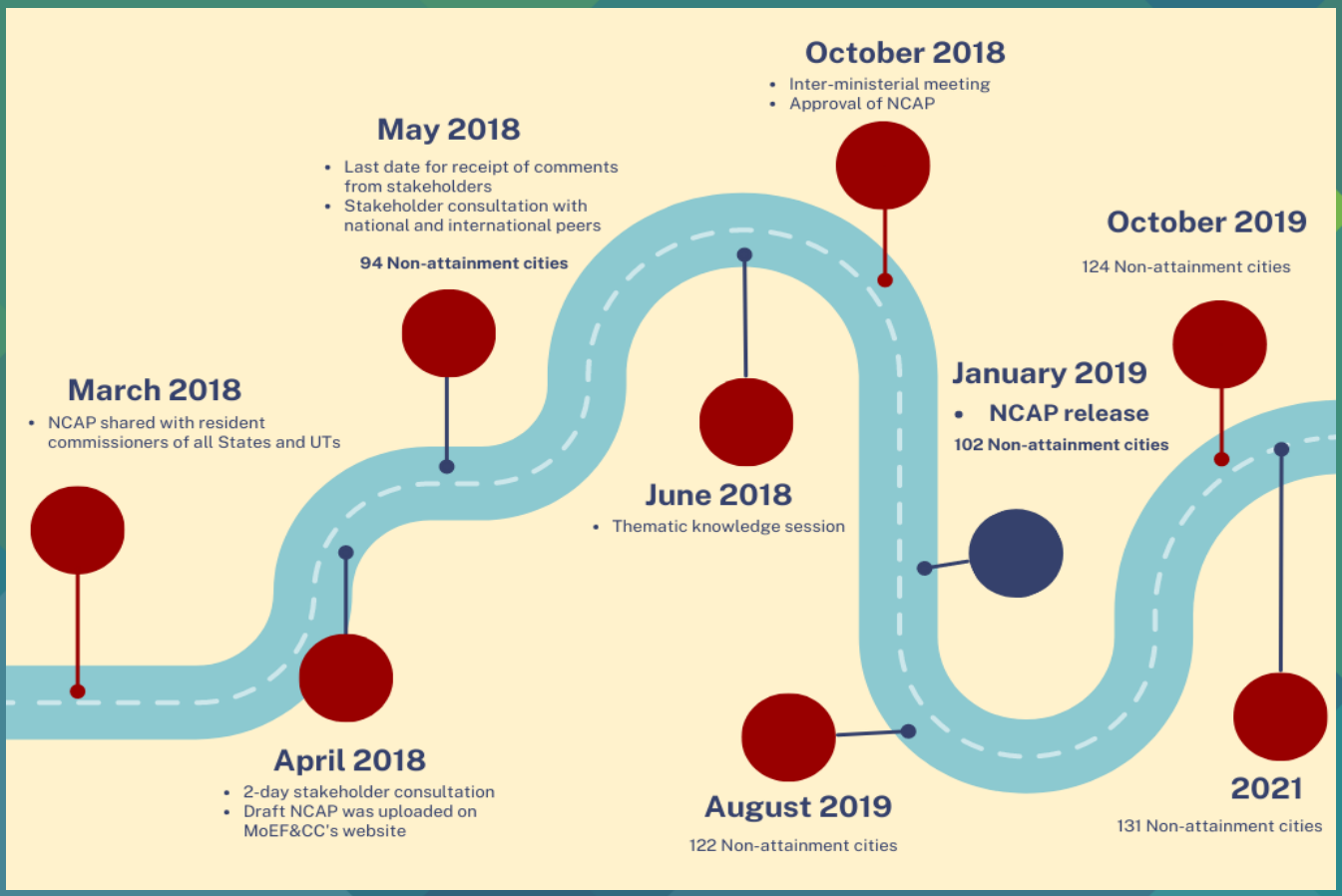
Tracing the Hazy Air 2023

Progress Report on National Clean Air Programme (NCAP)

January 2023



CREA

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.

About CREA

The Centre for Research on Energy and Clean Air (CREA) is an independent research organisation focused on understanding the trends, causes, health impacts and solutions to air pollution.

CREA uses scientific data, research and evidence to support the efforts of governments, companies and organizations 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 December 2019 and has staff in several Asian and European countries. For more information: https://energyandcleanair.org/

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Summary

The National Clean Air Programme (NCAP) was launched in 2019 as a dynamic document focused around formulating and renewing action plans for combating particulate matter pollution through periodic reviews based on scientific inputs. Further, a mid-term review was also proposed for setting of long-term pollution reduction targets based on the results obtained in the preceding years since inception of the program. Although four years have elapsed since the launch of NCAP, only 37 of the 131 non-attainment cities have completed source apportionment studies. Greater transparency for tracking the continued progress of NCAP can be achieved by allowing public access to these studies along with ensuring regular updation of the city action plans based on the source apportionment studies conducted in order to develop a robust and comprehensive target-based method of mitigating air pollution.

A convergence of funds from existing schemes has been adopted along with critical gap grants for cities with million plus population as per the 15th Finance Commission recommendations and for remaining Non-Attainment cities under NCAP. The program is monitored through a network of implementation, monitoring and review committees at the city, state and national levels. Various templates and guidelines for conducting studies, i.e., emission inventory, source apportionment, carrying capacity studies and state action plans etc. have been formulated over the past four years and yet most of the actual work for knowledge and database building has been delayed by years and still doesn't show promising progress. Although it has been reported that 10 State Action Plans have been formulated, only Uttar Pradesh has revealed its action plan to the public as of date. No regional or airshed level action plans have been prepared till now.

Between 2019-22, India managed to add only 45 manual ambient air quality monitoring stations per year, totalling to 883 stations across 378 cities under NAMP as of December 2022. This is an increase from 703 in 2019. The NCAP envisaged installing 1,500 stations by 2024, which leaves 617 stations to be installed over next 2 years (2023-24).

Since the notification of the National Clean Air Programme (till December 2022), a total of Rs 652.61 crores have been released under NCAP out of which only Rs 301.69 crores were utilised; which is less than 50% utilisation of the total funds. Apart from funds released under NCAP, a total of Rs 6,435 crores were also allocated under XVFC for the financial year 20-21 and 21-22, and only Rs 1,629.82 crores (~25%) were utilised till December 2022.

While the National Clean Air Programme is nearing the end of its first stage next year, the government plans on revamping it in mission mode with a specific focus through action plans for critical polluting sectors such as transport, power and industries among others This review highlights the existing lacunae in the current structure of NCAP such as:

- Lack of comprehensive mechanism to govern air quality management at the city, district, state and regional level/airshed level.
- Lack of any substantive emission load reduction-based approach as no action plan speaks of a cap on the consumption of fossil fuels and its reduced usage, especially in the power and transport sector.
- Lack of transparent data availability on air quality levels across the country in the absence of an adequate air quality monitoring infrastructure, lack of integration of already existing infrastructure i.e., ambient air quality monitoring stations installed by industries in compliance of Environmental Clearance (EC) conditions and usage of satellite data for remote assessment of pollution levels in a systematic manner.
- Lack of integration of air quality management plans with forecasting mechanisms, Continuous Emission Monitoring System (CEMS) data and Decision Support System (DSS) by administrative agencies.

- Lack of transparency in sharing action plan status reports by cities, states and ministries even at the national level through NCAP portal PRANA shows a lack of accountability on the part of concerned authorities and agencies.

Based on the current review we recommend that:

- A future roadmap for NCAP will need to expedite the identification of airsheds in the country to formulate and implement airshed-based air quality management. The national ambient air quality standards revision committee should also discuss the notification of varied ambient air quality standards or guidelines based on the background air quality levels for different airsheds.
- A National Emissions Database quantifying the emission reduction targets at district/state and national levels, based on emission load should be set up to propel the achievement of National Ambient Air Quality Standards.
- In order to make a significant impact in combating air pollution, newer policy measures should include integrating the census definitions and existing administrative set-up for identifying non-attainment cities and implementing agencies for air quality management. District and state air quality plans may be prepared for comprehensive air quality management and updated with new information gathered through the studies and data compilation with efficient utilisation of established systems and tools.
- Data transparency in terms of integration of progress across sectors into the NCAP portal is crucial for public outreach, accountability, and information. Public access to national air quality data generated through satellite, Industrial air quality monitoring, CEMS, low-cost sensors and manual monitors should be ensured.
- Failure to abide by timelines for conducting various research studies (i.e., emission Inventory, source-apportionment, carrying capacity studies and health baselines etc.) should be penalised. These research studies are only helpful in setting the baseline if conducted within proper timelines.

Introduction

India celebrated its 75th year as an independent country in 2022 and became the world's fifth largest economy (TOI, 2022). While the country is moving fast on its economic development pathway, the high fossil fuel-based energy system over the past decades has led to increased air pollution, resulting in millions of deaths, reduced years of life and economic damage.(Pandey et al., 2021). Ambient air quality data published by the government has consistently reported exceedance of particulate matter (PM_{10}, $PM_{2.5}$) concentrations from the prescribed standards..

The National Clean Air Programme, launched in 2019 amidst Delhi and several other Indian cities consistently ranking worst amongst the world's most polluted cities, aimed to improve air quality through coordinated efforts across sectors, stakeholders and various state and central government schemes. The NCAP is the first pan-India policy aiming for a 20-30% reduction in particulate matter pollution by 2024 compared to levels in 2017 (MoEF&CC, 2019).

The program focuses on cities across 24 states and union territories which have been identified as non-attainment cities based on their ambient air quality data during 2015-2019 (NCAP-Tracker, 2022) [1]. At present, the Centre provides technical and financial support to 131 non-attainment cities through the Programme.

[1] Non-attainment cities were identified by the Central Pollution Control Board (CPCB) based on ambient air quality levels exceeding annual national ambient air quality standards (NAAQS) for five consecutive years.

National Clean Air Programme (NCAP)

Goal

The goal of the NCAP is to meet the prescribed annual average ambient air quality standards at all locations in the country in a stipulated time frame (long-term).

Target

Taking into account the available international experiences and national studies, the tentative national-level target of 20%–30% reduction of $PM_{2.5}$ and PM_{10} concentration by 2024 is proposed under the NCAP. This is keeping 2017 as the base year for the comparison of concentration.

Objective

- To ensure stringent implementation of mitigation measures for prevention, control and abatement of air pollution.
- To augment and evolve an effective and proficient ambient air quality monitoring network across the country for ensuring a comprehensive and reliable database.
- To augment public awareness and capacity-building measures encompassing data dissemination and public outreach programmes for inclusive public participation and for ensuring trained manpower and infrastructure on air pollution (MoEF&CC, 2019)

The CPCB initially identified 94 non-attainment cities while circulating the draft NCAP in 2018. This was later revised to 102 non-attainment cities (NACs) in January 2019 while releasing the final NCAP. With increasing pressure from citizens, civil society and researchers as well as the availability of more data, CPCB later revised the list of non-attainment cities to include 20 more cities in August 2019. In 2020, two more cities were added to the list of non-attainment cities, making it a total of 124 non-attainment cities. The latest addition to the cities covered under NCAP was made in 2021 when 8 million plus cities

were added to the list taking the number to 132. This was reduced to 131 after combining Asansol and Raniganj.

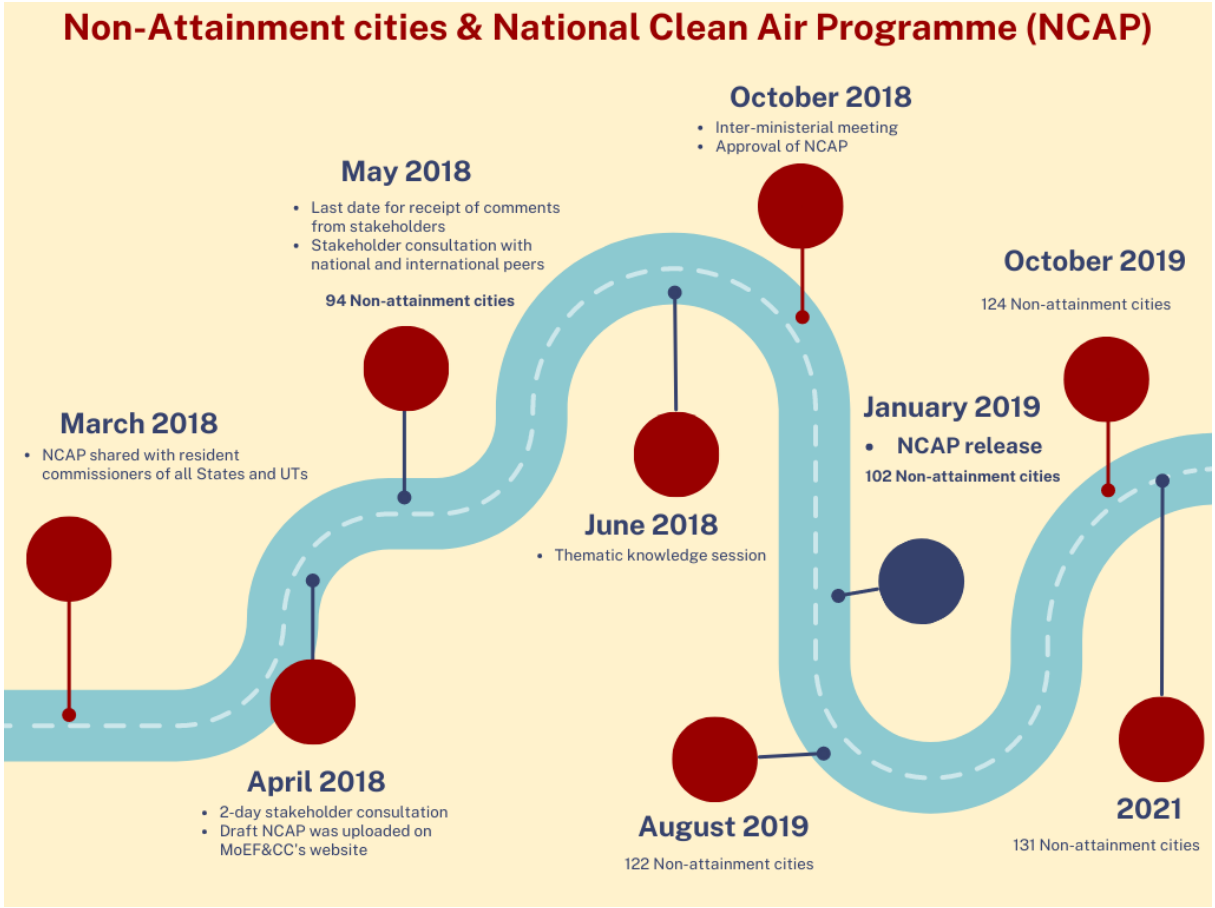


Figure 1: Coverage of cities under NCAP before and after 2019

A detailed assessment report by Greenpeace India (Chanchal et al, 2021) for the year 2018 revealed that NCAP leaves out around 231 cities where the level of air pollution exceeds the prescribed NAAQS. Furthermore, this still leaves out the geographies where air quality is not even monitored. Various reports and assessments put forward by government agencies, researchers and civil society have tried to look at the implementation and effectiveness of the NCAP over the past two years. The available research clearly indicates that the all-pervasive problem of air pollution isn't just limited to cities and needs increased efforts towards building a multi-sectoral and regional mechanism to tackle this critical issue.

