Spread and scale of winter air pollution in India - 2021-22

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The particulate pollution spiked and stayed elevated with varying intensity across all regions during the winter of 2021-22 (15 October to 28 February). Even though the overall regional averages of PM2.5 levels were lower than the previous winter in most regions, the winter smog episodes recorded severe spikes in several regions. Peak pollution is alarmingly high and synchronized despite large distances within the regions –especially in northern and eastern plains.

This has emerged from the concluding analysis for 2021-22 winter air quality tracker initiative of the Urban Data Analytics Lab of Centre for Science and Environment (CSE).

Clearly, the winter pollution challenge is not limited to mega cities or to one specific region; it is now a widespread national problem that requires urgent and deliberate action at a national scale. This requires quicker reforms and action in key sectors of pollution – vehicles, industry, power plants and waste management to bend the annual air pollution curve and daily spikes.

As availability of real time air quality data has improved in several regions with expansion of the air quality monitoring systems, it has become possible to assess the regional differences and understand the unique regional trends. This needs to inform the regional clean air action.

This air quality tracker initiative has helped to benchmark the winter air quality for peer-to-peer comparison within each region and inter-regional differences.

Data analysis: This 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. The data is captured from 326 official stations under the Continuous Ambient Air Quality Monitoring System (CAAQMS) spread across 161 cities in 26 states and union territories. Apart from Delhi, Puducherry and Chandigarh, there are 8 cities in Punjab, 24 cities in Haryana, 16 cities in Uttar Pradesh, 23 cities in Bihar, 6 cities in West Bengal, 8 cities in Rajasthan, 15 cities in Madhya Pradesh, 6 cities in Gujarat, 5 cities in Andhra Pradesh, 22 cities in Karnataka, two in Odisha, 6 cities in Kerala, 7 cities in Maharashtra, 3 cities in Tamil Nadu, 12 cities in Chhattisgarh, city each in Anurachal Pradesh, Jammu & Kashmir, Telangana, Assam, Meghalaya, Mizoram, Nagaland, and Tripura.

Delhi (40), Mumbai (21), Bengaluru (10), Chennai (8), Pune (8), Ahmedabad (8), Kolkata (7), Lucknow (7), Hyderabad (6), Patna (6), Agra (6), Moradabad (5), Ghaziabad (4), Noida (4), Gurugram (4), Faridabad (4), Navi Mumbai (4), Kanpur (4), Varanasi (4), Prayagraj (3), Meerut (3), Jaipur (3), Howrah (3), Kochi (3), Chandigarh (3), Gandhinagar (3), Gaya (3), Muzzafarpur (3), Thiruvananthapuram (2), Guwahati (2), Greater Noida (2), Chandrapur (2), Firozabad (2) and Gwalior (2) have more than one real-time station, therefore citywide average is used for analysis and it is defined as average of all city stations that meet minimum 75 per cent data completeness criteria.

Key highlights

Regional profile of winter pollution shows eastern region is as polluted as Delhi-NCR: The winter average of PM2.5 in eastern plains that also include the newly monitored 19 cities and towns of Bihar, was same as that of Delhi-NCR. Most polluted cities this winter are from Bihar and Delhi-NCR. Six Bihar towns feature in the top 10 most polluted cities this winter with Siwan and Munger at the top. In northern plains, Ghaziabad, Delhi, Faridabad, and Manesar are third, fifth, seventh and tenth in the list of ten most polluted

cities. Even though the seasonal average in smaller cities of Bihar rivals the mega-cities of NCR, their peak pollution during smog episodes are comparatively milder.

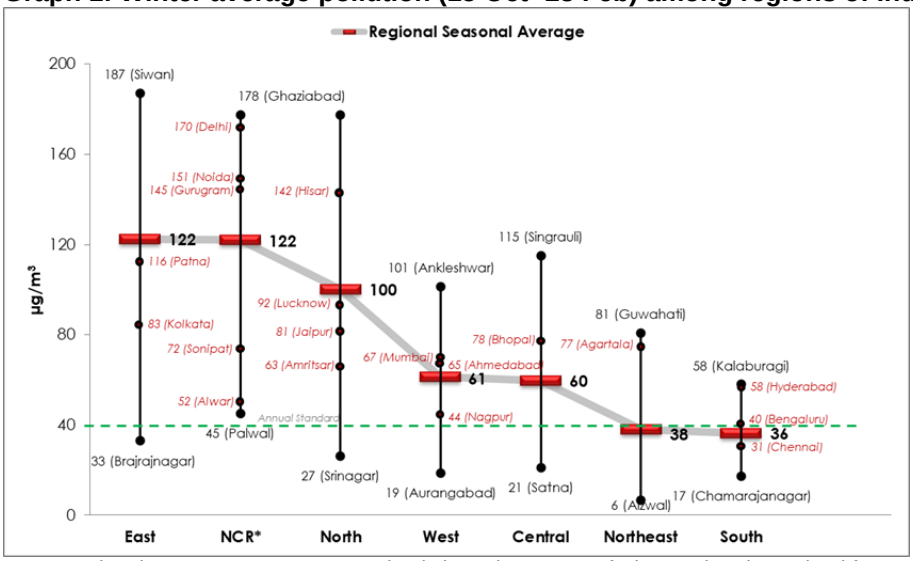
The NCR cities have experienced the most severe daily (24-hr average) $PM_{2.5}$ levels with Ghaziabad being the worst hit. Delhi, Noida, Faridabad, Greater Noida, and Gurugram have experienced he worst peak pollution (24-hr average) this winter.

The PM2.5 average of the eastern region is over three times the average of the cities in southern India and 22 per cent more polluted than North Indian cities (See *Graph 1: Trend in winter average pollution among regions of India*). Within the East, the Bihar sub-region is the most polluted.

From the peak 24-hr PM2.5 level perspective North Indian cities have recorded the highest daily pollution levels on an average. Within North, Delhi-NCR remains the most polluted sub-region with their worst days being almost five times the average. Its peak pollution is also almost five times higher the average peak of northeastern India cities (region with lowest peak pollution) and about 60 per cent higher than the average peak of eastern cities (region with the worst regional average).

It is important to note that mega cities are not the most polluted in any of the regions, it is the smaller and upcoming cities that are pollution hotspots. This is even more evident in the winter peak daily pollution data (See *Graph 2: Trend in winter peak pollution among regions of India*).

