PAVANA · POLICY BRIEF

Centre for Air Pollution & Environmental Health · Pahle India Foundation

Realizing NCAP's Health Promise: Indian Evidence and Recommendations for National Clean Air Programme Reform

NITI Aayog has the advisory position at the policy apex. What is needed is an initiative to connect air quality to health outcomes.

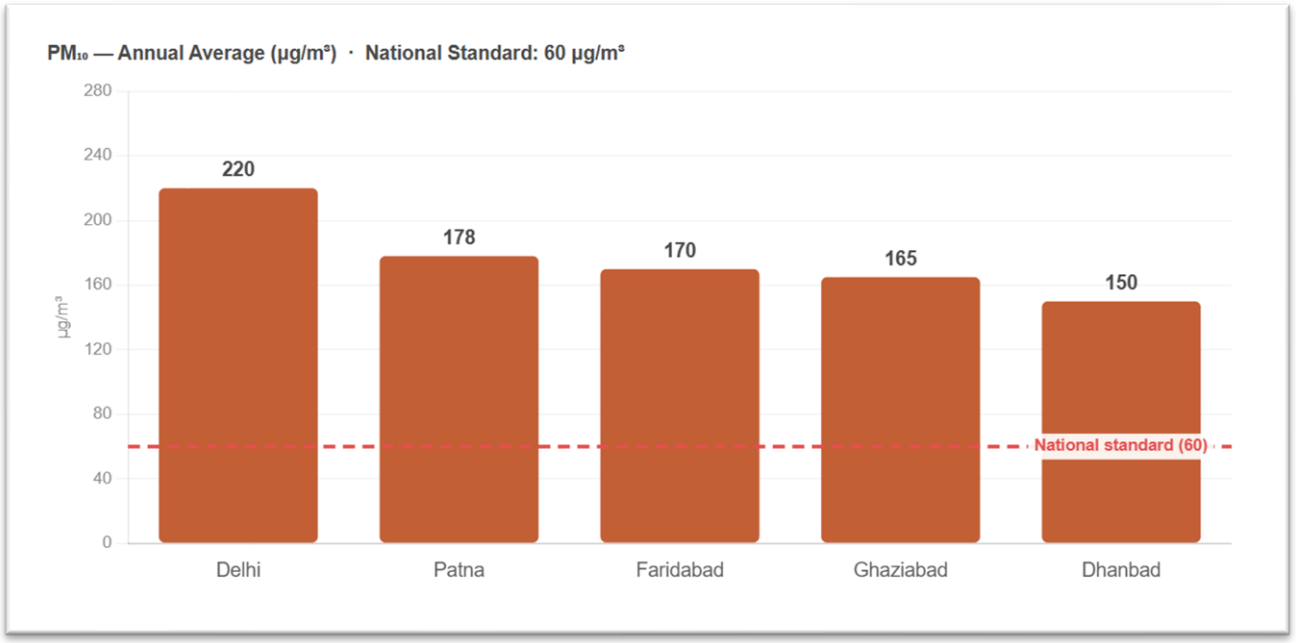
This policy brief responds to a felt and recognized gap in India's clean air policy discourse: the absence of a synthesis of India's own evidence on the health consequences of air pollution. Every study, dataset, and institutional source cited in this brief is India-generated - drawn from Indian cohorts, Indian registries, Indian surveillance systems, and Indian research institutions. India has produced substantial primary evidence on air pollution and health; what has been missing is a formal mandate requiring $PM_{2.5}$ reduction to be tracked against health outcomes.

