bharat CLIMATE FORUM

Council for International Economic Understanding | Dalberg

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Unlocking India's Blue Skies Economy

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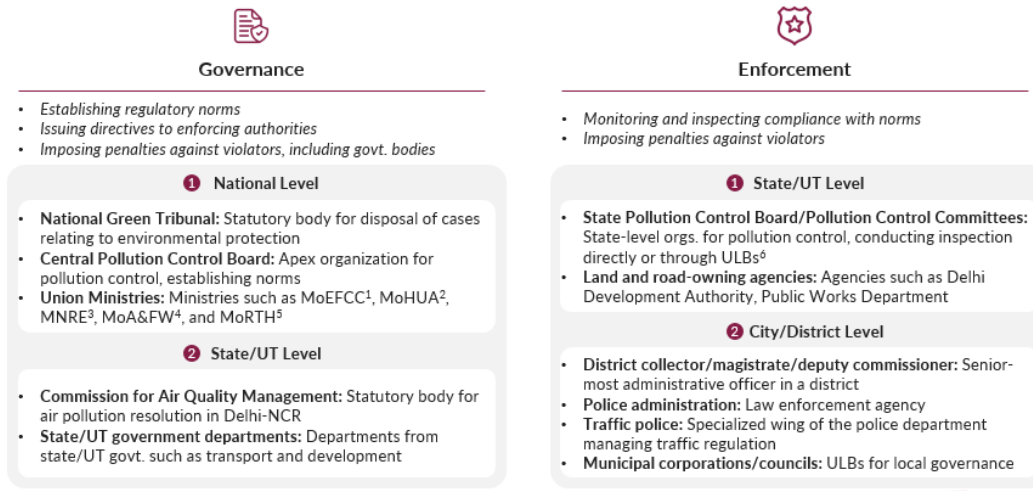
One Air, Many Bosses: Building Institutions For Integrated Climate And Clean Air Action

Context and rationale

India has established a broad architecture of governance and enforcement mechanisms to tackle air pollution, spanning national, state, and local levels. At the national level, the National Clean Air Programme (NCAP) serves as a central strategy, with targets for reducing PM concentrations and supporting 131 non-attainment cities through action plans and capacity building. On a state level, regulatory norms like the Graded Response Action Plan (GRAP) in Delhi-NCR provide tiered, real-time responses to rising pollution levels. Complementing these are sector-specific regulations—from the Construction and Demolition Waste Rules (2016) and Solid Waste Management Rules (2016) to Bharat Stage Emission Standards for vehicles and emission caps on thermal power plants. Multiple agencies including the Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs), the Commission for Air Quality Management (CAQM), and urban local bodies are tasked with regulation and enforcement across these domains (refer to exhibit 1).

Exhibit 1: Key governance and enforcement entities in India for air pollution norms



Despite the institutional architecture for air quality management in India, three interlinked challenges continue to undermine impact on the ground: fragmented governance structures, limited institutional capacity, and weak citizen engagement. These systemic issues not only delay action during pollution crises but also dilute the long-term effectiveness of regulatory interventions.

Firstly, a key challenge lies in the fragmentation of responsibilities across government tiers and agencies, leading to overlapping mandates, inconsistent enforcement, and delayed action. In Delhi, for example, air quality enforcement involves the Ministry of Environment, CAQM, CPCB, DPCC, municipal bodies, and the police—all operating with intersecting roles but no unified accountability structure. Sector-specific regulations add to this complexity: in transport, emission norms are issued by the Supreme Court and MoRTH, monitored by state transport departments, enforced by traffic police, and supplemented by GRAP directives from CAQM—implemented by yet another set of local authorities. This diffusion of authority

often results in delays, contradictory decisions, and enforcement gaps, especially during pollution crises.

