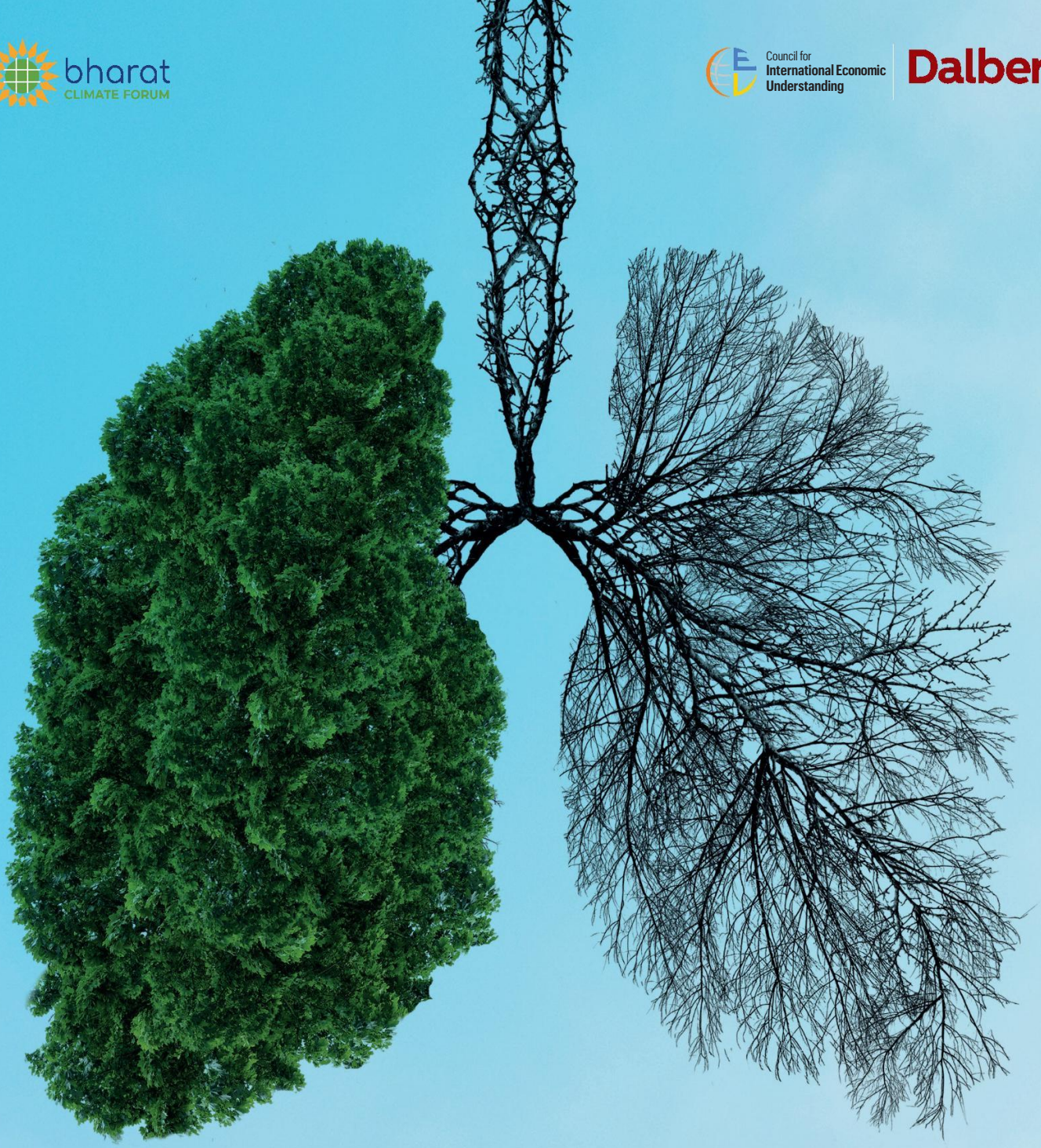
bharat CLIMATE FORUM

Council for International Economic Understanding | Dalberg



Aironomics 2025

Unlocking India's Blue Skies Economy

Date: May 31, 2025 | **Location:** ITC Maurya, New Delhi

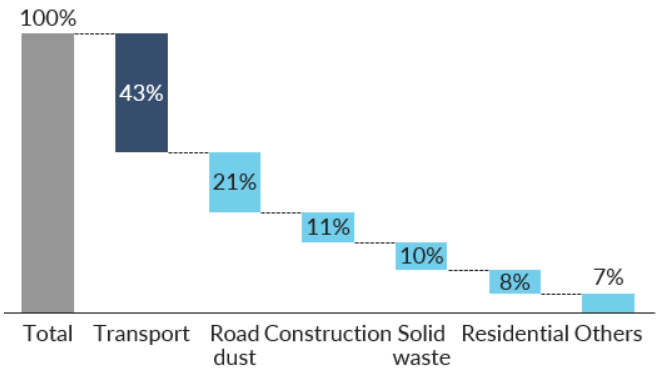
Roadblocks and Runways

Steering India's Mobility Toward Clean Air

Context and rationale

Transportation is one of the largest contributors to air pollution and greenhouse gas emissions, particularly in urban areas. The transport sector contributes to 40% of air pollution in India,[1] responsible for more than 40% of total NOX emissions, 12% of energy-related CO2 emissions, and around 7% of combustion-related PM 2.5 emissions.[2,3] In Delhi, for instance, transport is the single largest contributor of PM 2.5 at 43%.[4]

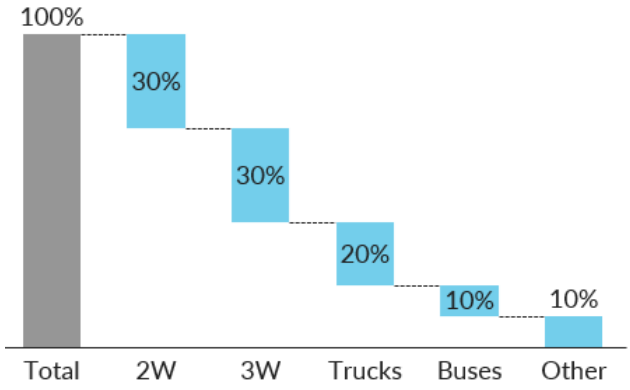
Figure 1: Sources of air pollution in Delhi



Within the transportation sector, two-wheelers, three-wheelers, and trucks are the largest contributors to air pollution and GHG emissions. In Delhi, two-wheelers (2W) and three-wheelers (3W) account for around 60% of transport-related pollution, followed by trucks at 20%, buses at 10%, and the remaining 10% from other vehicles such as passenger cars.[5] Nationally, heavy-duty vehicles have the highest share of CO2 emission contribution at ~45%, followed by cars (~25%), 2W (~15%), buses (~9%), and light-duty vehicles (~8%).[6]

[1] Economic Times, 'Transport sector accounts for 40 per cent of air pollution; need to develop greener fuels', 2023
[2] IEA, 'Air quality and climate policy integration in India', 2021
[3] IEA, 'Transitioning India's Road Transport Sector', 2023
[4] TERI, 'Cost effectiveness of interventions for control of air pollution in Delhi', 2019