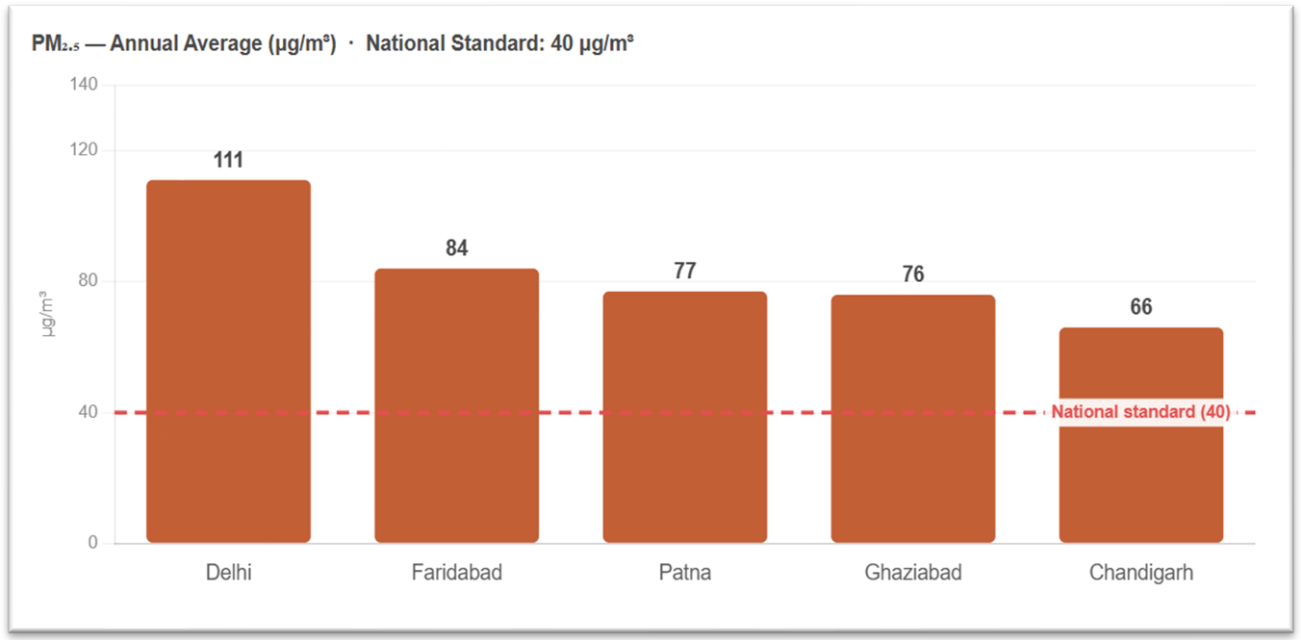
1 India's Clean Air Progress - and the Health Opportunity Ahead

India is home to some of the most polluted cities on earth. Many cities in the Indo-Gangetic Plain including Delhi, Siwan, Greater Noida, Patna, and Lucknow rank among the world's most polluted[1]. Yet the air pollution challenge is not confined to large cities alone. Annual $PM_{2.5}$ concentrations across Indian cities consistently exceed India's own Central Pollution Control Board (CPCB) standard (40 µg/m³)[2]. In 2024, annual average concentrations of PM_{10} and $PM_{2.5}$ exceeded national ambient air quality standards (NAAQS), among cities with continuous CPCB monitoring stations, in 43 and 23 cities respectively[3]. A programme designed to protect Indian lives should also include places where most of those lives, and most of that burden, is actually located. It is against this backdrop that India's own research institutions have spent two decades documenting what this pollution does to Indian bodies and that evidence now demands a policy response.

108 of 130	**51%**
NCAP cities fall short of India's NAAQS PM_{10} standard in FY 2024-25 after six years and ₹13,000+ crore of the programme	of released NCAP funds utilized by 82 MoEFCC-funded cities (₹831 cr of ₹1,616 cr released) -- a utilization challenge alongside the health challenge
MoEFCC, Lok Sabha, December 2025[4]	CSE, An Agenda for Reform, July 2024[5]

Top 5 polluted cities in India by PM_{10} & $PM_{2.5}$ concentration (2024)





Source: Central Pollution Control Board (CPCB), Annual Report 2024-25, MoEFCC, Government of India[3]

Within this broader challenge, NCAP's own performance data tells a partial but important story. In FY 2024-25, 103 of 130 NCAP cities showed improvement in PM_{10} concentrations compared to the 2017-18 baseline, yet only 22 cities actually conform to India's own NAAQS[4]. While the trend is improving, 108 cities still do not meet India's own standard. More critically, NCAP targets remain pegged to PM_{10}, not $PM_{2.5}$, the finer particulate that penetrates deeper into lung tissue and carries stronger dose-response links to cardiovascular mortality. $PM_{2.5}$ penetrates the blood-brain barrier, and has documented impacts on neurological health as well. **A programme benchmarked against the less health-relevant pollutant, and scoped only to cities, is misaligned with the burden it was actually designed to address. The health consequences of this pollution are not confined to the lungs. Evidence generated through Government of India surveillance and research systems consistently demonstrates that air pollution**

affects multiple organ systems and disease categories across the life course.