Purpose and Scope of the Report

The current report is a continuation of 'Tracing the Hazy Air: Progress Report on National Clean Air Programme' released by the Centre for Research on Energy and Clean Air in January 2022 (Ghildiyal and Dahiya, 2022). The report attempts to analyse the implementation and progress of the National Clean Air Programme (NCAP) towards reducing air pollution levels since its launch in January 2019. The assessment will help policymakers, civil society organisations, researchers and citizens to realign the actions and priorities for efficient utilisation of resources and energy towards cleaning the air. This review of the flagship National Clean Air Programme (NCAP) takes stock of the progress made in governance and management of ambient air quality in the country till December 2022.

The scope of the study is limited to tracking the indicators at the national level coordinated or implemented by national institutions while an in-depth analysis of the actions by non-attainment cities and their respective states or union territories is not included in the current study.

Materials and Methodology

To track the implementation of the NCAP various primary and secondary sources were considered. Information was sourced from various government ministries such as MoEFCC, MoPNG, CPCB, SPCBs, MoP, etc. The data was also extracted from the questions asked at both the Houses (Loksabha and Rajyasabha) of the Parliament during various sessions. Numerous reports from non-governmental organisations and articles from various news agencies were also taken into account while compiling the data. Simultaneously, several RTI's were filed to the relevant ministries and departments of the government to compile the information. All the data which was gathered from different sources were then compiled in an Excel sheet and only quantifiable parameters were considered.

Tracking Progress

Institutional Strengthening

The National Clean Air Programme (NCAP) launched in January 2019 stipulated the formation of major committees at the central, state and city levels for implementation and monitoring of NCAP. Although all such committees have been constituted at national and state levels, the mandated five sectoral working groups have not been constituted as of December 2022. However, MoEF&CC has initiated coordination among seven ministries for the preparation of sector-specific action plans to improve air quality (PRANA, 2022a). However, even after more than two years of formulation of these committees, the functioning is still opaque as public disclosure regarding the minutes of the meetings or actions taken is missing from public data sharing platforms such as NCAP portal PRANA developed by CPCB. While the Apex Committee, Steering Committee, Monitoring Committee and Implementation Committee are sharing their minutes of meetings in the public domain through the NCAP portal PRANA, all other committees at the centre, state and city levels lack systematic and comprehensive public disclosure of information and actions taken throughout the country. The Apex committee has only met once in 2022 since its inception, the Steering committee has convened five times wherein annual funds for actions under NCAP have been approved and Monitoring Committee and Implementation Committee has met nine and 11 times respectively since 2019 (PRANA, 2022b).

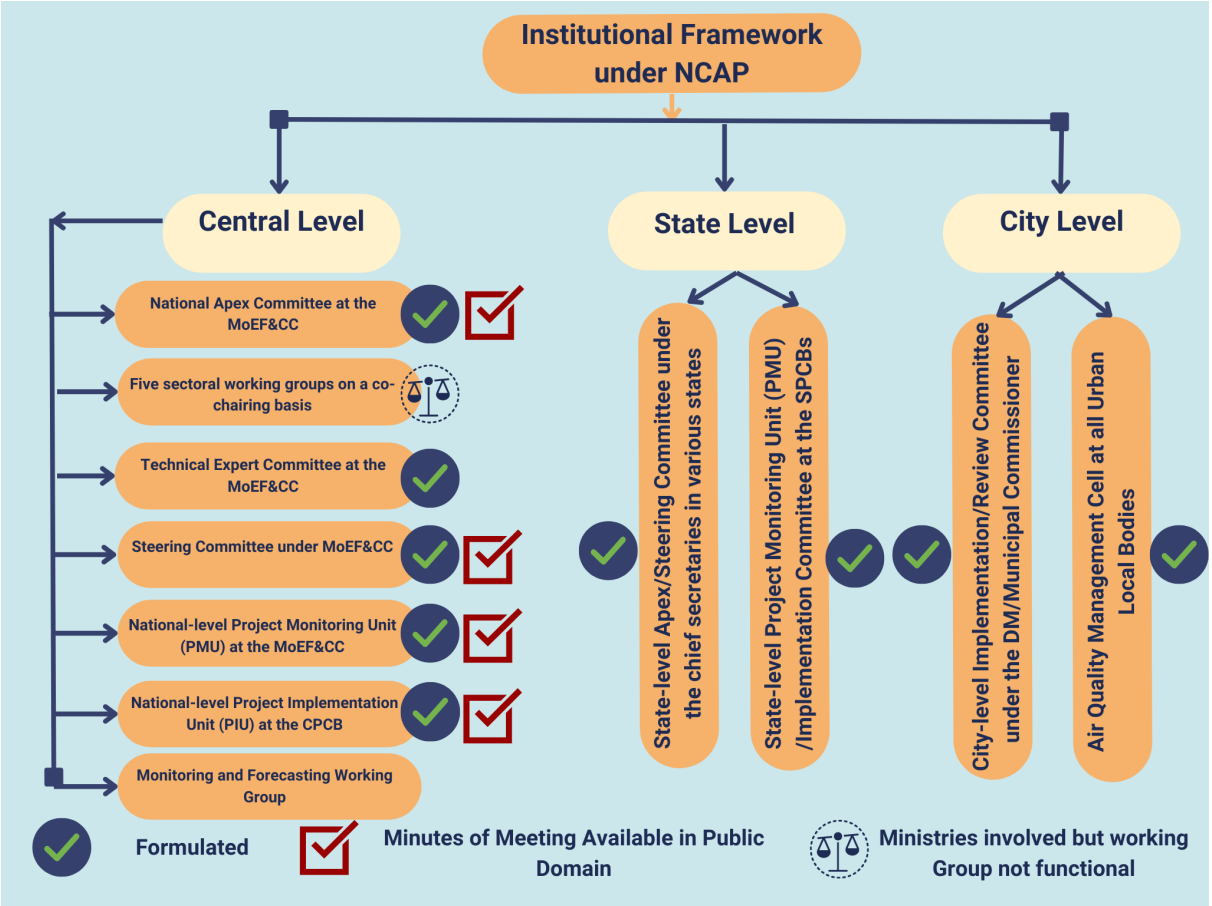


Figure 2: Institutional Framework under National Clean Air Programme (NCAP)

Apart from the committees at the Central level:

- Twenty-four states and union territories with non-attainment cities have also formed Steering and Implementation Committee for NCAP (MOEF&CC, 2021)
- The City Implementation committees constituted for all non-attainment cities are headed by District Magistrates or Municipal Commissioners, who are responsible for the ground implementation and review of actions under NCAP.
- A technical advisory group, **National Knowledge Network** has been constituted by the Government and **Institutes of Repute** have been identified for local technical capacity building (NKN, 2022).

- As per minutes of the Steering Committee of NCAP, most of the Institute of Repute (IoRs) are engaged in air quality monitoring, data analysis and utilisation, training, air quality modelling, source apportionment, emission inventory and capacity building activities (PRANA, 2021).
- However, minutes of meetings by State or city Level Committees and technical outputs in terms of reports or recommendations made by IoRs or National Knowledge Network (NKN) to the local or central government are not available in the public domain. NKN has started putting together a compilation of research done by group members on the web portal for the network.
- A Memorandum of Understanding has been signed by SPCBs with urban local bodies (ULB) and IoRs for identifying and implementing actions impacting air quality. SPCBs and ULBs have also signed agreements with MoEF&CC and CPCB for the implementation of target-based city-specific year-wise action plans (PRANA, 2022c).

Training and Capacity Building

Three regional workshops (West, South and North) have been conducted by MoEF&CC for creating awareness about NCAP and sharing best practices in the country (PRANA, 2022d), (PIB, 2022a). In addition to this, "Guidelines for Capacity Building and Public Outreach under NMCA/NCAP" has been published in July 2022 with a financial outlay of Rs 4.96 crores for five years till 2025-26 (MOEF&CC, 2022a). These funds shall be utilised for capacity building by ULBs, environment departments and MoEF&CC.

Webinars have also been conducted by NKN, UNEP, World Bank and others for imparting air quality management knowledge. However, government agencies still lack adequate manpower for air pollution control. According to a recent report by think-tank iForest, the air quality management sector requires at least 50,000 new jobs, ranging from researchers and analysts to air quality supervisors in ULBs and regulators in Pollution Control Boards (iFOREST, 2022).

Air Information Centres and Technology Assessment Cell

As per the NCAP document, a plan for setting up of an Air Information Centre (AIC) and Technology Assessment Cell (TAC) was to be completed by 2019 and regional and central AICs set up with some identified institutes by 2020. While Air Quality Monitoring Cells (PRANA, 2022c) have been formed in every urban local body of 131 Non-Attainment Cities for overseeing the implementation of NCAP and State Pollution Control Boards and Committees and ULBs have been directed to share information related to air quality, specific AICs haven't been set-up at the regional or central level. The CPCB has also proposed formulation of a central AIC to the MoEF&CC.

Further, the technology assessment cell has not been formed. However, a technology challenge to identify new technologies for air pollution was conducted by CPCB in 2022 (CPCB, 2022a). TAC as well as AICs, if established strategically, can be major stakeholders in identifying the root cause of pollution through systematic data analysis and finding mitigation technologies or strategic interventions for emission and pollution reduction. However, actions taken in these hotspots to control air pollution have not been shared in the public domain.

Certification System for Monitoring Instruments

Under the NCAP, the National Physical Laboratory (NPL)-India Certification Scheme (NPL-ICS) was to be operated at the central and regional levels to cater to the country's needs for online monitoring of air pollution as well as to evolve an action plan establishing a certification agency for air pollution mitigation equipment by 2019.

In 2019, MOEF&CC designated CSIR-NPL as the "Certification Agency" for Air Pollution Monitoring Equipment and allocated Rs.5,660 lakhs to NPL for the establishment of a type testing calibration and certification facility for online continuous Emission Monitoring System (OCEMS) and Continuous Ambient Air Quality Monitoring System (CAAQMS) (CSIR-NPL, 2021). While NPL has launched the CSIR NPL India Certification Scheme in 2020 (CSIR-

NPL, 2022), the progress of this activity is not available in the public domain (ISM-ENVIS, 2019).

Air Quality Forecasting System

The System for Air Quality and Weather Forecasting and Research (SAFAR) is being used by the Centre and Delhi-National Capital Region (NCR) to implement preventive measures for addressing air pollution. However, as envisaged under NCAP, these measures have not been replicated in 131 NACs. At present forecasts are being generated for Ahmedabad, Bengaluru, Delhi, Hyderabad, Kolkata, Pune and Mumbai (IITM, 2022).

Hotspot-based forecasting had to be taken up in NACs by 2022. However, at present, cities are in the process of identifying hotspots based on air quality data. Out of 131 cities, 49 cities have identified air pollution hotspots in the city (PRANA, 2022e).

Table 1: Key indicators and their progress for Institutional Strengthening at under National Clean Air Programme

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
1	A plan for setting up air information centres will be formulated.	Centre	Centre/ State	MoEF&CC, CPCB, SPCBs	2019	Proposal of Rs.150 Lakh was submitted for funding under NCAP to MoEF&CC by CPCB but no funds were allocated till July 2022 (PRANA, 2022c). The Central Control Room (CCR) for dissemination of AQI is operational.
2	Air information centres at the central and regional levels will be set up in some of the identified institutes.	Centre	Centre/ State	MoEF&CC, CPCB, SPCBs	2020	No air information centres formulated at regional or state levels apart from CCR for Delhi-NCR (CCR, 2022a).
3	To operationalize NPL-India Certification Scheme (NPL-ICS) at the central and regional level to cater to the country's needs in respect of online monitoring of air pollution.	Centre	Centre	MoEF&CC, CPCB	2019	CSIR-NPL is notified as the responsible agency for certification but the progress of this activity is not available in the public domain (ISM-ENVIS, 2019).
4	To evolve an action plan for the need of certification agencies for air pollution mitigation equipment in addition to the monitoring equipment.	Centre	Centre	MoEF&CC, CPCB	2019	No information available
5	All the ongoing and future initiatives under SAFAR will be integrated with the NCAP for taking all preventive measures to draw the benefits for addressing the air	Centre	Centre	MoES, CPCB	2019	The Air Pollution forecasting and Decision support system for air quality management for Delhi is developed by IITM (SAFAR) exists but still lacks full integration with NCAP (DSS, 2022).

