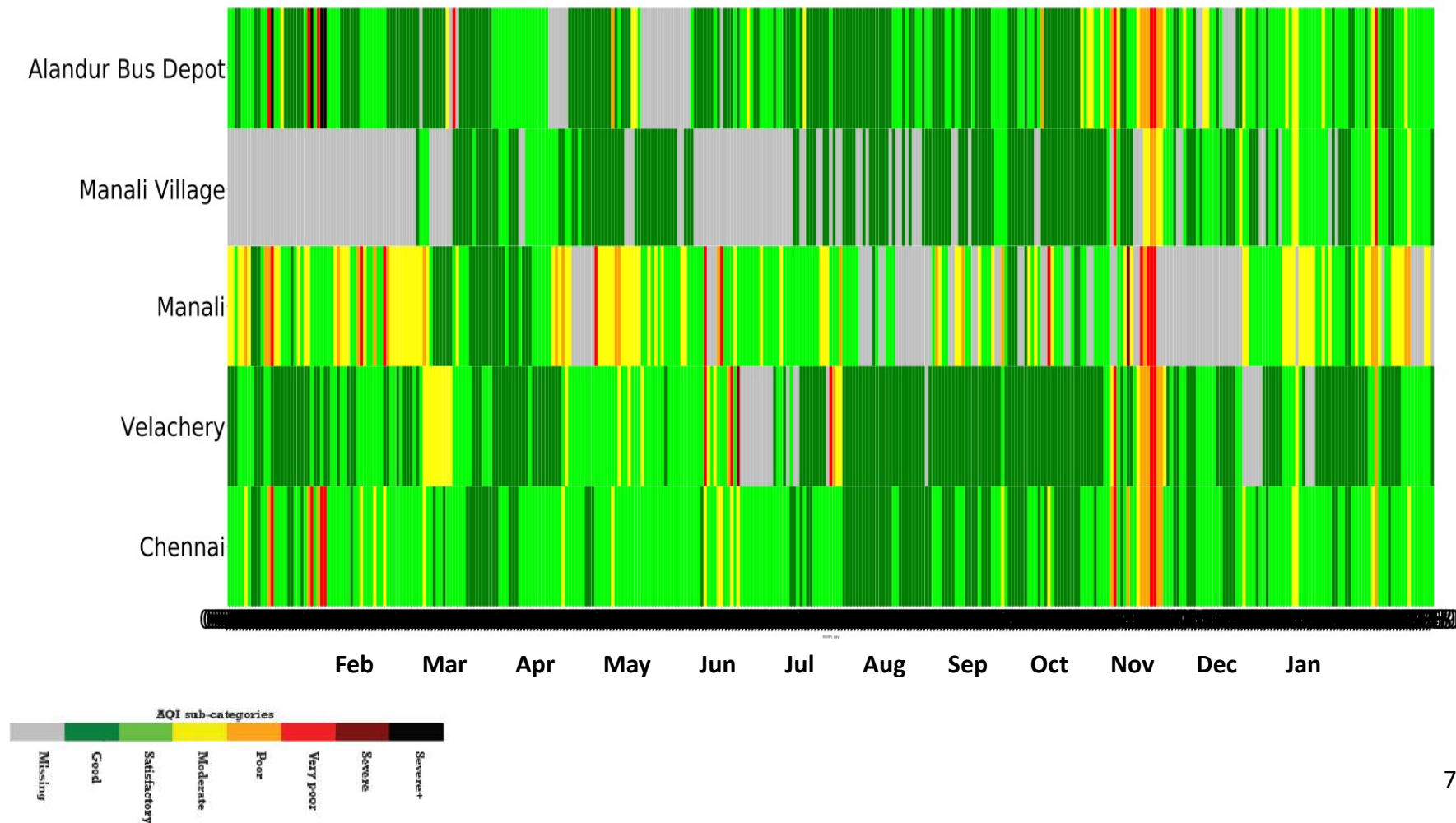
Hyderabad has high pollution season that starts in November and tapers of in February

High pollution episodes are city-wide in nature. But it hardly hits 'very poor' on AQI

