TRACING THE HAZY AIR 2026

PROGRESS REPORT ON NATIONAL CLEAN AIR PROGRAMME (NCAP)

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CREA

CREA is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions, to air pollution.

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Progress Report on National Clean Air Programme (NCAP)

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About CREA

The Centre for Research on Energy and Clean Air (CREA) is an independent research organisation focused on revealing the trends, causes, and health impacts, as well as the solutions to air pollution. CREA uses scientific data, research, and evidence to support the efforts of governments, companies, and campaigning organisations worldwide in their efforts to move towards clean energy and clean air, believing that effective research and communication are the keys to successful policies, investment decisions, and advocacy efforts. CREA was founded in Helsinki and has staff in several Asian and European countries.

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Key findings

Air quality progress in National Clean Air Programme (NCAP) cities

- Out of 130 cities, 28 NCAP cities still do not have continuous ambient air quality monitoring stations (CAAQMS). Among the 102 cities that do have monitoring stations, 100 cities reported 80% or more PM_{10} data coverage.
- Of these 100 NCAP cities, 23 recorded an increase in PM_{10} concentrations. Only 51 cities achieved the initial NCAP target of a 20-30% reduction in PM_{10} levels and 23 cities achieved the revised NCAP target of 40% reduction in PM_{10}.
- 77 cities reported a reduction in PM_{10} concentrations, yet 68 of those cities still had PM_{10} concentrations exceeding the National Ambient Air Quality Standards (NAAQS).

Air quality across India

- **PM_{10} concentration**
  - In 2025, out of 229 cities in India with 80% or more PM_{10} data, 190 cities exceeded the NAAQS for $PM_{10,}$ while 39 cities met the standard.
  - Delhi, the national capital, is the most polluted city with an annual average PM_{10} concentration of 197 µg/m^3, followed by Ghaziabad (190 µg/m^3) and Greater Noida (188 µg/m^3).
  - Out of the 89 cities in the Indo-Gangetic Plain (IGP) with CAAQMS, only 61 cities have the PM_{10} data more than 80% and among that 60 exceed the NAAQS. Similarly, in the National Capital Region (NCR), all 14 cities with data (>80%) exceed the NAAQS.
  - Rajasthan, Maharashtra, Bihar, Haryana, Odisha, Punjab, West Bengal, Gujarat, Chandigarh, Himachal Pradesh, Jammu & Kashmir, Delhi, Jharkhand, Arunachal Pradesh, and Telangana states had all the monitored cities exceeding PM_{10} NAAQS.

- **$PM_{2.5}$ concentration**
  - Out of 231 cities with 80% or more $PM_{2.5}$ data, 103 cities exceeded the NAAQS for $PM_{2.5}$, while 128 cities met the standard.
  - Byrnihat (Assam), Delhi, and Ghaziabad (Uttar Pradesh) ranked as the top three most polluted cities in India, with annual $PM_{2.5}$ concentrations of 100 µg/m^3, 96 µg/m^3, and 93 µg/m^3, respectively.

- Out of 61 cities observed with data for more than 80% days in the IGP, 47 exceed the NAAQS, while 14 comply with the standard. In the NCR, 12 out of 14 cities (with data >80% days) exceed the NAAQS, with only 2 meeting the standard.
- State level analysis showed that the exceedance was high in Bihar (20 cities exceed NAAQS out of 24 monitored cities), Rajasthan (17 out of 34), Uttar Pradesh (13 out of 20), Odisha (11 out of 15), Punjab (6 out of 7), West Bengal (6 out of 7), Assam (4 out of 6), and Gujarat (4 out of 6).

Monitoring network

- In 2025, India had 1,600 air quality monitoring stations, including 565 CAAQMS and 1035 manual stations, covering 584 cities across 28 states and 7 union territories. This marks an increase of 69 manual stations and 7 CAAQMS compared to 2024.
- However, the NCAP target of 1,500 manual stations by 2024 remains unmet, with a shortfall of 465 stations even in 2025.
- Despite the increased installation of CAAQMS, data quality remains a concern due to poor maintenance and non-compliance with CPCB siting guidelines.

Source apportionment

- Only 90 out of 130 cities have completed source apportionment studies so far, indicating that even by the end of the extended NCAP period, around 40 cities still do not know the sources of their pollution.

Funding

- Despite ₹13,415 crore being released under NCAP and XV-FC funds since inception, only ₹9,929 crore has been utilised, indicating a utilisation rate of just 74%.
- NCAP spending remains highly skewed, with 68% allocated to road dust management, followed by transport (14%) and waste management and biomass burning (12%), while industry, domestic fuel use, and public outreach each received less than 1% and capacity building and monitoring only 3%.

Recommendations

- Prioritise $PM_{2.5}$ and its precursor gases over PM_{10}
- Revise the list of non-attainment cities under NCAP
- Enforce emission load reductions through stricter, time-bound emission standards
- Allocate funding based on source apportionment studies
- Adopt an airshed approach for regional clusters

Introduction

The National Clean Air Programme (NCAP) was launched by the Ministry of Environment, Forest and Climate Change (MoEF&CC) in January 2019 to improve air quality in 130 non-attainment and million-plus cities/urban agglomerations across 24 states/union territories, by engaging all relevant stakeholders. NCAP aims for a reduction of 20-30% in PM_{10} concentrations by 2024-25 compared to the baseline year of 2017-18 (CPCB, 2024; PQRS Q.NO-381, 2024)

The target has been revised to achieve up to a 40% reduction in PM_{10} levels or to meet PM_{10} NAAQS (60 µg/m^3) by 2025-26. City-specific targets ranging from 4-15% have been given for the reduction in annual PM_{10} concentrations by implementing city-specific action plans. In addition, an annual target of 15% improvement in good days has been prescribed for 49 million plus cities/urban agglomerations (PIB, 2023; PQRS Q.NO-1966, 2024).

This annual progress report on the NCAP comes at an important moment as the current NCAP cycle ends. With the programme period closing, this year's report assesses the NCAP's implementation and outcomes.

The analysis covers funding allocation and utilisation, the status of source apportionment studies, and the expansion and performance of the national air quality monitoring network. It also evaluates PM_{10} improvements across NCAP cities against their reduction targets and provides a comprehensive PM_{10} and $PM_{2.5}$ assessment for all monitored cities in India, benchmarked against the National Ambient Air Quality Standards (NAAQS).

Given the anticipated revision of the NCAP, the report also identifies and reviews current non-attainment cities, defined as areas that have consistently failed to meet the NAAQS for five consecutive years.. The existing list is largely based on monitoring data from the 2011–2015 period, meaning it is now almost a decade old. Several cities may have slipped into non-attainment due to rising pollution levels, while others may have improved. Updating this list is therefore critical for evidence-based planning in the next phase of the programme.

Together, these assessments offer a consolidated view of India's progress at the close of the first NCAP phase and highlight remaining gaps. The report aims to inform policymakers, researchers, and practitioners as they design the next generation of clean air interventions.

Materials and methodology

The methodology employed to monitor the implementation of the NCAP involved the comprehensive examination of both primary and secondary sources. Information was gathered from various government ministries, including but not limited to the Indian government's Ministry of Environment, Forest and Climate Change (MoEFCC), the Ministry of Petroleum and Natural Gas (MoPNG), the Central Pollution Control Board (CPCB), and the State Pollution Control Boards (SPCBs). Additionally, data were extracted from parliamentary sessions in both the Rajya Sabha (Council of States) and Lok Sabha (House of the People), regarding questions posed during different sessions. The research process extended to the inclusion of reports from non-governmental organisations, articles from diverse news agencies, and the submission of several Right to Information applications (RTIs) to pertinent government ministries and departments.

The $PM_{2.5}$ data for identifying non-attainment cities were generated by following the machine learning framework developed by Kawano et al. (2025). Daily $PM_{2.5}$ values were generated at 10 km resolution for all of India using satellite data for aerosol optical depth, NO_2 and CO, as well as weather data and other auxiliary datasets in a two-step modelling approach. We followed the method as described in Kawano et al. (2025), trained the model and produced the $PM_{2.5}$ values for the time period of 2019 to 2024 (Rushwood et al., 2025)

For the purpose of identifying non-attainment cities, we used the complete list of 4,041 statutory towns (hereafter referred to as cities) from the Census 2011 (PMAY, 2025). From this set, towns were classified as non-attainment if they exceeded the annual $PM_{2.5}$ standard consistently for five years during 2019–2024, excluding the COVID-19 lockdown period of 2020 to maintain comparability across years. This approach reflects current pollution conditions and captures urban areas that may have become non-attainment in recent years, rather than relying on older monitoring data.