[5] CSE, 2024. Retrieved from: 'Business Standard. Vehicular emissions major cause of Delhi's winter pollution, says CSE', 2024, and Dalberg analysis
[6] WRI, Pathways to decarbonize India's transport sector: Scenario analysis using the Energy Policy Simulator

Figure 2: Breakdown of contribution to transport-linked air pollution in Delhi by vehicle type



The government has taken various steps across both national and state levels that integrate addressing transport-linked air pollution and India's climate goals. Under its Panchamrit commitments, India aims to achieve energy independence by 2047 and reach net-zero emissions by 2070**.** The government has recognized EVs as a key lever in this transition and aims to achieve 30% EV penetration by 2030 which translates to approximately 102 million EVs on the road. To support this shift, at the national level, the Ministry of Heavy Industries has launched the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme which provides subsidies (up to Rs 10,000 crore in Phase II[7]) for EVs and the Production-Linked Incentive (PLI) scheme which offers financial incentives up to ~Rs 26,000[8] crore to manufacturers of EVs and advanced chemistry battery cells to promote domestic production. Newer schemes such as the PM e-Bus Sewa aim to deploy 10,000 e-buses across cities through a public-private partnership model, while the PM e-Drive initiative supports demand and supply-side incentives for electric two-wheelers and three-wheelers. At the state level, EV policies in states offer additional incentives. Delhi's EV policy, for example, offers up to Rs 30,000 purchase subsidy for 2W and ~Rs 10,000 incentive for scrapping petrol 2W and CNG 3W.[9]

