CLIMATE TRENDS

Air Quality Assessment of Major Indian Cities (2015–2025)

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Air Quality Assessment of Major Indian Cities (2015–2025)

Our analysis of Air Quality Index (AQI) data across major Indian cities from 2015 to November 2025 shows that none of the top urban centres in India can be considered safe in terms of air quality. Although the degree of pollution varies from city to city and some improvement is visible in certain locations in recent years, all assessed cities consistently fall within ranges that indicate moderate to hazardous pollution levels, with some cities routinely breaching recommended safe limits. Delhi remains the most polluted city throughout the study period, maintaining persistently high AQI values from peaks above 250 (2016) to levels still near 180 in 2025. While there is minor year-to-year fluctuation, the city never approaches safe thresholds and continues to experience chronic poor air quality driven by vehicular emissions, industrial activity, seasonal crop burning, and geographic factors.

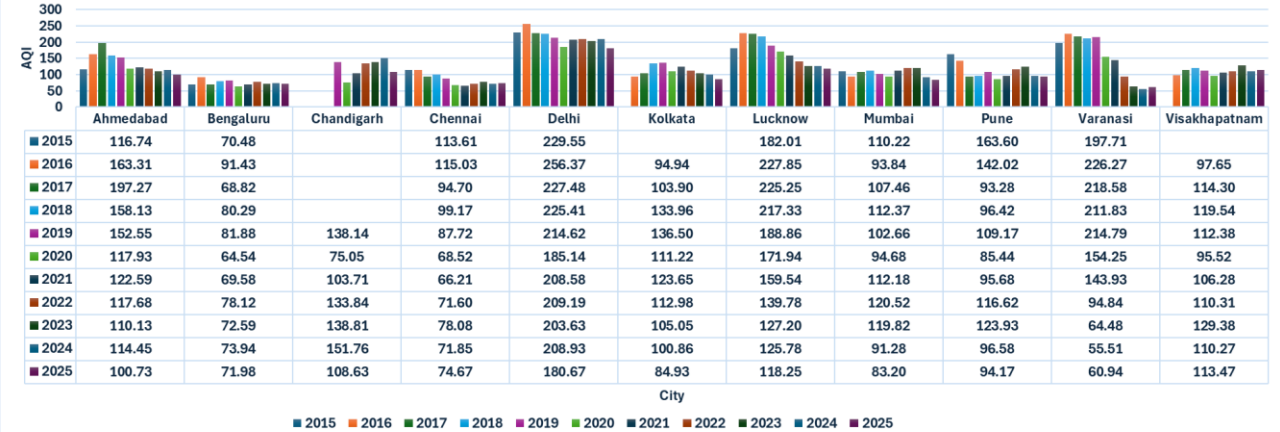
Lucknow, Varanasi, Ahmedabad, and Pune also show prolonged periods of elevated AQI. Lucknow and Varanasi started with extremely high levels (often above 200), and although both cities show steady improvement after 2019, their 2025 AQI values remain above healthy limits. Ahmedabad shows a similar pattern, with AQI reductions after 2017 but still hovering around 100–120 for most years. Kolkata, Chennai, Chandigarh, Visakhapatnam, and Mumbai present moderate AQI values compared to northern cities but still fail to reach consistently safe levels. Some cities like Chennai and Mumbai show notable improvement after 2020, reflecting the impact of regulatory measures, better fuel standards, and reduced industrial activity during the pandemic years. However, even these cities show regular oscillations indicating ongoing pollution pressures. Bengaluru shows the lowest AQI values among the listed cities, remaining largely between 65 and 90. Yet even these levels exceed what would be considered “good” air quality, showing that no major metro escapes pollution concerns.

Overall, the data confirms that every major Indian city analysed experiences unhealthy air quality for a significant portion of the year, and even improving cities remain outside the safe AQI range. Despite recent policy interventions and technological improvements, India’s top cities continue to face serious air-quality challenges, highlighting the need for more aggressive pollution-control strategies, sustained enforcement measures, and long-term urban planning reforms.

Overview

This study analysed Air Quality Index (AQI) data across major Indian cities from 2015 to November 2025. The goal was to understand long-term pollution trends and determine whether any major city meets safe air-quality standards.