Sanathnagar is the worst among the city network
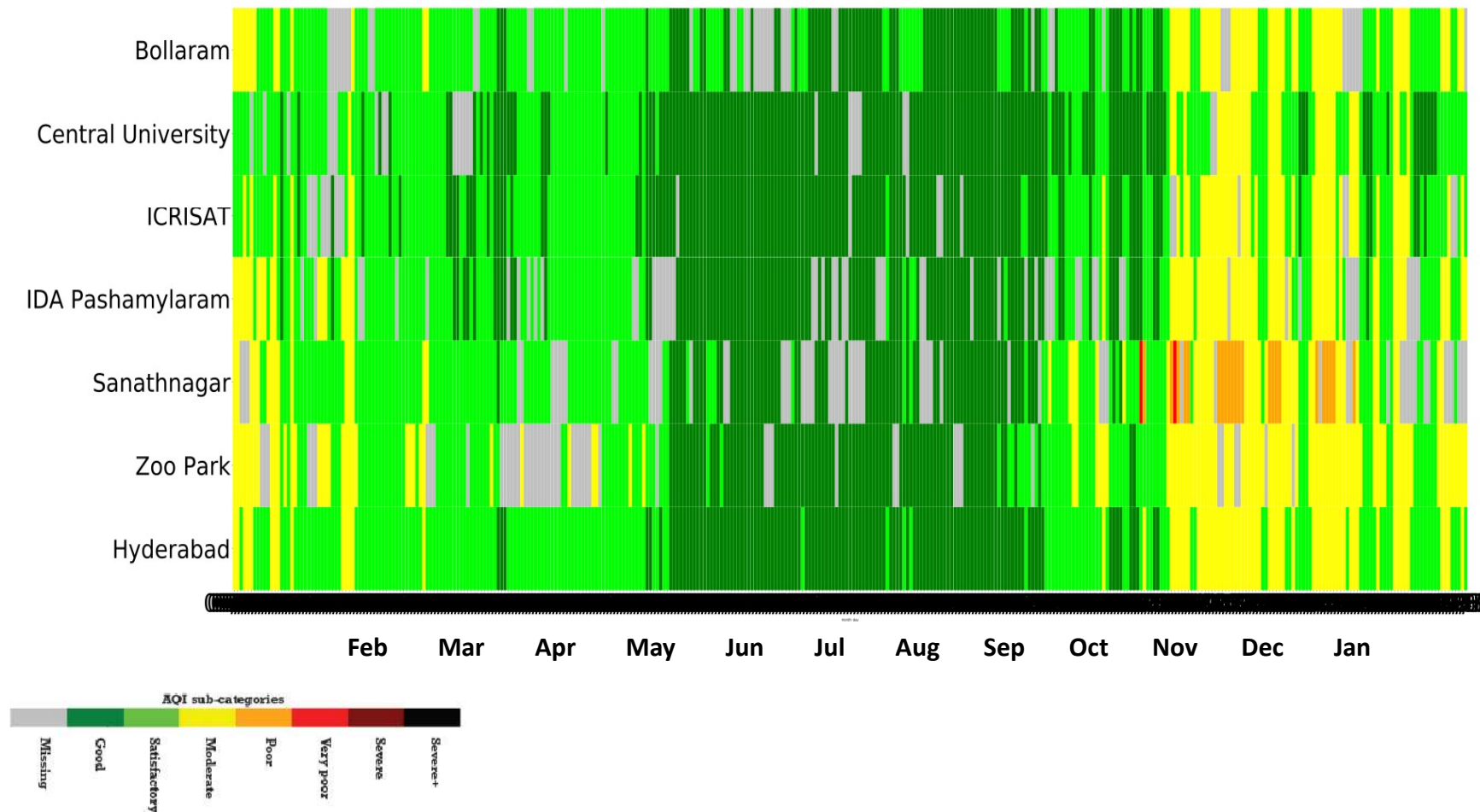
Mumbai have winter high pollution problem

Mumbai's peak pollution is recorded around 25th December.
High pollution is a city-wide phenomena.
All stations except Bandra are new stations and don't have enough data.
Station at Bandra have significant missing data during winter months.
Borivali East is the cleanest station of the city network