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
	pollution issue from the available information.					
6	The forecasting to be extended to 102 non-attainment cities under the NCAP.	Centre	Centre	MoES, CPCB	2022	SAFAR forecasting is only available for Ahmedabad, Bengaluru, Delhi, Hyderabad, Kolkata, Pune and Mumbai[2].
7	Hotspot-based forecasting to be taken up moving ahead from city-specific forecasting in 102 cities.	Centre	Centre	MoES, CPCB	2022	49 cities have identified air pollution hotspots, others still have to identify hotspots. No information was available on hotspot-based forecasting.
8	The satellite data available through the satellite network of ISRO to be integrated for monitoring and forecasting under the NCAP.	Centre	Centre	MoES, CPCB	2022	ISRO developed the web-based system[3] for satellite data assessment for Air Pollution but it still lacks integration with NCAP.
9	A detailed action plan for setting up the network to be formulated.	Centre	Centre	MoEF&CC, CPCB	2019	National Knowledge Network[4] has been constituted by the Government and Institutes of Repute have been identified for local technical capacity building.
10	A system of a regular web-based online interaction mechanism will be evolved to ensure continuity of interactions.	Centre	Centre	MoEF&CC, CPCB	2020	No information available

[2] https://ews.tropmet.res.in/mumbai/index.php

[3] https://airquality.iirs.gov.in/

[4] https://nkn.urbansciences.in/

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
11	A detailed action plan for a technology assessment cell to be formulated.	Centre	Centre	DST, MoEF&CC, CPCB	2019	The technology assessment cell has not been formulated, however a technology challenge to identify new technologies for air pollution was conducted by CPCB in 2022.
12	A technology assessment cell will be created involving the IITs, IIMs, universities, industries, and using the existing DST mechanisms and programmes, India Innovation Hub, etc.	Centre	Centre	DST, MoEF&CC, CPCB	2019	No information available
13	Apex committee at the MoEF&CC	Centre	Centre	MoEF&CC	2019	Formulated, only met once since 2019
14	National Level PMU at the MoEF&CC	Centre	Centre	MoEF&CC	2019	Information on the engagement of contractual manpower for NCAP work at MoEF&CC, CPCB and SPCBs is available (PRANA, 2021). However, information on a PIU is not available.
15	Five Sectoral Working Groups on a co-chairing basis	Centre	Centre	MoEF&CC, MoP, MoRTH, MoHUA, MoA, DIPP	2019	Coordination among seven ministries has been initiated for the preparation of sector-specific action plans to improve air quality, but, the Working group doesn't exist
16	A Monitoring and Forecasting Working Group	Centre	Centre	MoEF&CC	2019	No information
17	A Technical Expert Committee at the MoEF&CC	Centre	Centre	MoEF&CC	2019	Formed, but no public information

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
18	A national-level Project Implementation Unit (PIU) at the CPCB	Centre	Centre	CPCB	2019	Information on the engagement of contractual manpower for NCAP work at MoEF&CC, CPCB and SPCBs is available. However, information on a PIU is not available (PRANA, 2021).
19	A State Monitoring Committee under the chief secretary in the states	State	State	DoE	2019	Formed
20	State-level PMU at the SPCB	State	State	SPCB	2019	Formed
21	City-level implementation/review Committee under the DM/municipal commissioner	State	City	Municipal Corporation	2019	Formed and headed by either Municipal Commissioner or District Collector (MOEF&CC, 2021).

Knowledge and Database Augmentation

Ambient Air Quality Monitoring Network

Air quality monitoring is essential for understanding pollutant trends, checking for compliance with standards and taking precautionary measures. Air quality in India is monitored by Central and State Pollution Control Boards and some national institutions such as the Indian Institute of Meteorology and National Environmental Engineering Research Institute (NEERI) through a network of manual monitoring stations and continuous ambient air quality monitoring stations (CAAQMS). As of December 2022, a total of 883 manual stations were installed under National Air Quality Monitoring Programme (NAMP) (CPCB, 2022b). Under NAMP, pollutant monitoring is conducted twice a week, with a minimum of 104 observations per year (CPCB, 2013). In addition to manual monitors, about 407 CAAQMS (as of December 22, 2022) have been installed across the country (CCR, 2022b). Figure 1 shows the locations of manual stations and CAAQMS in India.

The NCAP outlined the expansion of the NAMP network from 703 manual monitoring stations in 2019 to 1,500 stations by 2024, while 180 stations, i.e, 45 stations per year have been added to the network -a big task for increasing the coverage of manual monitoring nationally still remains. If NCAP is to achieve its set target of 1,500 stations, installation of more than 300 stations per year for the next two years would be required.

The Programme also envisaged that all NAMP stations would be equipped with $PM_{2.5}$ monitoring by 2024, only 360 stations with $PM_{2.5}$ monitoring were added to NAMP network till FY22 (PQ-MOEF&CC, 2022a). This leaves more than 500 existing stations that need to be upgraded with $PM_{2.5}$ monitoring over the next two years. And all 617 new stations to be added should also be equipped with $PM_{2.5}$ monitoring.

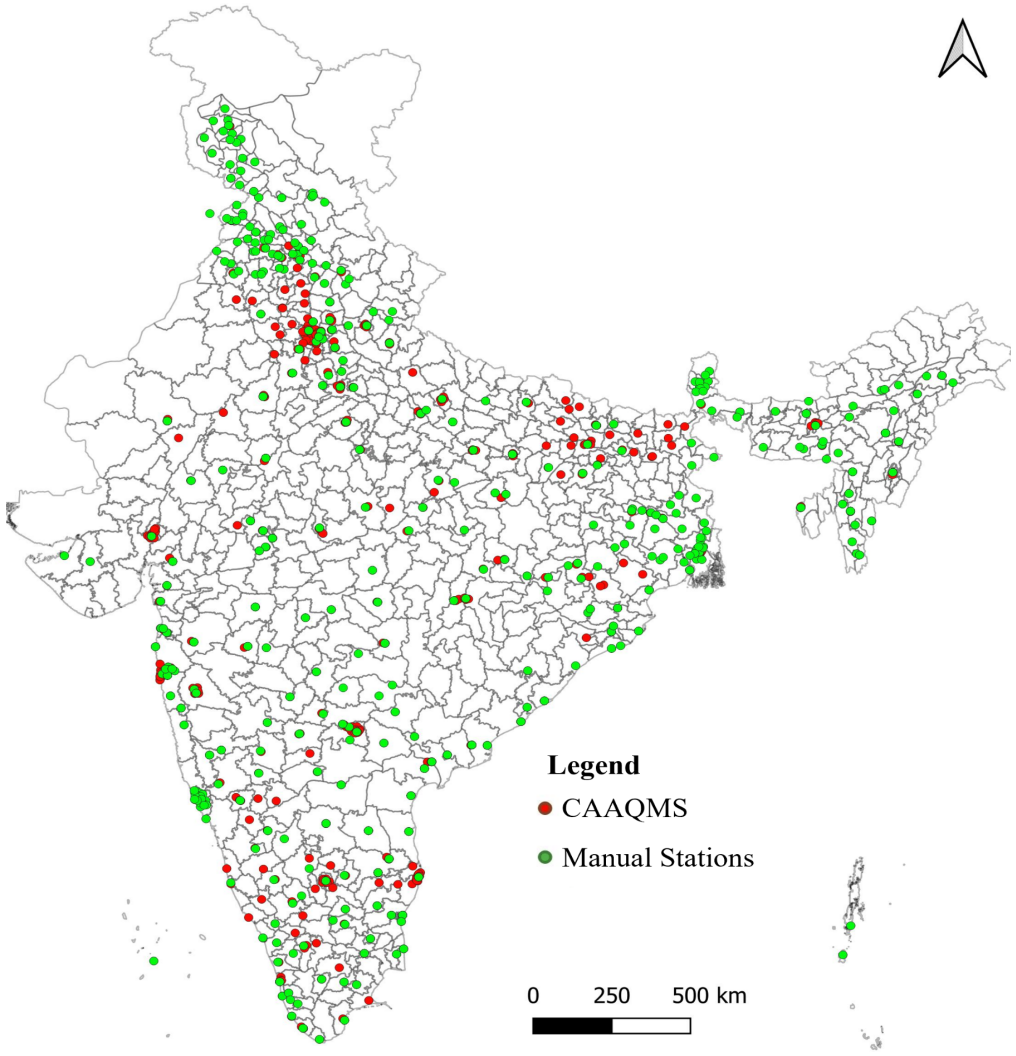


Figure 3: Location of ambient air quality monitoring stations in India: CAAQMS and NAMP

While ground based air quality monitoring will have its limitations and will take time to be strengthened, usage of satellite data in addition to ground monitoring was proposed for air quality monitoring under NCAP. While Indian Space Research Organisation (ISRO) developed the web-based system[5] for satellite data assessment for air pollution, it still lacks integration with NCAP. Along with that, IIT-Delhi initiated a three-year project titled "Satellite-based monitoring of ambient $PM_{2.5}$ at national scale for air quality management" with financial support from CPCB under NCAP in 2018-19 (PRANA, 2021). Through this

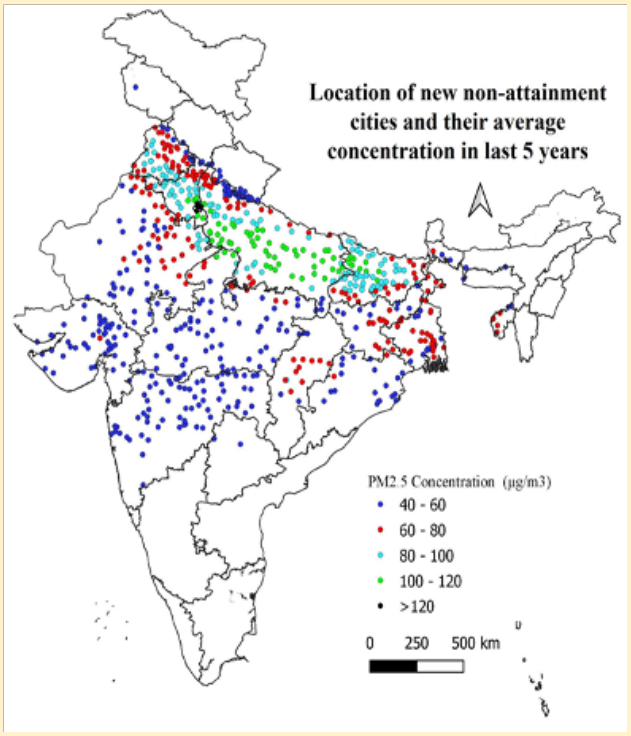
[5] https://airquality.iirs.gov.in/

system, Satellite-based Application for Air quality management at the National Scale (SAANS) has been set up as an interactive web portal and $PM_{2.5}$ data from 2000-2019 has been compiled at two different spatial and temporal scales. However, these datasets are not available in the public domain.

Need for expansion of $PM_{2.5}$ monitoring in the country

A satellite data-based $PM_{2.5}$ analysis from 2017-2021 highlighted that out of 1,353 cities and towns identified from the Census 2011*, the annual average of $PM_{2.5}$ levels were within the national ambient air quality standards in 581 cities and exceeded in 772 cities consecutively for five years**.

At present, $PM_{2.5}$ is being monitored through 407 real-time monitoring stations. The number of manual stations equipped with $PM_{2.5}$ monitoring is 360 stations in 171 cities.



Locations of new non-attainment cities based on $PM_{2.5}$ levels exceeding NAAQS can be seen in the figure. It is necessary that $PM_{2.5}$ levels are monitored at more locations to initiate fine particulate matter management which is a major concern, especially in the Indo-Gangetic Plain and western and central India.