The data clearly shows that none of the top Indian cities can be considered safe in terms of air quality during this entire period. Although some cities show gradual improvement in recent years, AQI levels remain consistently above recommended safe thresholds.



	Ahmedabad	Bengaluru	Chandigarh	Chennai	Delhi	Kolkata	Lucknow	Mumbai	Pune	Varanasi	Visakhapatnam
2015	116.74	70.48		113.61	229.55		182.01	110.22	163.60	197.71	
2016	163.31	91.43		115.03	256.37	94.94	227.85	93.84	142.02	226.27	97.65
2017	197.27	68.82		94.70	227.48	103.90	225.25	107.46	93.28	218.58	114.30
2018	158.13	80.29		99.17	225.41	133.96	217.33	112.37	96.42	211.83	119.54
2019	152.55	81.88	138.14	87.72	214.62	136.50	188.86	102.66	109.17	214.79	112.38
2020	117.93	64.54	75.05	68.52	185.14	111.22	171.94	94.68	85.44	154.25	95.52
2021	122.59	69.58	103.71	66.21	208.58	123.65	159.54	112.18	95.68	143.93	106.28
2022	117.68	78.12	133.84	71.60	209.19	112.98	139.78	120.52	116.62	94.84	110.31
2023	110.13	72.59	138.81	78.08	203.63	105.05	127.20	119.82	123.93	64.48	129.38
2024	114.45	73.94	151.76	71.85	208.93	100.86	125.78	91.28	96.58	55.51	110.27
2025	100.73	71.98	108.63	74.67	180.67	84.93	118.25	83.20	94.17	60.94	113.47

Figure 1. Mean AQI derived from daily AQI values for each city from 2015 to 20 November 2025. Data source: Central Pollution Control Board (CPCB), Government of India (cpcb.gov.in).

Key Findings

1. No Major City Achieved Safe AQI Levels

Across all 11 cities analysed, every single location reported AQI values above safe limits for most or all the decade. Even the least polluted metros frequently exceeded recommended thresholds.

2. Delhi Remains the Most Polluted City

- Recorded the highest AQI almost every year.
- Peaked in **2016 at over 250**.
- Despite slight improvement after 2019, 2025 still shows **~180**, far from safe.
- Pollution is driven by:

- dense traffic
- industrial emissions
- winter inversion
- crop-burning impacts

3. Northern Cities Show Persistent High Pollution

Cities such as **Lucknow, Varanasi, and Ahmedabad** show consistently high AQI levels:

- Lucknow and Varanasi frequently stayed **above 200** until 2020.
- Slight downward trends appear, but **2025 values still exceed safe air quality.**
- Ahmedabad fluctuates but remains mostly between **110–160**.

4. Moderately Polluted Cities Still Not "Safe"

Cities like **Kolkata, Chandigarh, Visakhapatnam, Mumbai, and Chennai** show moderate pollution:

- AQI ranges mostly **between 80 and 140**.
- Some improvements appear after 2020, especially in Chennai and Mumbai.
- Even with improvements, values **do not reach consistently safe ranges**.

5. Bengaluru Shows the Best Air Quality — but Still Not Safe

- AQI remains between **65 and 90** most years.
- Although comparatively cleaner, these values **still exceed the 'Good' category**.
- Rapid urbanization and vehicle growth prevent the city from falling into safe ranges.