While these efforts have helped create a relatively mature EV market for 2W, 3W, and 4W, the adoption of electric buses and trucks remains at a nascent stage. In FY25, two- and three-wheelers dominated the EV market, accounting for over 90% of total sales, with annual growth rates of 10–20%. Four-wheelers—primarily light motor and passenger vehicles—made up around 5% of EV sales. In contrast, electric buses represented less than

[7] Ministry of Heavy Industries, Fame India Scheme
[8] Ministry of Heavy Industries, Steps taken by the Government to boost domestic manufacturing of Electric vehicles and to reduce the country's dependence on imports
[9] Inc42, Delhi EV Policy: Govt Plans INR 30,000 Subsidy For Purchasing 2-Wheelers

1% of total sales and grew by just 4% year-on-year.[10] Similarly, e-truck sales began only in 2023, with ~550 e-trucks sold in 2023 and 2024.[11]

State-owned buses have seen considerable success in electrification through a bus-leasing model but private operators face challenges. A key enabler for public sector e-bus adoption has been the Gross Cost Control model, where OEMs lease electric buses to State Transport Undertakings (STUs) with the demand aggregated by entities such as Convergence Energy Services Limited (CESL). This model eliminates the need for STUs to purchase buses outright, thereby addressing key financial barriers such as high upfront capital costs and collateral requirements. However, replicating this model for the private sector is difficult due to fragmented and limited demand, as compared to STUs. Further, industry bodies like the Bus & Car Operators Confederation of India (BOCI) have shown limited traction in serving as demand aggregators for private fleet operators.

With e-trucks in a much more nascent stage due to technological limitations, the government is pushing a transition to lower-emission BS-6 trucks as a feasible solution in the short term. Currently, there are very few e-truck models which have passed the prototyping phase and are yet to be produced on a large scale for commercial availability,[12] which will require greater investment in R&D, stronger demand, and incentives to reduce battery costs. Recognizing that electrification of trucks remains nascent, transitioning old diesel trucks to BS-6 trucks is seen as a near-term strategy to reduce emissions from freight, with strong scrapping incentives from the government. Haryana's 5-year Vehicle Scrappage Policy offers a 10% Motor Vehicle Tax rebate, along with a 25% registration fee rebate.[13] Uttar Pradesh's scrappage policy offers waivers on penalties for non-payment of dues for 1.5 lakh such vehicles, in addition to rebates.[14] In Delhi, diesel vehicles older than 10 years are no longer allowed to refuel at fuel stations, with the scrappage policy providing a 10–15% Motor Vehicle Tax rebate.[15,16]

However, despite these challenges, innovative solutions are emerging to accelerate bus and truck electrification. Innovative financing solutions like ADB's $40M blended finance package to private sector e-mobility player GreenCell for developing 255 e-buses can be replicated to de-risk private capital investments, thereby supporting private bus operators.[17] In the freight sector, major logistics fleet players have begun piloting electrification

[10] Vahan, 2025. Retrieved from: Autocar, 'EV sales grow 17% to 1.96 million in FY2025, 2- and 3Ws, cars and SUVs hit new highs', 2025
[11] VAHAN dashboard
[12] JMK Research and Analysis, E-trucks market in India
[13] Transport Department of Government of Haryana, Vehicle Scrappage Policy Haryana, 2022
[14] Hindustan Times, 'Aiming to reduce pollution, UP govt offers tax exemption on scrapping of end-of-life vehicles', 2024
[15] Business Standard, 'Tax structure explained: Delhi govt offers rebate for scrapping old cars', 2024
[16] ETV Bharat, 'A Look At Delhi Govt's Vehicle Scrappage Policy And Steps To Implement 'No Petrol' Rule For Overaged Vehicles', 2025
[17] ADB, GreenCell Sign $40 Million Financing for Safer E-Buses in India, Especially for Women Commuters

of their fleet, such as Amazon India which has partnered with Eicher Motors to deploy up to 1,000 e-trucks over the next five years.[18]

Replicating these solutions at scale can unlock a massive economic opportunity. India plans to electrify 8 lakh diesel buses over the next 6-7 years,[19] with e-bus sales likely to grow ~4x within the next 2 years itself.[20] Similarly, the number of trucks in India expected to more than quadruple from 4 million in 2022 to ~17 million by 2050, indicating a vast market for electrification. Overall, the Indian EV market is estimated to reach ~$240 billion and create 5 crore jobs by 2030.[21]

This roundtable, '***Roadblocks & Runways: Steering India's Mobility Toward Clean Air***' will bring together policymakers, industry players, and financing institutions to scale these solutions for accelerating the transition to cleaner transport in India and unlocking the billion-dollar opportunity.

