Decoding winter air pollution in cities of Southern India

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This analysis is part of the next in the series of air quality tracker initiative the Centre for Science and Environment (CSE) to follow changing patterns of air quality trends in different regions of the country. This seeks to understand the impact of the extraordinary year 2020 that has witnessed one of the biggest disruptions in the recent times. This is also an inflexion point at the onset of the new decade. This addresses basic curiosities around the impact of the lockdown, lowering of the regional influence on local air quality, and deeper seasonal patterns that unmask the underlying high trends despite the lockdown phases. After analyzing the changing trends in the Indo-Gangetic Plain, Delhi and National Capital region, Rajasthan, Maharashtra, and West Bengal, this analysis unravels the pattern in cities of Southern India– vulnerable but poorly monitored region from air quality perspective.

New analysis of winter pollution (until 26 January of this year), shows how clean air gains of the lockdown and monsoon period were lost with the reopening of the economy and with the onset of the winter. Even though the atmospheric conditions during winter in this region is not the same as that of the Indo Gangetic Plain in the northern region, trapping of winter pollution is not insignificant either -- especially in inland cities.

Higher $PM_{2.5}$ levels is a typical and predictable winter trend when continuous emissions from local sources including vehicles, industry, construction, and episodic pollution from biomass burning get trapped due to meteorological changes. But winter is not as harsh in southern cities therefore impact of inversion is expected to be limited, yet pollution build-up has been noted. Even though the average level of $PM_{2.5}$ for the summer and monsoon months in 2020 is considerably lower than the previous year due to the pandemic related to summer lockdown, the $PM_{2.5}$ levels this winter have risen beyond the 2019 in most of the monitored cities. Chennai and Thiruvananthapuram being the only exception. Combination of the reopening of the economy and changing meteorology is responsible for high winter pollution but this regional variation calls out for more nuanced and robust pollution control strategy. The region cannot rely only on natural advantage of warmer winters and sea breeze to avoid bad air. This demands speed and scale of action.

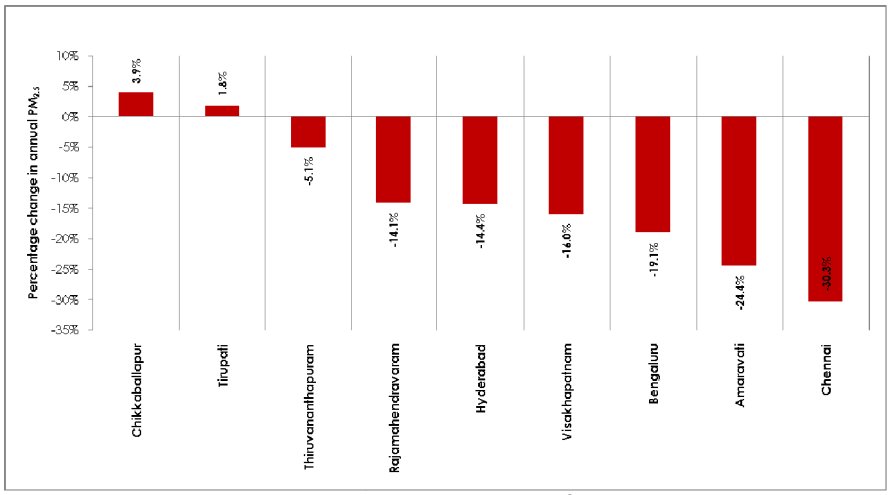
This detailed data analysis points to the fact that the air pollution is a south India problem as well and this requires quicker reforms and action in key sectors of pollution – vehicles, industry, power plants and waste management to control winter pollution and further bend the annual air pollution curve.

Data used in the analysis: The analysis is based on publicly available granular real time data (15-minute averages) from the Central Pollution Control Board's (CPCB) official online portal Central Control Room for Air Quality Management. Real-time data from 36 cities was accessed but only 21 cities – Hyderabad, Amaravati, Rajamahendravaram, Tirupati, Visakhapatnam, Bagalkot, Chikkaballapur, Chikkamagaluru, Hubballi, Mysuru, Ramnagara, Vijaypura, Yadgir, Bengaluru, Coimbatore, Chennai, Kannur, Kollam, Kozhikode, Kochi, and Thiruvananthapuram have been selected for this analysis because real time data is available for these cities for whole of 2020. This has analysed data recorded by 10 air quality monitoring stations at Bengaluru, 8 stations in Chennai, 6 stations in Hyderabad, 3 stations in Kochi, 2 stations in Thiruvananthapuram, one station each rest of the cities under the Continuous Ambient Air Quality Monitoring System (CAAQMS) of CPCB. Weather data for Bengaluru, Chennai, Hyderabad, Thiruvananthapuram, and Visakhapatnam has been sourced from the weather stations of Indian Meteorological Department (IMD) located at the airport of each city. This air quality trend analysis does not include investigation of local sources of pollution.

Key highlights

While several bigger cities have witnessed reduction in annual trends in PM2.5, smaller towns and cities have experienced increase: Only 9 out of the 21 cities have data for complete 2019. The 2020 average $PM_{2.5}$ level in many inland cities in the Deccan Plateau has climbed up to breach the average concentration recorded in 2019. Chikkaballapur in southern Karnataka is the worst performer with 3.9 per cent increase from 2019 level. Tirupati registered 1.8 per cent increase. Most improvement is noted in Chennai which closed 2020 with a 30 per cent lower $PM_{2.5}$. Amravati at 24 per cent, Bengaluru at 19 per cent, Visakhapatnam at 16 per cent, Hyderabad and Rajamahendravaram at 14 per cent are other best performers in the pool. Thiruvananthapuram showed improvement of 5 per cent (See *Graph1: Percentage change in $PM_{2.5}$ annual average in south Indian cities*). For context, Delhi's 2020 average is 13 per cent lower than its 2019 level.

Graph1: Percentage change in $PM_{2.5}$ annual average in south Indian cities



Note: Annual average $PM_{2.5}$ concentration is based on mean of monthly averages. For cities with multiple stations average of only those stations are used which were working in both 2019 and 2020 for all 12 months. Data uptill 31 December 2020.
Source: CSE analysis of CPCB's real time air quality data

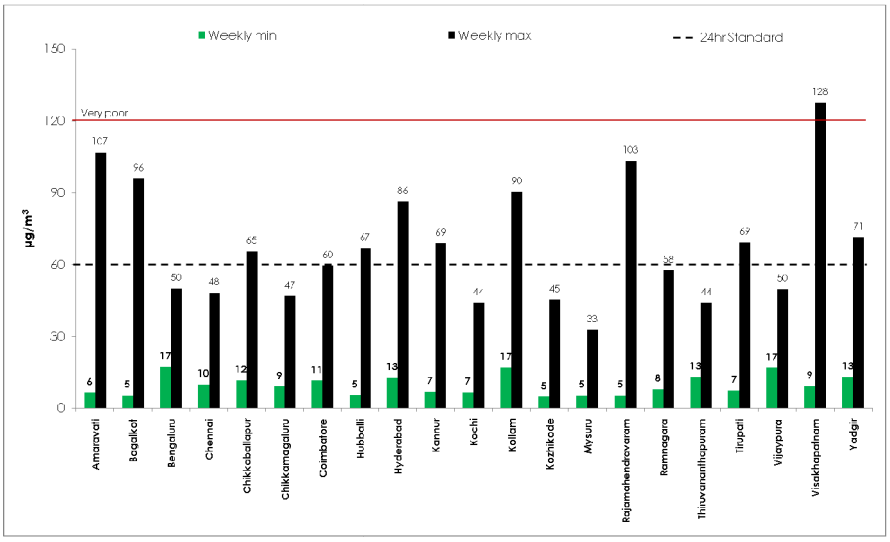
Average level of $PM_{2.5}$ has been lowest during this summer and monsoon due to the lockdown but could not prevent the winter spike: The overall $PM_{2.5}$ average this summer and monsoon has been predictably lower compared to the previous year largely because of the unprecedented economic disruption during the summer lockdown and phased unlocking. But reopening of the economy coinciding with the onset of the winter trapping of pollution made $PM_{2.5}$ levels rose starting October. From the respective cleanest week the weekly average of $PM_{2.5}$ in Hyderabad rose 7 times, in Bengaluru 3 times, Chennai 5 times, Visakhapatnam 14 times, and Thiruvananthapuram 3 times to the dirtiest week. These major cities recorded lesser deterioration than Delhi where weekly air quality worsened 14 times but smaller towns beat the capital. Rajamahendravaram deteriorated 19 times, Bagalkot 18 times, Amravati 17 times, Hubballi 12 times, Kannur and Kozhikode 10 times each (See *Graph 3: Change in weekly $PM_{2.5}$ levels 2020 – Difference between cleanest and most polluted week*).