> The question before NITI Aayog is not whether India has the evidence. Its own institutions have generated it. The question is whether NITI Aayog can use its advisory position at the policy apex to ensure that what India knows about $PM_{2.5}$'s health burden becomes what India formally tracks, reports, and reduces.

2 The Evidence: What Indian Research Has Established

A substantial and growing body of primary research, generated by the very institutions that underpin India's tobacco control policy, non-communicable disease (NCD) burden estimates, and maternal health guidelines, documents the health consequences of air pollution across multiple outcomes and populations. The stakes extend beyond domestic health policy. Meeting Sustainable Development Goals (SDG) is not achievable in India without substantially reducing the health burden of air pollution[6]. Air pollution is not a parallel agenda to NCDs; it is one of its primary drivers.

> The Government of India routinely relies on evidence in public health generated by institutions such as All India Institute of Medical Sciences, Indian Council of Medical Research, Public Health Foundation of India, the Indian Institutes of Technology, and Sri Ramachandra Institute of Higher Education and Research. These same institutions generate evidence on air pollution and health; hence its integration into clean air policy would be consistent with established evidence-based governance processes.

Evidence by Health Outcome and Intervention Response

Health Outcome	Key Indian Findings and Institution	Study / Source
Cardiovascular - Hypertension	$PM_{2.5}$ exposure associated with elevated systolic blood pressure and significantly higher incidence of hypertension in urban Delhi adults. Prospective cohort design; 5,342 participants. *PHFI / AIIMS-CARRS Cohort, Delhi*	Prabhakaran D et al. (2020)[7]
Metabolic - Type 2 Diabetes	22% higher incidence of type 2 diabetes per 10 µg/m³ increase in annual average $PM_{2.5}$ (HR 1.22; 95% CI 1.09-1.36) among 12,064 participants in Delhi and Chennai. Among the first prospective cohort evidence on $PM_{2.5}$ and diabetes from Indian urban populations. *PHFI - CARRS Cohort, Delhi & Chennai*	Mandal S et al. (2023)[8]
Respiratory - Children	Indoor $PM_{2.5}$ and NO_2 significantly elevated in homes of children with respiratory illness in an industrial area of Delhi. Lung function impairment documented in Ashok Vihar children; exposure- response relationship demonstrated. *Delhi-based research group*	Kumar R et al. (2007, 2008)[9,10]

Health Outcome	Key Indian Findings and Institution	Study / Source
Respiratory - Urban Slums	Indoor PM and Respirable Suspended Particulate Matter (RSPM) levels in Nizamuddin slum households in Delhi significantly elevated above reference levels; associated respiratory health effects documented among residents in poorly ventilated housing. *IIT Delhi / Delhi University*	Kulshreshtha P et al. (2008)[11]
Respiratory - Rural Women	Both obstructive and restrictive lung defects documented in women and children exposed to biomass cookstove emissions in rural Tamil Nadu. $PM_{2.5}$ identified as the primary driver. *Multi-institutional, rural Tamil Nadu*	Patel et al. (2018)[12]
Cancer - Lung	ICMR-NCDIR documents higher lung cancer incidence in India's most polluted metro cities. Lung cancer incidence has shown a significant upward trend in Indian metro cities. *National Cancer Registry Programme, Bengaluru*	Nath et al. (2022)[13]
Systemic - Vitamin D	Children aged 9-24 months in high-pollution locality in Delhi had mean serum vitamin D of 12.4 ng/ml less than half of the requirement from low-pollution area. ($p<0.001$). This demonstrates pollution's reach beyond respiratory and cardiovascular systems. *St. Stephen's Hospital, Delhi*	Agarwal KS et al. (2002)[14]
Intervention - BP & Oxidative Stress	Portable HEPA air filtration in an all-female old-age home in Rohtak, Haryana (29 participants) showed statistically significant improvement in systolic blood pressure ($p<0.001$) during active vs. sham filtration, with CRP and oxidative DNA damage as secondary outcomes. *PGIMS, Rohtak, Haryana*	Ahuja A et al. (2025)[15]
Intervention evidence Natural Experiment - Lockdown	COVID-19 lockdown (2020) caused approximately 50% $PM_{2.5}$ reductions across Delhi, Mumbai, and Kolkata documented by CPCB monitoring data and peer-reviewed analysis. This demonstrated that targeted emission controls can achieve rapid, measurable air quality improvements, providing India-specific empirical evidence that policy-driven source reduction works. *Multiple Indian universities*	Dhaka SK et al. (2020) and Mandal J et al. (2021)[16,17]