Graph 1: Winter average pollution (15 Oct- 28 Feb) among regions of India

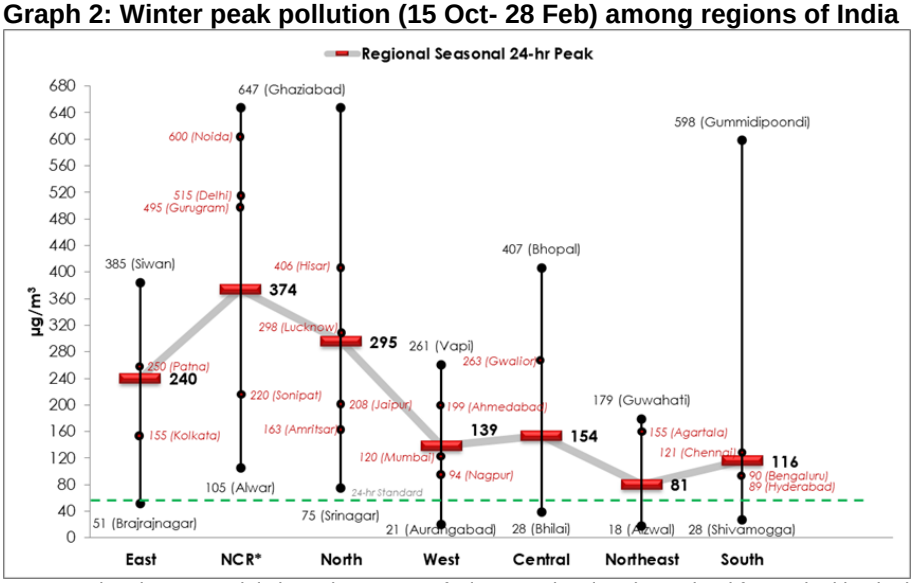


Note: Regional average $PM_{2.5}$ concentration is based on mean of winter value determined for each cities in the region. Winter value of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in a city with minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

The average winter pollution of 2021-22 is lower than the previous winter: The regional $PM_{2.5}$ levels this winter is lower compared to previous winter across all regions with some variation. Air quality on an average was 12 per cent cleaner this winter compared to previous winter based on an average of 136 cities that have valid daily $PM_{2.5}$ concentration data for over 75 per cent of days of both winters (15 October to 28 February). Most improvement on average was noted in Northeast region (33 per cent) while Western region cities showed the least improvement (8 per cent).

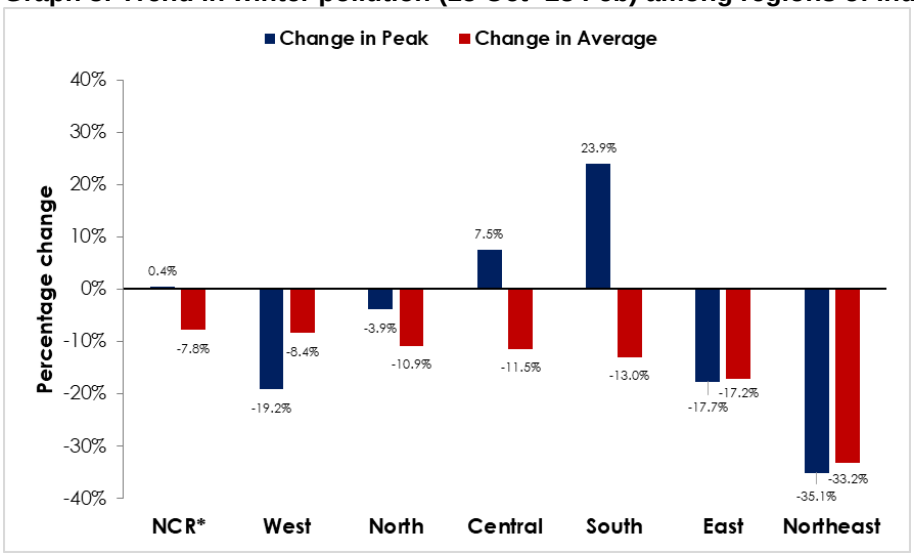
North Indian cities on an average have recorded 11 per cent lower PM2.5 level this winter, but the improvement in sub-region of Delhi NCR is smaller - just about 8 per cent (See *Graph 3: Trend in winter pollution (15 Oct- 28 Feb) among regions of India*). Delhi-NCR also saw marginal increase in their average peak 24-hr pollution. The peak pollution rose significantly from the baseline among the cities in the South (24 per cent) and Central Indian cities (7 per cent) despite the overall fall in the winter average.

Graph 2: Winter peak pollution (15 Oct- 28 Feb) among regions of India



Note: Regional $PM_{2.5}$ peak is based on mean of winter peak value determined for each cities in the region.
Source: CSE analysis of CPCB's real time air quality data

Graph 3: Trend in winter pollution (15 Oct- 28 Feb) among regions of India



Note: Based on cities that have data for both winter seasons (2020-21 and 2021-22).
Source: CSE analysis of CPCB's real time air quality data

Smaller cities of Bihar recorded higher pollution during winter than big cities of Delhi-NCR: Siwan in Bihar was the most polluted city in India this winter with seasonal average of 187 µg/m3. In fact, 13 cities of Bihar feature in top 25 cities with highest levels in winter (See *Annexure 1: All India peer comparison of winter pollution*). Delhi NCR has 11 cities in the list of 25 most polluted cities. Hisar in Northern Haryana is the only city in top 25 outside the sub-regions of Bihar and NCR.

From peak winter pollution perspective NCR cities completely dominate the list of most polluted with significantly worse 24-hr averages compared to rest of the country. Ghaziabad has witnessed the worst peak (24-hr average) among all the cities this winter with levels 647 µg/m3 (almost 11-times the Indian standard).

Aizwal in Mizoram and Shillong in Meghalaya were the least polluted cities in the country.

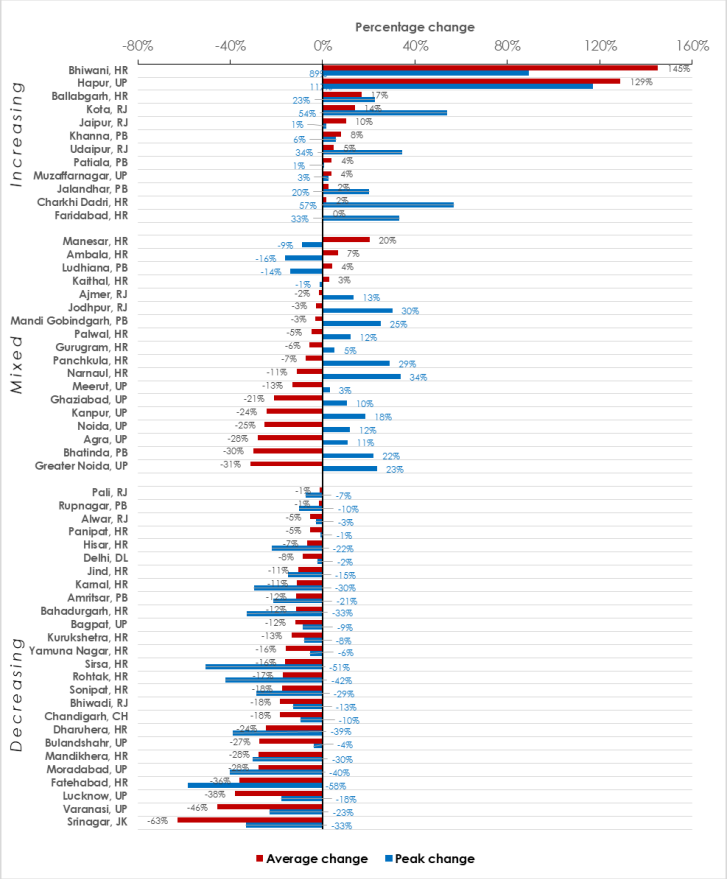
Winter air quality in northern region

The northern region includes 60 cities with real time monitoring facilities and are spread across the states of Punjab, Haryana, Chandigarh, Delhi-NCR, Rajasthan and UP. 56 of these cities had functional monitoring in 2020 winter as well. Geographically, this region represents the North Central Plains.