Andhra Pradesh cities were most polluted in the region with Visakhapatnam, Amravati, and Rajamahendravaram being only cities with weekly average exceeding 100 $\mu g/m^3$. Mysuru was cleanest city with its worst weekly average only rising to 33 $\mu g/m^3$. Bengaluru, Chennai, Chikkaballapur, Chikkamagaluru, Coimbatore, Hubballi, Hyderabad, Kannur, Kochi, Kollam, Kozhikode, Rajamahendravaram, Ramnagara, Thiruvananthapuram, Tirupati, and Vijaypura are other cities whose worst weekly average was found to be below 24hr standard i.e. 60 $\mu g/m^3$.

Dirtiest week for Hyderabad, Amravati, Rajamahendravaram, Chikkaballapur, and Yadgir was week ending on 3 January 2021. For Tirupati, Visakhapatnam, Hubballi, Chennai, Coimbatore, Kannur, Kozhizode, Kochi, and Thiruvananthapuram, the dirtiest week on the week ending on 27 December

2020. Chikkamagaluru and Vijaypura the dirtiest week on the week ending on 8 November 2020. Bengaluru, Bagalkot, Mysuru, Ramnagara, and Kollam the dirtiest week on the week ending on 1 November 2020. Cleanest week for Rajamahendravaram, Tirupati, Visakhapatnam, Bagalkot, Chikkaballapur, Chikkamagaluru, Hubballi, Mysuru, Ramnagara, Vijaypura, Yadgir, Bengaluru, Coimbatore, Chennai, Kannur, Kollam, Kozhikode, Kochi, and Thiruvananthapuram was recorded pre-monsoon in months of April, May, and early June. Rest of the region recorded their cleanest week during monsoon (July, August, and September). The transient change of the lockdown phases could not be sustained without the systemic changes needed to control pollution from vehicles, industry, power plants, and waste.

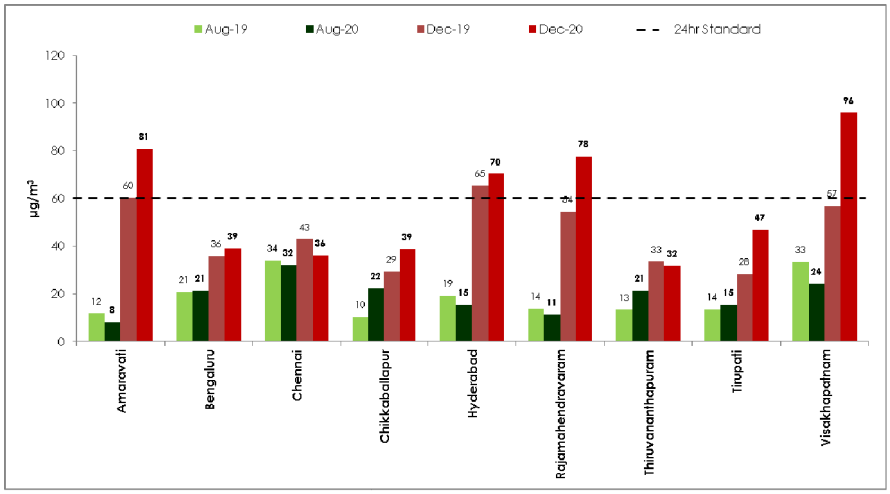
Graph 3: Change in weekly $PM_{2.5}$ levels 2020 – Difference between cleanest and most polluted week



Note: Average $PM_{2.5}$ concentration for a week is based on mean of all CAAQM stations in the city.
Source: CSE analysis of CPCB's real time air quality data

Average December $PM_{2.5}$ level has been considerably higher in inland cities this year: December this year was dirtier across most inland cities in the peninsula. The $PM_{2.5}$ average this December was worst in Andhra Pradesh with 69 per cent higher in Visakhapatnam, 66 per cent in Tirupati, 43 per cent in Rajamahendravaram and 34 per cent in Amravati compared to December 2019. Karnataka cities recorded dirtier December as well with 33 per cent higher in Chikkaballapur and 8 per cent in Bengaluru. Hyderabad's December was 7.5 per cent dirtier in 2020 compared to 2019. Chennai and Thiruvananthapuram buck the trend recorded registered 16 per cent and 5 per cent cleaner December respectively compared to 2019 (See *Graph 4: Difference in winter pollution build-up: 2020 winter vs 2019 winter (monthly averages*).

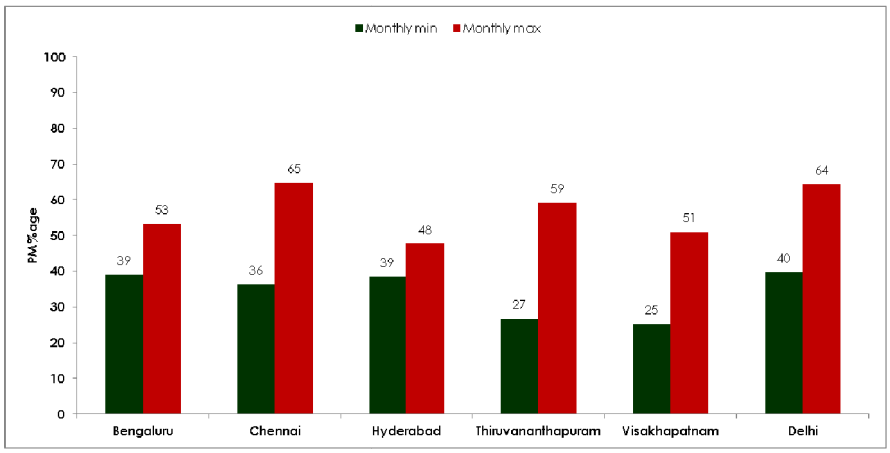
Graph 4: Difference in winter pollution build-up: 2020 winter vs 2019 winter (monthly averages)



Note: Average $PM_{2.5}$ concentration for a month is based on mean of all CAAQM stations in the city.
Source: CSE analysis of CPCB's real time air quality data

Air quality gets more toxic with the onset of winter - share of tinier $PM_{2.5}$ in the PM_{10} increases: The share of tinier and finer particles in the overall coarser PM_{10} concentration determines the toxicity of air. When the overall share of tinier $PM_{2.5}$ in the overall coarser PM_{10} is higher, the air is more toxic as the tiny particles penetrate deep inside the lungs and cut through the blood barrier increasing health risk. Interestingly, during lockdown, when the overall suspended coarser particles had settled down reducing the PM_{10} levels, the $PM_{2.5}$ had also come down. Bengaluru and Hyderabad have relatively high PM2.5 percentage throughout the year but their monthly peaks are lower relative to coastal metro cities (See *Graph 5: Changing share of percentage share of $PM_{2.5}$ in PM_{10} among months*). The share of $PM_{2.5}$ in PM_{10} in Chennai has been identical range as registered in Delhi in 2020 though overall levels are lower.