Mortality	Every 25 µg/m³ increase in $PM_{2.5}$ associated with 0.8% increase in daily non-accidental mortality in Delhi; 1.5% increase among adults aged 60 and above. Short-term exposure time-series analysis; 700,512 deaths recorded June 2010–December 2016. *PHFI / Centre for Policy Research, Delhi*	Krishna B et al. (2021)[21]

The studies presented are drawn from a broader peer-reviewed evidence base. Health Effect Institute's global burden of disease evidence portal lists 647 Indian studies, and approximately 200 peer-reviewed studies document direct human health outcome evidence from air pollution exposure in India, spanning respiratory, cardiovascular, metabolic, maternal, and child health outcomes. Please note that studies mentioned above vary in design; table is indicative of the breadth of Indian literature and is not an exhaustive list.

India's Emerging Primary Evidence Infrastructure

Two ongoing prospective cohort studies led by researchers across AIIMS Delhi, IIT Delhi, IIT Bombay, and St John Research Institute will fill the gap with gold-standard primary evidence:

APiPED - Air Pollution Impact on Pregnancy & Early Childhood Development[18]	**APEAL - Longitudinal Effects of Air Pollution on Adolescent Lungs[19]**
Enrolling 2,500 pregnant women from urban and rural Delhi NCR; following children to age 2. Directly measures $PM_{2.5}$ and PM_{10} using personal portable monitors for a sub-sample. Will generate India's first primary clinical evidence linking measured ambient $PM_{2.5}$ to maternal outcomes and early child development - birthweight, inflammation biomarkers, and neurodevelopment.	4,000 adolescents across Delhi, Mumbai, Bengaluru, and Mysuru; categorised by $PM_{2.5}$ exposure level. Uses spirometry and forced oscillation technique alongside blood biomarkers. Will produce India's first age-appropriate lung function reference values in polluted urban settings and establish trajectory of lung development under chronic $PM_{2.5}$ exposure.

Both studies are at the protocol-stage - results are several years away, but this indicates that India's research institutions are now generating the gold-standard prospective cohort evidence that current policy gaps demand. ***The next phase of NCAP should be designed to receive and act on these findings as they emerge.***

Where the Evidence Is Strongest - and Where It Thins

Well-Studied: Regions	**Under-Studied: Regions**
Delhi NCR mainly dominates the primary evidence based followed by Tamil Nadu reflecting the concentration of research infrastructure - AIIMS, PHFI, IIT Delhi, SRIHER in cities where institutional capacity is strongest. Moreover, evidence is also emerging from cities such as Mumbai, Bengaluru and Mysuru.	The Indo-Gangetic Plain cities with the worst pollution burden i.e., Patna, Kanpur, Lucknow, Ghaziabad have the least primary research coverage. This is the most critical geographic gap for policy purposes. Additionally, North-Eastern states have no or little evidence on the growing pollution level.

Critical Disease Gaps

India has no prospective cohort study linking ambient $PM_{2.5}$ to COPD incidence. For ischemic heart disease, the Million Death Study - using nationally representative SRS mortality data found a null-to-weak association[20] These gaps are significant and must not become a reason for inaction.

3 NITI Aayog's Position - The Only Body That Can Bridge the MoEFCC-MoHFW Gap at the Policy Apex

NITI Aayog sits at the intersection of every ministry and every national priority. No other institution in India can facilitate the cross-ministerial coordination that health-linked NCAP reform requires. The next phase of NCAP cannot be designed with health outcome metrics unless MoEFCC and MoHFW formally agree to link their data systems, align their programme targets, and build joint accountability mechanisms. That conversation will not happen through either ministry alone - it requires a body that has the mandate to coordinate national development priorities. NITI Aayog is that body, and the Member (Health) is its most direct channel into the health-environment intersection.