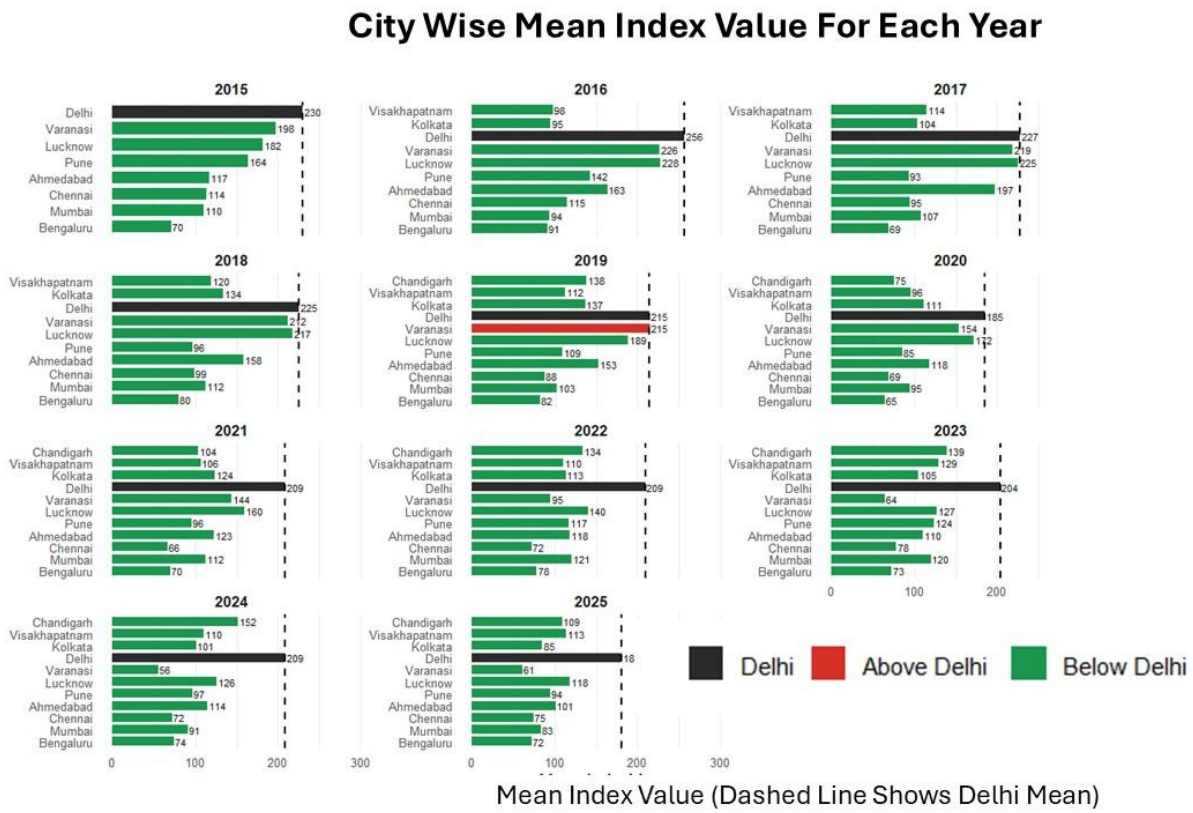


Figure 2. Mean AQI derived from daily AQI values for each city from 2015 to 20 November 2025. Data source: Central Pollution Control Board (CPCB), Government of India (cpcb.gov.in).

City-Wise Trend Summary (2015–2025)

City	Trend Summary
Delhi	Severely polluted throughout; slight decline after 2019 but remains hazardous.
Lucknow	Extremely high early AQI; gradual reduction but still unhealthy.
Varanasi	Major improvement since 2021, but still above safe standards.
Ahmedabad	Peaks in 2017; modest improvement afterward.
Pune	Mid-range pollution; fluctuates but overall improvement after 2020.
Kolkata	Moderate AQI, gradual decreasing trend since 2022.
Chennai	Noticeable improvement post-2020; AQI still not safe.
Mumbai	Mixed trends; improved in 2024–25.
Chandigarh	Moderate pollution; elevated AQI around 2022–2024.
Visakhapatnam	Mild to moderate pollution; rising trend after 2020.

City	Trend Summary
Bengaluru	Lowest AQI among all cities but still above healthy limits.

Indo-Gangetic plains: A meteorological trap

Seasonal events like Diwali fireworks and stubble burning in Punjab and Haryana, both occurring around October–November, add short-term spikes to pollution. While Delhi-NCR did see a surge in pollution levels after Diwali, there was a massive decrease in the farm fire incidents in 2025. Yet, Delhi's air quality did not recover—revealing the strong influence of meteorology on winter pollution levels.

Precipitation is also the natural way of washing out pollutants from the atmosphere. However, rain has remained absolutely absent from the Indo-Gangetic plains so far in the season. Delhi has recorded no rainfall from October 1 to November 28. Furthermore, no respite is in the offing as rains remain far and distant.