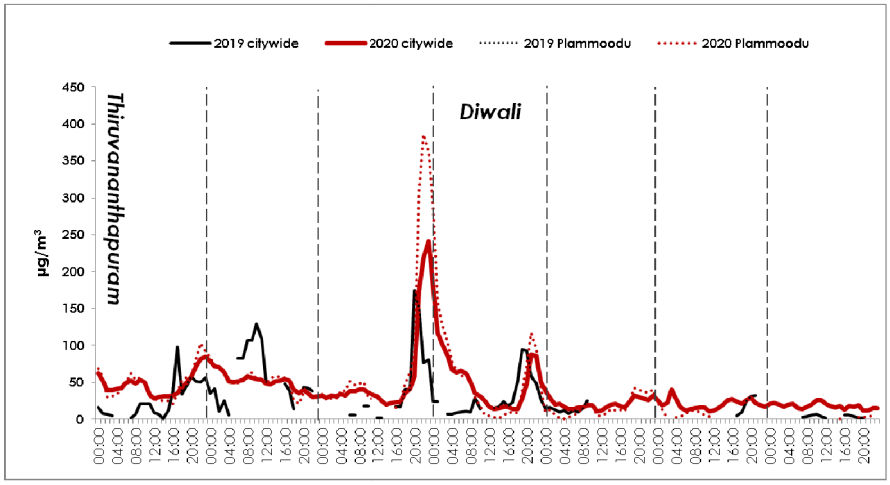
Graph 5: Changing percentage share of $PM_{2.5}$ in PM_{10} among months



Note: Average of only those stations has been used that have valid daily value for both $PM_{2.5}$ and PM_{10}.
Source: CSE analysis of CPCB's real time air quality data

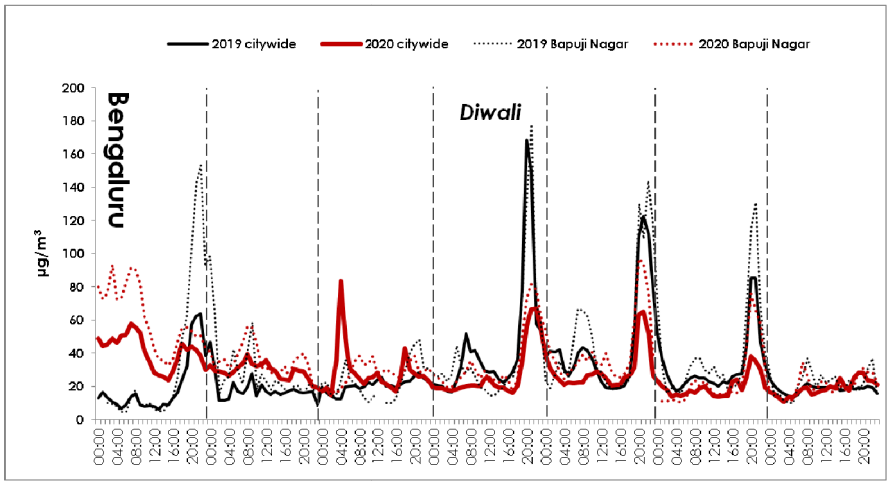
Diwali is an issue in southern cities as well: Thiruvananthapuram had dirtier diwali night in 2020 compared to 2019: In 2020 there was 114 per cent higher rise in hourly $PM_{2.5}$ concentration at Plammoodu station of Thiruvananthapuram between afternoon and night of Diwali that is mostly caused due to firecracker busting. Hourly concentration peaked at 386 µg/m^3 in the evening of November 2020, which is the highest hourly concentration recorded in the capital city of Kerala between start of lockdown in March to end of 2020 (See *Graph 6: How hourly pollution changed on Diwali day in Thiruvananthapuram*).Bengaluru, Chennai, Hyderabad, and Visakhapatnam too registered abnormal spike in hourly pollution on Diwali night but is was considerably lower compared to spike noted in 2019 Diwali.

Graph 6a: How hourly pollution changed on Diwali day in Thiruvananthapuram



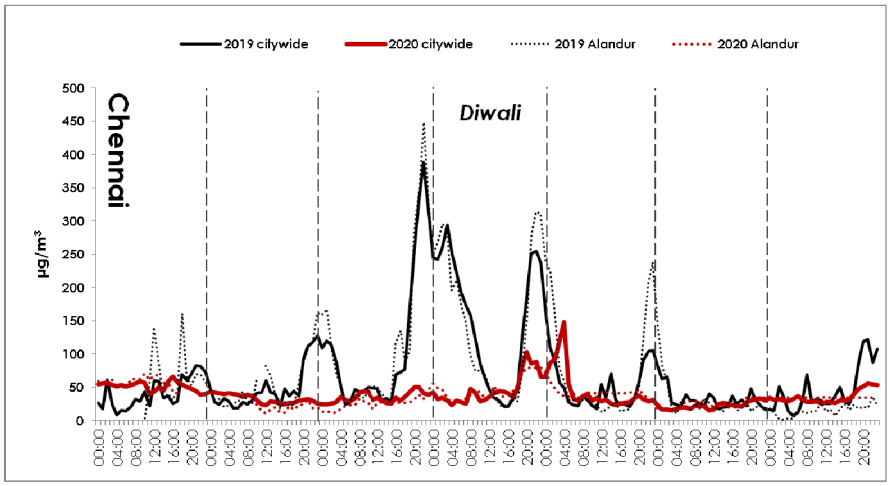
Note: Diwali dates are 27 Oct 2019, and 14 Nov 2020. Citywide is based on average PM2.5 concentration of all CAAQM stations operational in the city on a given day. Dotted lines represent a specific CAAQM station of the city to showcase variation in $PM_{2.5}$ concentrations among city's numerous CAAQM stations.
Source: CSE analysis of CPCB's real time air quality data

Graph 6b: How hourly pollution changed on Diwali day in Bengaaluru



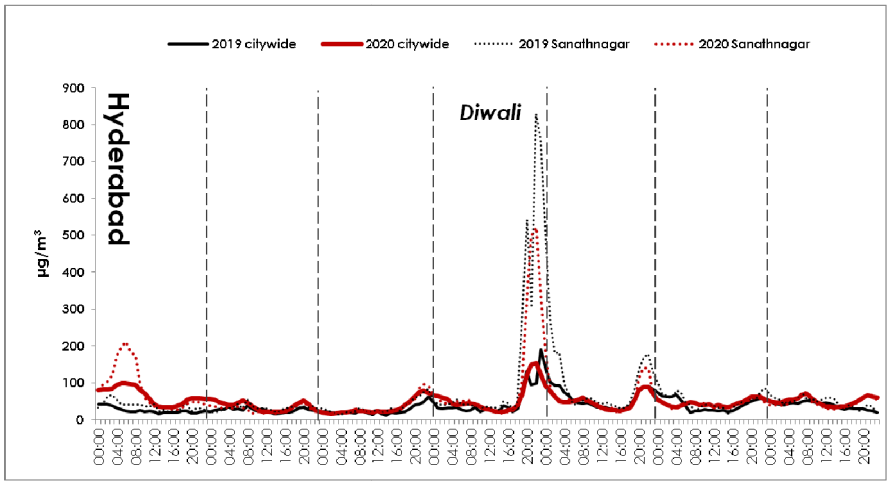
Note: Diwali dates are 27 Oct 2019, and 14 Nov 2020. Citywide is based on average PM2.5 concentration of all CAAQM stations operational in the city on a given day. Dotted lines represent a specific CAAQM station of the city to showcase variation in $PM_{2.5}$ concentrations among city's numerous CAAQM stations.
Source: CSE analysis of CPCB's real time air quality data