Cities with increasing trend: 12 cities in the region show increasing trend, i.e. both winter average and peak increased compared to their previous winter. Bhiwani in Haryana saw a staggering jump of 145 per cent in the winter average and 89 per cent increase in peak. It was followed by Hapur in UP that registered 129 per cent increase in winter average and 117 per cent increase in peak. Other cities that show increase include Ballabgarh, Kota, Jaipur, Khanna, Udaipur, Patiala, Muzaffarnagar, Jalandhar, Charkhi Dadri, and Faridabad (See *Graph 4: Trend in winter pollution among cities of North India*).

Cities with mixed trend: 18 cities in the region show mixed trend, i.e. their winter average has declined but the peak pollution increased compared to their previous winter or visa-versa. Manesar, Ambala, Ludhiana and Kaithal show increase in their winter average but registered lower peak pollution. Ajmer, Jodhpur, Mandi Gobindgarh, Palwal, Gurugram, Panchkula, Narnaul, Meerut, Ghaziabad, Kanpur, Noida, Agra, Bhatinda, and Greater Noida saw decline in their winter average but registered higher peaks compared to last winter. Greater Noida has the most divergent trend as its winter average declined by 31 per cent but its peak is 23 per cent higher.

Graph 4: Trend in winter pollution (15 Oct- 28 Feb) among cities of North India



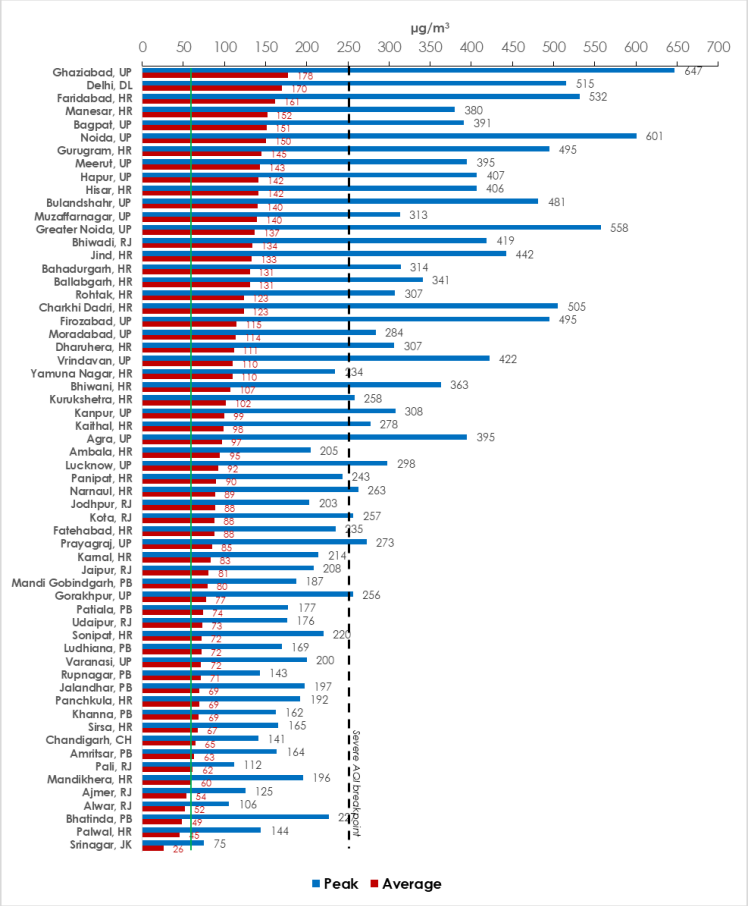
Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Cities recording declining trend in winter pollution: 26 cities show declining trend, i.e. both winter average and peak decreased compared to their previous winter. Srinagar in Jammu & Kashmir saw the highest decline with a drop of 63 per cent in their winter average and 33 per lower peak. Delhi also registered decline but marginal. Its winter average declined by 8 per cent and peak by 2 per cent. Other cities with declining trend include Pali, Rupnagar, Alwar, Panipat, Hisar, Jind, Karnal, Amritsar, Bahadurgarh, Bagpat, Kurukshetra, Yamuna Nagar, Sirsa, Rohtak, Sonipat, Bhiwadi, Chandigarh, Dharuhera, Bulandshahr, Mandikhera, Moradabad, Fatehabad, Lucknow, and Varanasi.

Most polluted cities: Most polluted city in the region during winter was Ghaziabad with winter average of 178 µg/m^3 followed by Delhi that had a winter average of 170 µg/m3. Next eight spots are all occupied by neighboring NCR cities, namely Faridabad, Manesar, Bagpat, Noida, Gurugram, Meerut, and Hapur. Cities of NCR completely dominated the list of the most polluted. Hisar is the most polluted city in North outside NCR with winter average of 142 µg/m3 followed by Firozabad, Moradabad and Vrindavan. All in immediate vicinity of NCR. (See *Graph 5: Peer comparison of winter pollution in cities of North India*).

Least polluted cities: Srinagar is the cleanest city in North. Palwal in Haryana, Bhatinda in Punjab and Alwar in Rajasthan are the other cities with relatively lower winter average. Interestingly, the peak pollution exceeded the standard of 60 µg/m^3 in all the cities.

Graph 5: Peer comparison of winter pollution in cities of North India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

Air quality in eastern region

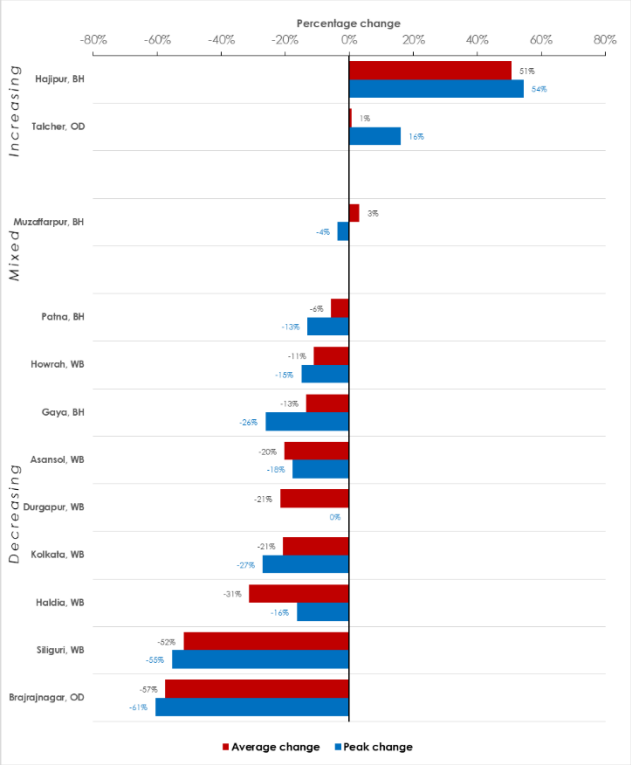
The eastern region includes 28 cities spread across Bihar, West Bengal, Jharkhand and Odisha. Geographically, this region represents the Eastern Plains and Eastern Highlands.