* Cities and towns with more than 1 lakh population
**Includes NCAP cities

The following table tracks the status of 11 actions for augmenting air quality monitoring in the country as outlined under NCAP:

Table 2: Key indicators and their progress for Strengthening of Air Quality Monitoring Network under National Clean Air Programme

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
1	Augment the manual monitoring stations from the existing 703 stations to 1,500 stations	Centre	City/State	CPCB, SPCBs	2024	45 stations/year installed between 2019-22 totalling to 883 stations under NAMP. 617 stations to be installed over the next 2 years (2023-24).
2	150 CAAQMS with an average of 2–3 stations in each city to be installed, prioritising the Indo-Gangetic plain	Centre	City/State	CPCB, SPCBs	2024	Number of CAAQMS has been strengthened to 407 till date. However, 2-3 stations in each city of the Indo-Gangetic-Plain are yet to be installed.
3	Satellite-based measurements.	Centre	City/State	CPCB, SPCBs, SAC, ISRO	2024	IIT Delhi initiated a three-year project titled "Satellite-based monitoring of ambient $PM_{2.5}$ at national scale for air quality management" with financial support from CPCB under NCAP in 2018-19 (PRANA, 2021). Under the programme, Satellite-based Application for Air quality management at the National Scale (SAANS) has been set up as an interactive web portal and $PM_{2.5}$ data from 2000-2019 has been compiled at two different spatial and temporal scales. However, datasets are not available in the public domain.ISRO developed the web-based system[6] for satellite data assessment for air pollution but it still lacks integration with NCAP.
4	Identification of an alternative technology for real-time monitoring with an impetus on low-cost indigenous real-time monitoring stations and promoting real-time monitoring in other cities with these	Centre	City/State	CPCB, SPCBs	2024	The Steering Committee of NCAP constituted a committee for examination of the efficacy of capturing data by means of a satellite-based imagery system and sensor-based system and acceptance of sensor-based data in 2021 (PRANA-Minutes, 2021). In addition to this, international organisations have facilitated sensor-based monitoring of air quality in many regions including

[6] https://airquality.iirs.gov.in/

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
	low-cost sensors. With average of 10 sensors in each city, 1,000 sensors are being targeted.					Maharashtra, Gujarat, Rajasthan, Delhi and Karnataka (PRANA, 2022f). The proposal on "Evaluation of Low-cost Sensors" by CSIR - NPL is being examined by the Project Appraisal Committee (PRANA, 2022c).
5	Mobile air quality monitoring network to be made part of these alternative technologies. At least one mobile monitoring station for each city is to be considered.	Centre	City/State	CPCB, SPCBs	2024	While the Mobile Air Quality Vehicles have been operationalised by CPCB, Delhi pollution control committee and Maharashtra pollution control board (CPCB, 2008), (DDCD, 2022), (ENVEA, 2022), information regarding other states wasn't available.
6	Set up 100 monitoring stations in the rural areas	Centre	City/State	CPCB, SPCBs	2024	As of December 2022, 27 rural air quality monitoring stations were installed in Punjab, Daman & Diu and Dadra & Nagar Haveli. 17 new Monitoring stations in rural areas in the States of Himachal Pradesh (5), Kerala (2), Mizoram (5), Odisha (2), Tripura (1), and Uttar Pradesh (2) have been sanctioned during 2021-22((PQ-MOEF&CC, 2022a). A 2020 low-cost sensor-based study in a sample of villages and small towns in North India found that $PM_{2.5}$ concentrations were often similar to or higher than the nearest large city (Singh et al., 2020).
7	Review the existing guidelines and issue a protocol for the setting up of monitoring stations and monitoring	Centre	City/State	CPCB, SPCBs	2024	As per PRANA, the World Bank is developing a white paper for MoEF&CC on strengthening air pollution measurement (PRANA, 2022g).
8	Augment the number of monitoring stations for $PM_{2.5}$ from the existing 167 across 80 cities to all stations under NAMP	Centre	City/State	CPCB, SPCBs	2024	Only 193 stations with $PM_{2.5}$ monitoring were added to the NAMP network between FY 2019-22 (PQ-MOEF&CC, 2022a). 523 existing stations are to be upgraded with $PM_{2.5}$ monitoring during the next two years and all 617 new stations to be added should also be equipped with $PM_{2.5}$ monitoring.

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
9	Set-up 10 city Super Network to generate highly-quality controlled data and represent national air quality dynamics.	Centre	City/State	CPCB, SPCBs, MoEF&CC	2021	Information regarding a national plan for Super City Network is not available in the public domain. However, efforts to conduct real-time source apportionment in Delhi was supported by CPCB through Environment Protection Charges Fund and Delhi Government is being undertaken by IIT Kanpur which aims to establish a super site in Delhi to monitor real-time air quality and make forecasts. (PAAC-EPC, 2018), (DDCD, 2022).
10	The plan for 10 city Super Networks to be formulated.	Centre	Centre	CPCB, MoEF&CC	2019	No Information
11	Super sites as representative sites in cities and rural areas	Centre	Centre	CPCB, MoEF&CC	2019	No Information

Table 3: Key indicators and their progress for Quantification of Emissions and Impact Assessment Actions under National Clean Air Programme

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
1	Unified guidelines for source apportionment study will be formulated and updated.	Centre	Centre	CPCB, MoEF&CC	2019	Unified guidelines for source apportionment study have been updated by CPCB (PRANA, 2018).
2	Source apportionment studies to be extended to all 102 non- attainment cities.	Centre	Cities/State	MoEF&CC, CPCB	2020	As per PRANA, Source Apportionment (SA) studies have been completed in 37 out of 131 cities and are under process in 54

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
						NACs. 31% of the 131 NACs are yet to initiate city-level SA studies (PRANA, 2022c).
3	A comprehensive national emissions inventory, which is still lacking in the country will be formalized under the NCAP.	Centre	Centre	MoEF&CC, CPCB	2020	While city-level emission inventories have been completed by 37 out of 131 cities and national emission inventory is being updated by MoEF&CC in collaboration with TERI, a centralised system for reporting emissions across sectors is missing in India's air quality management policy(PRANA, 2021). The government had also stipulated the establishment of a robust emission inventory and tracking system and the development of an IT-based emission inventory system as criteria for performance assessment of million-plus Urban Agglomerations funded under recommendations of the 15th Finance Commission (CPCB, 2022c). However adequate systems could not be traced back to the urban local body websites.
4	Guidelines with respect to the periodicity of reviews of ambient air quality and emission standards to be formulated.	Centre	Centre	CPCB, MoEF&CC	2020	Revision of NAAQS has been awarded by CPCB to a joint team led by IIT Kanpur in December 2021. However, no such guidelines are available in the public domain till date (PRANA, 2022c).
5	Study on the national environmental health profile to be completed in time.	Centre	Centre	MoEF&CC	2019	As per MoEF&CC, National Environmental Health Profile shall be carried out in 20 cities by Project Management Unit at AIIMS, New Delhi. The project has been extended till March 2024 (MOEF&CC, 2022b).

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
6	Response study and cohort study program to be undertaken.	Centre	Centre	MoH&FW	2019	No information available
7	Ministry of Health to actively take up environmental health for ensuring a regular health profile or database for assisting decision making.	Centre	Centre	MoH&FW	2019	ICMR in collaboration with the Public Health Foundation of India (PHFI) & Institute of Health Metrics and Evaluation (IHME) conducted a study titled “The impact of air pollution on deaths, disease burden and life expectancy across the states of India''. As per this study in 2019, 1.7 million Deaths (18% of the total deaths) and 11.5% of the total DALYs (Disability-Adjusted Life Year) in India were attributable to air pollution Pandey et al., 2021).
8	Framework for a monthly analysis of data wrt health to be created. The data from mapping of the industry; tabulation of a daily AQI, $PM_{2.5}$ and PM_{10} measurements (24 hours average); meteorological parameters; deaths due to heart attack, strokes, respiratory arrest following the existing respiratory ailments, trends in lung cancer if available wrt all cities to be fed into a central computer and to be analysed every month by people trained in environmental health for correct interpretation.	Centre	Centre	MoH&FW	2024	Framework does not exist. However, daily Air Quality Index bulletins are being published for more than 180 cities and towns (CPCB, 2023).

S.No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
9	Awareness and orientation workshops shall focus on a target audience and the media is to be used for a wide dissemination of information. However, the precise information to be shared has to be carefully worked out by a team of experts in air pollution and environmental health.	Centre	Centre	MoH&FW, MoEF&CC, CPCB	2024	MoHFW has launched the National Program on Climate Change and Human Health (NCDC, 2022) at National Centre for Disease Control (NCDC) to create awareness, capacity building, health sector preparedness and response and partnerships related activities on the climate-sensitive health issues in the country since 2019. Now the Programme has expanded in all the State/UTs and activities are conducted in the form of training on Climate Sensitive Diseases, Surveillance on Acute Respiratory Illnesses and Heat-related Illnesses, generation & dissemination of IEC on Air Pollution & Heat and its health impacts on health.
10	Studies on health and economic impact of air pollution to be supported.	Centre	Centre	MoH&FW, MoEF&CC, CPCB	2024	ICMR funded a study titled “Health and economic impact of air pollution in the states of India: the Global Burden of Disease Study 2019”. The study estimated that 17.8% of total deaths in India in 2019 were attributed to air pollution which resulted in US$ 28.8 billion and US$ 8.0 billion loss due to deaths and morbidity respectively. The total loss of 36.8 billion US$ was equivalent to 1.36% of India’s gross GDP (Pandey et al., 2021)
11	Media is to be used for wide dissemination of information and the precise information to be shared has to be carefully worked out by a team of experts in air pollution and environmental health.	Centre	Centre	MoH&FW	2024	Health advisory on Air Pollution has been published under the NPCCHH in September 2022. Daily AQI values are being disseminated through CPCB, and SPCB websites as well as through the social media platforms of NPCCHH (MOHFW, 2022).

Financial Support for Implementation of NCAP

Since the notification of the National Clean Air Programme (till December 2022), a total of Rs 652.61 crores have been released as critical gap funding, out of which only Rs 301.69 crores were utilised, showing less than 50% utilisation. Apart from funds released under NCAP, a total of Rs 6,435 crores were also allocated under XVFC for the financial year 20-21 and 21-22. However, only Rs 1,629.82 crores (~25%) were utilised till December 2022 (CPCB, 2022c). City-wise details are provided in Appendix.

Mitigation Actions

Mitigation measures under NCAP outline actions to be taken up by different stakeholders for seven emission sectors. Air quality management at various geographical levels is also planned under this category. Although sectoral achievements have been reported by the government, it has not translated into real-time results in air quality improvement in all earmarked areas. Further, the lack of city and state-wise quantification of actual physical progress makes it difficult to assess the overall success of the program.

In order to expedite sector-specific planning and management of emissions, the MoEF&CC has identified seven other partner ministries for the formulation of sectoral plans. While all the seven identified ministries have put forward their actions for air quality improvement, city-specific targets have been mentioned by only the Union Ministry of Road Transport and Highways and the Ministry of Heavy Industries. All stakeholders need to formulate policies and legislations seeking effective implementation of air quality improvement actions in order to actualize the set targets as per NCAP. However, sectoral targets in line with air quality goals are feasible only through tracking of emissions. An Emission Database accounting for all sectors is the need of the hour for measuring and developing new strategies to combat air pollution. The present study lists the interventions reported by the government at the national or state level till December 2022. Non-Attainment city-wise implementation status of any action if available has been highlighted in the following table.

Table 4: Key indicators and their progress for Sectoral Interventions under National Clean Air Programme

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
1	Dust Management (Road Dust And C&D)	Introducing mechanical sweepers on the basis of feasibility study in cities;	State	State	MoHUA, Municipal Corporation	Ongoing	As per MoHUA 32 NACs of 5 states have approved a plan for procurement of 200 mechanical road sweepers (PRANA, 2022c).
2	Indoor Air Pollution Management	Building specific Guidelines and Protocols on monitoring and management of indoor air pollution. Guidelines and provisions for building designs that define proper ventilation, clean cooking and living area to maintain healthy air quality inside the house to be integrated with Pradhan Mantri Awas Yojana (PMAY)	Centre	Centre	MoEF&CC, CPCB, MoH	2019	In compliance with the Hon'ble NGT order in the matter of OA No. 206 of 2022, appropriate standards for indoor air quality are under preparation by a joint committee of members from Central Pollution Control Board, Ministry of Environment, Forests and Climate Change, Ministry of Health and Family Welfare and Ministry of Housing and Urban Affairs and Expert members from BIS, CSIR, ICMR, IPCA and IIT Delhi constituted during 2022 (NGT, 2022). .
3		Extend PMUY in non-attainment cities/towns and associated village areas.			MoEF&CC, CPCB	2020	Rs. 4,965 crores has been allocated under Direct Benefit Transfer for LPG (DBTL) and Pradhan Mantri Ujjwala Yojana (PMUY) subsidy (PQ-MOP&NG, 2022a).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
	Power Sector Emissions	Stringent compliance by all TPPs with respect to the emission norms	State	State	MoP, MoEF&CC	2022	Government has issued revised notification in 2022 which allows power plants under Categories A, B, and C to comply with the new norms by December 2024, 2025, and 2026 respectively (MOEF&CC-Notification, 2022).
4		CGD network distribution	State	City/State	MoPNG	2019	Expansion of the CGD network to cover 98% population and 88% of geographical areas is targeted by the government. As on June 30, 2022, CGD Infrastructure is operational in 93 NACs (PRANA, 2022c), (PQ-MOP&NG, 2022b).
5		Phasing out older coal-based power plants and converting specific coal-based power plants to natural gas	State	City/State	MoP, MoPNG	2024	About 20 coal-based power plants units (1725 MW) within 7 non-attainment cities/ districts have been retired since NCAP launch. However, 22 old units with 43 MW capacity (≥40 years as on 31.12.2025) located in NCAP regions are yet to be phased out (CEA, 2022).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
6		Emphasis on improved power reliability in urban areas to eliminate the operation of DG sets.	State	City/State	MoP, D/o Energy, DISCOMs	2024	The Ministry of Power notified Electricity (Rights of Consumers) Amendment Rules, 2022 to ensure uninterrupted power supply by DISCOMs and shift to renewable energy with battery storage (MOP, 2022a).
7		Expansion of renewable (RE) power initiatives prioritising the use of existing framework of NAPCC in non-attainment cities	Centre	City/State	MoP, MNRE, MoEF&CC	2024	As on 30th November 2022, total renewable energy installed in the country is 166.36 GW which includes 61.97 GW Solar Power, 41.89 GW Wind Power, 10.73 GW Bio-Power, 4.92 GW Small Hydro Power and 46.85 GW Large Hydro Power (PQ-MNRE, 2022). MoP has specified upto 43.33% RPO trajectory till 2029-30 (MOP, 2022b). MNRE and MoP have been identified as partner ministries by MoEF&CC, however, an action plan for RE expansion under NCAP is not available.
8	Industrial Emission	Introduction of gaseous fuels in industries including SMEs.	State	State	D/o Heavy Industry, SPCBs	2022	As per MoPNG, 93 NACs have 6765 Industrial and 25,918 Commercial PNG Connections (PRANA, 2022c).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
9		Enforcement of new and stringent $SO_2/NO_x/ PM_{2.5}$ standards for industries using solid fuels	State	State	SPCB,CPCB	Immediately	Only 6 of the 17 highly polluting industries emission standards were amended in the last six years (Ghildiyal and Dahiya, 2022).
10		Full enforcement of zig-zag brick technology in brick kilns	State	State	SPCBs, CPCB	immediately	MoEF&CC notified that all new brick kilns shall be allowed only with zig-zag technology or vertical shaft or use of Piped Natural Gas as fuel in brick making and shall comply with the stack emission limit of 250 mg/Nm^3 for Particulate Matter. Existing kilns shall be converted to zig-zag technology or vertical shaft or use Piped Natural Gas as fuel by February 22, 2023, in case of kilns located within 10 kms radius of non-attainment cities and by February 22, 2024, for other areas. Implementation status is not available (MOP, 2022b).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
11		For DG Sets already operational, ensure usage of either of the two options: (i) Use of retrofitted emission control equipment having a minimum specified PM capturing efficiency of at least 70%, type approved by one of the 5 CPCB recognized labs. (ii)Shifting to gas-based generators by employing new gas-based generators or retrofitting existing DG sets for partial gas-usage.	State	City/State	SPCB, CPCB	2022	MoEF&CC notified emission limits for new engines up to 800 kW used for Genset in 2022 which shall be effective from 1st July 2023 (MOEF&CC, 2022c).
12	Transport Sector Emission	Stringent implementation of BS VI norms all over India by April 2020.	State	City/State	MoRTH, D/o Transport, SPCB	2020	Nationwide introduction of BS-VI vehicles and fuel was adopted from 2020.