Graph 6c: How hourly pollution changed on Diwali day in Chennai



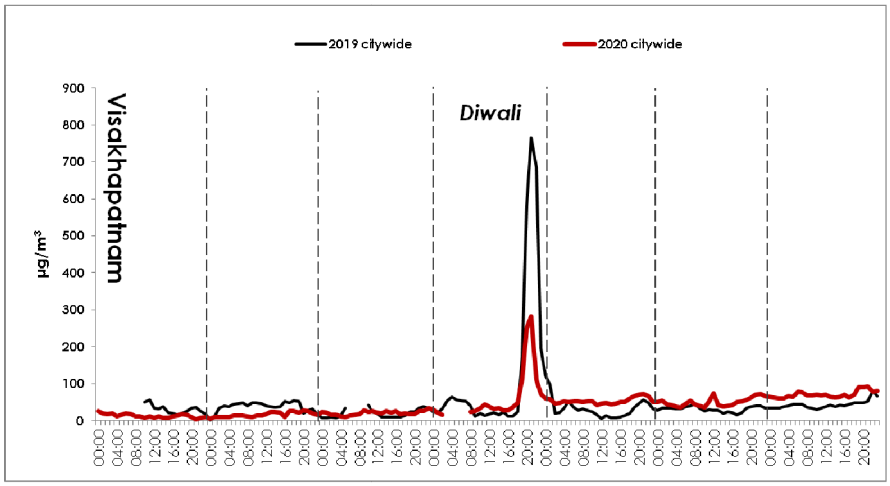
Note: Diwali dates are 27 Oct 2019, and 14 Nov 2020. Citywide is based on average PM2.5 concentration of all CAAQM stations operational in the city on a given day. Dotted lines represent a specific CAAQM station of the city to showcase variation in $PM_{2.5}$ concentrations among city's numerous CAAQM stations.
Source: CSE analysis of CPCB's real time air quality data

Graph 6d: How hourly pollution changed on Diwali day in Hyderabad



Note: Diwali dates are 27 Oct 2019, and 14 Nov 2020. Citywide is based on average PM2.5 concentration of all CAAQM stations operational in the city on a given day. Dotted lines represent a specific CAAQM station of the city to showcase variation in $PM_{2.5}$ concentrations among city's numerous CAAQM stations.
Source: CSE analysis of CPCB's real time air quality data

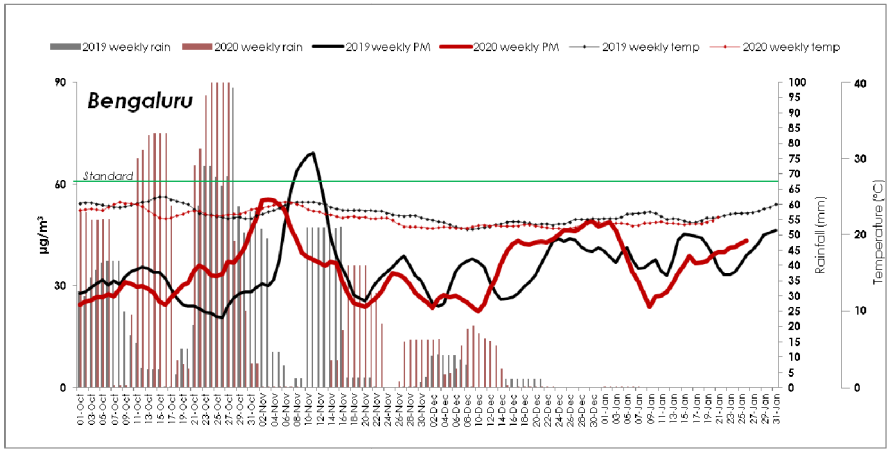
Graph 6e: How hourly pollution changed on Diwali day in Visakhapatnam



Note: Diwali dates are 27 Oct 2019, and 14 Nov 2020. Citywide is based on average PM2.5 concentration of single CAAQM station operational in the city.
Source: CSE analysis of CPCB's real time air quality data

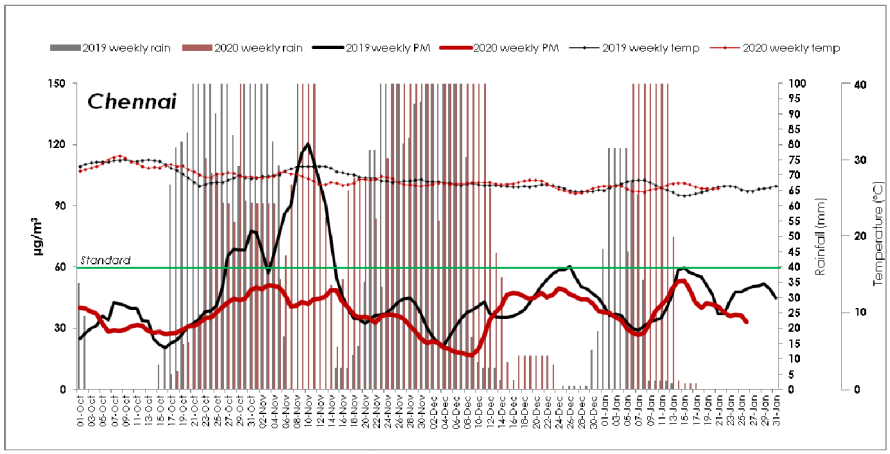
Hyderabad and Visakhapatnam had earlier start of bad air days in 2020 winter: The rolling weekly average rose over the 24hr standard or 60 µg/m^3 in Visakhapatnam on October 23 (9 days earlier), and Hyderabad on October 25 (14 days earlier). This winter overall has been 34 per cent dirtier in Visaakhapatnam, 7 per cent in Hyderabad, and 9 per cent in Thiruvananthapuram. Bengaluru registered no change in the seasonal average while Chennai was 20 per cent cleaner. The rolling weekly average didn't breach the standard in Bengaluru, Chennai and Thiruvananthapuram (See *Graph 7: Rate of increase in $PM_{2.5}$ in a) Bengaluru, b) Chennai, c) Hyderabad, d)* Thiruvananthapuram*, e)* Visakhapatnam*: 2019 vs 2020*).

Graph 6a: Rate of increase in $PM_{2.5}$ in Bengaluru: 2019 vs 2020



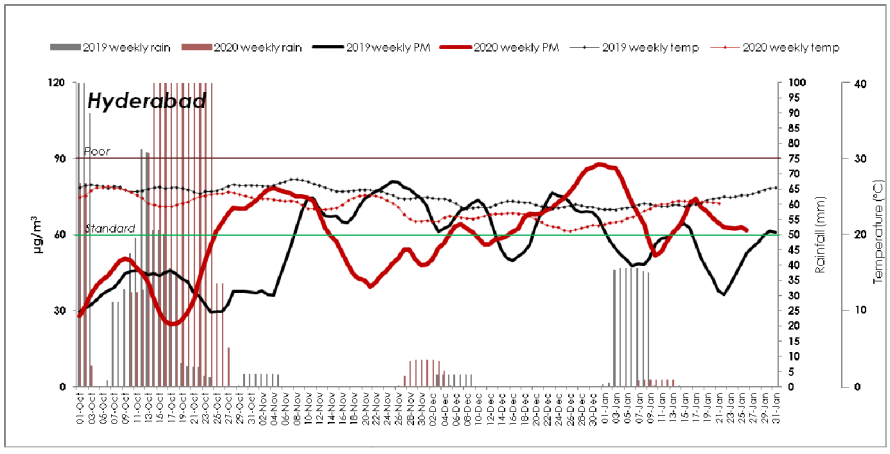
Note: All values are rolling weekly average. Data: CPCB ($PM_{2.5}$), IMD (Temperature and rainfall)
Source: CSE analysis

Graph 6b: Rate of increase in $PM_{2.5}$ in Chennai: 2019 vs 2020



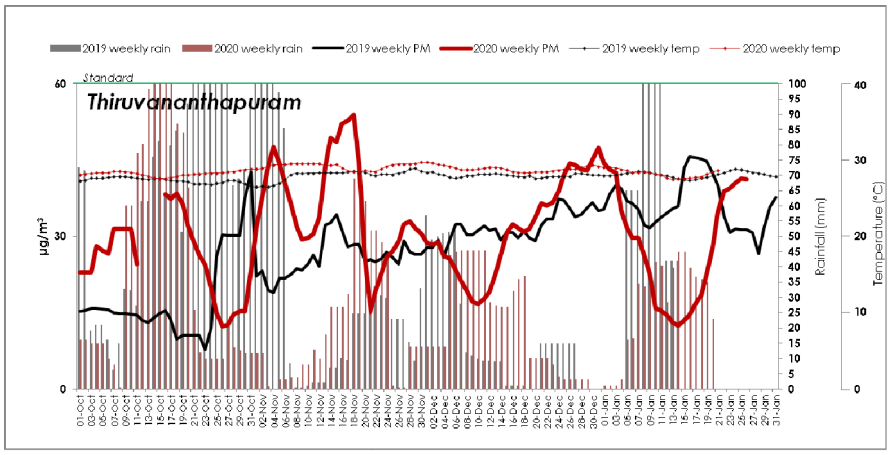
Note: All values are rolling weekly average. Data: CPCB ($PM_{2.5}$), IMD (Temperature and rainfall)
Source: CSE analysis

