Road to Viksit Bharat

Five Building Blocks to Power India's Transition to Zero-Emission Trucks

Image used for representative purposes.

Charting the Course

India's zero-emission trucking (ZET) journey began only in the past few years, but it already reflects strong ambition, growing momentum, multi-agency coordination, and broad ecosystem support. Government agencies such as NITI Aayog, the Ministry of Heavy Industries (MHI), the Ministry of Road Transport and Highways (MoRTH), the Office of the Principal Scientific Adviser (PSA), and the Ministry of Ports, Shipping, and Waterways have developed technical roadmaps, policy recommendations, and incentive schemes that aim to catalyse the initial deployment of ZETs. Complementing these efforts, state governments, agencies such as the India Ports Association (IPA), and other private companies are facilitating pilots and partnerships to deploy different ZET technologies. From global pledges to on-ground trials, these milestones reflect the early uptake of ZETs in India and the emergence of a local ecosystem critical to scaling their deployment.

India's ZET Evolution

2022

September 2022
NITI Aayog launches e-FAST India, a platform to unite government and industry to accelerate medium- and heavy-duty trucking (MDT and HDT) electrification.

NITI Aayog releases *Transforming Trucking in India,* a landmark report that charts a pathway for ZET technology, infrastructure, finance, and policy.

2023

March 2023
PSA launches *Technical Roadmap for Deployment of Zero-Emission Trucking in India.*

July 2023
Businesses and fleet operators express demand for 7,750 electric freight vehicles by 2030, as part of NITI Aayog's E-Fast platform.

October 2023
PSA releases *Technology Assessment of Zero-Emission Trucking on the Delhi-Jaipur Corridor.*

Telangana launches Telangana – Zero Emission Trucking Accelerator (TN-ZETA), to drive state-level policies, pilots, and partnerships.

2024

April 2024
IPA launches *Piloting ZETs at Ports* initiative to accelerate ZET deployment at major ports.

July 2024
PSA releases *Technical Roadmap for Deployment of Zero-Emission Trucking in India Version 2.*

PSA releases the *eMobility R&D Roadmap for India.*

August 2024
PSA unveils the *Bharat ZET Policy Advisory* outlining 30 key interventions to reach 100% ZET sales by 2050.

September 2024
MHI unveils PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) scheme with total funding of ₹10,900 crore (~US$1.3 billion), including ₹500 crore (~US$57 million) for electric trucks and infrastructure.

December 2024
MHI's *Draft Guidelines for Inviting Proposals to avail incentives under the PM E-DRIVE Scheme for Deployment of EV Charging Infrastructure in India* outlines top 20 priority highways for electric trucks.

2025

February 2025
Tamil Nadu launches the Tamil Nadu Zero Emission Trucking Accelerator, which aims to foster the ZET ecosystem, including policy, pilots, and infrastructure.

May 2025
PSA launches India's Priority Corridors for ZET, identifying 10 key routes.

Maharashtra's *EV Policy 2025* introduces incentives for ZETs.

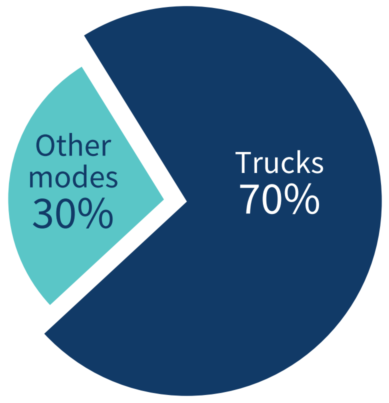
July 2025
MHI issues PM E-DRIVE incentive guidelines for electric trucks.

PSA releases the report on *ZET Adoption in India and Its Impact on Emission and Energy.*

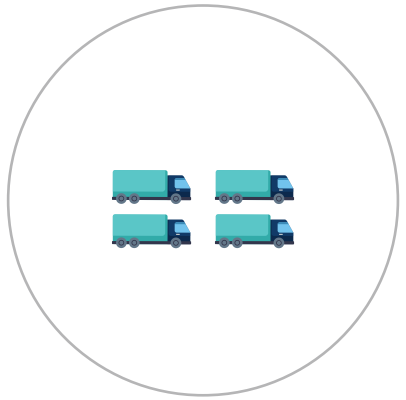
Bureau of Energy Efficiency (BEE) invites comments on the Draft Proposal for Future Fuel Efficiency Norms for Heavy-Duty Vehicles (HDVs), Medium-Duty Vehicles (MDVs), and Light-Duty Vehicles (LDVs).

Why Zero-Emission Trucking Matters for India?