74

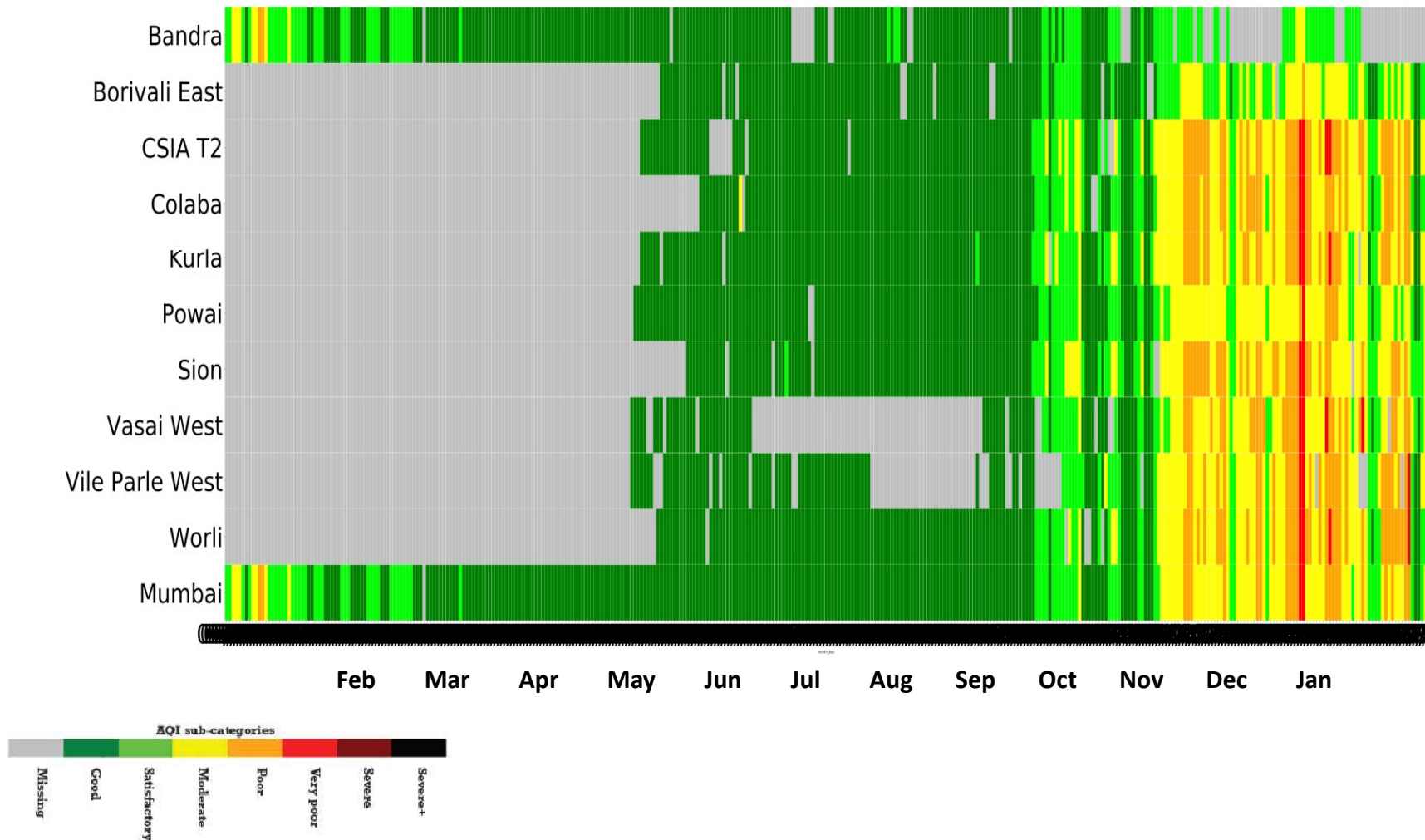