Cities with increasing trend: Two cities in the region show increasing trend, i.e. both winter average and peak increased compared to their previous winter. Hajipur in Bihar saw a jump of 51 per cent in the winter average and 54 per cent increase in peak. Talcher in Odisha registered 1 per cent increase in winter average and 16 per cent increase in peak. (See *Graph 6: Trend in winter pollution among cities of North India*).

Cities with mixed trend: Muzaffarpur is the only city in the region that show mixed trend, i.e. their winter average declined but peak pollution increased compared to their pevious winter or visa-versa. Its winter average increased by 3 per cent but its peak was 4 per cent lower.

Cities with declining trend: Nine cities in the region show declining trend, i.e. both winter average and peak decreased compared to their last winter. Brajrajnagar in Odisha saw the most decline with a drop of 57 per cent in their winter average and 61 per lower peak. Kolkata also registered decline -- winter average declining by 21 per cent and peak by 27 per cent. Other cities with declining trend are Patna, Howrah, Gaya, Asansol, Durgapur, Haldia, and Siliguri.

Graph 6: Trend in winter pollution (15 Oct- 28 Feb) among cities of eastern region

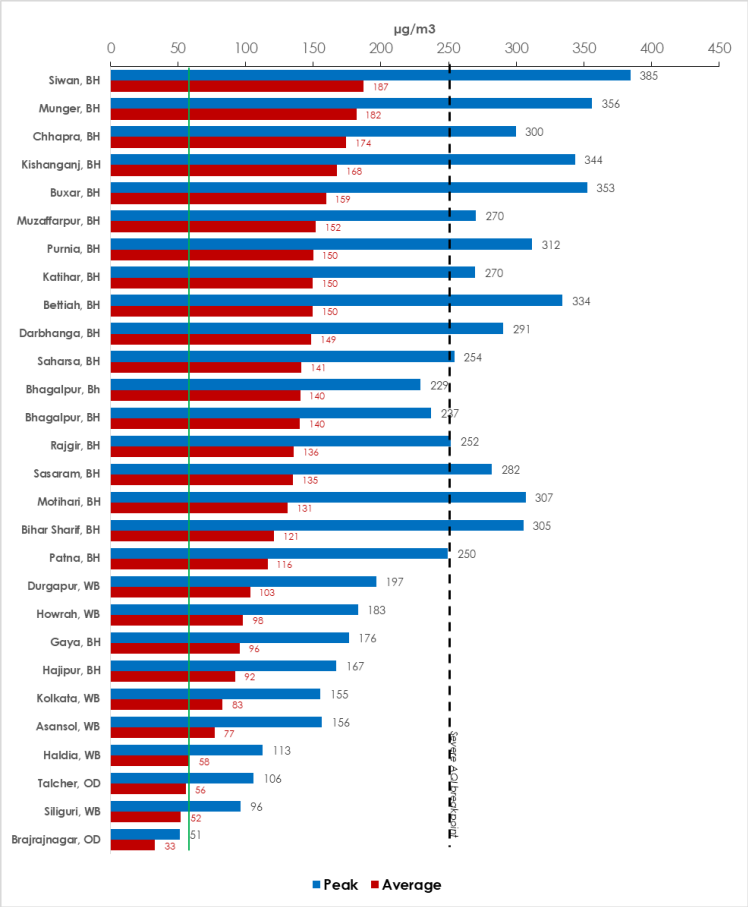


Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Most polluted cities: Most polluted city in the region was Siwan in Bihar with winter average of 187 µg/m^3. In fact, small cities of Bihar completely dominate the list of most polluted and occupy the top 17 spots. Durgapur with winter average of 103 µg/m3 was the most polluted city in West Bengal. Patna and Kolkata occupied 18th and 23rd position on the chart (See *Graph 7: Peer comparison of winter pollution in cities of East India*).

Least polluted cities: Brajrajnagar in Odisha and Siliguri in West Bengal recorded the lowest winter average in the region. Brajrajnagar is the only city in the region with peak pollution under that 24-hr standard.

Graph 7: Peer comparison of winter pollution in cities of East India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

Air quality in western region

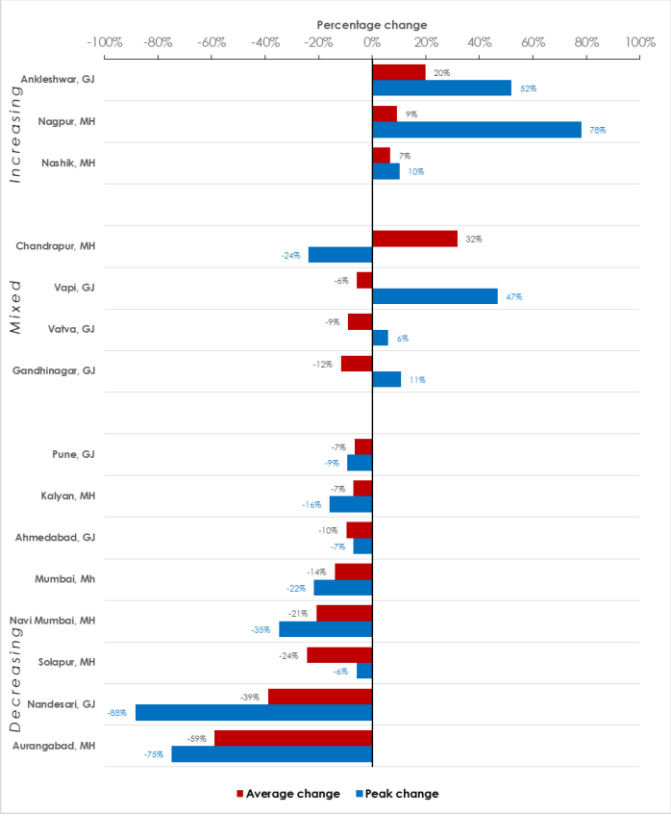
The region includes 15 cities spread across Gujarat and Maharashtra. All cities have data for both winter seasons. Geographically, this region represents the arid west, Northern Deccan plateau and Konkan Coast.

Cities with increasing trend: Three cities in the region show increasing trend, i.e. both winter average and peak increased compared to their previous winter. Ankleshwar in Gujarat saw a jump of 20 per cent in the winter average and 52 per cent increase in peak. Nagpur in Maharashtra registered 9 per cent increase in winter average and 78 per cent increase in peak. Nashik in Maharashtra registered 7 per cent increase in winter average and 10 per cent increase in peak. (See *Graph 8: Trend in winter pollution among cities of West India*).