For the year 2025, $PM_{2.5}$ and PM_{10} concentrations were assessed using data from the Central Pollution Control Board's Continuous Ambient Air Quality Monitoring System (CAAQMS) (CPCB-CCR, 2025). The 2025 concentrations were compared with the NCAP baseline year to examine changes in particulate levels and evaluate the extent of progress made toward the programme's reduction targets.

Mitigation measures

Table 1 presents the cumulative physical progress of activities reported under the NCAP, combining outputs delivered through NCAP funds, Fifteenth Finance Commission (XV-FC) grants, and convergence with other government schemes (PQRS Q.NO-51, 2024). Overall, the data show that a significant share of reported progress has been achieved through XV-FC funding and scheme convergence.

Implementation has been dominated by infrastructure- and service-oriented measures. These include end-to-end paving of 18,307 km of roads, mechanical sweeping covering 11,880 km per day using 396 machines, and the development of 5,378 acres of green area. Solid waste management interventions also account for a large share of reported progress, with 8,232 tonnes per day of construction and demolition waste processing capacity established and 156 lakh tonnes of legacy waste remediated. While such measures can temporarily reduce resuspended dust, they primarily address indirect or surface-level contributors to $PM_{2.5}$ rather than the dominant emission sources.

In contrast, actions that directly reduce emissions at source remain comparatively limited. Only 3,926 electric buses have been deployed nationwide, and 759 EV charging stations have been established, despite transport emissions being a major driver of urban air pollution. Similarly, the establishment of 199 PNG or electric crematoria, while beneficial, represents a marginal intervention when viewed against the scale of combustion-related emissions across non-attainment cities.

Overall, the pattern of implementation suggests a preference for activities that are easier to plan, fund, and report in physical terms, often through convergence with existing schemes. However, these actions are not, in themselves, sufficient pollution reduction measures.

The table, therefore, highlights a structural disconnect between reported implementation progress under NCAP and the need for source-specific emission control strategies that directly target the formation of $PM_{2.5}$, including emissions from transport, industry, power plant and other combustion sources.

Table 1 — Achievements under NCAP

Activities	Unit	Progress under NCAP	Progress under XV-FC	Total Progress (NCAP + XV-FC)	Progress under Convergence of other schemes	Grand Total
End-to-end road pavement	Km	1,353	10,801	12,154	6,153	18,307
Road length swept through Mechanical Road Sweepers (MRS No. 396)	Km/day (No.)	5,550 (185)	3,720 (124)	9,270 (309)	2,610 (87)	11,880 (396)
Development of green area	Acres	745	3,591	4,337	1,041	5,378
C&D processing sites established	TPD	115	815	930	7,302	8,232
No. of electric buses purchased and deployed	Nos.	2	1,411	1,413	2,513	3,926
No. of EV charging stations established	Nos.	18	424	442	317	759
No. of PNG/Electric crematorium established	Nos.	28	146	174	25	199
Legacy waste sites remediated	Lakh MT	3	35	38	117	156

Financial support

Under NCAP, an amount of ₹19,614 crores has been earmarked to 130 cities during the period FY 2019-20 till FY 2025-26, out of which 49 million-plus cities/urban agglomerations are funded under XV-FC air quality grant and the remaining 82 cities are funded by NCAP (PRANA, 2025).

Financial year-wise funds allocated and utilised are shown in the Figure below. Under the NCAP, a total of ₹13,415 crore has been released under NCAP and XV-FC funds from its inception until now. Of this, ₹9,929 crore has been utilised, reflecting an overall utilisation rate of 74%. Breaking this down:

- Under the NCAP fund, ₹2,395 crore was released, of which ₹1,417 crore was utilised, resulting in a utilisation rate of 59%.
- Under the XV-Finance Commission grants, ₹11,021 crore was released, with ₹8513 crore utilised, indicating a utilisation rate of 77%.

While the XV-FC funding shows slightly better utilisation, both streams reflect suboptimal fund usage, leaving significant room for improvement. While the utilisation rate for million-plus cities improved in recent years, the overall trend shows persistent delays and gaps in implementing planned interventions. The low utilisation rate for 82 non-attainment cities is particularly concerning, given the pressing need to address air quality issues.

These trends raise critical questions about administrative bottlenecks, the readiness of local bodies to execute projects, and the adequacy of planning and monitoring mechanisms. With the current financial year nearing its end, the limited progress made so far further emphasises the urgent need for strengthened accountability and efficient fund utilisation to ensure timely action against air pollution.

Few states demonstrate very high levels of fund utilisation. Madhya Pradesh, Tamil Nadu, and Odisha report complete utilisation (100%), representing the highest performers nationally. These are closely followed by Gujarat (98%), Uttar Pradesh (96%), and Uttarakhand (96%).