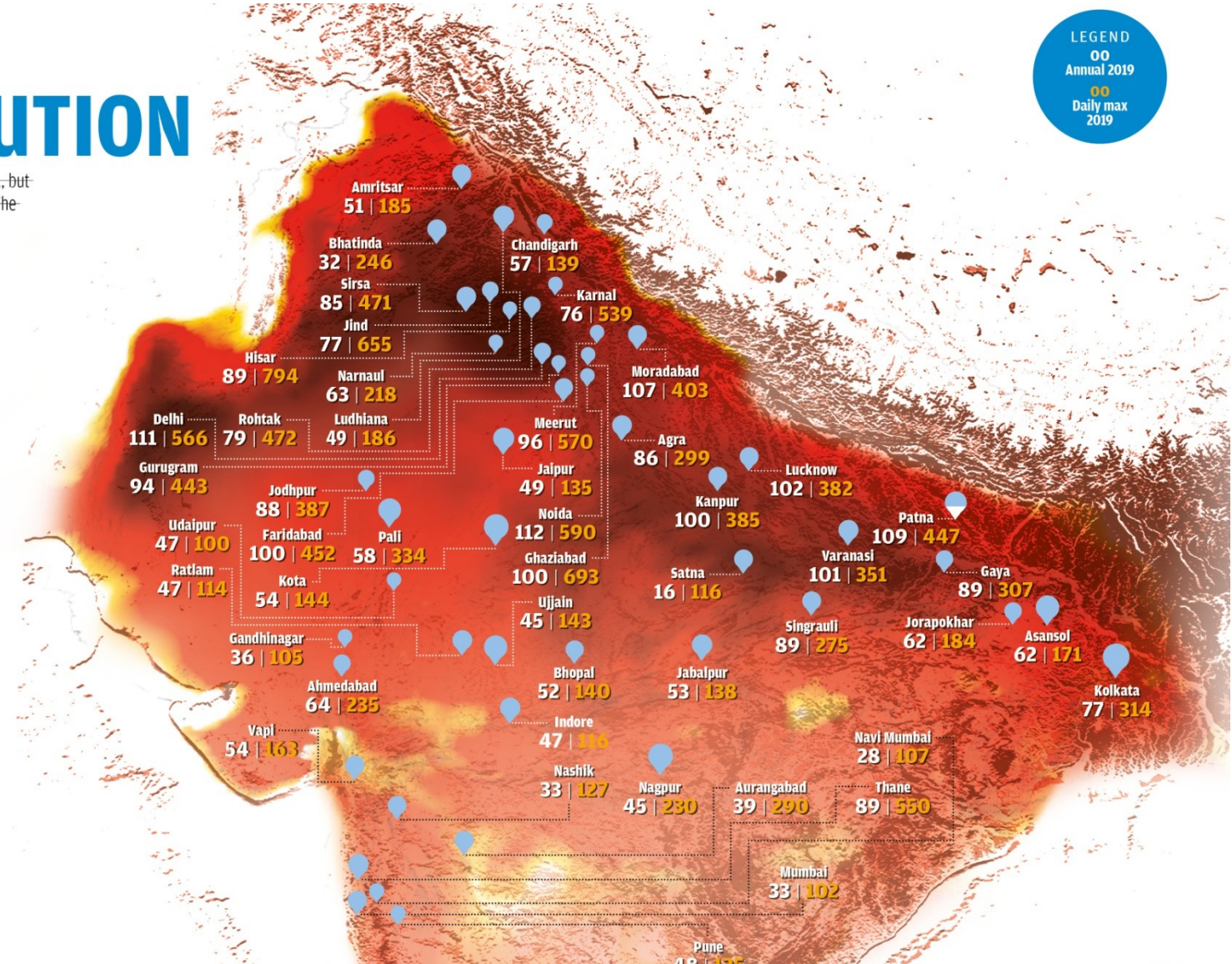