"With cold north-westerly winds sweeping into the plains, minimum temperatures are set to drop further—making it even harder for pollutants to disperse. As temperatures fall, the inversion layer thickens, creating a stronger barrier that prevents sunlight and wind from breaking through and clearing the air. This season's Western Disturbances have been weak and have failed to trigger widespread rainfall across North India. Without rain to wash pollutants out of the atmosphere, the pollution lingers for longer periods, leading to early and persistent smog-like conditions," **said Mahesh Palawat, Vice President - Meteorology and Climate Change, Skymet Weather.**

The region's geography adds another layer of complexity. The Himalayas block the escape of air to the north, forcing pollution to drift slowly across northern India before eventually exiting over the Bay of Bengal. Within cities, dense urban structures create additional "surface roughness," a frictional effect that further slows wind speeds and limits dispersion.

According to experts, preventive planning becomes essential before the cold, still winter days when fog is likely and not after the pollution has peaked.

"Technology can help address many local pollution sources within you own airshed, but this requires reliable data. There are numerous ways to be proactive, but we need an intelligent decision-support system to guide those choices—whether it's assessing if an anti-smog gun is effective, cost-efficient, or even necessary. Poorly designed interventions can end up causing more pollution than they prevent. With data, we can evaluate the impact of any measure in real time. Cities are increasingly

using data-driven approaches for planning, and technology now provides the insights needed to make smart short, medium, and long-term decisions," **said Prof S N Tripathi, Dean, Kotak school of sustainability, Indian Institute of Technology-Kanpur.**

Palak Balyan, Research Lead, Climate Trends added, *"Moving to another city for cleaner air isn't a real solution, and most people can't afford to do it anyway. What India needs is sustained, long-term, science-based policy reform backed by genuine political will to take tough decisions. Air pollution affects everyone, but not equally: people who spend more time outdoors like street vendors, sanitation staff, transport workers, and construction workers, feel the impact the most. Over time, pollution also influences quality of life, productivity, and economic well-being across communities. Instead of short-term fixes or relocating, investing in systemic change is the only way to truly tackle the country's pollution crisis and build a healthier."*

For the Indo-Gangetic Plains, and Delhi in particular, the winter pollution crisis is not merely a matter of emissions—it is a meteorological trap. Effective solutions must combine year-round emission reductions with strong seasonal preparedness, acknowledging the powerful role that weather and geography play in shaping air quality.

Indo-Gangetic plains, a region spanning to the south of the Himalayas, struggle with poor to severe air quality levels every winter. Each year, cities across this belt slip into "poor" to "severe" Air Quality Index (AQI) categories, with Delhi consistently topping the charts, followed by major cities such as Lucknow and Kanpur.

A major reason lies in the region's geography. Delhi-NCR sits in the middle of a vast, flat basin bound by the Himalayas to the north. This topography naturally traps pollutants from local and regional sources, making dispersion difficult even under normal conditions during the winter.

The summer monsoon season provides natural cleansing through rainfall, while strong westerly winds during the pre-Monsoon season help in dissipating the pollutants away. Winter, however, works against the region.

During winters (December-February), the air in the planetary boundary layer (the lowest part of the atmosphere) is thinner as the cooler air near the earth's surface is denser. The cooler air is trapped under the warm air above, forming a kind of atmospheric 'lid'. This phenomenon is called winter inversion. Since the vertical mixing of air happens only within this layer, the pollutants released lack enough space to disperse in the atmosphere.

Throughout winter, cooler surface temperatures intensify temperature inversions. This creates fog which combines with pollutants in the atmosphere to form Delhi's characteristic smog. The reduced mixing height during this period severely restricts the vertical dispersal of pollutants.

Normally, temperature decreases with height, allowing air to mix vertically, since warm air rises. Under inversion conditions, this pattern reverses, and pollutants are trapped near the ground.

Conclusion:

In conclusion, the AQI analysis from 2015 to November 2025 shows that none of India's major cities meet safe air-quality standards, regardless of region or development level. While a few cities demonstrate gradual improvement over time, the overall pollution load remains high, with northern cities like Delhi, Lucknow, and Varanasi experiencing the most severe and persistent levels. Southern and western cities such as Bengaluru, Chennai, Mumbai, and Pune perform comparatively better but still fail to achieve truly healthy air-quality ranges. These findings highlight the continued impact of traffic emissions, industrial activity, seasonal factors, and rapid urbanization across the country. The decade-long trend reinforces the need for stronger environmental policies, sustained regulatory enforcement, cleaner energy transitions, and coordinated pollution-control initiatives to safeguard public health and advance long-term urban sustainability.