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
13		Stringent implementation of National Biofuel Policy with respect to ethanol and biodiesel blending target of 20% and 5%, respectively by 2030.	Centre	State	MoP, MNRE, MoA	2030	Quantity of ethanol received by PSU OMCs has increased to 385.92 Crore Litres in 2021-22 (till Nov 30) from 173.03 Crore Litres in 2019-20. For the Ethanol Supply Year (ESY) 2021-22, Oil Marketing Companies (OMCs) achieved 10.16% blending as on 10th July, 2022 and the target under the National Biofuel Policy of 20% blending of ethanol in petrol has been advanced to ESY 2025-26 from 2030 (PQ-MOP&NG, 2022c).
14		City Action plans to review the extension of Mass Rapid Transit (MRT) in cities/towns.	Centre	City/State	MoRTH, D/o Transport, CPCB	2024	Metro rail facility is either operational or under construction in 21 cities NACS as on July 2022. MoHUA has informed that as on December 2022, 810 km of the metro network is operational in 20 cities with a daily ridership of 85 lakh passengers and 980 km of the metro network is under construction in different Cities (The-Hindu, 2022).
15		Scaling up of R&D on use of Hydrogen as transport fuel	Centre	City/State	MoPNG & MNRE	2022	National Green Hydrogen Mission has proposed the development of 5MMT green hydrogen production capacity per annum with an associated renewable energy capacity addition of about 125 GW in the country (PIB, 2023).
16		Formulation of National, State and City specific action plan for e-mobility	Centre	City/ State	MoP, DHI, NITI Aayog, MoEF&CC	2021	Under NEMMP 2020, MoHI formulated a Scheme namely Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
							14 States and UTs have prepared State EV policy as per BEE (BEE, 2023).
17		Rapid augmentation of charging infrastructure in the country focusing on 102 cities	Centre	City/ State	MoP, DHI	2024	In 2022, revised consolidated Guidelines & Standards for charging Infrastructure for Electric Vehicles (EV) were launched. As per the action plan under NCAP of MoHI, 2877 charging stations have been sanctioned under FAME II to 68 cities including 36 NACS.
18		Government-run buses for public transport, private buses and 3-wheelers to be converted to EV	Centre	City/ State	MoP, DHI	2024	No information on the conversion of internal combustion engine buses to electric buses is available. However, as per the action plan under NCAP of MoHI, 6315 buses have been sanctioned under FAME II to 74 cities and out of these 42 are NACs.
19	Agricultural Emission	Evaluate the status of implementation of the MoA funded scheme in the states and impact on reduction of air pollution in Delhi and NCR.	Centre	States	MoEF&CC, CPCB	2024	Central Sector Scheme, 'Promotion of Agricultural Mechanization for in-situ management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi' was announced in 2018 under which Rs. 3,318.17 crores has been released till 2022-23 for Custom Hiring Centres and Crop Residue Management Machines (PIB, 2022b). A fungi-based bio-decomposer was developed and piloted by the Indian Council of Agricultural Research for the rapid decomposition of paddy straw.

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
20		Evaluate the socio-economic feasibility for implementation of ex-situ options like production of Prali-Char, biochar, pellets, briquettes, bioCNG, bioethanol etc. as ex-situ solutions for management of crop residue burning especially with NPB in place.	Centre	State	MoA, MoEF&CC, CPCB	2020	As on October 31, 2022, 38 CBG/biogas plants with installed capacity of around 225 MT per annum have been commissioned under SATAT. However, socio-economic feasibility study reports are not available (PIB, 2022c).
21		Coordination with ISRO for regular availability of Remote Sensing Monitoring data for crop burning by the farmers.	Centre	Centre	MoEF&CC, CPCB	2019	The Consortium for Research on Agroecosystem Monitoring and Modeling from Space (CREAMS), an initiative of the Indian Agricultural Research Institute funded under the NICRA project provides crop residue burning events (CREAMS, 2022).
22	Waste Management	Formulate plan for use of Smart Cities framework to launch NCAP in the 43 smart cities falling in the list of 102 non-attainment cities.	Centre	City/State	MoHUA, MoEF&CC	2019	As per the last Steering Committee minutes, 50 NACs have established the Integrated Command Control Centers (ICCC), out of which 17 ICCCs are connected with ambient air quality monitors (PRANA, 2022c).
23		Construction of decentralized composting plant, bio methanation plant and C&D waste plants.	Centre	City/State	MoHUA, Municipal Corporation	2020	51 cities approved remediation of 757 lakh metric tonnes of legacy waste. Only 19 NACS of 4 States approved the setting up of 1300 TPD C&D waste processing facilities as of June 2022 (PRANA, 2022c).

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
24		Swachh Bharat Mission and National Mission on Sustainable Habitat to be used as a platform to push the objectives under this sector.	Centre	City/State	MoHUA, MoEF&CC	Immediately	Under Swacch Bharat Mission 5 NACs received 5 Star Rating for Garbage Free City, 25 NACS received 3 Star Rating for Garbage Free City and 10 cities received 1 Star Rating for Garbage Free City (PRANA, 2022c).

Table 5: Key indicators and their progress for Air Quality Management Planning under National Clean Air Programme

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
1	Regional And Transboundary Plan	A comprehensive regional plan to be formulated incorporating the inputs from the regional source apportionment studies.	Centre/State		MoEF&CC, CPCB	2020	The Commission for Air Quality Management (CAQM) announced the Policy to Curb Air Pollution in the National Capital Region in 2022 (CAQM, 2022). This plan lists actions under three timelines i.e., up to 1 year, 1-3 years and 3-5 years. Further, as per information available from PRANA, the World Bank is assisting India in setting up a regional air quality management model/planning tool for the densely populated Indo-Gangetic-Plain (PRANA, 2022g).
2		Air quality management at the South-Asian	Centre	Centre	MoEF&CC	2019	As a part of transboundary air quality management, India is part of the Malé

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
		regional level by activating the initiatives under 'Male Declaration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia' and SACEP to be explored					Declaration which is being revived in 2022 to restart implementation along with raising the necessary funds and connecting to other initiatives fostering regional cooperation in Asia (SEI, 2022). A comprehensive Transboundary Plan is yet to be formulated under NCAP.
3	State Action Plan For Air Pollution	A preliminary state action plan for air pollution to be formulated for all the 23 states, which harbor 102 non-attainment cities.	Centre	State	SPCB, CPCB, MoEF&CC	2020	So far 10 out of 24 States and Union Territories with NACs have prepared State Actions Plans on air quality management. Public availability of state clean air action plans was missing till December 2022 and the status of implementation of the actions identified was also missing (PRANA, 2022h). .
4		The guidelines for the preparation of the state action plan to be formulated.	Centre	Centre	MoEF&CC, CPCB	2019	MoEF&CC prepared an indicative template for preparation of the State Action Plan (MOEF&CC, 2021).
5	City Specific Air Quality Management Plan For 102 Non-Attainment Cities	Preliminary City-specific action plans to be formulated for 102 non-attainment cities.	Centre	City/State	CPCB, MoEF&CC	2019	At present there are 131 Non-Attainment Cities and city action plans have been prepared for all 131 cities (PRANA, 2022h).
6		City-specific action plans to be taken up for implementation by the	State	City/State	D/o Environment, SPCB	2020	AQM Cell at the ULB level and State Level Steering, Monitoring and City Implementation Committees have been

S.No	Component/Activities		Level for Funding	Level For Implementation	Agencies	Timeline (Year)	Remarks
		State Government and city administration.					constituted to oversee the implementation of city action plans in 131 NACs (PRANA, 2022c).
7		City based clean air action plans are to be dynamic and evolve based on available scientific evidence including the information available through source apportionment studies.	Centre	City/State	CPCB, MoEF&CC	2020	Source Apportionment studies are being carried out in 37 out of 131 NACs. However, updated city action plans are not available for any of those NACs.
		A separate emergency action plan in line with GRAP for Delhi to be formulated for each city for addressing the Severe and Emergency AQI.	Centre	City/State	CPCB, MoEF&CC	2020	GRAP has been prepared by 120 out of 131 cities, however, a copy of GRAP is only available for 48 cities (CPCB, 2022c) and actions on its implementation are very opaque in absence of public information.

Table 6: Three tier mechanisms for Review Of Monitoring, Assessment And Inspection and technology Support *under National Clean Air Programme*

S.No	Component/Activities		Level for Funding	Implementation Level	Agencies	Timeline (Year)	Remarks
1	Stringent Enforcement Through Three Tier Mechanism For Review Of Monitoring, Assessment And Inspection	Web based system to be evolved in association with NIC and other relevant national and international agencies.	Centre	Centre/State	MoEF&CC, CPCB, SPCBs	2020	Online Continuous Emission Monitoring System (OCEMS) has to be installed at the individual industrial units for 17 highly polluting categories of industries. Corrective measures are taken based on real-time data in case of violation of prescribed norms observed by CPCB and SPCB. However, no information on a three-tier web-based system in association with NIC is available (PQ-MOEF&CC, 2022b).
2	Technology Support	Clean technologies with potential for air pollution mitigation will be supported for R&D, pilot-scale demonstration, and field-scale implementation	Centre	Cities/ State	MoEF&CC, CPCB	2019	Control of Dust Emissions using dust suppressant was carried out in Delhi and advisory has been issued to SPCBs and road owning agencies to use dust suppressants in Delhi NCR. A pilot study for the assessment of reducing air pollution in urban areas by using an outdoor cleaning system is being carried out at two locations in Delhi by CPCB and DPCC (PAAC-EPC, 2020).
		The mechanism for such support will be formulated as an action plan.	Centre	Centre	MoEF&CC, CPCB	2024	Project Appraisal Committee for appraising individual project proposals of the centrally sponsored scheme “Control of Pollution” in the MoEF&CC has been constituted. However, information on projects sanctioned by the committee is not available (PIB, 2022d).

Administrative Structure for Air Quality Management

Airshed-based planning through collaborative management of emissions across various administrative structures has been one of the best scientific approaches to improving air quality. A shift towards airshed-based air quality management has been enumerated in the National Clean Air Programme. The World Bank is also supporting India to identify airsheds in the country and working on developing airshed air quality management plans for the Indo-Gangetic-Plains region, which needs to be replicated for other regions.

However, it is also necessary to utilise the existing administrative governance structures for better air quality management. The current structure of air quality planning which is restricted to city administrative boundaries has led to exclusion of many large point sources within the States and Union Territories. Further, there are non-attainment areas which fall under the same Sub Division and hence implementing and reporting actions to resolve air quality issues in such areas may lead to duplicity. For example, the list of 132 non-attainment cities has been reduced to 131 cities due to the merging of Asansol and Raniganj of West Bengal. However, similar issues in cities like Hyderabad UA which also have Patancheru as a part of the same Urban Agglomeration have not been addressed. The disbursal of financial support under the 15th Finance Commission is based on Urban Agglomerations with high populations, whereas the release of funds under NCAP is for non-attainment cities exceeding ambient air quality standards. Hence, integration of the census definitions to identify non-attainment areas needs to be developed. This will establish clear responsibilities of nodal implementation agencies at the State, district and urban local body levels.

The current structure also utilises urban local bodies as the last point of representation by state governments. However non-attainment cities such as Byrnihat (PM_{10} levels of 181µg/m^3in 2021-22), a village in Ribhoi district at the Assam and Meghalaya border, do not

come under the jurisdiction of an Urban Local Body and must have representation from Umling Community & Rural Development Block.

In addition to the above-stated issues, it is also to be noted that important databases which will be used for emission inventory build-up are compiled at district levels rather than city level, i.e., petroleum product consumption and with most industrial fossil fuel consumption taking place beyond municipal boundaries of the cities. It is very critical to look at the recalibration of administrative structures to make them comprehensive at local units as well as to integrate regional plans across states for better air pollution regulation. Further datasets such as the Census which influence other datasets and policy making also need to be updated for defining the changes in transitional areas which increase with increasing economic development (ORF, 2020).

Air Quality (PM_{10}) in Non-Attainment Cities under NCAP

Air Quality Improvement Targets under NCAP

NCAP envisaged reducing PM-$_{10}$ and $PM_{2.5}$ concentrations by 20-30% by 2024 as compared to levels in 2017. However, in 2022, city-wise targets for reduction in PM_{10} concentrations from 2021-22 to 2025-26 have been defined by the Government for disbursal of funds under NCAP and the 15th Finance Commission (MOF, 2021), (MOEF&CC (CP), 2022).