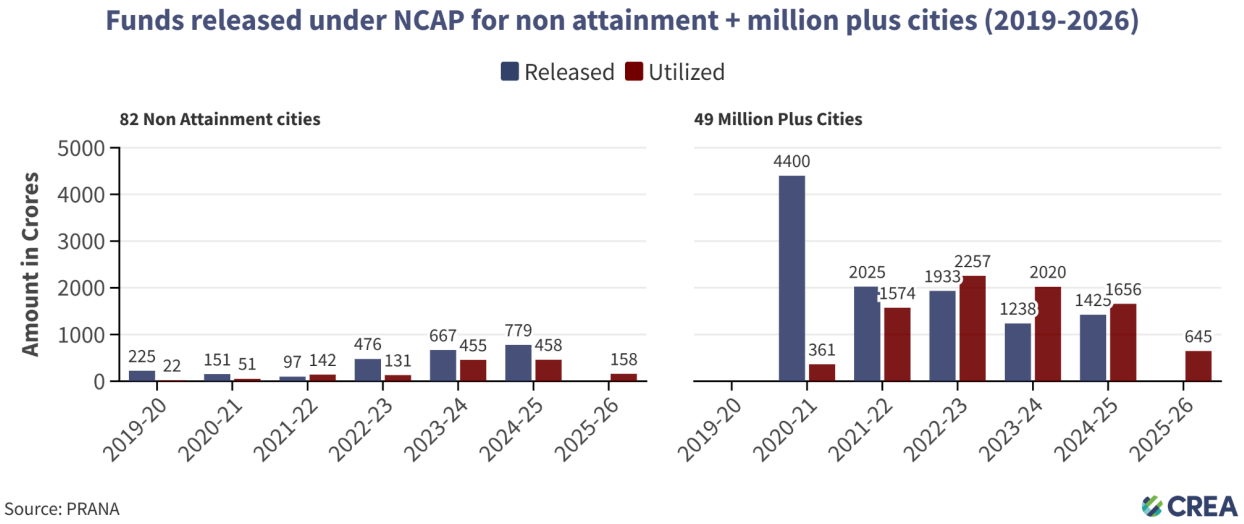

Figure 1 — Funds released and utilised under NCAP, India, 2019-2026

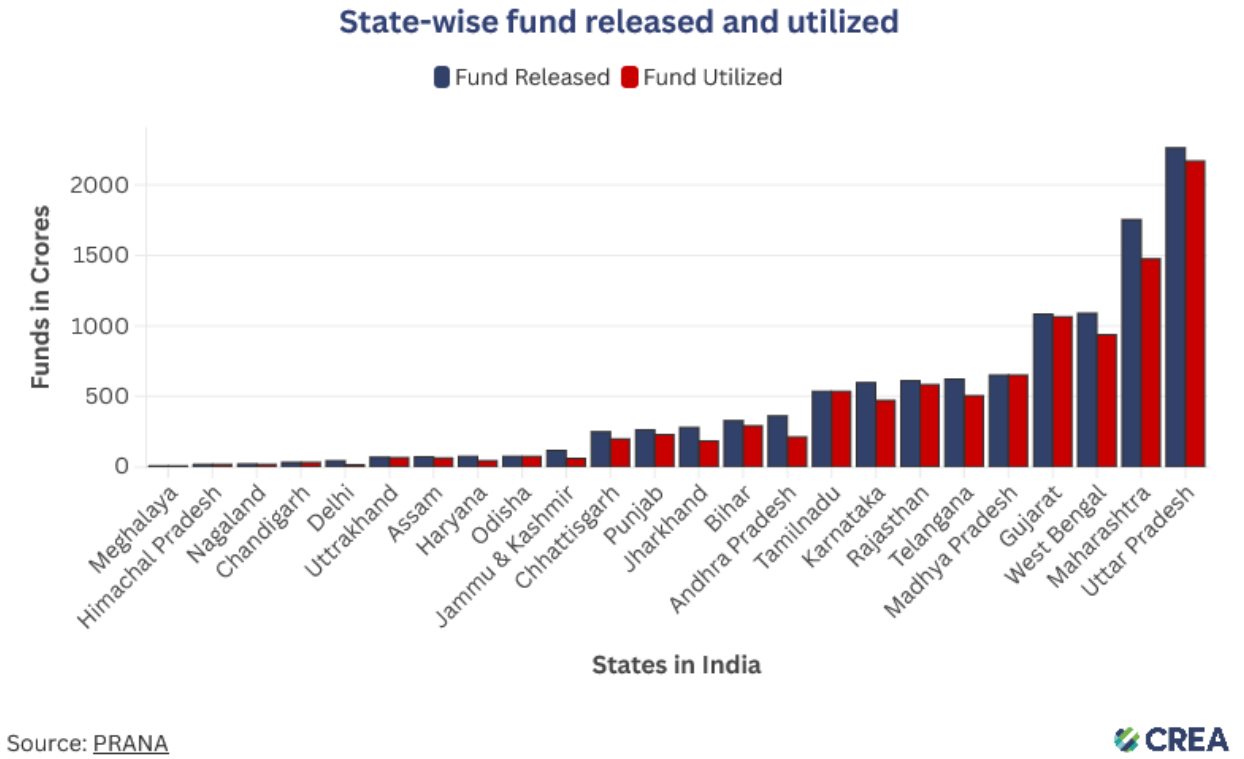

Figure 2 — State-wise funds released and utilised under NCAP, India

A substantial group of states has achieved fund utilisation percentage ranges between 85-95%, including Rajasthan (95%), Chandigarh (95%), Himachal Pradesh (95%), Nagaland (92%), Assam (89%), Bihar (89%), Punjab (88%), and West Bengal (86%).

States falling within the 75-85% utilisation bracket include Maharashtra (84%), Telangana (81%), Meghalaya (81%), Chhattisgarh (80%), and Karnataka (79%).

In contrast, several states exhibit comparatively lower utilisation levels, pointing to a poor implementation rate. Jharkhand (66%), Andhra Pradesh (59%), Haryana (59%), Jammu & Kashmir (50%), and Delhi (33%) show significant underutilisation of allocated funds.

City action plans to undertake various air quality improvement measures, such as control of road dust, vehicular emissions, biomass burning & waste management and industrial pollution, are implemented through mobilisation of resources through convergence of schemes of the Central and State government, as well as their own resources of urban local bodies and other development authorities. Funds provided under NCAP are utilised to meet the critical gap for implementing activities as part of the city action plan (PQRS Q.NO-1986, 2024).

The utilisation of funds under NCAP reflects an imbalanced allocation and a limited focus on key pollution sources. Of the ₹13,415 crore spent so far, a disproportionate 68% has been allocated to road dust management, the transport sector constitutes the second largest share as 14% and is followed by waste management and biomass burning as 12%. while other critical sectors, such as industries (<1%), domestic fuel (<1%), and public outreach (<1%) received minimal attention for the last 3 years. Similarly, capacity building and monitoring, essential for long-term air quality management, accounted for only 3% of the expenditure (RTI, 2025).

This skewed prioritisation indicates a lack of a comprehensive strategy to address pollution holistically, with critical areas like industries and power plants remaining underfunded despite their significant contribution to emissions. Furthermore, with only 74% of the total funds released utilised, the slow pace of fund disbursement and implementation raises concerns about the efficiency and effectiveness of NCAP in achieving its goals. The data prompts questions about the rationale behind these allocations and the overall efficacy of the resource distribution strategy in comprehensively addressing the prevailing high pollution levels across the country.

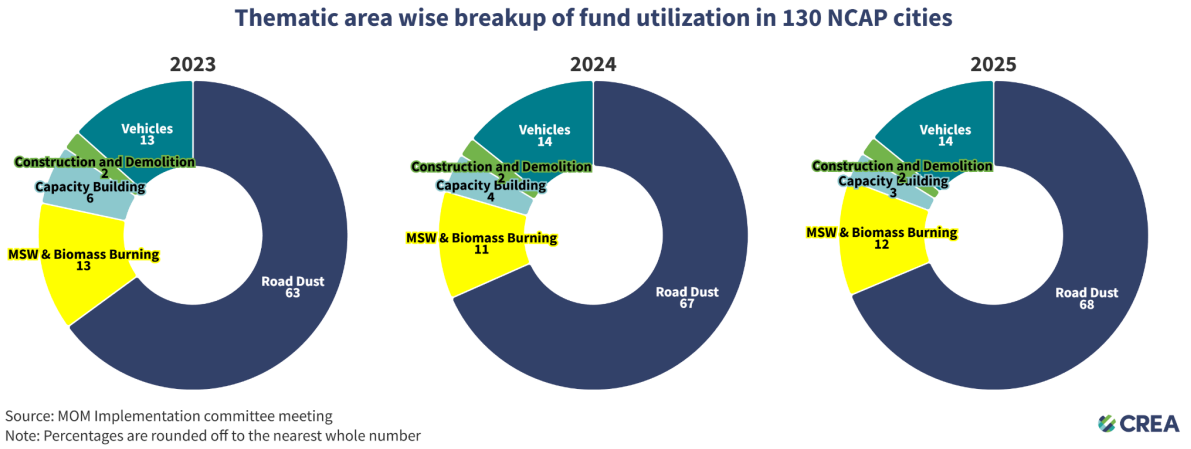

Figure 3 — Thematic area-wise breakup of fund utilisation in 130 NCAP cities, India, 2023-2025

Knowledge network and augmentation

Air quality monitoring network

In 2025, India had a total of 1,600 air quality monitoring stations, comprising 565 CAAQMS and 1,035 manual stations under the National Air Monitoring Programme (NAMP). These monitors cover 584 cities in 28 states and 7 UTs across the country. Compared to 2024, when there were 1,524 stations, this marks an increase of 76 stations. Specifically, CAAQMS expanded only by 7 stations (from 558 in 2024 to 565 in 2025), while NAMP manual stations grew by 69 (from 966 to 1,035) (PRANA, 2025; CPCB-CCR, 2025).

NCAP had set an ambitious target to augment the number of manual air quality monitoring stations under the NAMP to 1,500 by 2024. However, this target remains unmet, with the number of manual stations reaching 1,035 in 2025, falling short by 465 stations.

To ensure the credibility of air quality data, regular calibration and maintenance of monitoring instruments are essential. Proper calibration ensures accurate readings, while routine maintenance prevents malfunctions. Adhering to CPCB guidelines for the proper siting of monitoring stations is equally crucial to avoid biased measurements caused by obstructions or proximity to localised pollution sources. Co-locating monitors for cross-validation, continuous monitoring of environmental variables like temperature and

humidity, and implementing robust data validation systems can further enhance the accuracy and trustworthiness of the data.

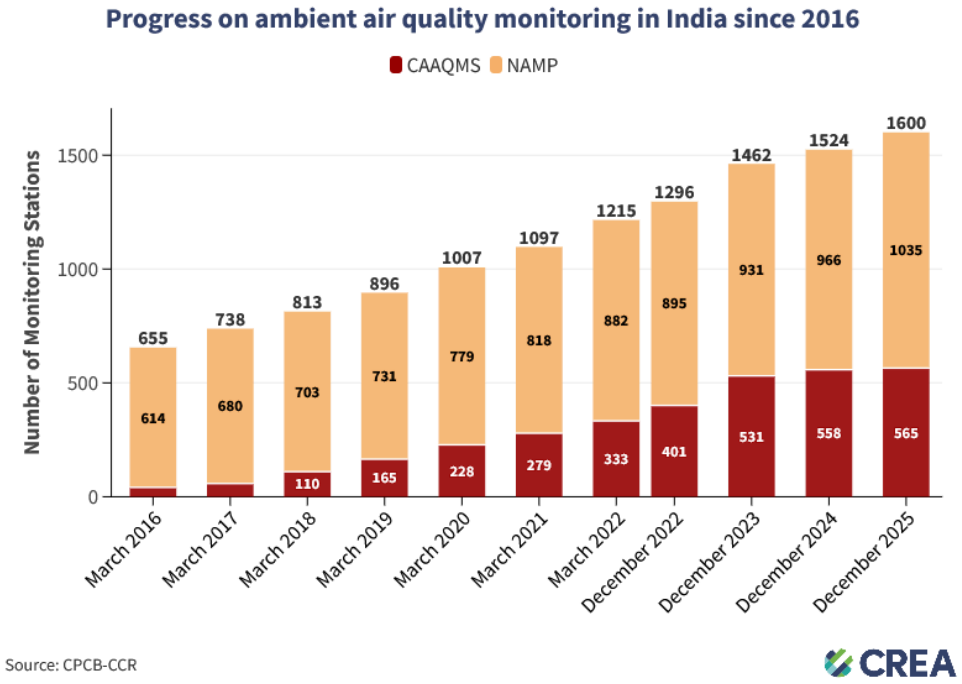

Figure 4 — Progress of ambient air quality monitoring stations in India since 2016

Source apportionment

A detailed review of the PRANA platform presents a fragmented picture of progress on source apportionment (PRANA, 2025). As of 2025, 90 cities across 20 states had completed their source apportionment studies, generating critical evidence on major pollution sources such as vehicles, industry, biomass burning, construction dust, and solid waste burning.