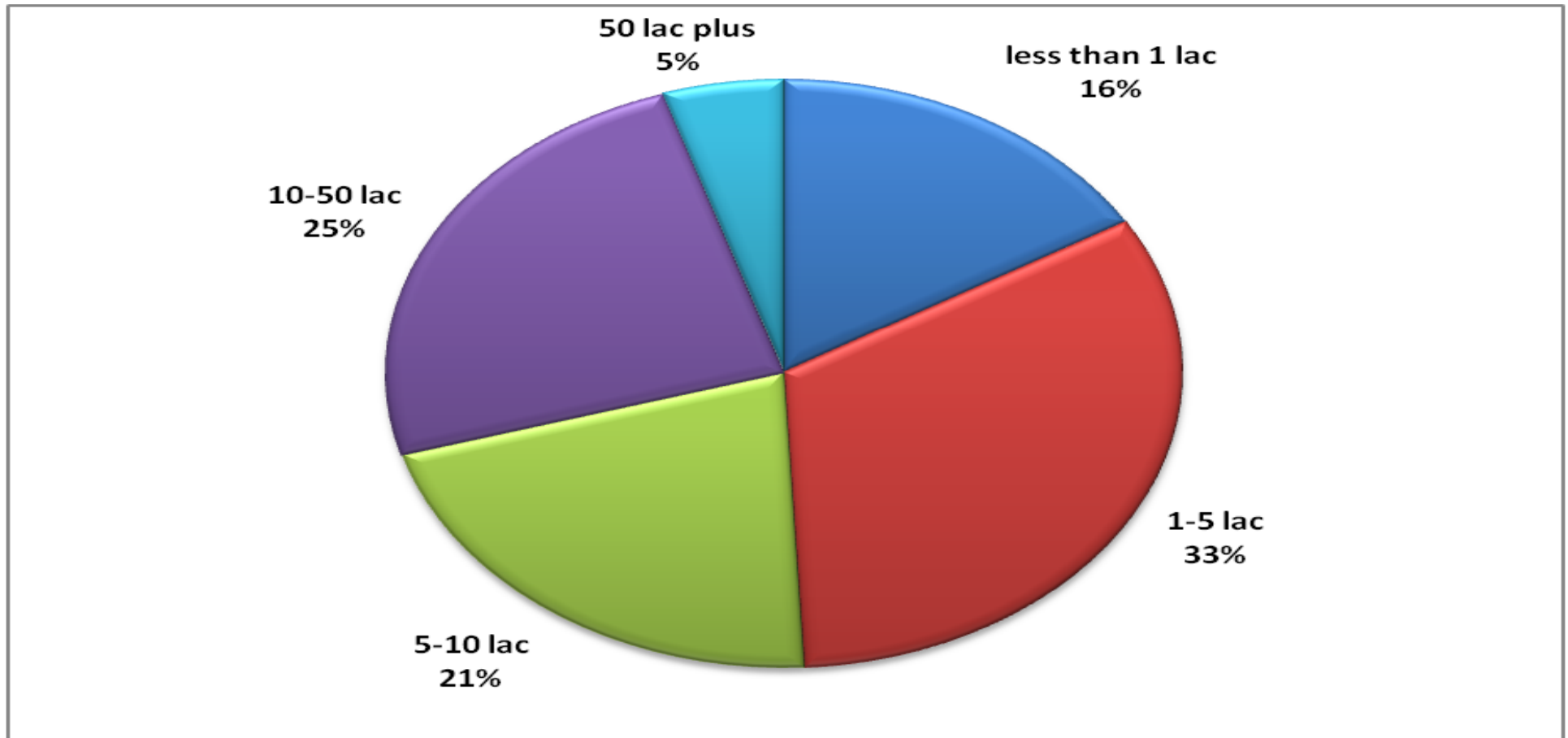# Pollution – High and Low