The Member (Health) at NITI Aayog has a specific mandate to advise the PMO on health-system reform, the SDG India Index, the NITI Health Index, and the Aspirational Blocks Programme. Each is directly relevant to air pollution's health burden. SDG Indicator 3.9.1 - mortality attributable to ambient air pollution - is India's own international commitment. The NITI Health Index assesses state-level performance across 24 health indicators; adding $PM_{2.5}$-attributed cardiorespiratory burden would make air quality a formal dimension of state accountability. The Aspirational Blocks Programme targets India's most disadvantaged geographies - many of which overlap with India's most polluted NCAP non-attainment cities.

Pahle India Foundation was established by Dr. Rajiv Kumar, former Vice Chairman of NITI Aayog (2017-22), and brings NITI-aligned institutional culture: evidence-based, inter-ministerial in orientation, and committed to policy translation. PAVANA's approach to this brief - grounding every recommendation in Indian evidence and government data, and framing every ask within existing institutional mandates - reflects that heritage.

4 The Opportunity: Connecting India's Air Quality and Health Data

India does not have an evidence problem. It has an institutional design problem. India generates pollution data and health data in parallel and has no routine system to connect them.

CPCB	PM-JAY	NPCCHH ARI Sentinel Surveillance
Real-time $PM_{2.5}$ from CPCB's nationwide CAAQMS network across NCAP cities- Data collected, published, available	Hospital admissions with ICD-10 disease codes across Ayushman Bharat- Data collected, not linked to pollution	Operational since 2017 across selected sites across states but no public data reports released and no formal $PM_{2.5}$ linkage

These three systems operate in parallel. No formal mechanism connects them.

The Government of India has built the analytical infrastructure. The National Knowledge Network on Air

Pollution Management, coordinated through IITs under NCAP, provides technical advisory capacity. CPCB continuously generates $PM_{2.5}$ data. PM-JAY HMIS tracks cardiorespiratory admissions. ICMR holds the research commissioning mandate. What is missing is the cross-ministerial directive at the policy apex that makes these systems work together toward a shared health outcome target. NITI Aayog - through its advisory role to the PMO and its inter-ministerial coordination mandate - is the only institution that can issue that directive.

5 Specific Asks for NITI Aayog

01 Advise the PMO to Direct MoEFCC and MoHFW to Jointly Design Health Metrics into the Next Phase of NCAP

The next phase of NCAP will be designed in the policy window that is now open. If health outcome metrics are not embedded at this stage, they cannot be retrofitted. NITI Aayog Member (Health) to formally recommend to the PMO: (i) a Cabinet direction requiring MoEFCC and MoHFW to jointly develop a health outcome target framework for the next phase of NCAP - specifying $PM_{2.5}$-associated cardiorespiratory burden reduction targets alongside concentration reduction targets; (ii) a formal MoEFCC—MoHFW data-sharing protocol linking CPCB CAAQMS ambient $PM_{2.5}$ data with PM-JAY HMIS cardiorespiratory admissions; (iii) a biannual inter-ministerial review on NCAP health performance, reporting to the Cabinet Secretary.

Immediate · NITI Aayog / PMO / Cabinet Secretariat

02 Include $PM_{2.5}$-Attributed Health Burden in the NITI Health Index and SDG India Dashboard

SDG Indicator 3.9.1 - mortality attributable to ambient air pollution - is India's own international commitment and is tracked in the SDG India Dashboard. The NITI Health Index assesses state-level health performance. NITI Aayog to: (i) direct the SDG India Index team to formally track SDG 3.9.1 using CPCB CAAQMS data as the ambient $PM_{2.5}$ exposure input; (ii) include a $PM_{2.5}$-attributed health burden indicator in the NITI Health Index's next edition, sourced from ICMR-NCDIR cancer registry data and PM-JAY HMIS cardiorespiratory admissions; (iii) require NCAP non-attainment states to report $PM_{2.5}$-attributed health burden as a formal state health performance metric in the next Health Index cycle.