However, even at the end of the extended NCAP implementation cycle, 40 cities across 11 states had still not completed their studies, with several states yet to submit final reports. This gap raises a fundamental concern: without a clear understanding of what is driving pollution in these cities, it remains unclear how city action plans and NCAP funds are being targeted for effective pollution control.

Table 2 — State-wise source apportionment study completed cities

State	Cities with completed source apportionment study
Andhra Pradesh	Vijayawada, Chittoor, Eluru, Guntur, Kadapa, Kurnool, Ongole, Rajahmundry, Visakhapatnam, Anantapur, Nellore, Srikakulam, Vizianagaram
Assam	Guwahati, Nagaon, Nalbari, Sibsagar, Silchar
Bihar	Gaya, Patna, Muzaffarpur
Chhattisgarh	Bhilai, Korba, Raipur
Delhi	Delhi
Gujarat	Ahmedabad, Vadodara, Surat & Rajkot
Himachal Pradesh	Baddi, Damtal, Kara- Amb, Nalagarh, Paonta Sahib, Parwanoo, Sunder Nagar
Jammu & Kashmir	Jammu
Jharkhand	Dhanbad
Karnataka	Bangalore, Gulbarga, Hubli Dharwad and Davangere
Madhya Pradesh	Bhopal, Gwalior
Maharashtra	Mumbai, Pune, Solapur, Nashik, Navi Mumbai, Amravati, Aurangabad, Kolhapur
Meghalaya	Byrnihat
Odisha	Angul, Talcher, Cuttack, Bhubaneswar, Balasore, Kalinganagar, Rourkela
Punjab	Mandi-Gobindgarh, Khanna, Patiala, Dera Bassi, Naya Nangal, Dera Baba Nanak, Ludhiana, Jalandhar
Rajasthan	Jaipur, Kota, Alwar
Tamil Nadu	Chennai, Madurai, Trichy, Thoothukudi
Uttarakhand	Dehradun, Kashipur & Rishikesh
Uttar Pradesh	Prayagraj, Varanasi, Kanpur, Agra, Ghaziabad, Lucknow
West Bengal	Barrackpore, Haldia, Kolkata, Asansol, Durgapur, Howrah

Andhra Pradesh, Assam, Bihar, Chhattisgarh, Delhi, Himachal Pradesh, Karnataka, Meghalaya, Odisha, Tamil Nadu, Uttarakhand, and West Bengal have completed source apportionment studies for all cities within their respective jurisdictions.

In contrast, several large states show partial and uneven progress. Maharashtra and Uttar Pradesh, despite having the highest number of cities under NCAP (19 and 17, respectively), each still have 11 cities with pending studies. Other states, including Madhya Pradesh, Jharkhand, Rajasthan, Telangana, Jammu and Kashmir, Punjab, Chandigarh, Kerala, Haryana, and Nagaland, report varying levels of incomplete coverage.

Air quality levels in 2025

PM_{10} status in NCAP cities

Despite seven years of implementation, the NCAP still faces critical challenges in achieving its air quality improvement goals. Among the 130 cities included under NCAP, only 102 have installed CAAQMS, leaving 28 cities without this essential monitoring infrastructure. Furthermore, in 2025, of the cities with CAAQMS, only 100 provide more than 80% valid PM_{10} data, and only these cities have been included in the analysis, limiting the comprehensiveness of insights into air quality trends.

The NCAP aims for a PM_{10} reduction of up to 40% by 2026 compared to baseline levels. Data analysis reveals that, despite efforts under NCAP, a total of 23 out of 100 cities have experienced an increase in PM_{10} levels since the program's inception.

Although the remaining 77 cities show some improvement in PM_{10} reduction when compared to PM_{10} baseline levels, only nine of these have managed to bring their levels below the more lenient NAAQS, highlighting the uneven progress in meeting air quality standards. For a more detailed discussion, PM_{10} concentration changes are compared with initial NCAP 2025 (20-30% and higher) and revised NCAP 2026 (40%) targets.

Cities that have achieved the initial NCAP target (20-30% PM_{10} reduction and higher)

- Even after 7 years of NCAP implementation, only 51 cities achieved the initial target of 20-30% or higher PM_{10} reduction by 2025.
    - Uttar Pradesh had the highest of 13 cities in this category, followed by Maharashtra (7 cities), Punjab and West Bengal had four cities each, three cities each in Rajasthan, Tamil Nadu and Uttarakhand, two cities each in Bihar and Gujarat. One each in Andhra Pradesh, Assam, Chandigarh, Chhattisgarh, Jammu & Kashmir, Jharkhand, Karnataka, Madhya Pradesh, Nagaland, and Telangana.

Cities that have achieved the revised NCAP target (40% PM_{10} reduction or achieved PM_{10} NAAQS)

- 40% PM_{10} reduction: 23 cities have already achieved the revised target and are located in Uttar Pradesh (8 cities), Maharashtra (3 cities), and two each in Uttarakhand, Punjab, and Rajasthan, and one each in Jammu & Kashmir, Jharkhand, Tamil Nadu, Gujarat, West Bengal and Nagaland.
- Achieved PM_{10} NAAQS: 12 cities, viz., Sivasagar, Madurai, Bareilly, Davanagere, Silchar, Bhilai, Thoothukodi, Tiruchirappalli, Kalaburagi, Dehradun, Kohima, and Rishikesh, achieved PM_{10} NAAQS. It should be noted that even if Silchar and Kalaburagi concentrations are slightly increased from baseline concentration, it is still under NAAQS.

Cities that have not achieved targets

- 26 cities had reductions between 1 and 20%.
  - Maharashtra had the highest number of seven cities in this category, then Andhra Pradesh, Madhya Pradesh and Assam each had three cities, and two cities in states such as Karnataka, Punjab, and Rajasthan, followed by one city in Himachal Pradesh, Delhi, Uttar Pradesh, and West Bengal.
- 23 cities have increased concentration when compared to baseline PM_{10} levels.
  - Odisha leads with 6 cities, followed by 5 cities in Maharashtra, 2 cities each in Andhra Pradesh, Assam, Chhattisgarh, and Madhya Pradesh. One each in Bihar, Karnataka, Tamil Nadu and West Bengal.

Even at the end of the second extended NCAP implementation period, the fact that a majority of cities are still struggling to meet even the initial reduction targets makes it clear that the intended 40% reduction is no longer achievable within the programme's lifetime.

Due to a lack of transparency in city progress, it remains unclear how cities achieved the reported improvement in air quality, making it challenging to identify the specific actions that led to such reductions.

Furthermore, several cities lack source apportionment-based action plans, and the underutilization of allocated resources raises serious concerns about the reliability and accuracy of the reported data.

Table 3 — Status of PM_{10} in NCAP cities

PM10 reduction or increase	# of NCAP Cities	# of cities > PM_{10} NAAQS (60 µg/m3)	# of cities < PM_{10} NAAQS (60 µg/m3)
Cities with >= 40% reduction	23	18	5
Cities with 31 to 40% reduction	14	10	4
Cities with 21 to 30% reduction	14	13	1
Cities with 11 to 20% reduction	18	18	0
Cities with 1 to 10% reduction	8	8	0
Cities with increased concentration	23	21	2

PM_{10} analysis

A total of 229 cities across India had more than 80% of daily data. Compliance with PM_{10} NAAQS and AQI categories is discussed here. The PM_{10} AQI categories are defined as follows: Good (PM_{10} Concentration: 0-50 µg/m^3), Satisfactory (51-100 µg/m^3), Moderate (101-250 µg/m^3), Poor (251-350 µg/m^3), Very Poor (351-430 µg/m^3), and Severe (>430 µg/m^3).