Potential Opportunities and Challenges

The potential to scale clean mobility in India's transport sector is underscored by multiple emerging opportunities, driven by a large domestic market, policy ambition, and evolving technologies.

Opportunities and Challenges for E-buses

Unlocking Economic and Environmental Gains

- **Tapping into the multi-billion dollar e-bus market**: India is expected to replace 8 lakh diesel buses with e-buses over the next 6-7 years, creating a multi-billion-dollar market for electric buses and generating significant employment opportunities across manufacturing, maintenance, and charging infrastructure.
- **Potential to reduce CO2 emissions from urban transport**: Buses contribute to a significant share of carbon emissions, and electrifying bus fleets can substantially lower CO2 emissions, with 14 tonnes of CO2 abated per year by transitioning 1 diesel bus to e-bus.[22]

Key Barriers to Private Sector Participation

- **Limited policy benefits:** Despite policy momentum for e-buses through PM E-DRIVE and PM E-Bus Sewa, electrification of buses remains limited in scale as the private sector is largely excluded from these policies.
- **High upfront costs coupled with perceived risk:** Commercial lenders typically finance only up to 80% of e-bus costs, due to high perceived risk, leaving operators

[18] Amazon, Amazon partners with Eicher to deploy electric trucks for deliveries in India
[19] Business Standard, FAME III: India to replace 800k diesel buses with electric over 7 years
[20] Business Standard, India's e-bus sales likely to grow 3.6-fold in FY27, projects CareEdge
[21] NDTV, Nitin Gadkari Expects India's EV Industry To Create Five Crore Jobs By 203
[22] Dalberg analysis

to cover high upfront margins—up to Rs 30 lakh per bus—while also demanding significant collateral beyond the project, limiting the ability of private operators to scale.

- **Limited charging infrastructure and depot electrification:** The current shortage of charging stations and the lack of adequate depot electrification infrastructure pose significant barriers to supporting the growing fleet of e-buses, especially with concerns about range anxiety (>300 km).
- **Lack of skilled workforce for e-bus maintenance and operations**: There is a shortage of trained technicians and operational staff capable of maintaining and operating e-buses.
- **Scalability barriers in the e-bus leasing model for private operators:** While the bus leasing model has shown promise in the public sector, its scalability in the private sector is constrained by fragmented demand and the lack of strong industry bodies to support fleet operators in securing favorable terms.

Solution Pathways to Scale E-Bus Adoption

- **Large-scale electrification of buses by extending government schemes to the private sector**: Government-led programs such as PM e-Bus Sewa aim to deploy 10,000 e-buses across 169 cities,[23] creating a foundation for mass urban electrification and city-level emissions reduction, with large-scale transition potential if extended to the private sector.
- **Replicating public sector leasing models for private operators:** The Gross Cost Contracting model, used successfully by State Transport Undertakings through demand aggregation by entities like CESL, can be adapted for private fleets with appropriate policy support and market coordination support. Policy support through targeted EV mandates for private fleet (e.g., school, staff) can improve financial viability of leasing, while market coordination support from industry bodies can enable demand aggregation.
- **Exploring innovative and blended finance solutions to unlock private capital:** Models that blend concessional and commercial finance—like ADB's $40M blended finance package to GreenCell—can de-risk investments and unlock private capital for bus electrification, especially for the private sector.

Opportunities and Challenges for E-trucks

Unlocking Economic and Environmental Gains

- **Leveraging the freight market opportunity**: India's trucking demand is expected to grow over fourfold by 2050, requiring ~17 million trucks, creating a huge market opportunity for freight electrification alongside job creation in manufacturing, logistics, and maintenance sectors.