A population-based target of a **20-45% reduction in PM_{10} levels** has been set for 2025-26 for 82 non-attainment cities compared to revised baseline levels of 2019-20. Similarly, a 15% year-on-year reduction of annual average PM_{10} concentrations has been set as one of the performance criteria for the 100% release of funds to 42 Urban Agglomerations under the 15th Finance Commission grants. The government notified that the financial year (April to March) will be adopted as the air quality management calendar (PRANA-Minutes, 2021).

The MoEF&CC also published **Swachh Vayu Sarvekshan** or "Guidelines for Ranking of Cities under NCAP for FY 2022-23 to 2025-26" in 2022 (SVS-MOEF&CC, 2022). These rankings are based on measures to abate emissions, public awareness activities and improvement in PM--$_{10}$ concentrations. A weightage of 95% has been attributed to emission abatement measures and a weightage of 2.5% has been attributed to both public awareness activities and improvement in PM--$_{10}$ concentrations. Three cities shall be awarded under three categories based on population above 10 lakhs, 3-10 lakhs and less than 3 lakhs.

Air Quality (PM-$_{10}$) in Non-Attainment Cities

As per the annual average PM_{10} -data reported by CPCB, 34 out of 82 cities funded under NCAP achieved the performance targets during 2021-22. Similarly, only 4 out of 42 Urban Agglomerations achieved a 15% reduction in annual average PM_{10} during 2021-22 as compared to the levels reported during 2020-21, leaving most cities away from their concentration reduction targets for FY 2021-22 as depicted in figure 4-6.

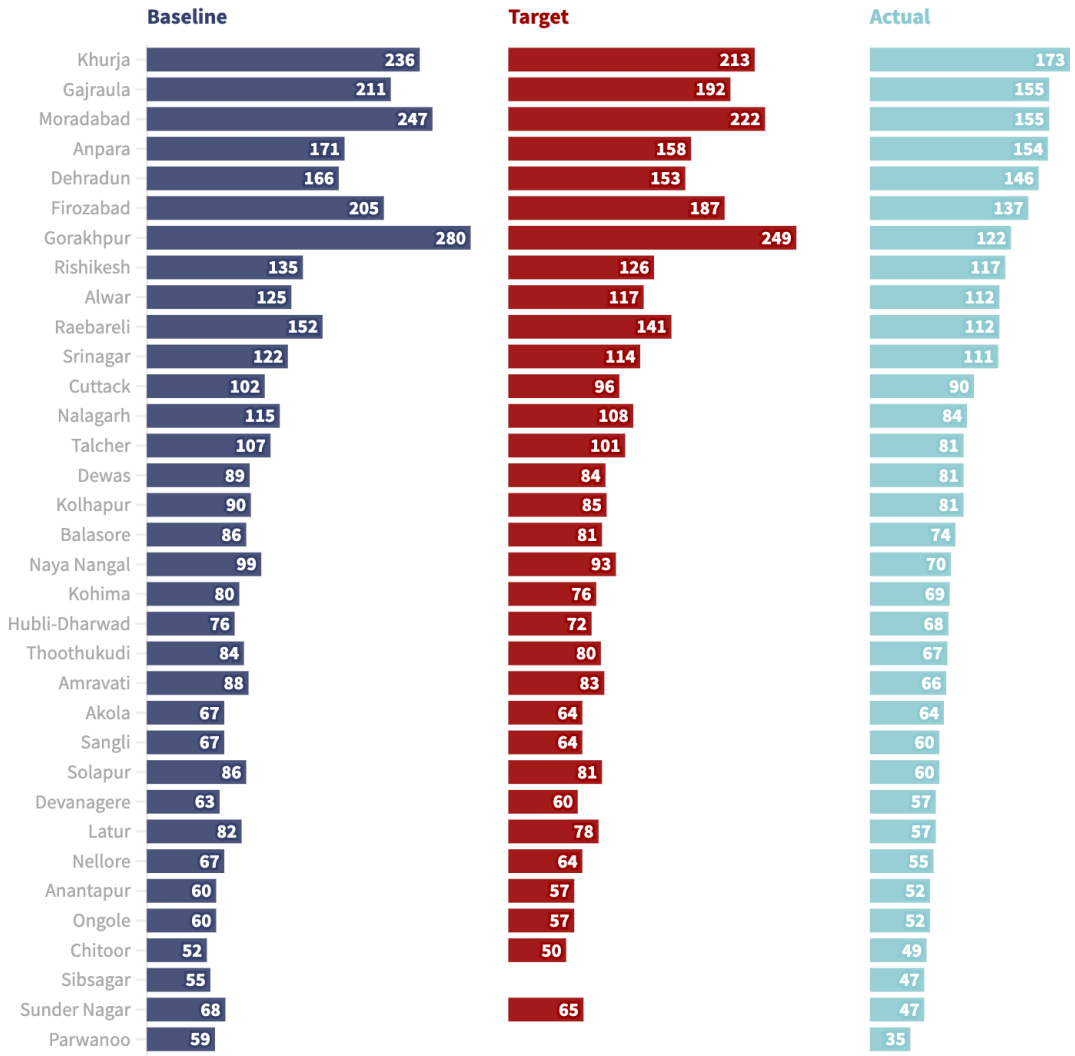


Figure 4: Annual average PM_{10} (µg/m3) of 34 Cities which Achieved Performance Targets under NCAP

'National Clean Air City' Awards were given to 9 best-performing cities under Swachh Vayu Sarvekshan 2022 (PIB, 2022e). In the first category of cities, Lucknow was awarded the first prize of Rs. 1.5 crore for reducing average ambient PM_{10} concentration by 31% from 2019-20 to 2021-22. In the second category, Moradabad bagged the first prize with a cash reward of Rs. 75 lakhs by reducing PM_{10} concentration by 36%. And in the third category, Dewas bagged the first prize with a cash reward of Rs. 37.5 lakhs. The CPCB data also revealed that 15 out of the 131 non-attainment cities were within the annual NAAQS standard of 60 µg/m^3.

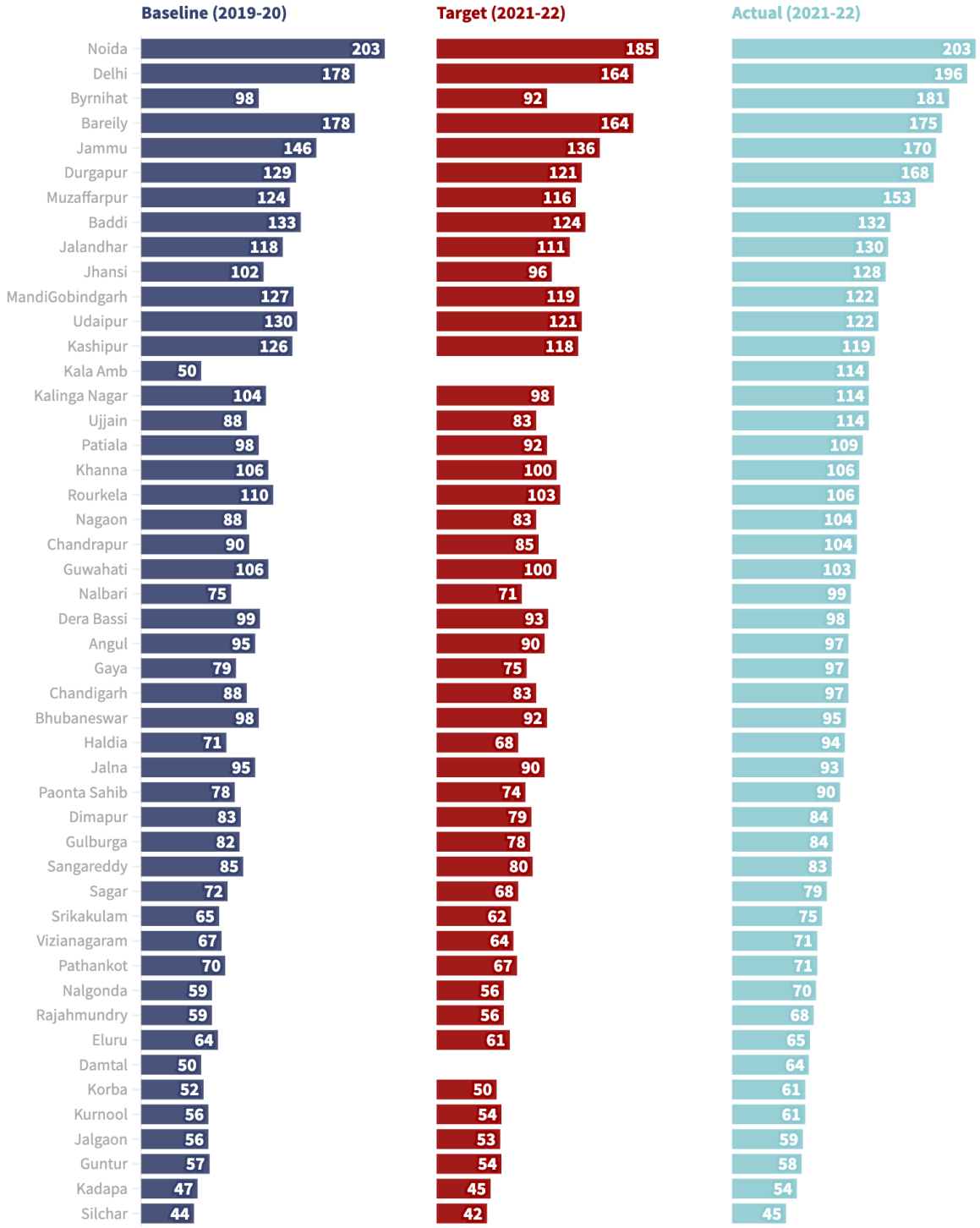


Figure 5: Annual average PM_{10} ($\mu g/m^3$) of 48 Cities which could not achieve Performance Targets under NCAP

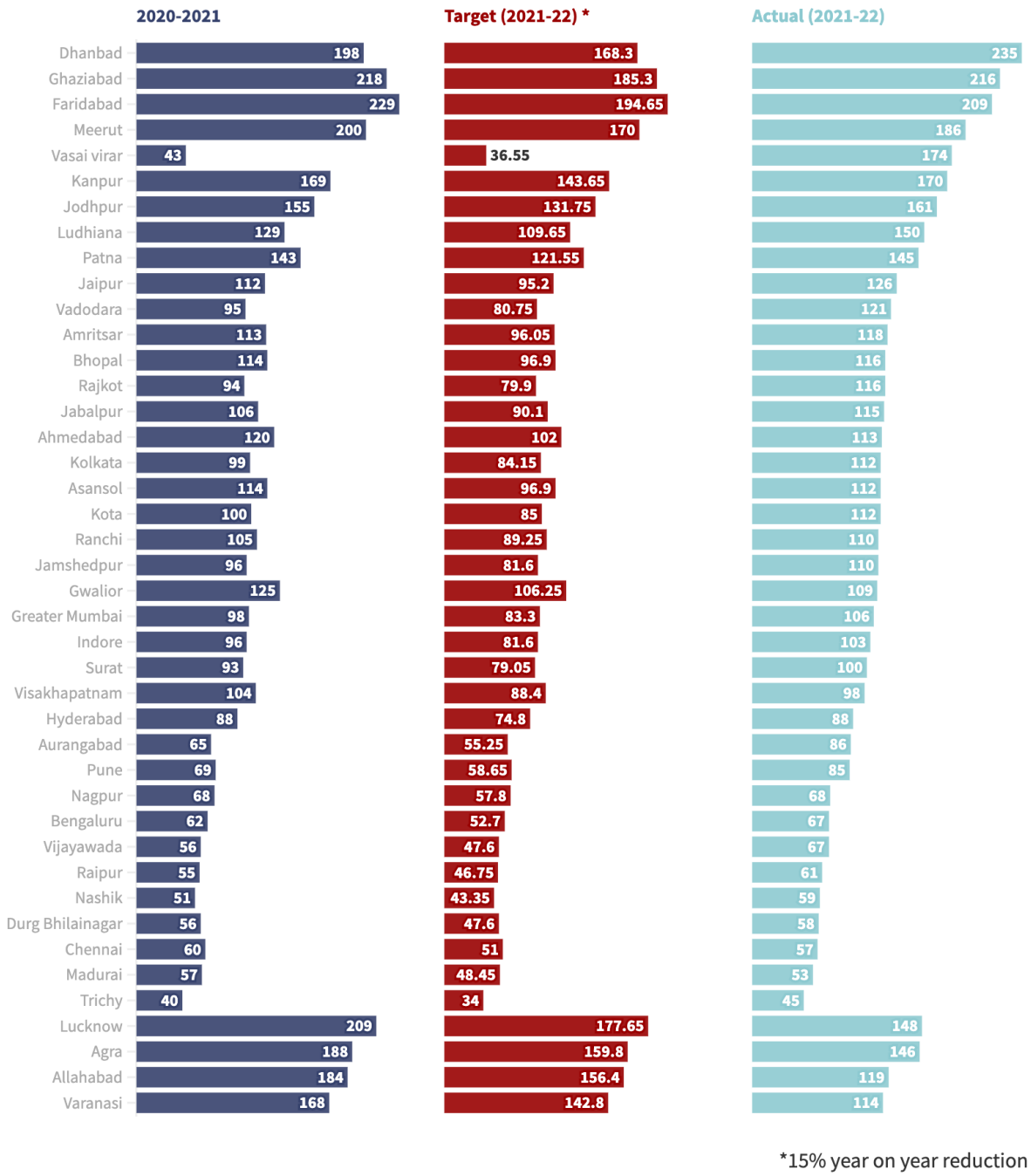


Figure 6: Annual average PM_{10} ($\mu g/m^3$) of 42 Urban Agglomerations against their Performance Targets

* These 42 Urban Agglomerations also include Patancheru in Hyderabad UA, Thane, Ulhasnagar, Navi Mumbai, Badlapur in Greater Mumbai UA, Barrackpore and Howrah in Kolkata UA.