- **Indian cities:** Out of 229 cities in India, 190 cities exceed the NAAQS for PM_{10}, while 39 cities meet the standard. In terms of PM_{10} AQI categories, 63 cities fall in the 'Moderate' category, 149 are classified as 'Satisfactory,' and 17 cities have 'Good' air quality. Notably, no cities are in the 'Poor', 'Very Poor' or ‘Severe’ categories.

- **National Clean Air Programme (NCAP) cities:** Among 100 NCAP cities, 88 exceed the NAAQS for PM_{10}, and 12 meet the standard. Regarding air quality distribution, 27 cities are categorised as 'Moderate,' 71 as 'Satisfactory,' and only two as 'Good.'

- **Indo-Gangetic Plain (IGP) cities:** Out of 61 cities that have more than 80% days observed in the IGP, 60 exceed the NAAQS for PM_{10}, while only one city meets the standard. The AQI distribution shows that 23 cities fall in the 'Moderate' category, 38 in the 'Satisfactory' category, and no city recorded AQI in the ‘Good’ category.

- **National Capital Region (NCR) cities:** In the NCR, which has 14 cities with more than 80% days of data observation, all 14 cities exceed the NAAQS standards for

PM_{10}. The AQI categories for these cities indicate that 12 are in the 'Moderate' category and two are in the 'Satisfactory' category.

Table 4 — PM_{10} Compliance and AQI classification of Indian cities in 2025

Category	India	National Clean Air Programme	Indo Gangetic Plain	National Capital Region
Total cities with CAAQMS	289	102	89	29
Total cities with 80% data	229	100	61	14
Compliance and exceedance				
Cities > NAAQS	190	88	60	14
Cities < NAAQS	39	12	1	0
AQI Category				
Good (0-50 µg/m3)	17	2	0	0
Satisfactory (51-100 µg/m3)	149	71	38	2
Moderate (101-250 µg/m3)	63	27	23	12
Poor (251-350 µg/m3)	0	0	0	0
Very Poor (351-430 µg/m3)	0	0	0	0
Severe (>430 µg/m3)	0	0	0	0

The PM_{10} air quality assessment across Indian states reveals varied levels of compliance with the NAAQS:

- Among states with a large number of assessed cities (more than 20), Rajasthan, Maharashtra and Bihar exhibit critical challenges, with all 34, 30 and 24 cities, respectively, exceeding the NAAQS.
- In states with a moderate number of assessed cities (10–20), Uttar Pradesh presents an alarming trend, as 19 out of 20 cities exceed the standard. Tamil Nadu stands out positively, with 14 out of 18 cities meeting the NAAQS for PM_{10}. Followed by Odisha, which has all 16 cities exceeds the PM_{10} NAAQS standards. Madhya Pradesh struggles significantly, with 11 out of 12 cities exceeding the NAAQS. In contrast, Karnataka had nine out of 12 cities complying with the NAAQS.
- Among states with fewer than 10 assessed cities, Andhra Pradesh, with eight out of nine cities, Chhattisgarh (7 out of 8 cities), Punjab and West Bengal fare similarly, with all seven cities and Assam (4 out of 6), Gujarat with all five cities, and Haryana with all two cities failing to meet the standard. However, Kerala, four out of five

cities, and Uttarakhand, two out of three cities, recorded their annual PM_{10} concentrations meeting the NAAQS.

- For states with only one assessed city, the results are mixed. Nagaland, Pondichery, Sikkim, and Tripura report full compliance with the NAAQS, while Arunachal Pradesh, Chandigarh, Delhi, Himachal Pradesh, Jammu & Kashmir, Jharkhand, and Telangana show non-compliance.

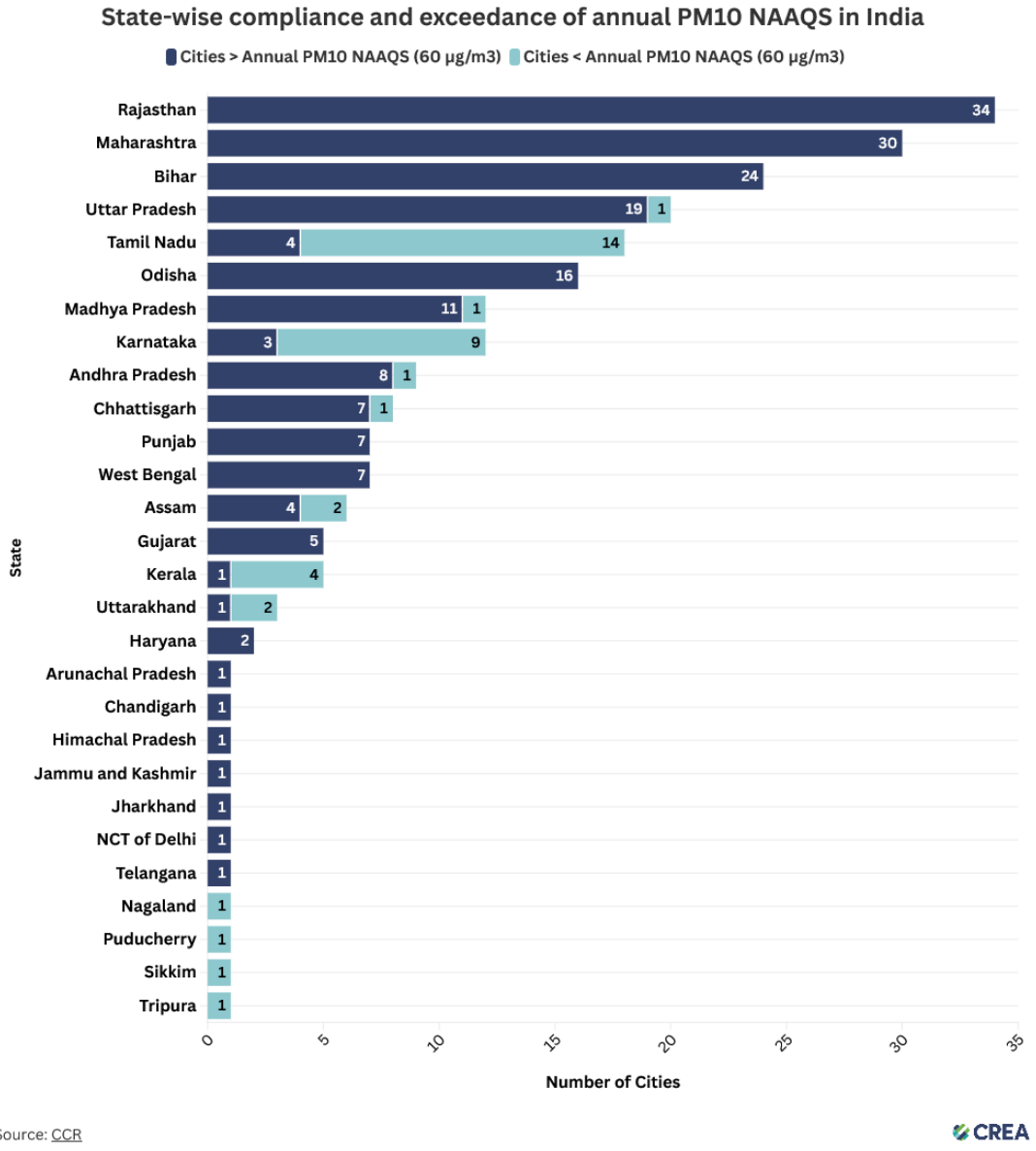

Figure 5 — State-wise compliance and exceedance of annual PM_{10} in India

Ranking of Indian cities based on PM_{10} concentration

Analysis showed that Delhi, the national capital, is the most polluted city with an annual average PM_{10} concentration of 197 µg/m^3. This value is three times the prescribed NAAQS. Over the course of 2025, Delhi exceeded the NAAQS for 284 days. The distribution of PM_{10} levels in the city was as follows: Eight days in the 'Good' category, 73 days in the 'Satisfactory' category, 173 days in the 'Moderate' category, 69 days in the 'Poor' category, 36 days in the 'Very Poor' category, and six days in the 'Severe' category.

Ghaziabad, in Uttar Pradesh, ranked second, with an annual average PM_{10} concentration of 190 µg/m^3. The city exceeded the NAAQS for 285 days in 2025. Air quality was particularly concerning, with the city experiencing 22 days classified under the 'Severe' category, the highest among all Indian cities.

Greater Noida, Uttar Pradesh, ranked third with an annual average of 188 µg/m^3, surpassing the NAAQS on 317 days.