Graph 6c: Rate of increase in $PM_{2.5}$ in Hyderabad: 2019 vs 2020



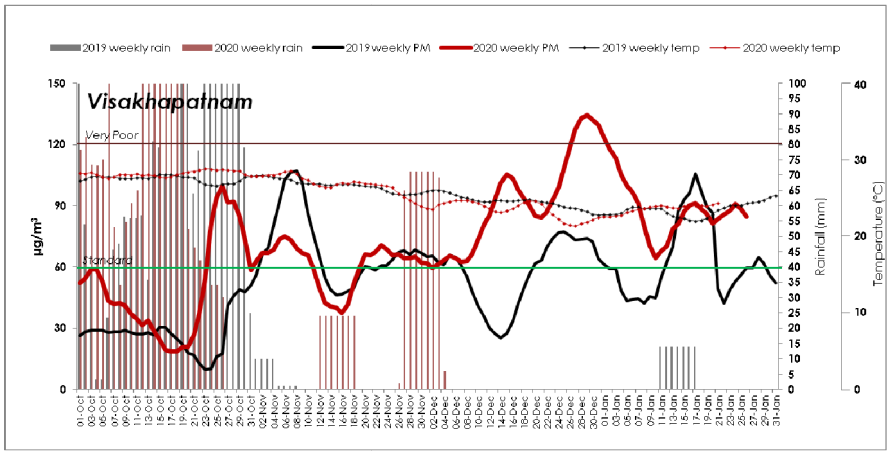
Note: All values are rolling weekly average. Data: CPCB ($PM_{2.5}$), IMD (Temperature and rainfall)
Source: CSE analysis

Graph 6d: Rate of increase in $PM_{2.5}$ in Thiruvananthapuram: 2019 vs 2020



Note: All values are rolling weekly average. Data: CPCB ($PM_{2.5}$), IMD (Temperature and rainfall)
Source: CSE analysis

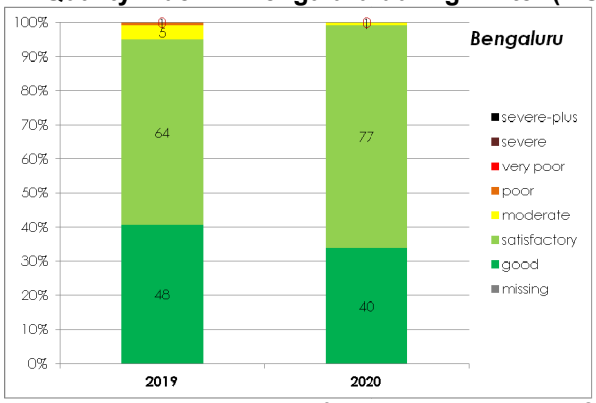
Graph 6e: Rate of increase in $PM_{2.5}$ in Visakhapatnam: 2019 vs 2020



Note: All values are rolling weekly average. Data: CPCB ($PM_{2.5}$), IMD (Temperature and rainfall)
Source: CSE analysis

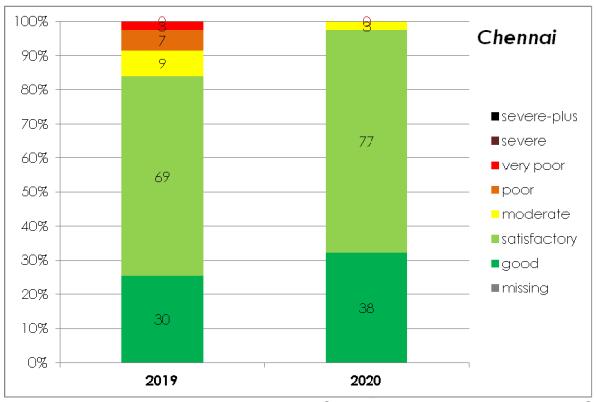
Number of days with $PM_{2.5}$ concentration meeting standard was considerably lower this winter in Hyderabad and Visakhapatnam; Bengaluru, Chennai. Thiruvananthapuram seen lesser bad air days: There have been 31 days of poor or worse air days this winter compared to 10 recorded last year in Visakhapatnam. Hyderabad registered a day will poor air quality compared to zero in winter of 2019. Similarly standard days have been lesser by 11 days in Hyderabad, 23 days in Visakhapatnam (See *Graph 7: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in a) Bengaluru, b) Chennai, c) Hyderabad, d)* Thiruvananthapuram*, e)* Visakhapatnam *during winter (1 Oct –26 Jan) 2019 and 2020*). Thiruvananthapuram met the air quality standard on all the days of this winter. Chennai and Bengaluru saw reduction in number of days with PM level exceeding the standard but Bengaluru also saw decrease in number of days with good air quality.

Graph 7a: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in Bengaluru during winter (1 Oct – 26 Jan) 2019 and 2020.



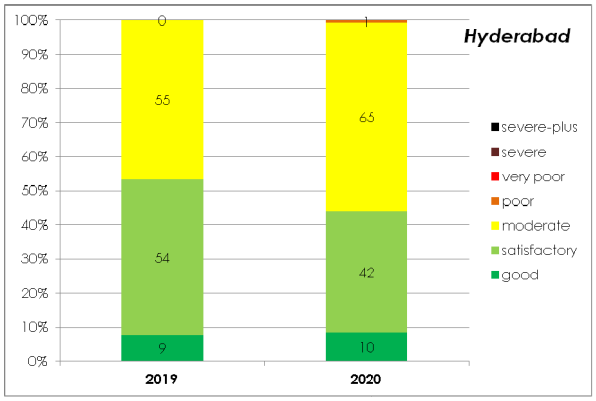
Note: Average $PM_{2.5}$ concentration for a day is based on single CAAQM station.
Source: CSE analysis of CPCB's realtime air quality data

Graph 7b: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in Chennai during winter (1 Oct – 26 Jan) 2019 and 2020.



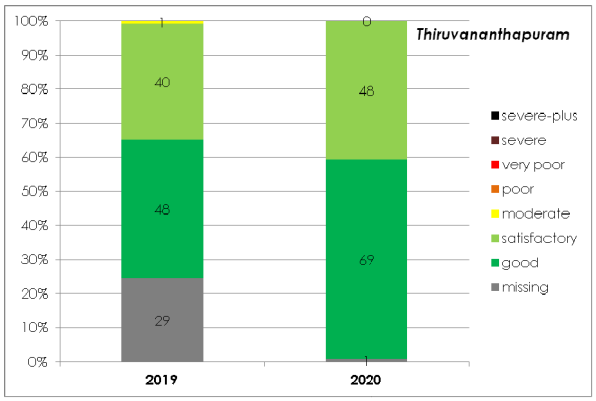
Note: Average $PM_{2.5}$ concentration for a day is based on single CAAQM station.
Source: CSE analysis of CPCB's realtime air quality data

Graph 7c: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in Hyderabad during winter (1 Oct – 26 Jan) 2019 and 2020.