Conclusion and Way Forward

This review highlights the existing lacunae in the current structure of NCAP such as:

- Lack of comprehensive mechanism to govern air quality management at the city, district, state and regional level/airshed level.
- Lack of any substantive emission load reduction-based approach as no action plan speaks of a cap on the consumption of fossil fuels and its reduced usage, especially in the power and transport sector.
- Lack of transparent data availability on air quality levels across the country in the absence of an adequate air quality monitoring infrastructure, lack of integration of already existing infrastructure i.e., ambient air quality monitoring stations installed by industries in compliance of Environmental Clearance (EC) conditions and usage of satellite data for remote assessment of pollution levels in a systematic manner.
- Lack of integration of air quality management plans with forecasting mechanisms, Continuous Emission Monitoring System (CEMS) data and Decision Support System (DSS) by administrative agencies.
- Lack of transparency in sharing action plan status reports by cities, states and ministries even at the national level through NCAP portal PRANA shows a lack of accountability on the part of concerned authorities and agencies.

Based on the current review we recommend that:

- A future roadmap for NCAP will need to expedite the identification of airsheds in the country to formulate and implement airshed-based air quality management. The national ambient air quality standards revision committee should also discuss the notification of varied ambient air quality standards or guidelines based on the background air quality levels for different airsheds.

- A National Emissions Database quantifying the emission reduction targets at district/state and national levels, based on emission load should be set up to propel the achievement of National Ambient Air Quality Standards.
- In order to make a significant impact in combating air pollution, newer policy measures should include integrating the census definitions and existing administrative set-up for identifying non-attainment cities and implementing agencies for air quality management. District and state air quality plans may be prepared for comprehensive air quality management and updated with new information gathered through the studies and data compilation with efficient utilisation of established systems and tools.
- Data transparency in terms of integration of progress across sectors into the NCAP portal is crucial for public outreach, accountability, and information. Public access to national air quality data generated through satellite, Industrial air quality monitoring, CEMS, low-cost sensors and manual monitors should be ensured.
- Failure to abide by timelines for conducting various research studies (i.e., emission Inventory, source-apportionment, carrying capacity studies and health baselines etc.) should be penalised. These research studies are only helpful in setting the baseline if conducted within proper timelines.

Abatement of air pollution is and will remain a major focus area of every emerging economy striving towards achieving the balance between progress and the basic right to breathe clean air. India is expected to become a developed country by 2047, which can only be achieved if the citizens live in a healthy environment and contribute to the economic development of the country by reducing health burden costs and being an efficient workforce. If the National Clean Air Programme (NCAP) is implemented systematically by bringing in appropriate changes in it ensuring accountability of polluting sectors in a mission mode, we will soon start seeing peaks for fossil fuel consumption in the power and transportation sectors followed by a decline which will lead to a reduction in emission loads and cleaner air.

References

BEE. (2023). E-Mobility. Bureau of Energy Efficiency. https://beeindia.gov.in/content/e-mobility [Accessed 8 January, 2023]

CAQM. (2022). Policy to Curb Air Pollution in the National Capital Region. https://caqm.nic.in/WriteReadData/LINKS/0031dcb806e-8af7-4b38-a9bc-65b91f2704cd.pdf [Accessed 2 January, 2023]

CCR. (2022a). Central Control Room. Central Control Room for Air Quality Management - Delhi NCR. https://app.cpcbccr.com/ccr/#/dashboard-emergency-stats [Accessed 19 December, 2022]

CCR. (2022b). Central Control Room. Central Control Room for Air Quality Management. https://app.cpcbccr.com/ccr/#/caaqm-dashboard-all/caaqm-landing [Accessed 22 December, 2022]

CEA. (2022). Information from CEA regarding emission norms and retirement of units-RTI. https://drive.google.com/file/d/1Nty7OFuj9-MY-fQbX-dD5OeNH8LkQ8UW/view

Chanchal A, Chauhan C. (2020). Airpocalypse IV: Assessment of Air Pollution in Indian Cities & National Ambient Air Quality Monitoring Programme (NAMP). https://www.greenpeace.org/static/planet4-india-stateless/2020/01/aeef07e3-airpocalypse-iv.pdf. [Accessed 2 January, 2023]

CPCB. (2008). Central Pollution Control Board. Brief Report on Ambient Air Quality Monitoring Conducted by Mobile Van At Different Locations in Delhi. https://cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMvTmV3SXRlbV8xMTVfRWRpdGluZyBSZXBvcnQgZm9yIFBvcnRhYmxlIFN0YXRpb24ucGRm [Accessed 9 December, 2022]

CPCB. (2013). Central Pollution Control Board. Guidelines for the Measurement of Ambient Air Pollutants, 36, 1–83. https://cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMvMjdfMTQ1ODE

xMDQyNl9OZXdJdGVtXzE5Nl9OQUFRTVNfVm9sdW1lLUkucGRm [Accessed 12 December, 2022]

CPCB. (2022a). Central Pollution Control Board. Technology Challenge for Identifying and Promoting Solutions for Mitigating Ambient Air Pollution, 1–11. https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS9fMTYwNjk4MjExMF9tZWRpYXBob3RvMjQ4NC5wZGY= [Accessed 3 December, 2022]

CPCB. (2022b). Central Pollution Control Board. Ambient Air Quality Status of the Country during 2021. https://cpcb.nic.in/displaypdf.php?id=bWFudWFsLW1vbml0b3JpbmcvTG9jYXRpb25fZGF0YV8yMDIxLnBkZg== [Accessed 14 December, 2022]

CPCB. (2022c). Central Pollution Control Board. GRAP and Funds Utilised under NCAP-RTI. https://drive.google.com/file/d/1yJlkKztwtUlvn45KGgQeFKcibL4NsBs3/view?usp=share_link

CPCB. (2023). Central Pollution Control Board. Daily Air Quality Index Bulletin. https://cpcb.nic.in//upload/Downloads/AQI_Bulletin_20230105.pdf [Accessed 9 January, 2023]

CREAMS. (2022). Consortium for Research on Agroecosystem Monitoring and Modeling from Space Laboratory. CREAMS. http://creams.iari.res.in/cms2/ [Accessed 4 December, 2022]

CSIR-NPL. (2021). Annual Report 2020-21. https://www.nplindia.org/wp-content/uploads/2022/09/ar_2020_2021.pdf [Accessed 7 January, 2023]

CSIR-NPL. (2022). India Certification Scheme. https://www.nplindia.org/wp-content/uploads/2022/01/NPLI_CS_booklet_v1.pdf [Accessed 7 January, 2023]

DDCD. (2022). Real-time Source Apportionment study for Delhi. DDCD. https://ddc.delhi.gov.in/our-work/5/real-time-source-apportionment-study#:~:text= [Accessed 4 January, 2023]

DSS. (2022). Decision Support System for Air Quality Management in Delhi. DSS. https://ews.tropmet.res.in/dss/index.php [Accessed 7 January, 2023]

ENVEA. (2022). 15 Mobile Air Quality Monitoring Stations for the State of Maharashtra. ENVEA. https://www.envea.global/15-mobile-air-quality-monitoring-stations-for-the-state-of-maharashtra/ [Accessed 21 December, 2022]

Ghildiyal, S. and Dahiya, S. (2022). Tracing the Hazy Air: Progress Report on National Clean Air Programme. https://energyandcleanair.org/wp/wp-content/uploads/2022/01/NCAP-Report_Jan22_.pdf [Accessed 14 December, 2022]

IFOREST. (2022). Creating Jobs while Managing Air Quality. https://iforest.global/wp-content/uploads/2022/09/Press-Note-_Jobs-for-clean-Air-1.pdf [Accessed 14 December, 2022]

IITM. (2022). Air Quality Early Warning and Decision Support System for Mumbai. IITM. https://ews.tropmet.res.in/mumbai/index.php [Accessed 22 December, 2022]

IQAir. (2022). World's most polluted cities (historical data 2017-2021). https://www.iqair.com/in-en/world-most-polluted-cities [Accessed 8 January, 2023]

ISM-ENVIS. (2019). MOEF&CC Notification 22nd August 2019 - S.O. 3023(E). ISM-ENVIS. http://ismenvis.nic.in/Database/Notification_22nd_August_2019-SO3023E_22396.aspx [Accessed 20 December, 2022]

MOEF&CC-Notification. (2022). Environment (Protection) Second Amendment Rules, 2022. https://moef.gov.in/wp-content/uploads/2022/09/Amendment-Notification-06092022-2-5.pdf [Accessed 18 December, 2022]

MOEF&CC. (2019). National Clean Air Programme. https://moef.gov.in/wp-content/uploads/2019/05/NCAP_Report.pdf [Accessed 9 December, 2022]

MOEF&CC. (2021). Overview of NCAP and XV-FC MPCCF and Convergence of Central Schemes / Programmes for Air Quality Improvement in Identified Cities. https://prana.cpcb.gov.in/assets/pdf/NCAPWorkshop/Day-1/TechnicalSession1/1.Overview_Convergence_Session_1_23Nov21.pdf [Accessed 17 December, 2022]

MOEF&CC. (2022a). Guidelines for Capacity Building and Public Outreach under NMCA/NCAP. https://prana.cpcb.gov.in/assets/pdf/Resources/Final_guidelines_CBPO.pdf [Accessed 20 December, 2022]

MOEF&CC. (2022b). National Environment Health Profile from Environmental Health Cell -RTI. https://drive.google.com/file/d/1mYcx0T4eFalCBwjvFBRegiuDpyagKZHM/view?usp=share_link

MOEF&CC. (2022c). System and Procedure For Retro-fit Emission Control Devices (RECD) Compliance to Diesel Power Generating Set Engines Up to Gross Mechanical Power 800 kW. https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS8zNThfMTY2ODE2NjYzNl9tZWRpYXBob3RvMTkwNTgucGRm [Accessed 9 December, 2022]

MOEF&CC (CP). (2022). Guidelines for Release and Utilisation of Funds under National Clean Air Program. https://prana.cpcb.gov.in/assets/pdf/Resources/OM_and_Funding_Guidelines.pdf [Accessed 12 December, 2022]

MOF. (2021). Operational guidelines for implementation of the recommendations on urban local body grants (Ambient air quality component). https://prana.cpcb.gov.in/assets/pdf/Resources/GL_19.pdf [Accessed 14 December, 2022]

MOHFW. (2022). Health Advisory on Air Pollution. Ministry of Health and Family Welfare Health. https://ncdc.mohfw.gov.in/showfile.php?lid=926 [Accessed 19 December, 2022]

MOP. (2022a). Ministry of Power Notification. Electricity (Rights of Consumers) Rules, 2022. https://drive.google.com/file/d/1OA7AKm3XLYlDEwTE9VhgAHfSUuH6ybuO/view [Accessed 23 December, 2022]

MOP. (2022b). Ministry of Power Notification. In Renewable Purchase Obligation and Energy Storage Obligation Trajectory till 2029-30. https://powermin.gov.in/sites/default/files/Renewable_Purchase_Obligatio

n_and_Energy_Storage_Obligation_Trajectory_till_2029_30.pdf [Accessed 21 December, 2022]

NCAP-Tracker. (2022). Portal for Regulation of Air Pollution in Non-Attainment Cities. NCAP Tracker. https://prana.cpcb.gov.in/#/NCAPTracker [Accessed 21 December, 2022]

NCDC. (2022). National Programme on Climate Change & Human Health. NCDC. https://ncdc.mohfw.gov.in/index1.php?lang=1&level=1&sublinkid=876&lid=660 [Accessed 5 December, 2022]

NGT. (2022). Raja Singh Vs Ministry of Housing and Urban Affairs & ORS. https://drive.google.com/file/d/1RUibrQbywu8SZ3lo1k8uo2CpT6UM1F0Y/view?usp=share_link [Accessed 22 December, 2022]

NKN. (2022). National Knowledge Network. NKN. https://nkn.urbansciences.in/ [Accessed 1 December, 2022]

ORF. (2020). Observer Research Foundation. Why do 'urbanised' villages resist being labelled as urban local bodies? https://www.orfonline.org/expert-speak/why-do-urbanised-villages-resist-being-labelled-urban-local-bodies/ [Accessed 17 December, 2022]

PAAC-EPC. (2018). Minutes of the 13th meeting of PAAC-EPC. https://cpcb.nic.in/displaypdf.php?id=dXBsb2Fkcy9FUEMvTW9NXzEzdGhfMjcuMTIuMjAxOF9QQUFDX0VQQy5wZGY= [Accessed 19 December, 2022]

PAAC-EPC. (2020). Minutes of the 17th meeting of PAAC-EPC. https://cpcb.nic.in/displaypdf.php?id=dXBsb2Fkcy9FUEMvTU9NLTE3LVBBQUMtRVBDLnBkZg== [Accessed 20 December, 2022]

Pandey, A., Brauer, M., Cropper, M. L., Balakrishnan, K., Mathur, P., Dey, S., Turkgulu, B., Kumar, G. A., Khare, M., & Beig, G. (2021). Health and economic impact of air pollution in the states of India: the Global Burden of Disease Study 2019. The Lancet Planetary Health, 5(1), e25–e38. https://doi.org/10.1016/S2542-5196(20)30298-9

PIB. (2022a). Dialogue towards Clean Air for NCR and Adjoining Areas. Press Information Bureau, Government of India.

https://pib.gov.in/PressReleseDetail.aspx?PRID=1803713 [Accessed 16 December, 2022]

PIB. (2022b). Increasing Problem of Stubble Burning. Press Information Bureau, Government of India. https://pib.gov.in/PressReleseDetailm.aspx?PRID=1882241 [Accessed 16 December, 2022]