Cities with mixed trend: Four cities in the region show mixed trend, i.e. their winter average declined but peak pollution increased compared to their previous winter or visa-versa. Chandrapur had the most divergent trend with winter average increasing by 32 per cent but its peak was 24 per cent lower.

Cities with declining trend: Eight cities in the region show declining trend, i.e. both winter average and peak decreased compared to their last winter. Aurangabad saw the most decline with a drop of 59 per cent in their winter average and 75 per lower peak. Mumbai also registered decline -- winter average declined by 14 per cent and peak by 22 per cent. Other cities that show declining trend include Pune, Kalyan, Ahmedabad, Navi Mumbai, Solapur and Nandesari.

Graph 8: Trend in winter pollution (15 Oct- 28 Feb) among cities of West India

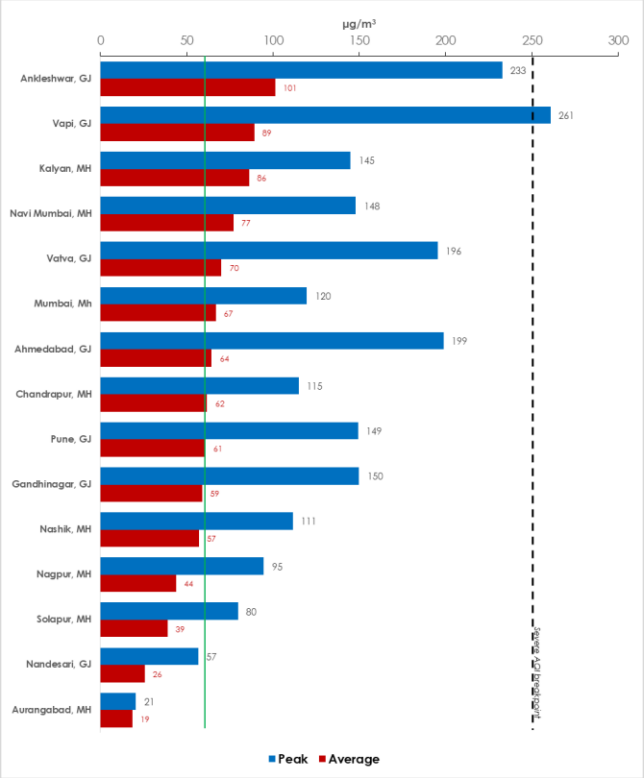


Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Most polluted cities: Most polluted city in the region was Ankleshwar with seasonal average of 101 µg/m^3. Next two spot were occupied by Vapi and Kalyan. (See *Graph 9: Peer comparison of winter pollution in cities of West India*).

Least polluted cities: Aurangabad and Nandesari recorded the lowest winter average in the region. Chandrapur, Solapur round up the list of three least polluted.

Graph 9: Peer comparison of winter pollution in cities of West India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

Air quality in Central region

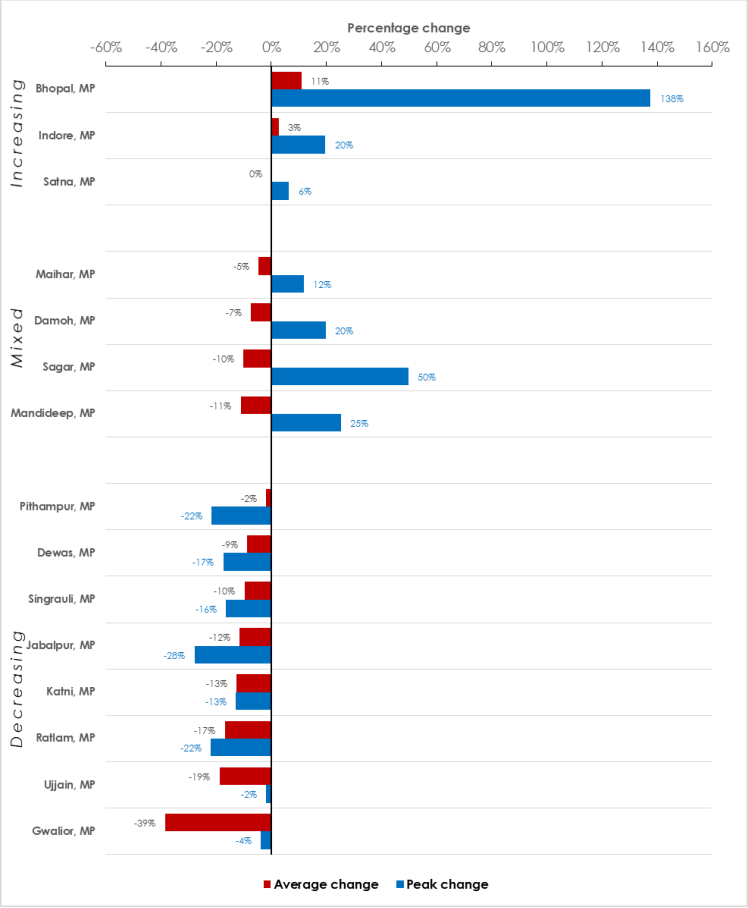
The region includes 17 cities spread across Madhya Pradesh and Chhattisgarh. 15 of these cities have data for both winters. Geographically this region represents the Central Highlands.

Cities with increasing trend: Three cities in the region show increasing trend, i.e. both winter average and peak increased compared to their last winter. Bhopal saw a jump of 11 per cent in the winter average and 138 per cent increase in peak. Indore registered 3 per cent increase in winter average and 20 per cent increase in peak. Satna registered no change in winter average but 6 per cent increase in peak. (See *Graph 10: Trend in winter pollution among cities of Central India*).

Cities with mixed trend: 4 cities in the region show mixed trend, i.e. their winter averaged declined but peak pollution increase compared to their last winter or visa-versa. Sagar had most divergent trend with winter average increased by 10 per cent but its peak was 50 per cent lower. Other cities with mixed trend in the region are Maihar, Damoh, and Mandideep.

Cities with declining trend: Eight cities in the region show declining trend, i.e. both winter average and peak decreased compared to their last winter. Gwalior saw the most decline with a drop of 39 per cent in their winter average and 4 per lower peak. Other cities with declining trend are Pithampur, Dewas, Singrauli, Jabalpur, Katni, Ratlam, and Ujjain.