The remaining cities in the Top 10 most polluted cities include Noida, Baghpat, Sri Ganganagar, Gurgaon, Bikaner, Bhiwadi and Bulandshahr, taking respective positions from 4th to 10th spot in the order of mention.

Rajasthan had the largest number of cities in the Top 50 most polluted cities list, with 18 cities included, followed by Uttar Pradesh with 10 cities, then by Madhya Pradesh with five cities, Odisha and Bihar with four cities each and the states such as Haryana, Assam, Himachal Pradesh, Jharkhand, Andhra Pradesh, Punjab, West Bengal, Delhi, and Tamil Nadu had each one city on the list.

Thirunelveli, located in Tamil Nadu, is the cleanest city in India with PM_{10} annual average of 28 µg/m^3. Although this value is within the NAAQS, it is close to twice the WHO-recommended standards.

Madikeri in Karnataka and Gangtok in Sikkim followed as the second and third cleanest cities, respectively. Other cities in the 'Top 10 cleanest cities' list include Palkalaiperur, Chikkamagaluru, Ramanathapuram, Cuddalore, Thanjavur, Nagapattinam, and Chamarajanagar.

Among the 'Top 50 Cleanest Cities', Tamil Nadu leads with the highest number of 15 cities, followed by Karnataka with 11 cities, then by Andhra Pradesh and Kerala with each four cities, then by Chhattisgarh with three cities, then by Assam, Bihar, Uttar Pradesh and

Uttarakhand with each two cities and then by the states such as Madhya Pradesh, Nagaland, Pondicherry, Sikkim and Tripura with each one cities.

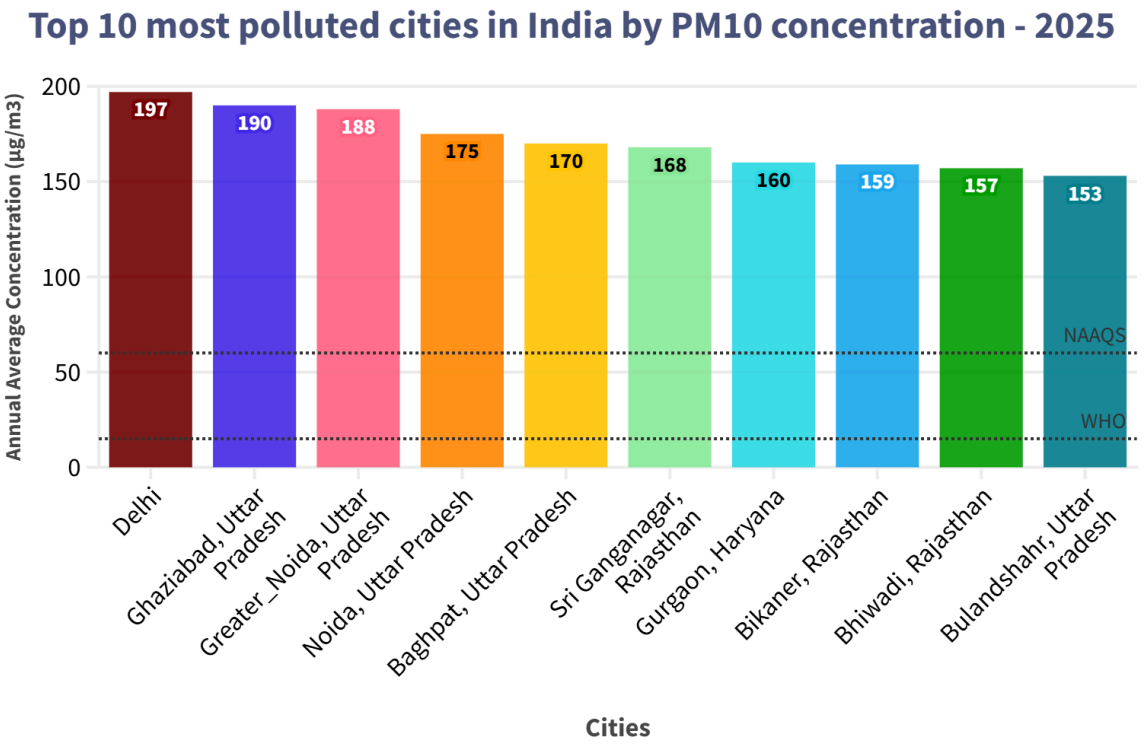

Figure 6 — Top 10 most polluted cities in India by PM_{10} concentrations in 2025

$PM_{2.5}$ analysis

A total of 231 cities had more than 80% of daily data. This section focuses on compliance with NAAQS and AQI categories. The AQI categories are defined as follows: Good ($PM_{2.5}$ Concentration: 0-30 µg/m^3), Satisfactory (31-60 µg/m^3), Moderate (61-90 µg/m^3), Poor (91-120 µg/m^3), Very Poor (121-250 µg/m^3), and Severe (>250 µg/m^3).

- **Indian cities:** Out of 231 cities observed in India, 103 cities exceed the NAAQS, while 128 cities meet the standard. In terms of $PM_{2.5}$ AQI categories, 164 cities are in the 'Satisfactory' category, 14 are 'Moderate,' and 50 are 'Good.' There are three cities classified as 'Poor'.

- **National Clean Air Programme (NCAP) cities**: Among 98 cities under the NCAP, 48 exceed the NAAQS, and 50 do not. In terms of air quality, 77 cities fall under the 'Satisfactory' category, four are in the 'Moderate' category, and 14 are classified as 'Good.' There are three cities recorded in the 'Poor' category.
- **Indo-Gangetic Plain (IGP) cities**: Out of 61 cities observed in the IGP, 47 exceed the NAAQS, while 14 meet the standard. The AQI category distribution shows 47 cities with 'Satisfactory' air quality, nine with 'Moderate,' and three in the 'Good' category. Two cities are in the 'Poor' category.
- **National Capital Region (NCR) cities**: In the NCR, with 14 cities, 12 exceed the NAAQS, and two meet the standard. The $PM_{2.5}$ AQI categories show that nine cities are 'Moderate,' and three are 'Satisfactory,' two are in the 'Poor' Category. None in the 'Good' category.

Table 5 — $PM_{2.5}$ Compliance and AQI classification of Indian cities in 2025

Category	India	National Clean Air Programme	Indo Gangetic Plain	National Capital Region
Total cities with CAAQMS	289	102	89	29
Total cities with 80% data	231	98	61	14
Compliance and exceedance				
Cities > NAAQS	103	48	47	12
Cities < NAAQS	128	50	14	2
AQI Category				
Good (0-30 µg/m3)	50	14	3	0
Satisfactory (31-60 µg/m3)	164	77	47	3
Moderate (61-90 µg/m3)	14	4	9	9
Poor (91-120 µg/m3)	3	3	2	2
Very Poor (121-250 µg/m3)	0	0	0	0
Severe (>250 µg/m3)	0	0	0	0