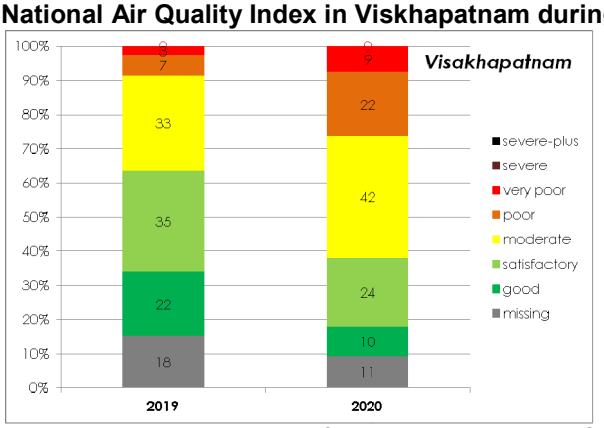
Note: Average $PM_{2.5}$ concentration for a day is based on mean of 3 CAAQM stations of Lucknow.
Source: CSE analysis of CPCB's realtime air quality data

Graph 7d: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in Thiruvananthapuram during winter (1 Oct – 26 Jan) 2019 and 2020.



Note: Average $PM_{2.5}$ concentration for a day is based on single CAAQM station at IGSC, Patna.
Source: CSE analysis of CPCB's realtime air quality data

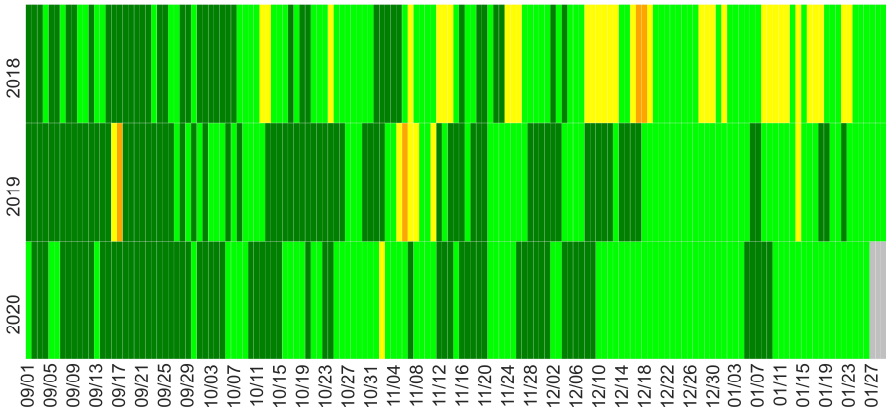
Graph 7e: Distribution of days based on $PM_{2.5}$ concentration and classified according to National Air Quality Index in Viskhapatnam during winter (1 Oct – 26 Jan) 2019 and 2020.



Note: Average $PM_{2.5}$ concentration for a day is based on single CAAQM station.
Source: CSE analysis of CPCB's realtime air quality data

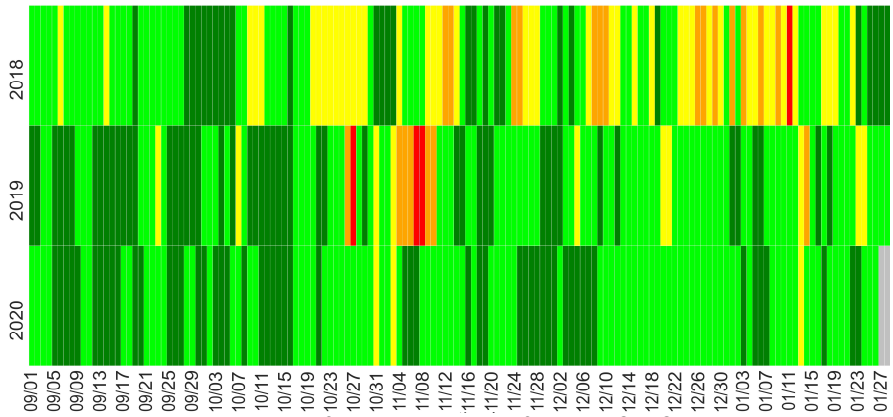
The cyclical ups and down of pollution this winter is less volatile – showing slower rise and fall than pervious winter: This inelastic behavior of $PM_{2.5}$ levels in southern cities is looking more volatile during this winter with frequent quicker rise and drop (*See Graph 8: Heatmap of daily $PM_{2.5}$ concentration in winter a) Bengaluru, b) Chennai, c) Hyderabad, d)* Thiruvananthapuram*, e)* Visakhapatnam *(1 Sept – 26 Jan) of 2018, 2019, and 2020*). This can be the impact of meteorology.

Graph 8a: Heatmap of Bengaluru's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



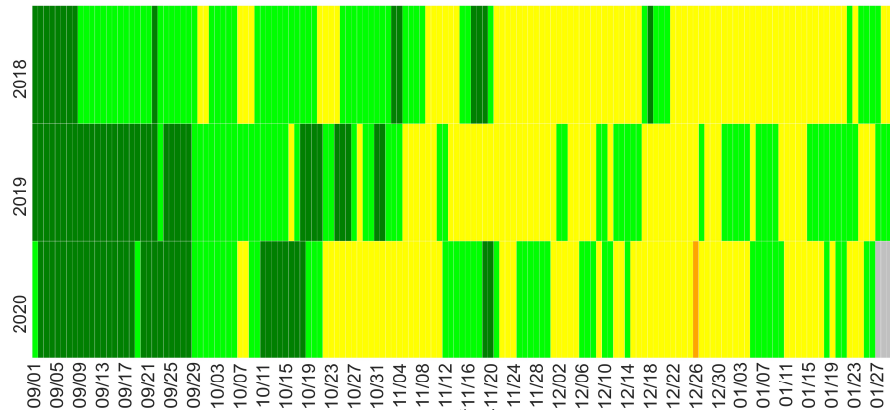
Note: Average $PM_{2.5}$ concentration for a day is based on average of all CAAQM stations in the city. Days are colored based on AQI categories.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8b: Heatmap of Chennai's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



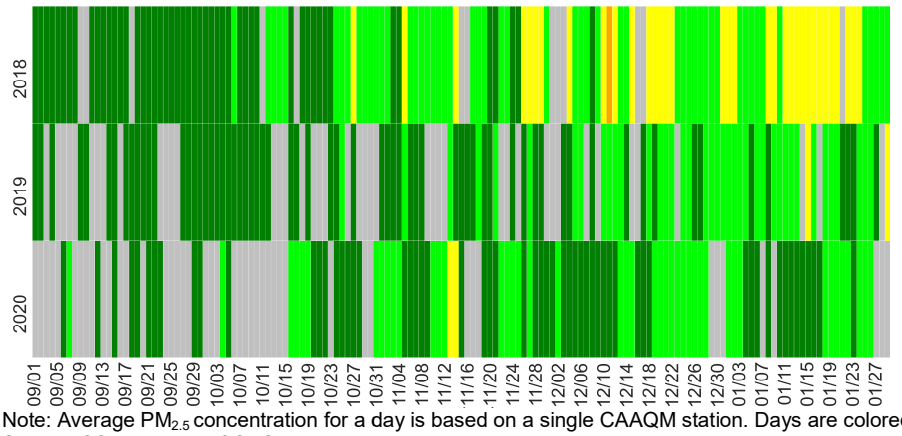
Note: Average $PM_{2.5}$ concentration for a day is based on four older CAAQM stations in the city. Days are colored based on AQI categories.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8c: Heatmap of Hyderabad's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



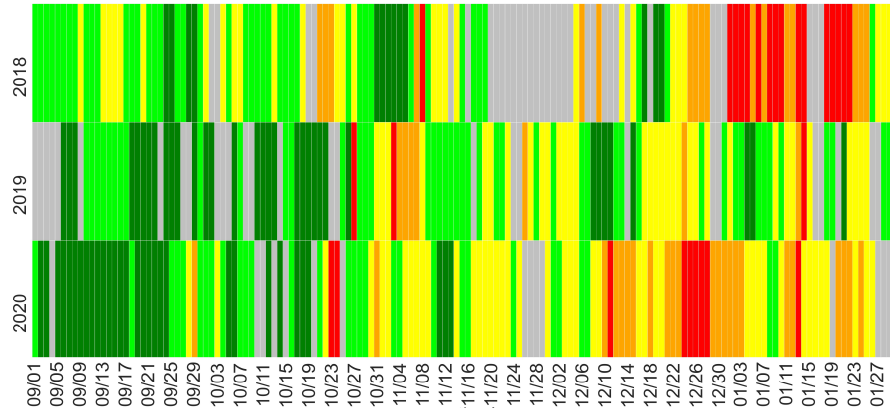
Note: Average $PM_{2.5}$ concentration for a day is based on mean of 3 CAAQM stations of Lucknow. Days are colored based on AQI categories.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8d: Heatmap of Thiruvananthapuram's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