Graph 10: Trend in winter pollution (15 Oct- 28 Feb) among cities of Central India

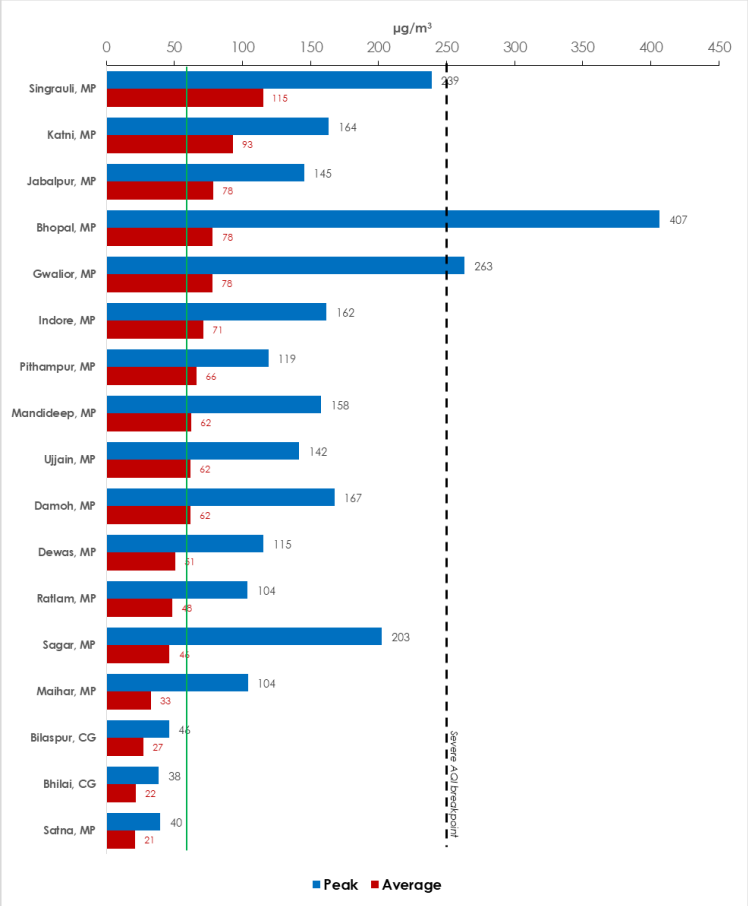


Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Most polluted cities: Most polluted city in the region was Srigrauli with winter average of 115 µg/m^3. Next two spot were occupied by Katni and Jabalpur. Bhopal with peak 24-hr level of 407 µg/m3 had highest peak pollution in the region. (See *Graph 11: Peer comparison of winter pollution in cities of Central India*).

Least polluted cities: Satna and Bhilai recorded the lowest winter average in the region. But the data from these two cities is of suspicious nature as the monitoring stations are owned and operated by industry and not the state pollution control board.

Graph 11: Peer comparison of winter pollution in cities of Central India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

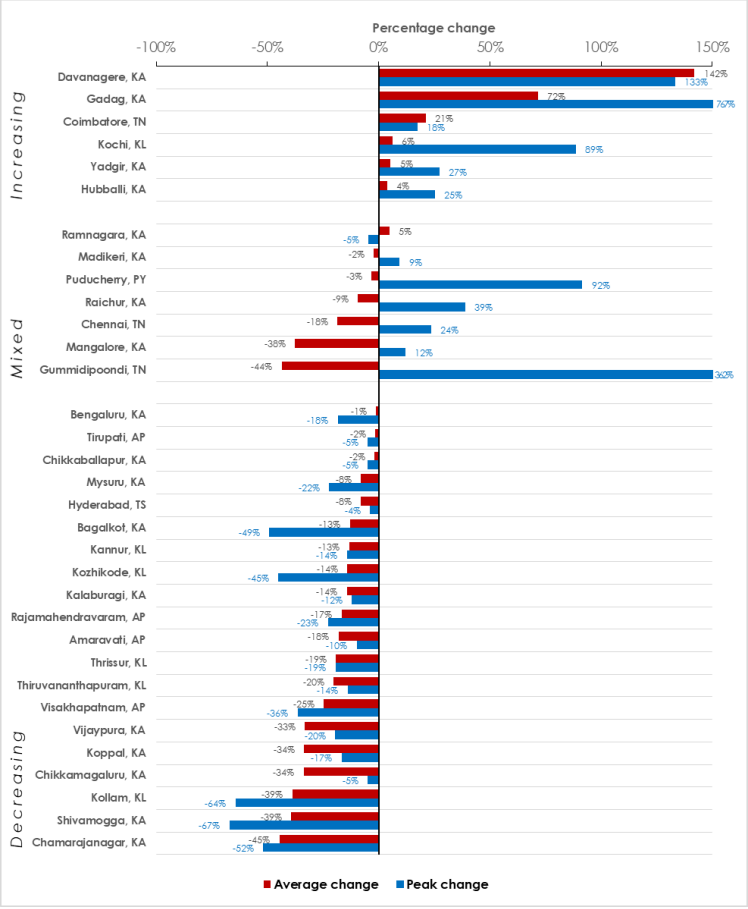
Air quality in southern region

The region includes 35 cities spread across Andhra Pradesh, Karnataka, Kerala, Puducherry, Tamil Nadu and Telangana. Geographically, this region represents the southern Deccan plateau, Western Ghats, Malabar and Coramandal coasts. Southern region recorded the lowest regional $PM_{2.5}$ average this winter but it also registered almost 24 per cent increase in regional average peak pollution compared to previous winter. Industrial towns of south namely Gummidipoondi in Tamil Nadu and Gadag in Karnataka, also appear in the worst 10 cities for peak pollution (24-hr value).

Cities with increasing trend: Six cities in the region show increasing trend, i.e. both winter average and peak increased compared to their previous winter. Davanagere saw a jump of 142 per cent in the winter average and 133 per cent increase in peak. Comibatore and Kochi are the major cities with increasing trend. Other cities with increasing trend in the region are Gadag, Yadgir, and Hubballi. (See *Graph 12: Trend in winter pollution among cities of South India*)

Cities with mixed trend: Seven cities in the region show mixed trend, i.e. their winter averaged declined but peak pollution increase compared to their last winter or visa-versa. Gummidipoondi in Tamil Nadu had the most divergent trend with winter average decreasing by 44 per cent but its peak was 362 per cent higher from its low base. Chennai also recorded mixed trend with winter average decreasing by 18 per cent but its peak was 24 per cent higher. Other cities with mixed trend in the region are Ramnagara, Madikeri, Puducherry, Raichur and Mangalore.