Short term · NITI Aayog / ICMR / MoHFW / MoEFCC

03 Task NITI Aayog's Development Analytics to Design the $PM_{2.5}$-to-Health Data Linkage Protocol

NITI Aayog's Development Monitoring and Evaluation Office (DMEO) has the capacity to design the technical protocol for linking CPCB CAAQMS district-level $PM_{2.5}$ data with PM-JAY HMIS cardiorespiratory admissions. NITI to task its analytics team to: (i) develop the data schema and

04 Include $PM_{2.5}$ Monitoring as a Development Indicator in the Aspirational Blocks Programme

Twelve of India's most polluted NCAP non-attainment cities overlap with Aspirational Blocks districts - including Patna, Kanpur, Muzaffarpur, Varanasi, and Dhanbad. These are precisely the places where pollution burden and development deficit coincide, creating compounded health harm on the

governance framework for a CPCB-PM-JAY data linkage, specifying the variables, aggregation levels, and data-sharing safeguards; (ii) identify three to five NCAP cities with the highest $PM_{2.5}$ burden and PM-JAY enrollment density as pilot cities; (iii) share the NITI-endorsed protocol with MoEFCC and MoHFW as a technical input to the next phase of NCAP design. PAVANA to provide analytical support at no cost.

Short term · NITI Aayog DMEO / CPCB / MoEFCC / MoHFW

most vulnerable populations. The Aspirational Blocks Performance Framework already tracks 49 indicators across health, nutrition, education, and infrastructure. NITI to include in the next edition: (i) annual mean $PM_{2.5}$ concentration, sourced from CPCB CAAQMS data or ISRO satellite-derived $PM_{2.5}$ for blocks without ground monitors; (ii) $PM_{2.5}$-associated ARI case rates from NPCCHH/NCDC disease surveillance. Making clean air a formal development indicator is a direct extension of the Aspirational Blocks mandate.

Short–Medium term · NITI Aayog / MoEFCC / NCDC / CPCB

6 Conclusion

India's challenge in addressing air pollution is not a shortage of evidence, but rather one of institutional design and policy translation. NFHS data traces its footprint in child respiratory health. ICMR-NCDIR cancer registries show its signature in lung cancer incidence in India's most polluted cities. CPCB's own monitoring network confirms that virtually all 130 NCAP cities exceed the $PM_{2.5}$ NAAQS of 40 µg/m³ and 108 cities still fall short of even the less stringent PM_{10} standard. Primary studies from AIIMS, PHFI, IIT Delhi, and other institutes independently document what this exposure does to Indian lungs, hearts, and metabolic health. ***The science is Indian. The data is Indian. The conclusion is unambiguous.***

The window to embed health outcome metrics into the next phase of NCAP is open now - and it will not remain open indefinitely. Programme architecture, inter-ministerial data protocols, and surveillance mandates are set at the design stage. A programme that launches without formal $PM_{2.5}$ to health linkage will spend years trying to retrofit what could have been built in from the start. The four asks in this brief are executable within existing institutional mandates, require no new legislation, and carry no foreign technical dependence.

The question before NITI Aayog is not whether India has the evidence. Two decades of Indian research from AIIMS, PHFI, IIT Delhi, IIT Bombay, ICMR-NCDIR, and other institutions have documented what $PM_{2.5}$ does to Indian lungs, hearts, and metabolic health. The window to embed health outcome metrics into the next phase of NCAP is open now and will not remain open indefinitely. The question is whether NITI Aayog will use its advisory position at the policy apex - its access to the PMO, its coordination mandate, its data analytics capacity, and its SDG tracking authority - to ensure that what India knows about $PM_{2.5}$'s health burden becomes what India formally tracks, reports, and reduces.

PAVANA offers technical support to NITI Aayog: (1) Providing the evidence synthesis and SDG 3.9.1 tracking framework for NITI's development analytics team; (2) Designing the CPCB-PM-JAY data linkage schema and governance protocol for the DMEO pilot; (3) Developing the Aspirational Blocks $PM_{2.5}$ indicator methodology. All three are offered at no cost and are executable within NITI Aayog's existing coordination and analytics mandate.

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