Note: Average $PM_{2.5}$ concentration for a day is based on a single CAAQM station. Days are colored based on AQI categories.
Source: CSE analysis of CPCB's realtime air quality data

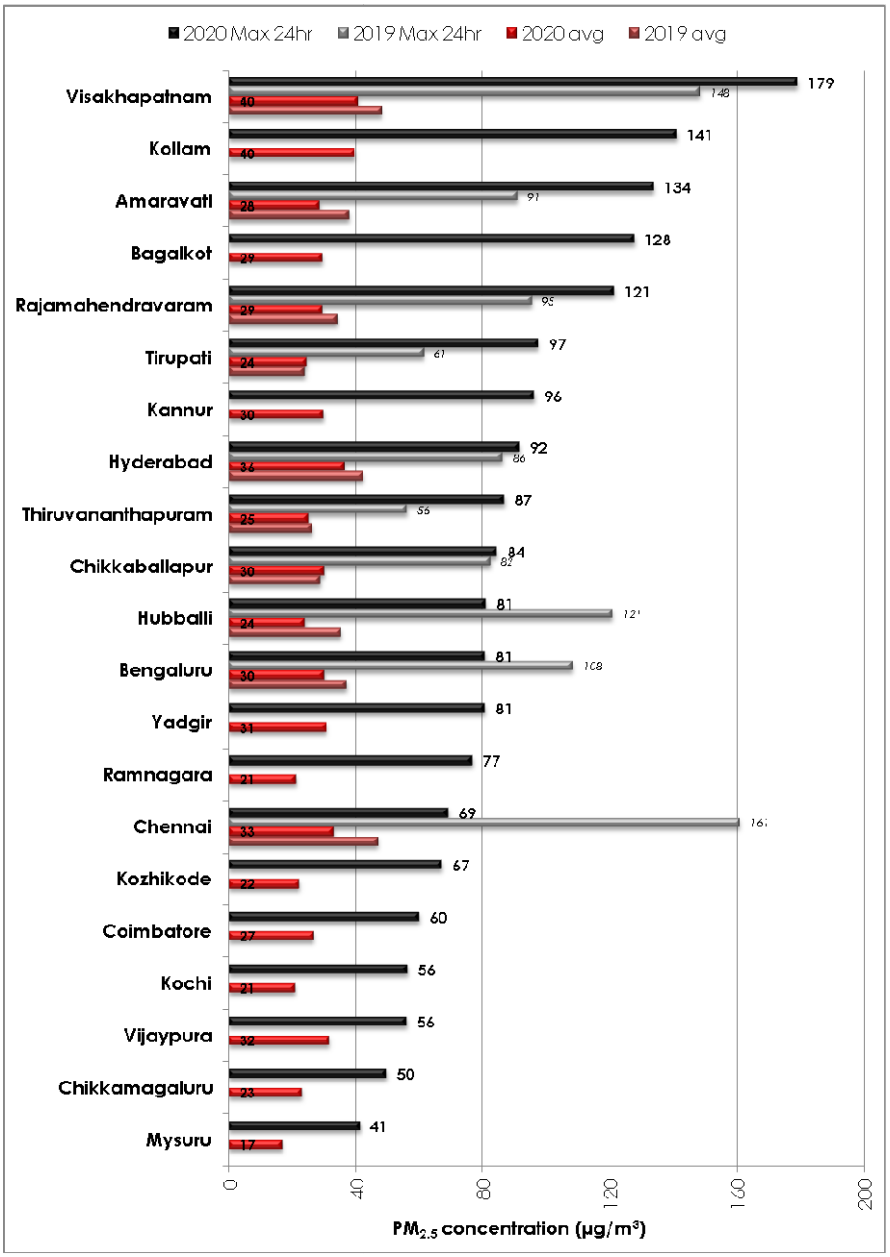
Graph 8e: Heatmap of Visakhapatnam's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



Note: Average $PM_{2.5}$ concentration for a day is based on a single CAAQM station. Days are colored based on AQI categories.
Source: CSE analysis of CPCB's realtime air quality data

Even with comparatively cleaner air during this year, most cities recorded daily spikes similar to those observed in 2019: CSE has compared the annual averages and peak 24hr averages in these southern cities between 2019 and 2020. This shows that the smaller towns even with much lower annual average levels of $PM_{2.5}$ have experienced almost same or higher maximum daily levels during winter when the entire region got air locked (See *Graph 9: How annual average and maximum level changed in southern cities and towns– comparison of 2019 and 2020*). Andhra Pradesh cities have relatively highest daily peak compared to the rest.

Graph 9: How annual average and maximum level changed in southern cities and towns– comparison of 2019 and 2020



Note: 2020 numbers are based on data up to 31 Dec 2020.
Source: CSE analysis of CPCB's realtime air quality data

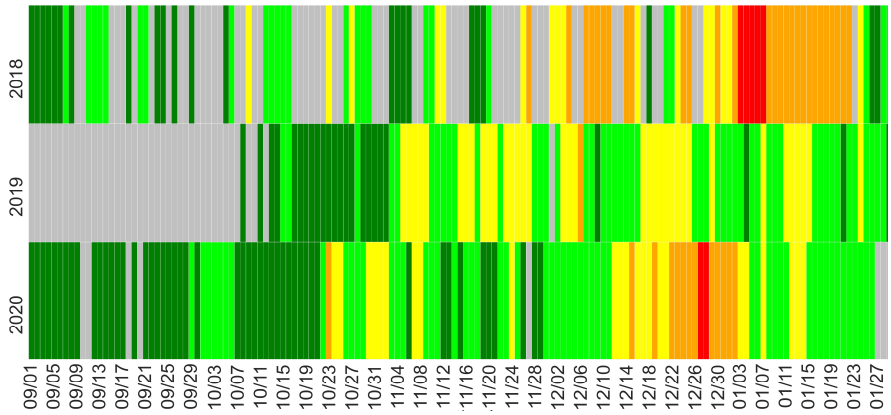
Need deep cuts

This analysis bears out the need for deeper clean air action in the regions of southern India that otherwise is considered less polluted than the northern belt. But the region will have to work harder to meet not only the national ambient air quality standards but also aspire to meet the health based guidelines of the World Health Organisation to reduce public health risk.

It is clear that the region has to take forward its wins so far and raise the level of ambition to drive action across all key sectors of pollution and in the entire region. Enforce power plant standards across the state, minimise use of coal and other dirty fuels in the industry while improving industrial emissions control systems, scale up public transport and vehicle restraint measures and manage waste to have a zero waste and zero landfill strategy.