Graph 12: Trend in winter pollution (15 Oct- 28 Feb) among cities of southern region



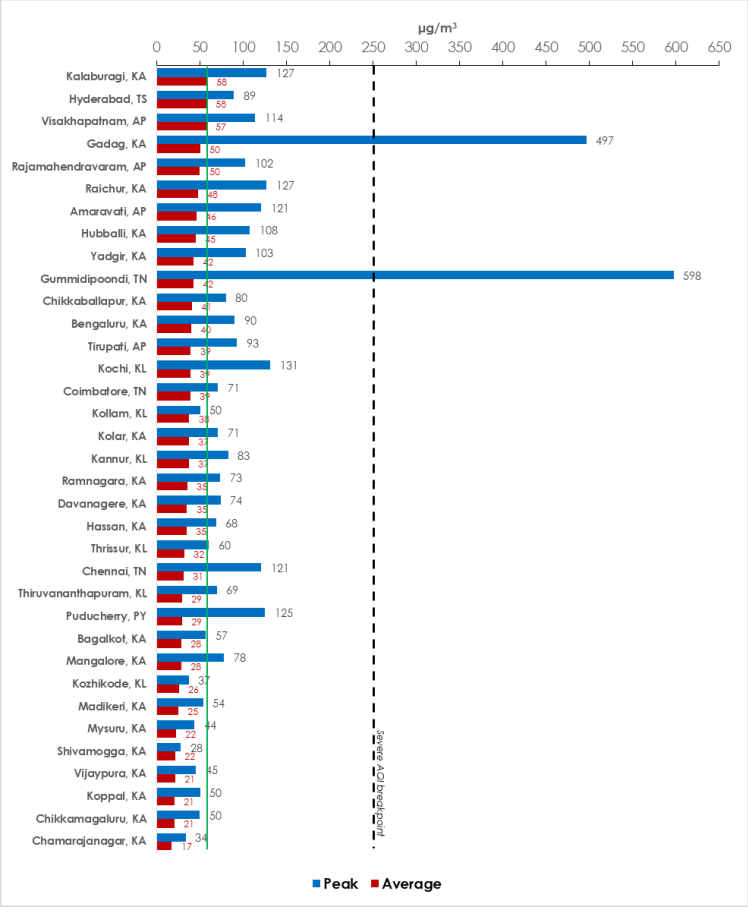
Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Cities with declining trend: 20 cities in the region show declining trend, -- both winter average and peak decreased compared to their previous winter. Chamarajanagar in Karnataka saw the highest decline with a drop of 45 per cent in their winter average and 52 per lower peak. Bengaluru and Hyderabad show marginal decline in their winter average and peak values. Other cities with declining trend are Tirupati, Chikkaballapur, Mysuru, Bagalkot, Kannur, Kozhikode, Kalaburagi, Rajamahendravaram, Amaravati, Thrissur, Thiruvananthapuram, Visakhapatnam, Vijaypura, Koppal, Chikkamagaluru, Kollam, and Shivamogga.

Most polluted cities: Most polluted cities in the region was Kalaburgi and Hyderabad, both had winter average of 58 µg/m^3. They are followed by Visakhapatnam (See *Graph 13: Peer comparison of winter pollution in cities of South India*).

Least polluted cities: Chamarajanagar and Chikkamagaluru in Karnataka recorded the lowest winter average in the region. Karnataka has the least polluted cities of the region followed by Kerala.

Graph 13: Peer comparison of winter pollution in cities of South India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

Air quality in Northeastern region

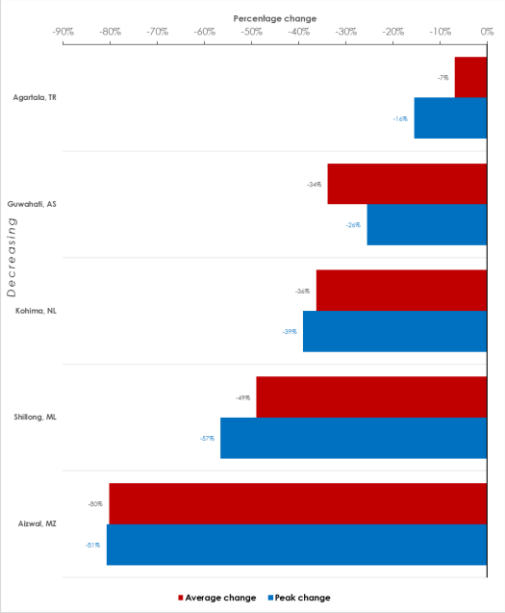
The region includes six cities. Geographically this region represents the Eastern Himalayas and Brahmaputra plains.

Cities with declining trend: All cities in the region show declining trend, i.e. both winter average and peak decreased compared to their previous winter. Aizwal in Mizoram saw the most decline with a drop of 50 per cent in their respective winter averages and 51 per cent lower peak. Agartala registered least change with its winter average declining by 7 per cent and peak level declining by 16 per cent. (See *Graph 14: Trend in winter pollution among cities of Northeast India*).

Most polluted cities: Most polluted city in the region include Guwahati with winter average of 81 µg/m^3. This is followed by Agartala that registered winter average of 77 µg/m^3 (See *Graph 15: Peer comparison of winter pollution in cities of Northeast India*).

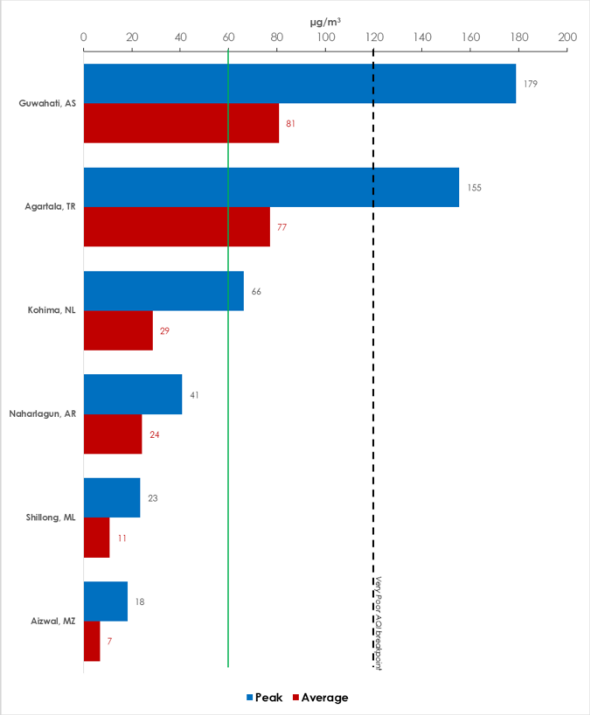
Least polluted cities: Aizwal and Shillong recorded the lowest winter average in the region. Hill stations are relatively less polluted than cities in river valleys and foothills. Aizwal and Shillong in Northeast had the lowest levels compared to the all other cities of all regions this winter. But cities and towns even with low seasonal average have suffered high spikes in daily levels.

Graph 14: Trend in winter pollution among cities of Northeast India



Note: Change in winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter and previous winter.
Source: CSE analysis of CPCB's real time air quality data

Graph 15: Peer comparison of winter pollution in cities of Northeast India



Note: Winter average and peak of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter.
Source: CSE analysis of CPCB's real time air quality data

Take away

The widely divergent trend in pollution levels across regions is strongly influenced by local geoclimatic conditions, meteorology and the intensity of pollution. But the emerging trend points towards a national air quality crisis. While the regions are battling to meet the national ambient air quality standards, winter conditions are aggravating the problem further. Even though the pandemic conditions have arrested the trend overall trend in most regions, there is still a mixed trend. Despite having a relatively lower annual average pollution levels the peak pollution during winter can spike. This indicates the influence of cool and calm winter conditions and also the regional influence.

While cities require their respective clean air action plans for controlling local pollution, the effort will have to be scaled up for the region to control pollution from widely dispersed sources across the urban and rural landscape. The multi-sector plan has to address vehicles, industry, power plants, household pollution, waste burning and more. This granular tracking of regional and local pollution needs to inform policy making and the compliance framework for air quality management to meet the clean air targets.