[23] Ministry of Housing & Urban Affairs, Cabinet approves "PM-eBus Sewa" for augmenting city bus operations; priority to cities having no organized bus service, 2023

- **Potential to reduce CO2 emissions from road transport by half:** Heavy-duty vehicles are the highest contributors of transport at ~45%, with electrification offering a significant opportunity to cut emissions.

Key Barriers to Adoption

- **High upfront costs of e-trucks and BS-6 trucks:** E-trucks can cost 2–4x more than diesel trucks. Similarly, BS-6 trucks are expensive, with the landed cost of a new BS-6 truck exceeding Rs 20 lakhs, including GST of Rs 5 lakhs, offering little incentive to small fleet operators to transition.[24]
- **Challenges in access to finance:** Commercial banks perceive e-trucks to be a risky segment, therefore limiting the provision of upfront capital for e-trucks, with no commercial e-truck loans available in the market.
- **Inadequate charging infrastructure:** India currently has around 12,000+ public EV charging stations, far below the demand needed for large-scale e-truck adoption on long-haul routes.
- **Limited model availability and performance challenges in e-trucks:** Reduction of battery efficiency with heavy truck loads, limited availability of e-truck models in medium- and heavy-duty segments, and persistent concerns around battery degradation and safety constrain the transition to e-trucks.
- **Low compliance with vehicle scrappage norms**: Old trucks continue to stay on roads either illegally or by being re-registered in other jurisdictions. Further, a strong informal resale market further disincentivizes scrappage, with owners opting to maintain or sell their vehicles rather than retire them.

Solution Pathways to Scale E-truck Adoption

- **Transitioning to BS-VI for short-term emission reduction:** In the near term, transitioning old diesel trucks to BS-VI standards, especially through state-supported scrappage incentives such as motor tax waivers, GST waivers, penalty amnesties, interest subvention, and incentives from OEMs, offers a feasible pathway to reduce pollution while EV freight technologies mature.
- **Testing and scaling of e-truck fleets in logistics and urban freight:** Pilots like Amazon India's partnership with Eicher Motors to deploy up to 1,000 e-trucks show potential for early commercial viability in middle- and last-mile delivery, particularly in urban areas where shorter ranges and depot-based charging are manageable.

Key Focus for Discussion

With the aim of unlocking clean air benefits through accelerated transport electrification, this session will explore the following:

[24] Dalberg analysis

E-buses

- How can **blended finance solutions be leveraged to reduce lenders' risk perception** and bring down the upfront equity requirements for private e-bus operators?
- How can **co-benefits** such as livelihood creation, carbon abatement, and health benefits be **leveraged to enhance innovative financing solutions** and **what role can philanthropy play** in doing so?
- What policy interventions or aggregators are needed to **adapt the Gross Cost Contracting leasing model for private bus** operators?
- What **R&D or pilot investments are required to enhance battery life and improve performance of e-buses** on high-frequency urban routes?
- How can national and state **EV policies be expanded to explicitly incentivize private sector** e-bus adoption?
- What **collaborative models between OEMs, ITIs, and governments** can ensure a trained pipeline of maintenance and operations staff for e-buses?
- What **policy incentives** or **regulatory concessions** are needed to accelerate the development of public and depot-based **battery charging infrastructure** for e-bus fleets?

E-trucks

- What **financing mechanisms**, including innovative financing, can **address the high capital costs** of BS-6 and e-trucks for small fleet operators?
- How can **scrappage incentives be made more attractive and enforceable** to shift operators from old diesel trucks to BS-VI or electric alternatives?
- Which **freight segments (e.g., intra-city delivery) are most viable** for early e-truck adoption given current battery and load constraints?
- What **policy or R&D incentives** are needed to **accelerate the development and commercial availability of e-truck** models across medium and heavy-duty segments?
- How can national and state **EV policies be tailored to expand e-truck adoption**?
- What **training and skilling initiatives** are needed to build a reliable workforce for the manufacturing, maintenance, and operation of electric trucks across fleet and depot networks?
- What **policy incentives** or **regulatory concessions** are required to accelerate the development of fast-charging infrastructure for electric freight fleets, particularly along key logistics corridors?

CIEU and Dalberg Advisors acknowledge and thank the International Council on Clean Transportation (ICCT) for their valuable support and contribution in building this pre-read issue note to shape the roundtable discussion.