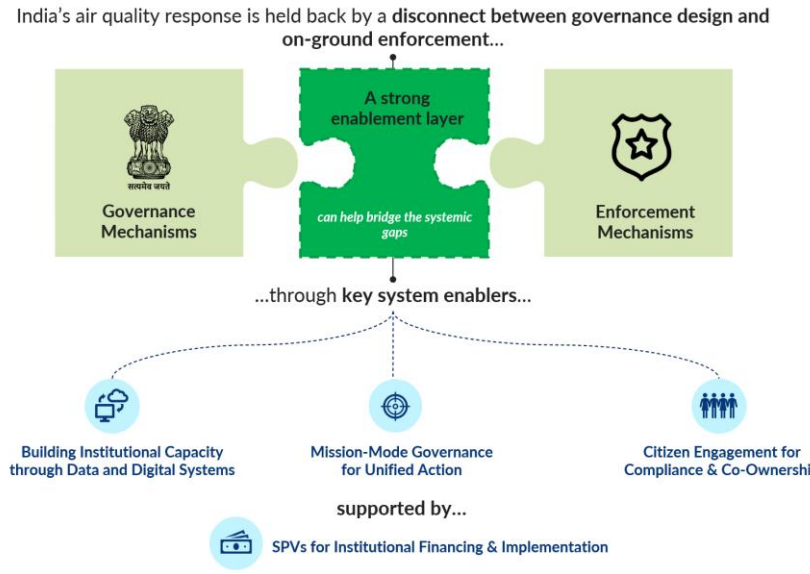
Another challenge is the lack of capacity in both technology and skilled personnel. India currently has 1,296 air quality monitoring stations, including both manual and continuous ambient air quality monitoring stations (CAAQMS). However, the grid only covers 12% of the 4,041 cities and towns in the country, indicating sparse coverage relative to the population and geographic size[1]. Local authorities also lack the trained personnel to enforce regulations in sectors like construction dust and industrial emissions. India's pollution control boards suffer from capacity gaps, with insufficient resources for inspections and compliance. This lack of capacity hampers enforcement, leading to inconsistent implementation and slower progress.

These structural and capacity-related issues are further accentuated by low public compliance and limited civic responsibility. Despite regulations, widespread non-adherence to norms—such as open waste burning or ignoring Pollution Under Control (PUC) requirements—undermines enforcement efforts. For instance, a 2022 audit by the Comptroller and Auditor General (CAG) revealed that over 20% of vehicles in Delhi were operating without valid PUC certificates, despite mandatory checks. Similarly, urban open burning of garbage and leaf litter remains prevalent in cities like Bengaluru and Lucknow, despite bans and awareness campaigns. This reflects a broader challenge of citizen disengagement and low environmental accountability, which blunts the impact of even well-designed policies.

To move from fragmented action to lasting impact, India must activate a new class of solutions that go beyond piecemeal interventions. These solutions must be systemic, scalable, and anchored in three mutually reinforcing levers: **building institutional capacity, effective mission-mode governance and active citizen engagement** (see exhibit 2). Underpinning and enabling these levers are robust financing mechanisms that can mobilize and align resources across sectors and scales. Together, they form the foundation of a more responsive, accountable, and future-ready air quality management ecosystem.

[1] India Today, AQI 101: Decoding how India's monitoring systems track the air we breathe

Exhibit 2: Key enablers to deliver a systemic and scalable response to India's air quality crisis



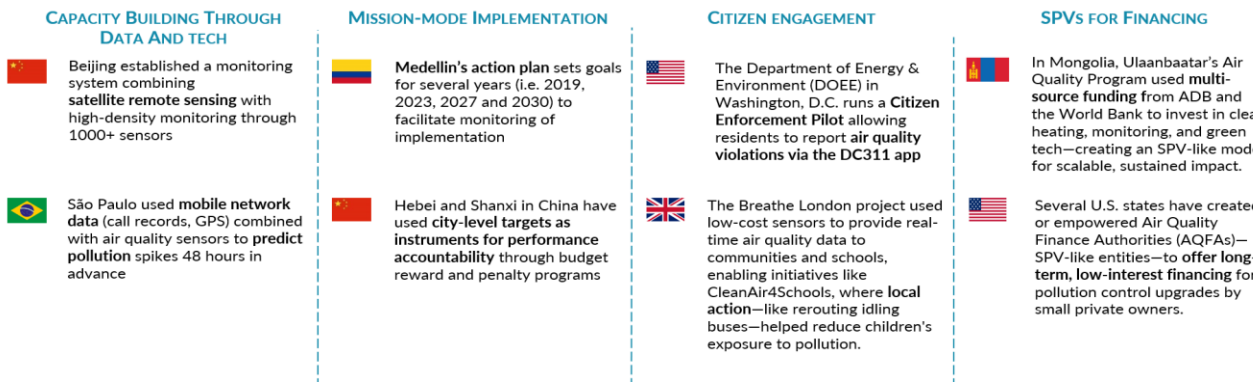
One of the first steps in operationalizing this shift is to strengthen institutional capacity through data and digital systems. Expanding low-cost sensor networks, as seen in pilots across Bengaluru and Ahmedabad, can provide granular, hyperlocal data to identify pollution hotspots and guide timely interventions. Advanced tools like satellite-based emissions tracking, AI-powered violation detection, and GIS-enabled mapping can support regulators in prioritizing inspections, automating alerts, and improving compliance workflows. Beijing and São Paulo offer powerful examples. Beijing uses satellite data and 1,000+ sensors for real-time pollution tracking, while São Paulo combines mobile network and sensor data to predict pollution spikes 48 hours in advance. Integrating these technologies with centralized dashboards can enhance transparency, improve inter-agency coordination, and bridge the gap between policy and execution in India.