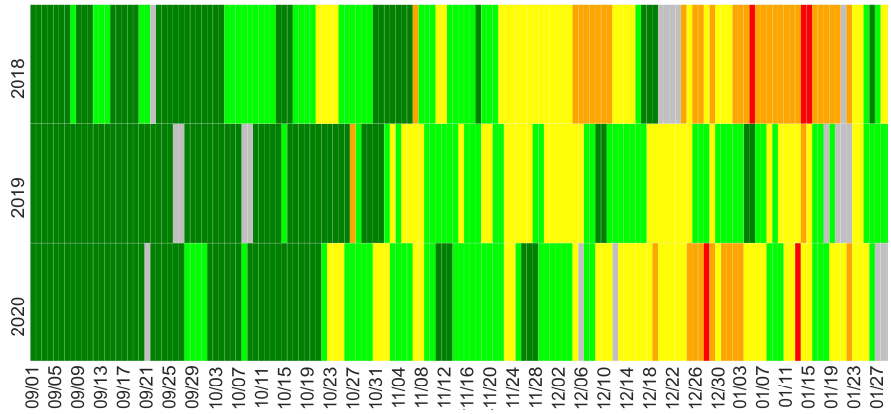
Annexures: Heatmap of other cities

Graph 8f: Heatmap of Amravati's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



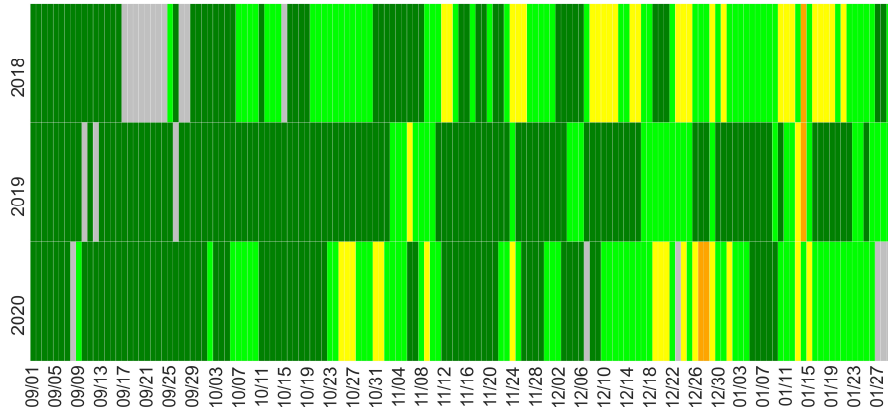
Note: Average $PM_{2.5}$ concentration for a day is in $\mu g/m^3$. Days are colored based on AQI categories, grey cells represent no valid data for that day.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8g: Heatmap of Rajamaaahendrvaram's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



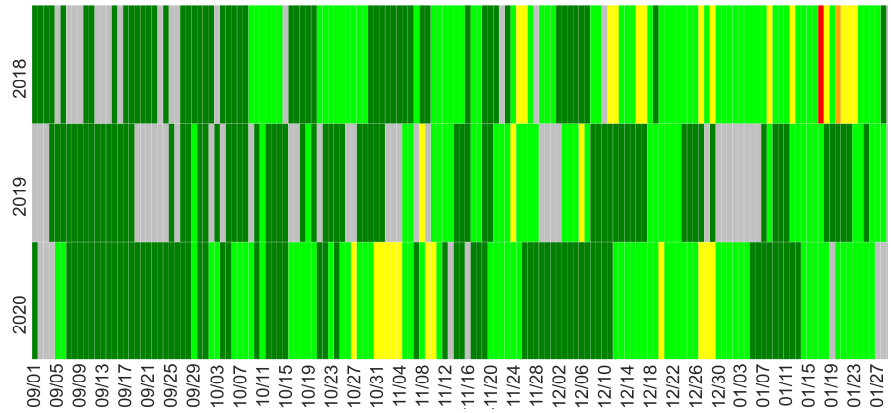
Note: Average $PM_{2.5}$ concentration for a day is in $\mu g/m^3$ and is based on mean of two CAAQM stations in the city. Days are colored based on AQI categories, grey cells represent no valid data for that day.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8h: Heatmap of Tirupati's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



Note: Average $PM_{2.5}$ concentration for a day is in $\mu g/m^3$. Days are colored based on AQI categories, grey cells represent no valid data for that day.
Source: CSE analysis of CPCB's realtime air quality data

Graph 8i: Heatmap of Chikkaballapur's daily $PM_{2.5}$ concentration in winter (1 Sept – 26 Jan) of 2018, 2019 and 2020



Note: Average $PM_{2.5}$ concentration for a day is in $\mu g/m^3$. Days are colored based on AQI categories, grey cells represent no valid data for that day.
Source: CSE analysis of CPCB's realtime air quality data

List of CAAQM stations used in the study

State		City	Station Name	
1	Andhra_Pradesh	Amaravati	1	Secretariat, Amaravati - APPCB
		Rajamahendravaram	1	Anand Kala Kshetram, Rajamahendravaram - APPCB
		Tirupati	1	Tirumala, Tirupati - APPCB
		Vijayawada	1	PWD Grounds, Vijayawada - APPCB
		Visakhapatnam	1	GVM Corporation, Visakhapatnam - APPCB
2	Karnataka	Bagalkot	1	Vidayagiri, Bagalkot - KSPCB
		Bangalore	1	Sanegurava Halli, Bengaluru - KSPCB
			2	City Railway Station, Bengaluru - KSPCB
			3	BWSSB Kadabesanahalli, Bengaluru - CPCB
			4	Peenya, Bengaluru - CPCB
			5	BTM Layout, Bengaluru - CPCB
			6	Bapuji Nagar, Bengaluru - KSPCB
			7	Silk Board, Bengaluru - KSPCB
			8	Hebbal, Bengaluru - KSPCB
			9	Hombegowda Nagar, Bengaluru - KSPCB
			10	Jayanagar 5th Block, Bengaluru - KSPCB
		Bidar	1	Naubad, Bidar - KSPCB
		Chamarajanagar	1	Urban, Chamarajanagar - KSPCB
		Chikkaballarpur	1	Chikkaballapur Rural, Chikkaballapur - KSPCB
		Chikkamagaluru	1	Kalyana Nagara, Chikkamagaluru - KSPCB
		Davanagere	1	Devaraj Urs Badavane, Davanagere - KSPCB
		Gadag	1	Panchal Nagar, Gadag - KSPCB
		Hubballi	1	Deshpande Nagar, Hubballi - KSPCB
		Kalaburagi	1	Lal Bahadur Shastri Nagar, Kalaburagi - KSPCB
		Kolar	1	Tamaka Ind. Area, Kolar - KSPCB
		Koppal	1	Diwator Nagar, Koppal - KSPCB
		Madikeri	1	Stuart Hill, Madikeri - KSPCB
		Manglore	1	Kadri, Mangalore - KSPCB
		Mysuru	1	Hebbal 1st Stage, Mysuru - KSPCB
		Raichur	1	Haji Colony, Raichur - KSPCB
		Ramanagara	1	Vijay Nagar, Ramanagara - KSPCB
		Shivamogga	1	Vinoba Nagara, Shivamogga - KSPCB
		Vijayapura	1	Ibrahimpur, Vijayapura - KSPCB
		Yadgir	1	Collector Office, Yadgir - KSPCB
3	Kerala	Eloor	1	Udyogamandal, Eloor - Kerala PCB
		Ernakulam	1	Kacheripady, Ernakulam - Kerala PCB
		Kannur	1	Thavakkara, Kannur - Kerala PCB

		Kochi	1	Vyttila, Kochi - Kerala PCB
		Kollam	1	Polayathode, Kollam - Kerala PCB
		Kozhikode	1	Palayam, Kozhikode - Kerala PCB
		Thiruvananthapuram	1	Plammoodu, Thiruvananthapuram - Kerala PCB
			2	Kariavattom, Thiruvananthapuram - Kerala PCB
		Thrissur	1	Corporation Ground, Thrissur- Kerala PCB
4	Tamil_Nadu	Chennai	1	Manali, Chennai - CPCB
			2	Velachery Res. Area, Chennai - CPCB
			3	Alandur Bus Depot, Chennai - CPCB
			4	Manali Village, Chennai - TNPCB
			5	Kodungaiyur, Chennai - TNPCB
			6	Royapuram, Chennai - TNPCB
			7	Arumbakkam, Chennai - TNPCB
			8	Perungudi, Chennai - TNPCB
		Coimbatore	1	SIDCO Kurichi, Coimbatore - TNPCB
		Gummidipoondi	1	Anthoni Pillai Nagar, Gummidipoondi - TNPCB
		Thoothukodi	1	Meelavittan, Thoothukudi - TNPCB
5	Telangana	Hyderabad	1	Central University, Hyderabad - TSPCB
			2	ICRISAT Patancheru, Hyderabad - TSPCB
			3	Bollaram Industrial Area, Hyderabad - TSPCB
			4	IDA Pashamylaram, Hyderabad - TSPCB
			5	Zoo Park, Hyderabad - TSPCB
			6	Sanathnagar, Hyderabad - TSPCB