STATE OF
AIR POLLUTION

India recorded just nine out of 93 disasters in Asia, but accounted for nearly 48 per cent deaths in 2019. The country also had nearly 46 per cent

LEGEND
OO Annual 2019
OO Daily max 2019

Amritsar
51 | 185

Bhatinda
32 | 246

Chandigarh
57 | 139

Sirsa
85 | 471

Karnal
76 | 539

Jind
77 | 655

Hisar
89 | 794

Narnaul
63 | 218

Moradabad
107 | 403

Delhi
111 | 566

Rohtak
79 | 472

Ludhiana
49 | 186

Meerut
96 | 570

Agra
86 | 299

Lucknow
102 | 382

Gurugram
94 | 443

Jaipur
49 | 135

Kanpur
100 | 385

Patna
109 | 447

Jodhpur
88 | 387

Udaipur
47 | 100

Faridabad
100 | 452

Pali
58 | 334

Noida
112 | 590

Varanasi
101 | 351

Gaya
89 | 307

Ratlam
47 | 114

Kota
54 | 144

Ghaziabad
100 | 693

Satna
16 | 116

Singrauli
89 | 275

Jorapokhar
62 | 184

Asansol
62 | 171

Ujjain
45 | 143

Gandhinagar
36 | 105

Jabalpur
53 | 138

Kolkata
77 | 314

Bhopal
52 | 140

Ahmedabad
64 | 235

Indore
47 | 116

Navi Mumbai
28 | 107

Vapi
54 | 163

Nashik
33 | 127

Nagpur
45 | 230

Aurangabad
39 | 290

Thane
89 | 550

Mumbai
33 | 102

Pune

70% of Non-attainment cities have population less than 10 lakh

Source: Based on data available on CPCB

Global action on regional pollution

China

- **Adopted unified planning, monitoring and alerting, and unified standards** in multiple contagious regions. Combined work plan for Beijing City, Tianjin City, Hebei Province, Shanxi Province, Shandong Province and Henan Province.
- **Target:** "2 + 26" cities to decrease average PM 2.5 concentrations and the number of heavy-pollution days by more than 15% from previous year.
- **Revised the emergency response plan to unify the alerts and grading for heavy air pollution**
- **Combined monitoring and inspection system**. Beijing Environmental Protection Inspection team responsible for 15 provinces
- **Mutually agreed action plans to reduce coal consumption, manage area sources and adjust the industrial structure.**
- **Violations of the Action Plan enforced across the region**
- **Reformed vertical management and accountability systems for monitoring, inspection and law enforcement** of the environmental protection agencies.

Global action on regional pollution

United States:
- **Clean Air Act: provisions to reduce long-range transport of pollution**
- **Each state's implementation plan to prevent emission from sources within its borders from contributing significantly to air pollution problems "downwind"** – specifically those that fail to meet standards
- **If a state fails** to develop the necessary plan to address this downwind pollution, **EPA can enforce federal plan**
- **Good neighbor provisions** -- dentify downwind air quality problems; identify upwind states that contribute enough to those downwind air quality problems for further review and analysis; identify emissions reduction necessary to prevent contributing significantly to downwind air quality problems
- **Air quality monitoring is carried out air basin levels.**
- States to take additional steps to satisfy good neighbor provisions or prove why additional measures are not necessary.

Global action on regional pollution

Europe

European Member States work together to control international air pollution under the Convention on Long Range Transboundary Pollution (the Air Convention).

European states within the European Union have begun to explore the regulatory means of building regional action across different jurisdictions.

India?

NCAP:

- A comprehensive regional Plan to be formulated incorporating the inputs from the regional source apportionment studies.

- No enforcement mechanism yet

- Technically no legal hurdle to introducing this approach. The Air (Prevention and Control) Act, 1981, Article 19 confers power to declare air pollution control areas.

- Under this provision critically polluted areas are declared that are largely industrial areas.

- The scope and ambit of this can be broadened to include more jurisdictions for integrated planning and compliance.

Strengthen legal framework for National Clean Air Programme

NCAP Approach:
- Collaborative, multi-scale and cross-sectoral coordination between central ministries, state governments and local bodies. Dovetailing policies and programmes with NCAP.

NCAP legal framework
- In consonence with Air Act (Prevention and Control of Pollution) Act, 1981, and in particular the provision of Section 16 (2) (b) to execute nation-wide programme.
- Compliance, monitoring and accountability framework for implementation and to meet targets; benchmark effectiveness of action
- Address the current gaps in laws for compliance and enforcement
- Punitive action, deterrence and incentives
- 15th Finance Commission to *propose measurable performance-based incentives for States*, among others. --- One of the criteria for finalising the states' share in central taxes and grants.
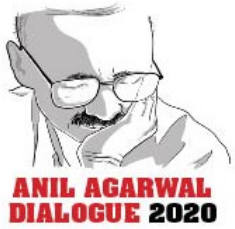
Deepen understanding of what it takes to cut pollution

Need massive transition

Clean fuels and technology transition in industry and power sector:
- Small and medium units; fugitive emissions from industrial processes and material handling etc; effective stack monitoring for enforcement
    - Pricing and availability of clean fuels
    - Monitoring and compliance in bigger industries and smart monitoring
    - Clean fuels for households

Mobility transition
- Need scale in public transport services and non-motorised transport in big and small towns – Need design rich solutions
- Effective vehicle restraint measures
- Zero emissions mandate for electric vehicles and control of real world emissions

Paradigm shift in waste management
- Enormous infrastructure deficit to control waste – address this
- Need scale in decentralised segregation, recycle and reuse
- Episodic fire incidents

Need scale, effectiveness and accountability
Need awareness to build support for difficult solutions

Thank You