Furthermore, to address India's fragmented air quality governance there's a need to adopt a mission-mode approach that unifies air quality efforts across sectors and levels of government. This approach reframes clean air not as a stand-alone environmental issue, but as a national development priority with clear goals, defined timelines, and shared accountability across ministries and states. Mission-mode programs enable alignment of regulatory, financial, and operational frameworks, ensuring that air quality actions are not ad hoc. They work because they are rooted in formal mandates, backed by strong political leadership, and reinforced through dedicated funding and robust monitoring mechanisms. Medellín (Colombia) has demonstrated the power of this approach by setting multi-year air quality targets to enable consistent monitoring, while China's Hebei and Shanxi also linked city-level goals to performance-based budgets with rewards and penalties. These models show how India can benefit from embedding air quality goals into formal governance routines backed by clear mandates and strong political commitment.

Lastly, alongside institutional and technological solutions, engaging citizens and shifting everyday behaviors is equally vital to sustaining clean air outcomes. Initiatives such as Earth5R's citizen-led monitoring programs show how awareness campaigns, hyperlocal data sharing, and community stewardship can drive greater accountability and behavior change at scale. Building a culture of shared responsibility is essential to bridge the gap between state action and societal outcomes. Globally, Washington D.C.'s Department of Energy and Environment has piloted a Citizen Enforcement initiative, enabling residents to report air quality violations via the DC311 app. The Breathe London project offers another model—using low-cost sensors to share real-time air quality data with schools and communities, which helped reduce children's exposure by triggering actions like rerouting idling buses. These examples reinforce that meaningful public engagement goes beyond awareness; it fosters trust, builds continuity, and turns citizens into active co-creators of clean air solutions.

To effectively implement these multifaceted strategies—spanning technology, governance, and citizen engagement—India requires robust institutional mechanisms to mobilize and manage resources at scale. Establishing Special Purpose Vehicles (SPVs) can serve as a pivotal solution, providing dedicated structures to coordinate cross-sectoral initiatives and attract diverse funding sources. For instance, Uttar Pradesh has launched the Uttar Pradesh Clean Air Management Project Authority (UP CAMPA) as an SPV to execute its airshed-based pollution control programs, securing substantial financing from the World Bank and carbon credit mechanisms. Internationally, Ulaanbaatar's Air Quality Program offers a compelling parallel—leveraging multi-source funding from the Asian Development Bank and World Bank to invest in clean heating, monitoring, and green tech through an SPV-like model. Several U.S. states have created Air Quality Finance Authorities (AQFAs) to offer long-term, low-interest financing for pollution upgrades by small private operators. These models highlight how SPVs can act as financial and operational anchors to enable sustained, scalable air quality improvements in India.

Exhibit 3: Global examples leveraging key enablers to drive scalable clean air impact



This session will bring together policymakers, experts, and stakeholders from various sectors to discuss how to strengthen India's air quality governance and enforcement frameworks. The discussion will focus on identifying key gaps in the current enforcement

structure and exploring how India can strengthen air quality governance through better institutional models to drive sustained, cross-sectoral action.

Potential Opportunities and Challenges

There is an opportunity to strengthen India's institutional architecture for air quality management by building on existing regulatory frameworks and expanding coordination mechanisms:

- **Anchoring air quality efforts in a mission-mode institutional architecture can accelerate systemic impact:** By building on existing regulatory frameworks and introducing a high-level coordinating authority, India has the chance to shift from fragmented mandates to unified, accountable governance. A Cabinet Secretariat–anchored entity with formal MoUs, joint action plans, and clear KPIs can institutionalize coordination across ministries and states, ensuring sustained momentum.
- **Integrated financing, monitoring, and technology systems can unlock scale and accountability:** With the right enablers—performance-based allocations, AI-powered monitoring, and market-based incentives—India can transform its air quality management from reactive spending to outcome-oriented investment. For instance, Gujarat's emissions trading scheme, supported by real-time monitoring, led to significant pollution reductions in participating factories.
- **Embedding citizen engagement and transparency into the ecosystem can strengthen compliance and trust:** Community-led monitoring, behavior-focused interventions, and real-time data access can help bridge the gap between top-down policies and ground-level action. These elements not only drive compliance but also foster a sense of ownership, making clean air a shared public value rather than a regulatory obligation.
- **Strengthening sectoral convergence and adaptive governance can amplify policy effectiveness:** Air pollution is a cross-sectoral challenge—but current responses remain fragmented across transport, industry, waste, and agriculture. There is a real opportunity to embed air quality outcomes into sectoral policies and align incentives across ministries through shared data systems, co-owned targets, and adaptive feedback loops.