PIB. (2022c). Targets under SATAT Scheme. Press Information Bureau. https://pib.gov.in/PressReleseDetailm.aspx?PRID=1881749 [Accessed 16 December, 2022]

PIB. (2022d). The Pollution Control Scheme. Press Information Bureau, 2022–2023. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1805791 [Accessed 16 December, 2022]

PIB. (2022e). Total cash prize of over Rs. 5 crores given for the first time to 9 cities under "National Clean Air City awards." Press Information Bureau, Government of India. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1880683 [Accessed 16 December, 2022]

PIB. (2023). Union Minister of Power and NRE, Shri R . K Singh interacts with stakeholders regarding National Green Hydrogen Mission. Press Information Bureau. https://pib.gov.in/PressReleseDetailm.aspx?PRID=1888972 [Accessed 4 January, 2023]

PQ-MNRE. (2022). Parliament of India Lok Sabha. Addition of Renewable Energy Generation Capacity. https://loksabha.nic.in/Questions/QResult15.aspx?qref=45763&lsno=17 [Accessed 4 January, 2023]

PQ-MOEF&CC. (2022a). Ministry of Environment, Forests and Climate Change. Air Quality Monitoring Stations. https://pqars.nic.in/annex/257/AU2130.pdf [Accessed 4 January, 2023]

PQ-MOEF&CC. (2022b). Ministry of Environment, Forests and Climate Change. Highly Polluting Industries across the Country, 8.5.2017, 2003–2005. https://pqars.nic.in/annex/258/AS101.pdf [Accessed 4 January, 2023]

PQ-MOP&NG. (2022a). Ministry of Petroleum and Natural Gas. PQ-MOP&NG, 1413. https://pqars.nic.in/annex/258/AU1413.pdf [Accessed 5 January, 2023]

PQ-MOP&NG. (2022b). Ministry of Petroleum and Natural Gas. Allocation Of CGD Network to All Smart Cities. https://pqars.nic.in/annex/257/AU942.pdf [Accessed 5 January, 2023]

PQ-MOP&NG. (2022c). Ministry of Petroleum and Natural Gas. Ethanol Production. https://pqars.nic.in/annex/258/AU632.pdf [Accessed 5 January, 2023]

PRANA-Minutes. (2021). Portal for Regulation of Air Pollution in Non-Attainment Cities. Minutes of Second Meeting of The Steering Committee of National Clean Air Programme. https://prana.cpcb.gov.in/assets/pdf/Resources/FinalMoMSC212june2020_2.pdf [Accessed 21 December, 2022]

PRANA. (2018). Portal for Regulation of Air Pollution in Non-Attainment Cities. Model Framework for Conducting Source Apportionment Studies. https://prana.cpcb.gov.in/assets/pdf/revised_SA_framework_on_esamiksha.pdf [Accessed 11 December, 2022]

PRANA. (2021). Minutes of Third Meeting of Steering Committee of National Clean Air Programme. PRANA. https://prana.cpcb.gov.in/assets/pdf/Resources/Final_MoM_SC3_28sep2021_3.pdf [Accessed 11 December, 2022]

PRANA. (2022a). Portal for Regulation of Air Pollution in Non-Attainment Cities. Ministries Under National Clean Air Programme. https://prana.cpcb.gov.in/#/partners [Accessed 19 December, 2022]

PRANA. (2022b). Portal for Regulation of Air Pollution in Non-Attainment Cities. Committees under National Clean Air Programme. https://prana.cpcb.gov.in/#/resources [Accessed 19 December, 2022]

PRANA. (2022c). Portal for Regulation of Air Pollution in Non-Attainment Cities. Minutes of 5th Meeting of Steering Committee of National Clean Air Programme (NCAP).

https://prana.cpcb.gov.in/assets/pdf/importantDocuments/Minutes_of_5th.pdf [Accessed 19 December, 2022]

PRANA. (2022d). Portal for Regulation of Air Pollution in Non-Attainment Cities. Sensitization Cum Review Workshop. https://prana.cpcb.gov.in/#/events [Accessed 19 December, 2022]

PRANA. (2022e). Portal for Regulation of Air Pollution in Non-Attainment Cities. 11th Meeting of Implementation Committee under NCAP. https://prana.cpcb.gov.in/assets/pdf/Resources/11th_IC_MoM_05.08.2022.pdf [Accessed 20 December, 2022]

PRANA. (2022f). Portal for Regulation of Air Pollution in Non-Attainment Cities. USAID. https://prana.cpcb.gov.in/#/internationCooperationCleanAir/USAID [Accessed 20 December, 2022]

PRANA. (2022g). Portal for Regulation of Air Pollution in Non-Attainment Cities. World Bank. https://prana.cpcb.gov.in/#/internationCooperationCleanAir/World%20Bank [Accessed 20 December, 2022]

PRANA. (2022h). Portal for Regulation of Air Pollution in Non-Attainment Cities. Minutes of Eleventh Meeting of Implementation Committee For National Clean Air Programme. https://prana.cpcb.gov.in/assets/pdf/Resources/11th_IC_MoM_05.08.2022.pdf [Accessed 21 December, 2022]

SEI. (2022). Reinvigorating the Malé Declaration offers South Asia the opportunity to improve air quality. Stockholm Environment Institute. https://www.sei.org/perspectives/reinvigorating-male-declaration/ [Accessed 14 December, 2022]

Singh, S., Campmier, M. J., Upadhya, A., Vakacherla, S., Mishra, H., Gingrich, J., Kushwaha, M., Pathak, R. K. P., Marshall, J. D., & Dey, S. (2020). Assessing rural vs. urban PM 2.5 disparities in the Indo-Gangetic Plain: A low-cost network approach. AGU Fall Meeting Abstracts, 2020, A177-0002. https://ui.adsabs.harvard.edu/abs/2020AGUFMA177.0002S/abstract

SVS-MOEF&CC. (2022). Guidelines for Ranking of Cities under NCAP for FY 2022-23 to 2025-26. Swachh Vayu Survekshan.

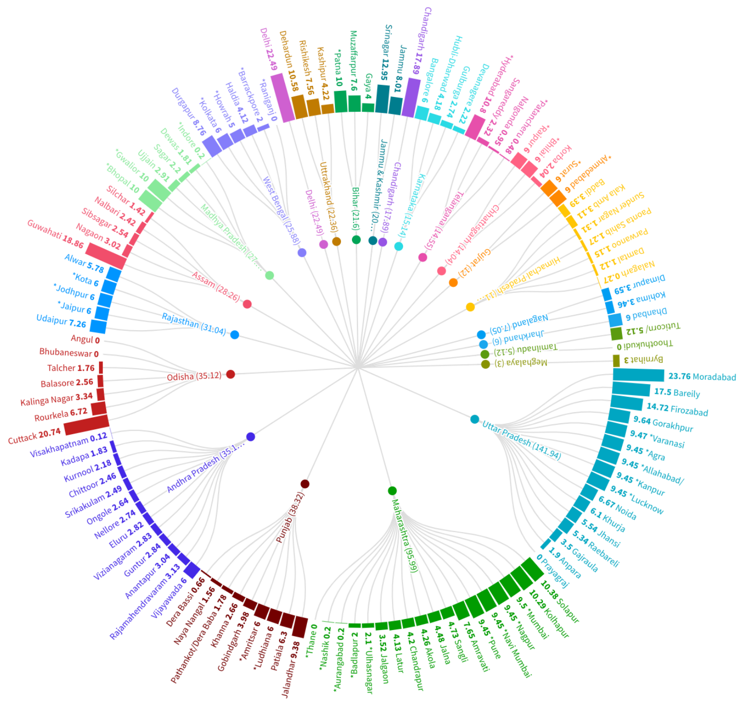
https://prana.cpcb.gov.in/assets/pdf/Resources/Swachh_Vayu_Survekshan_15_aug_2022.pdf [Accessed 4 January, 2023]

The-Hindu. (2022). Centre asks States to ensure balanced availability of public bus and Metro train services across cities. The Hindu. https://www.thehindu.com/news/national/as-networks-expand-ministry-of-urban-affairs-asks-states-to-ensure-balanced-availability-of-buses-and-metro-trains/article66099652.ece [Accessed 14 December, 2022]

TOI. (2022). India has become 5th largest economy in 2022. The Times of India. https://timesofindia.indiatimes.com/business/india-business/india-has-become-5th-largest-economy-in-2022-pm-modi-in-last-mann-ki-baat-of-year/articleshow/96492688.cms [Accessed 4 January, 2023]

Appendix

Allocation (652 Crore Rupees)



Utilised (302 Crore Rupees)

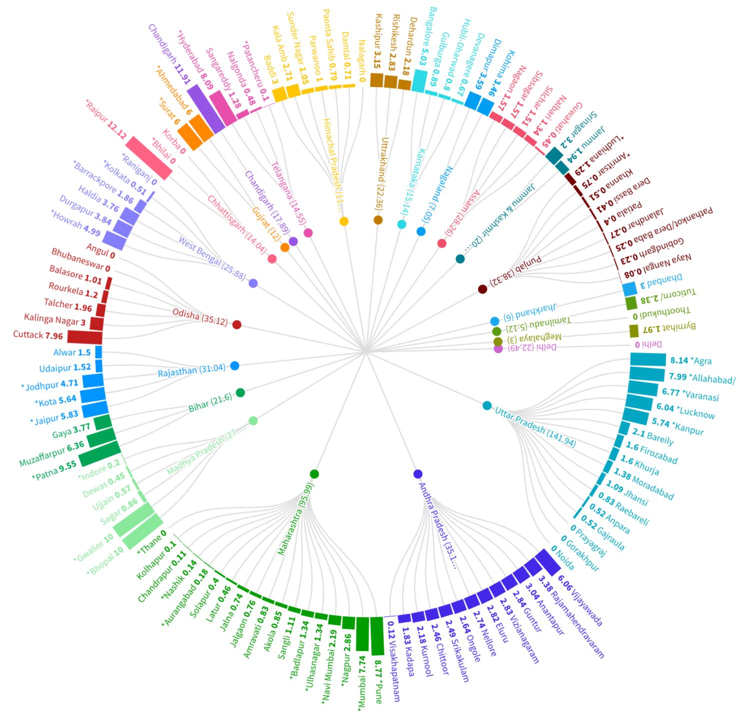


Figure: Status of Funds Released and Utilised under Critical gap fund under National Clean Air Programme - 2019-2022 (Rs. 652.61)

Allocation (6425 Crore Rupees)

Utilised (1629 Crore Rupees)

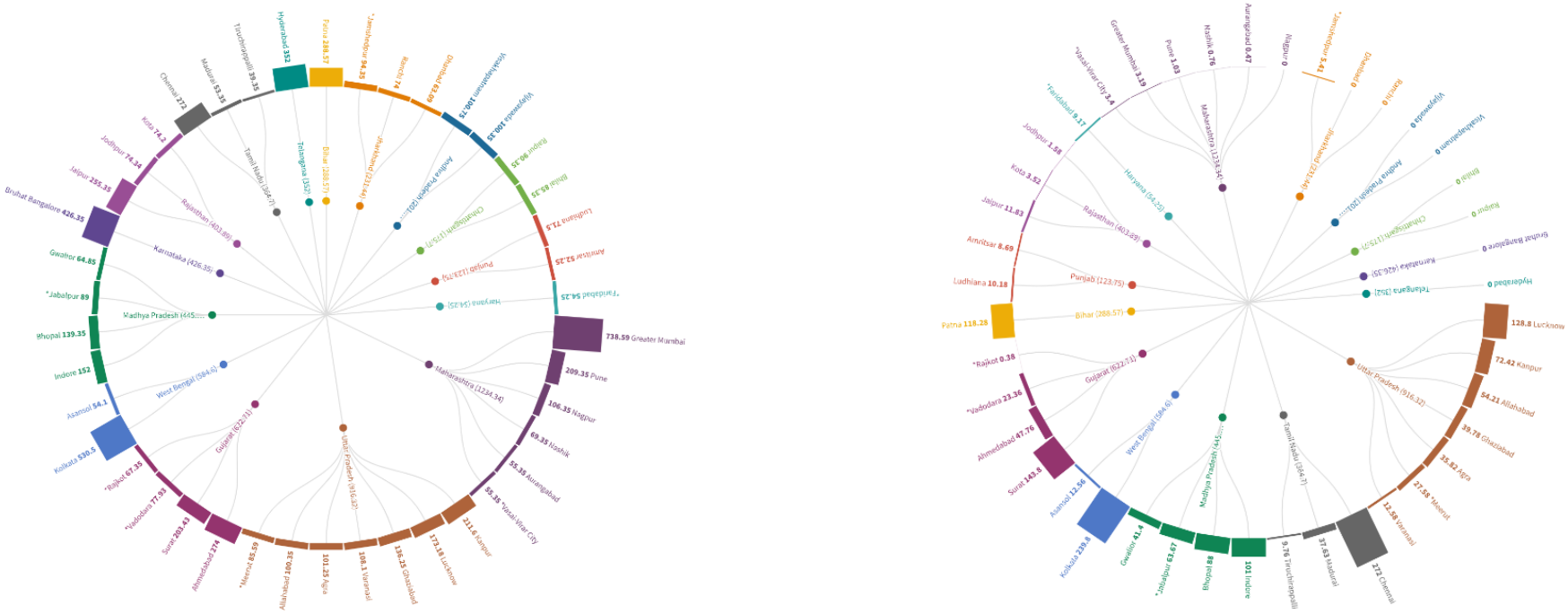


Figure: Status of Funds Released and Utilised by 15th Finance Commission under National Clean Air Programme- 2020-2022 (6425 Crore Rupees) in Crore