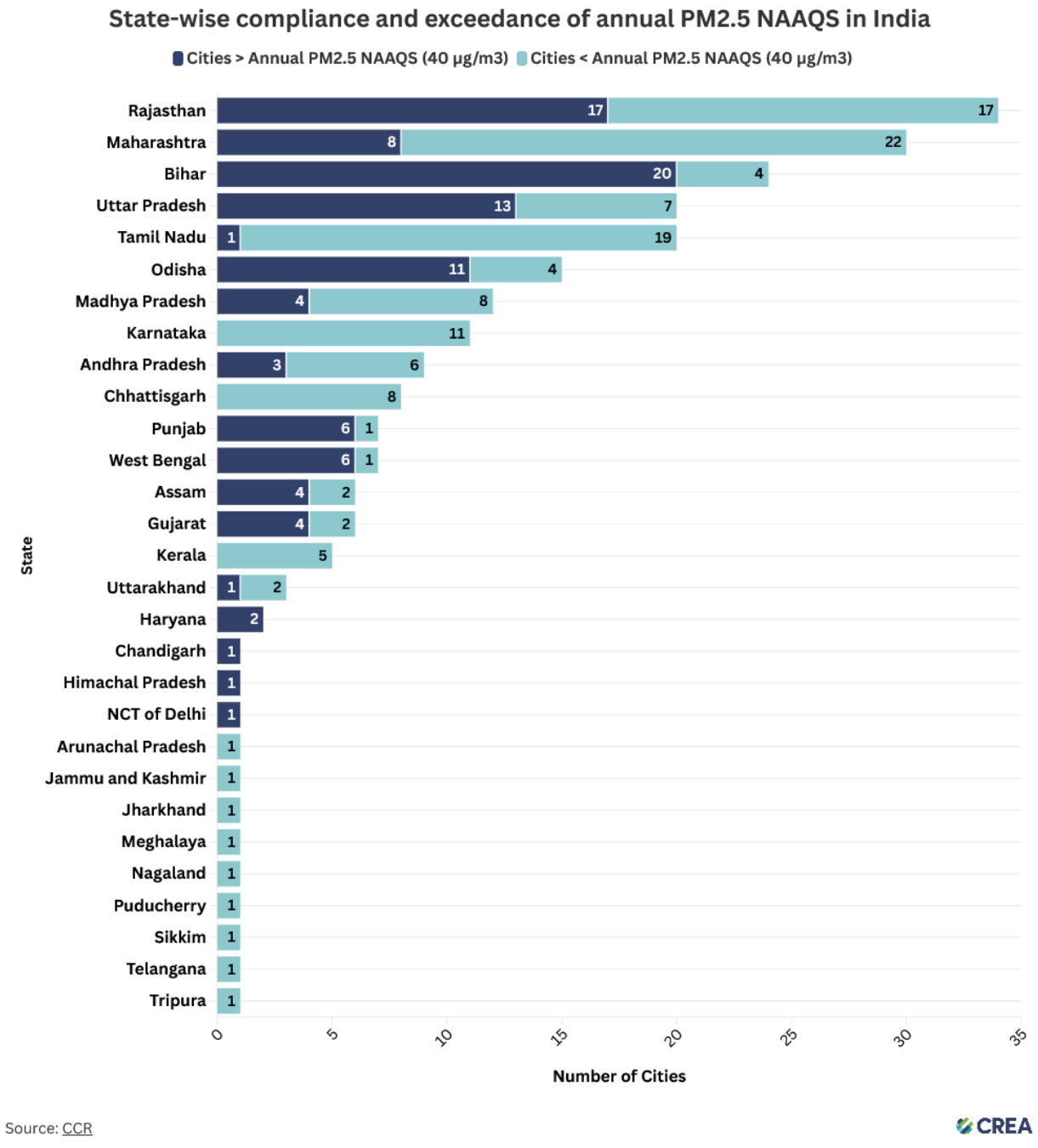

Figure 7 — State-wise compliance and exceedance of annual $PM_{2.5}$

The air quality assessment across Indian states reveals significant diversity in compliance with the NAAQS.

- Among states with a large number of assessed cities (more than 20), Rajasthan, and Bihar show alarming trends, with 17 out of 34, 20 out of 24, and 13 out of 20 cities exceeding NAAQS, respectively. Maharashtra, with the second largest number of cities, records 8 out of 30 cities exceeding the standard.
- States with a moderate number of assessed cities (10–20) also highlight varied performances. Uttar Pradesh (13 out of 20 cities exceeding NAAQS), Odisha (11 out of 15 cities) and Madhya Pradesh (4 out of 12 cities) face significant challenges, whereas Karnataka stands out, with all 11 cities meeting NAAQS. Also, Tamil Nadu performs comparatively better, with 19 out of 20 cities complying with NAAQS.
- For states with fewer than 10 assessed cities, Andhra Pradesh (3 out of 9 cities), Punjab and West Bengal (6 out of 7 cities) exceed NAAQS, while Assam and Gujarat records (4 out of 6 cities), then Uttarakhand (1 out of 3 cities) and Haryana (2 out of 2 cities) show high levels of non-compliance. On the other hand, Chhattisgarh and Kerala had all eight and five cities that met the standards, respectively.
- Several states with one city, such as Arunachal Pradesh, Jammu & Kashmir, Jharkhand, Megalaya, Nagaland, Puducherry, Sikkim, Telangana and Tripura report full compliance with NAAQS, whereas states like Chandigarh, Himachal Pradesh and Delhi see their only assessed cities exceeding the standard.

Ranking of Indian cities based on $PM_{2.5}$ concentration

The analysis revealed that Byrnihat (Assam), Delhi, and Ghaziabad (Uttar Pradesh) ranked as the top three most polluted cities in India in 2025, with annual $PM_{2.5}$ concentrations of 100 µg/m^3, 96 µg/m^3, and 93 µg/m^3, respectively.

- Byrnihat recorded the highest number of days exceeding the daily NAAQS, with 278 out of 356 monitored days. Additionally, it had ‘Severe’ (13 days), ‘Very Poor’ (75 days), ‘Poor’ (30 days), ‘Moderate’ (160 days) and ‘Satisfactory’ (78 days) for the $PM_{2.5}$ AQI category.

- Delhi exceeded the daily NAAQS on 212 out of 365 days in 2025. Being the second most polluted city, it experienced the ‘Severe’ AQI for 18 days and ‘Very Poor’ air quality for 86 days in the year.

- Ghaziabad exceeded the NAAQS standards for 194 days out of the observed 365 days.

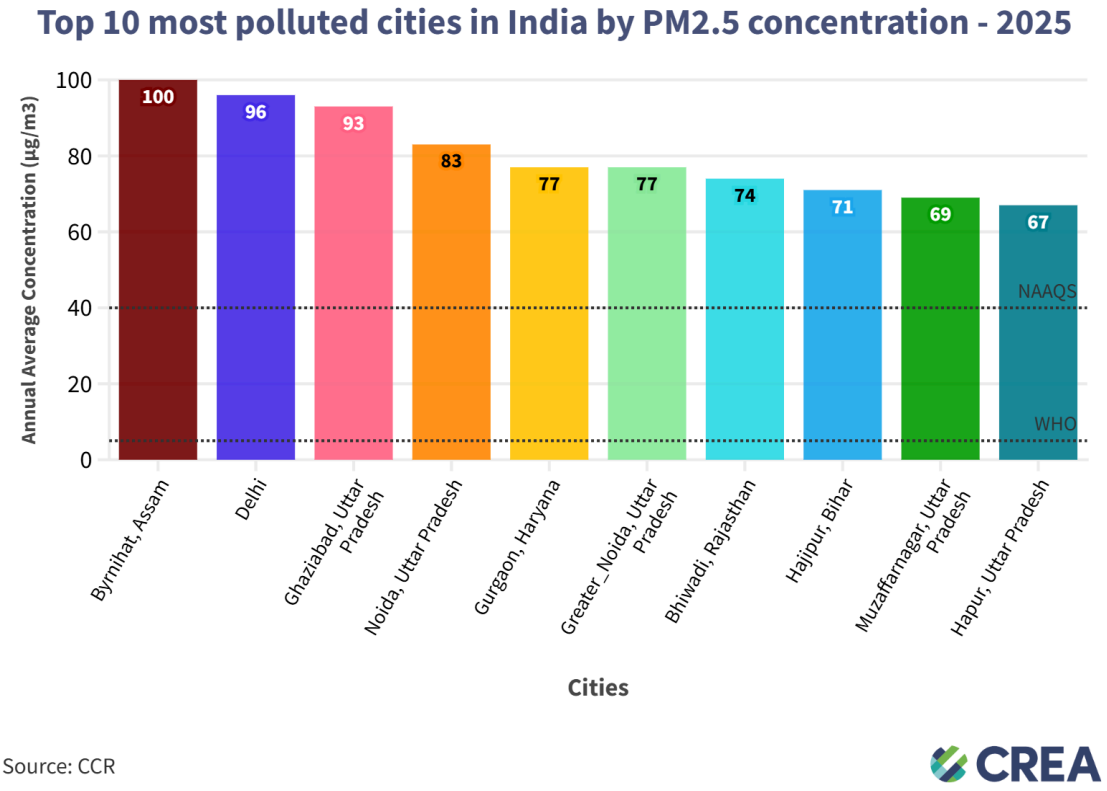

Figure 8 — Top 10 most polluted cities in India by $PM_{2.5}$ concentrations in 2025

Noida, Gurgaon, Greater Noida, Bhiwadi, Hajipur, Muzaffarnagar, and Hapur ranked as the 4th to 10th most polluted cities in India based on $PM_{2.5}$ concentrations.

Among the top 50 most polluted cities, Uttar Pradesh had the highest representation with 10 cities, followed by Rajasthan (9 cities), Bihar (7 cities), Odisha (5 cities), Madhya Pradesh (4 cities), Assam (3 cities), Andhra Pradesh, Punjab and West Bengal each had two cities and states such as Chandigarh, Gujarat, Haryana, Himachal Pradesh, Delhi and Tamil Nadu had each one city on the list.