Annexure 1: All India peer comparison of winter pollution

Rank	City	Winter PM2.5 average (µg/m^3)	Peak 24hr value (µg/m^3)
1	Siwan, BH	187	385
2	Munger, BH	182	356
3	Ghaziabad, UP	178	647
4	Chhapra, BH	174	300
5	Delhi, DL	170	515
6	Kishanganj, BH	168	344
7	Faridabad, HR	161	532
8	Buxar, BH	159	353
9	Muzaffarpur, BH	152	270
10	Manesar, HR	152	380
11	Bagpat, UP	151	391
12	Noida, UP	150	601
13	Purnia, BH	150	312
14	Katihar, BH	150	270
15	Bettiah, BH	150	334
16	Darbhanga, BH	149	291
17	Gurugram, HR	145	495
18	Meerut, UP	143	395
19	Hapur, UP	142	407
20	Hisar, HR	142	406
21	Saharsa, BH	141	254
22	Bulandshahr, UP	140	481
23	Bhagalpur, Bh	140	229
24	Bhagalpur, BH	140	237
25	Muzaffarnagar, UP	140	313
26	Greater Noida, UP	137	558
27	Rajgir, BH	136	252
28	Sasaram, BH	135	282
29	Bhiwadi, RJ	134	419
30	Jind, HR	133	442
31	Motihari, BH	131	307
32	Bahadurgarh, HR	131	314
33	Ballabgarh, HR	131	341
34	Rohtak, HR	123	307
35	Charkhi Dadri, HR	123	505
36	Bihar Sharif, BH	121	305
37	Patna, BH	116	250
38	Singrauli, MP	115	239
39	Firozabad, UP	115	495
40	Moradabad, UP	114	284
41	Dharuhera, HR	111	307
42	Vrindavan, UP	110	422
43	Yamuna Nagar, HR	110	234
44	Bhiwani, HR	107	363
45	Durgapur, WB	103	197
46	Kurukshetra, HR	102	258
47	Ankleshwar, GJ	101	233
48	Kanpur, UP	99	308
49	Kaithal, HR	98	278
50	Howrah, WB	98	183
51	Agra, UP	97	395
52	Gaya, BH	96	176
53	Ambala, HR	95	205
54	Katni, MP	93	164
55	Lucknow, UP	92	298
56	Hajipur, BH	92	167
57	Panipat, HR	90	243
58	Vapi, GJ	89	261
59	Narnaul, HR	89	263
60	Jodhpur, RJ	88	203
61	Kota, RJ	88	257
62	Fatehabad, HR	88	235
63	Kalyan, MH	86	145

Rank	City	Winter PM2.5 average (µg/m^3)	Peak 24hr value (µg/m^3)
64	Prayagraj, UP	85	273
65	Karnal, HR	83	214
66	Kolkata, WB	83	155
67	Guwahati, AS	81	179
68	Jaipur, RJ	81	208
69	Mandi Gobindgarh, PB	80	187
70	Jabalpur, MP	78	145
71	Bhopal, MP	78	407
72	Gwalior, MP	78	263
73	Gorakhpur, UP	77	256
74	Navi Mumbai, MH	77	148
75	Agartala, TR	77	155
76	Asansol, WB	77	156
77	Patiala, PB	74	177
78	Udaipur, RJ	73	176
79	Sonipat, HR	72	220
80	Ludhiana, PB	72	169
81	Varanasi, UP	72	200
82	Rupnagar, PB	71	143
83	Indore, MP	71	162
84	Vatva, GJ	70	196
85	Jalandhar, PB	69	197
86	Panchkula, HR	69	192
87	Khanna, PB	69	162
88	Sirsa, HR	67	165
89	Mumbai, Mh	67	120
90	Pithampur, MP	66	119
91	Chandigarh, CH	65	141
92	Ahmedabad, GJ	64	199
93	Amritsar, PB	63	164
94	Mandideep, MP	62	158
95	Chandrapur, MH	62	115
96	Ujjain, MP	62	142
97	Damoh, MP	62	167
98	Pali, RJ	62	112
99	Pune, GJ	61	149
100	Mandikhera, HR	60	196
101	Gandhinagar, GJ	59	150
102	Kalaburagi, KA	58	127
103	Haldia, WB	58	113
104	Hyderabad, TS	58	89
105	Visakhapatnam, AP	57	114
106	Nashik, MH	57	111
107	Talcher, OD	56	106
108	Ajmer, RJ	54	125
109	Alwar, RJ	52	106
110	Siliguri, WB	52	96
111	Dewas, MP	51	115
112	Gadag, KA	50	497
113	Rajamahendravaram, AP	50	102
114	Bhatinda, PB	49	227
115	Ratlam, MP	48	104
116	Raichur, KA	48	127
117	Sagar, MP	46	203
118	Amaravati, AP	46	121
119	Palwal, HR	45	144
120	Hubballi, KA	45	108
121	Nagpur, MH	44	95
122	Yadgir, KA	42	103
123	Gummidipoondi, TN	42	598
124	Chikkaballapur, KA	41	80
125	Bengaluru, KA	40	90
126	Tirupati, AP	39	93
127	Kochi, KL	39	131
128	Coimbatore, TN	39	71

Rank	City	Winter PM2.5 average (µg/m^3)	Peak 24hr value (µg/m^3)
129	Solapur, MH	39	80
130	Kollam, KL	38	50
131	Kolar, KA	37	71
132	Kannur, KL	37	83
133	Ramnagara, KA	35	73
134	Davanagere, KA	35	74
135	Hassan, KA	35	68
136	Brajrajnagar, OD	33	51
137	Maihar, MP	33	104
138	Thrissur, KL	32	60
139	Chennai, TN	31	121
140	Thiruvananthapuram, KL	29	69
141	Puducherry, PY	29	125
142	Kohima, NL	29	66
143	Bagalkot, KA	28	57
144	Mangalore, KA	28	78
145	Bilaspur, CG	27	46
146	Srinagar, JK	26	75
147	Nandesari, GJ	26	57
148	Kozhikode, KL	26	37
149	Madikeri, KA	25	54
150	Naharlagun, AR	24	41
151	Mysuru, KA	22	44
152	Bhilai, CG	22	38
153	Shivamogga, KA	22	28
154	Satna, MP	21	40
155	Vijaypura, KA	21	45
156	Koppal, KA	21	50
157	Chikkamagaluru, KA	21	50
158	Aurangabad, MH	19	21
159	Chamarajanagar, KA	17	34
160	Shillong, ML	11	23
161	Aizwal, MZ	7	18

Note: Winter average of a city is based on mean of daily $PM_{2.5}$ values recorded at CAAQM stations in the city that have minimum 75 per cent data for this winter. Winter peak of a city is based on mean of the highest daily $PM_{2.5}$ value recorded at CAAQM stations in the city that meet the data completeness requirement.
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