At the same time, several challenges undermine effective enforcement and accountability for air pollution control:

- **Institutional resistance and mandate protectionism may delay cross-ministerial alignment:** Existing ministries and departments may be reluctant to cede control or align under a central coordinating body due to jurisdictional turf, legacy systems, and political sensitivities. Without high-level political backing and formal accountability mechanisms, a mission-mode structure may remain symbolic rather than operationally transformative.

- **Weak incentive design and fragmented funding flows could limit impact and adoption:** While performance-based and market-linked tools (like emissions trading) show promise, their success hinges on robust baseline data, trust in enforcement, and clarity on financial flows. Many states may lack the institutional maturity or digital infrastructure to manage and disburse funds linked to measurable environmental outcomes, risking token compliance rather than genuine improvement.
- **Citizen fatigue, misinformation, and lack of localized platforms may dilute engagement:** Sustained public participation depends on timely, actionable, and hyperlocal information. Without adequate investments in awareness-building, feedback loops, and trust-building with communities, engagement efforts may stagnate or become performative. There's also the risk of citizen-led data being disregarded by authorities or misused in political conflicts.
- **Data asymmetries and misaligned sectoral incentives could hinder convergence:** Each sector—transport, waste, agriculture, energy—operates with its own data standards, timelines, and policy objectives. Unless sectoral ministries adopt shared targets, interoperable platforms, and co-benefit frameworks, efforts to converge may get stuck in bureaucratic gridlock. Adaptive feedback loops may also be undermined by slow data reporting cycles or rigid planning frameworks.

Key Focus for Discussion

With a focus on building stronger institutions for coordinated enforcement of air quality norms, the discussion will explore:

- What **institutional and structural gaps** continue to hinder effective enforcement of air quality norms across India, despite the presence of national and state-level regulatory frameworks?
- What **political economy and administrative barriers** obstruct the transition to a unified, mission-mode governance architecture for air quality management?
- How can a **high-level coordinating authority** be institutionalized to streamline roles, align incentives, and hold ministries accountable for air quality outcomes?
- How can **community-led monitoring, transparency platforms, and behavioral nudges** be embedded into formal enforcement systems to enhance compliance and build public trust?
- What **technological upgrades and innovations** are required to fill the monitoring gaps, and how can real-time data be used to enhance enforcement?
- What are the **key capacity-building priorities** at the state and municipal levels—from staffing and training to data literacy—to strengthen on-ground enforcement and reduce institutional bottlenecks?
- How can ministries and departments overseeing transport, waste, agriculture, and industry **align around common air quality goals** through shared data systems, co-owned KPIs, and adaptive governance mechanisms?

Session Flow

Panel Discussion - One Air, Many Bosses: Building Institutions For Integrated Climate And Clean Air Action	
Keynote Address (5 minutes)	The session will open with a keynote address highlighting the unique opportunity for India to lead a new era of clean air governance—by moving to a **unified, mission-mode approach** that aligns ministries, empowers institutions, and embeds air quality into the heart of national development planning.
Opening Remarks (5 minutes)	• The emcee will highlight the need to move towards a unified governance architecture that can deliver accountable, enforceable clean air action. • The emcee will **invite the panellists** on stage and introduce them. • The emcee will then hand the session over to the **moderator**.
Moderator Opening Remarks (5 minutes)	The moderator will frame the session by emphasizing that India now has an opportunity to translate its regulatory frameworks into real outcomes through **stronger coordination and empowered institution**s. They will spotlight the potential of **mission-mode governance—with clear mandates, shared KPIs, and aligned financing**—to make clean air a measurable, accountable goal.
Panel: Opening Question (10 minutes)	• Moderator asks panellists an **introductory question** to address • Panellists give **brief opening statements** from their vantage point
Structured Panel Discussion (25 minutes)	• The moderator asks **pointed questions** to panellists • Each panellist may choose to **build upon or challenge** the view of the previous • Panellists are encouraged to share their **reflections on the keynote address**
Closing thoughts and optional audience Q&A (10 minutes)	• Each panellist concludes with a **closing thought and key takeaway(s)** • They emphasize a **critical call-to-action** for the audience • Time permitting, the panellists may **answer questions** received from the audience