On the other hand, Tirunelveli (Tamil Nadu) emerged as the cleanest city in India in 2025, with an annual $PM_{2.5}$ concentration of 15 µg/m^3, followed by Chikmagalur (17 µg/m^3) and Madikeri (18 µg/m^3) in Karnataka. Other cities in the top 10 cleanest by $PM_{2.5}$ concentrations include Mysore, Tirupur, Chamarajanagar, Palkalaiperur, Shivamogga,

Shillong, and Agartala. Similar to PM_{10} trends, Tamil Nadu and Karnataka topped the list of the 50 cleanest cities by $PM_{2.5}$ in India in 2025, with 17 cities and 10 cities, respectively.

Assessment of $PM_{2.5}$ non-attainment cities

Using satellite data, we examined $PM_{2.5}$ concentrations in 4,041 cities, across India. Among these, 1787 cities consistently exhibited annual mean $PM_{2.5}$ concentrations exceeding the NAAQS limit in the five years considered (2019, 2021, 2022, 2023, and 2024).

This implies that about 44% of all Indian cities remain in a state of chronic $PM_{2.5}$ non-attainment, with no year showing compliance during this period. The persistence of exceedance across five years highlights that air pollution in these cities is structural rather than episodic, driven by continuous emission sources.

Under the NCAP, only 130 cities were identified as priority cities starting in 2019, primarily based on historical 2011-2015 PM_{10} and $PM_{2.5}$ exceedance and data availability. When these 130 NCAP cities are compared against the larger pool of 1,787 persistently non-attainment cities in India, a significant policy gap becomes evident.

Only 67 of these persistently non-attainment cities are currently covered under NCAP, while the remaining 1,720 cities lie outside the programme. This means that NCAP addresses just about 4% of India's non-attainment cities, leaving the vast majority of cities that continue to exceed the NAAQS outside the scope of targeted air quality action.

A state-level assessment shows the highly uneven distribution of non-attainment cities in India. Among the states with 100-plus non-attainment cities, Uttar Pradesh records the highest, with 416 cities, followed by Rajasthan (158 cities), Gujarat (152 cities), Madhya Pradesh (143), Punjab and Bihar (136 cities), and West Bengal (124 cities). States including Maharashtra (80), Haryana (78), Odisha (67), Assam (64), Himachal Pradesh (38), and Uttarakhand (37) record a considerably higher number of non-attainment cities.

On the other hand, southern states such as Tamil Nadu (5 cities) and Andhra Pradesh (3 cities) show comparatively very few cities to be considered for the action plans. Whereas Karnataka, Telangana, Kerala, and Puducherry exhibit no cities. Overall, the statewise pattern signifies the need for region-specific strategies and airshed-based action plans as the pollutants are concentrated geographically.

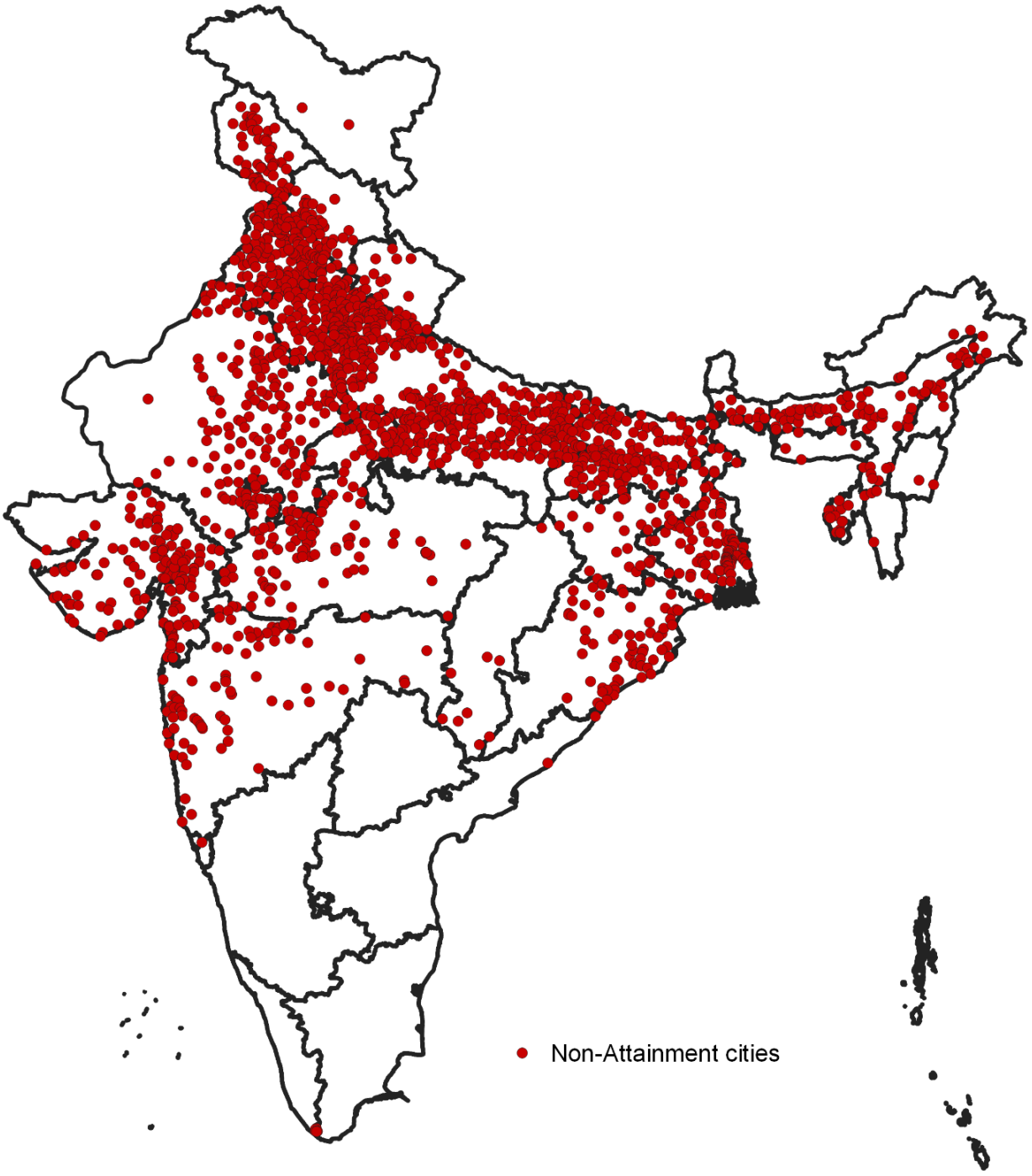

Figure 9 —Non-attainment cities for $PM_{2.5}$ in India during 2019-2024, excluding 2020

Table 6 — State-wise number of non-attainment cities

States	Number of non-attainment cities
Uttar Pradesh	416
Rajasthan	158
Gujarat	152
Madhya Pradesh	143
Punjab	136
Bihar	136
West Bengal	124
Maharashtra	80
Haryana	78
Odisha	67
Assam	64
Jammu and Kashmir	59
Himachal Pradesh	38
Uttarakhand	37
Jharkhand	33
Tripura	16
Chhattisgarh	10
Arunachal Pradesh	8
Nagaland	6
Meghalaya	5
Mizoram	5
Tamil Nadu	5
Manipur	3
Andhra Pradesh	3
Dadra Nagar Haveli and Daman & Diu	2
Chandigarh	1
Delhi	1
Goa	1

Way forward

Prioritise $PM_{2.5}$ and its precursor gases over PM_{10}

NCAP targets and performance indicators should be reoriented towards $PM_{2.5}$ and its precursor gases (SO_2, NO_x, NH_3). Without this shift, compliance with PM_{10} will continue to mask persistent health-damaging $PM_{2.5}$ exposure.

Revise the list of non-attainment cities under NCAP

The current NCAP city list no longer reflects the true scale of $PM_{2.5}$ non-compliance across India. Cities showing persistent exceedances over multiple years should be formally reclassified as non-attainment.

Enforce emission load reduction through stricter emission standards

Persistent exceedances of NAAQS indicate that existing action plans are insufficient to reduce total pollution loads. Stricter and time-bound emission standards must be enforced, particularly for major regional sources such as coal-fired power plants and industries. Compliance should be assessed based on ambient air quality outcomes, not procedural actions alone.

Allocate funding based on source apportionment studies

Funding allocation should be conditional on completed and up-to-date source apportionment studies. Cities without source clarity should not rely on generic or low-impact measures. Linking funds to evidence-based interventions would improve effectiveness and accountability.

Adopt an airshed approach for regional clusters

The concentration of non-attainment cities across large states and regions reflects strong regional pollution transport. City-centric action plans are insufficient for managing $PM_{2.5}$ formed and transported across airsheds. NCAP should institutionalise airshed-level planning and coordination across districts and states.

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