The demand for truck movement in India will rise exponentially over the next three decades.[1]

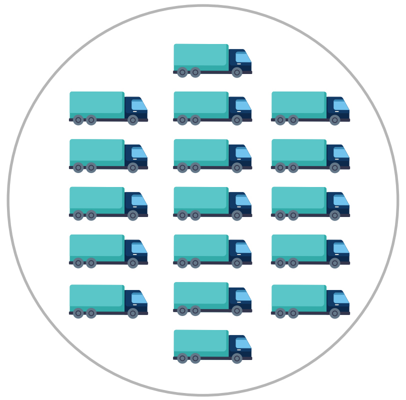


Share of total freight demand



4 million

Truck Stock, 2022

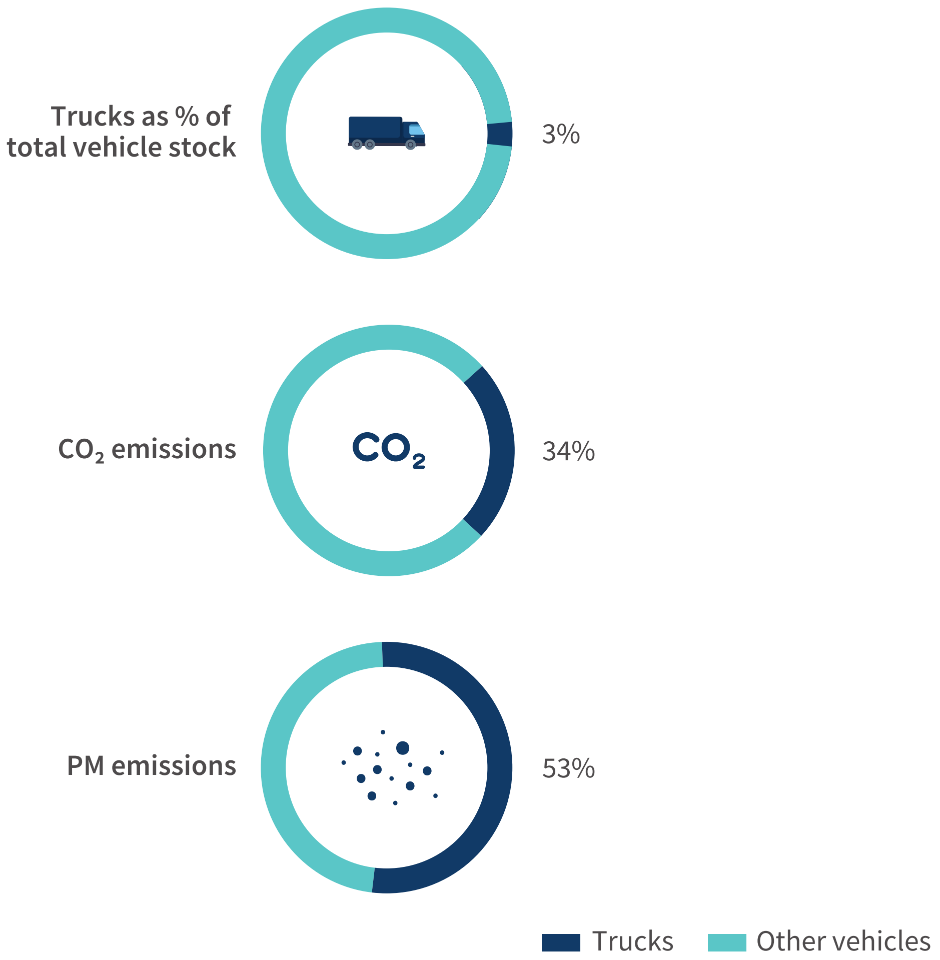


17 million

Truck Stock, 2050

While trucks are critical for economic growth, they disproportionately impact the environment.

Trucking as a portion of vehicle stock vs. contribution to CO_2 and PM emissions



ZETs present a strategic opportunity for India's transition to clean mobility and economic transformation.

With 85% ZET sales by 2050, India can cumulatively:

- Abate **2.8 gigatonnes of CO_2 emissions**
- Displace **993 billion litres** of diesel import, saving **INR 116 lakh crore**
- Reduce particulate matter (PM) and nitrous oxide (NOx) **pollution by ~40%**
- Create battery demand of **4,000 GWh**
- Unlock **17% savings** in logistics costs due to lower fuel consumption

Five Building Blocks for India's ZET Transition

India's ZET transition will depend on strong demand signals, mobilisation of capital, creation of infrastructure, ramp up of domestic manufacturing, and coherent policy action.

Unlock Demand for Early Moving Sectors

Aggregate use-case specific demand from anchor sectors.

Mobilise Capital for Transition

Structure innovative financing tools and risk-sharing models.

Deploy Charging Infrastructure along Priority Corridors

Build high-capacity charging along freight corridors with early grid planning.

Scale Local Manufacturing and Innovation

Support tech localisation and ramp-up of critical ZET components.

Align Policy and Incentives for Impact

Introduce fiscal and regulatory levers to boost adoption and localisation.

1. Unlock Demand for Early-Moving Sectors

OEMs need strong demand signals to invest in ZET production. Aggregating demand across key sectors will build confidence, inform product design, boost scale, and lower costs. Early-moving sectors where near-term demand creation and aggregation should be prioritised include cement, steel, ports, mining, and e-commerce.

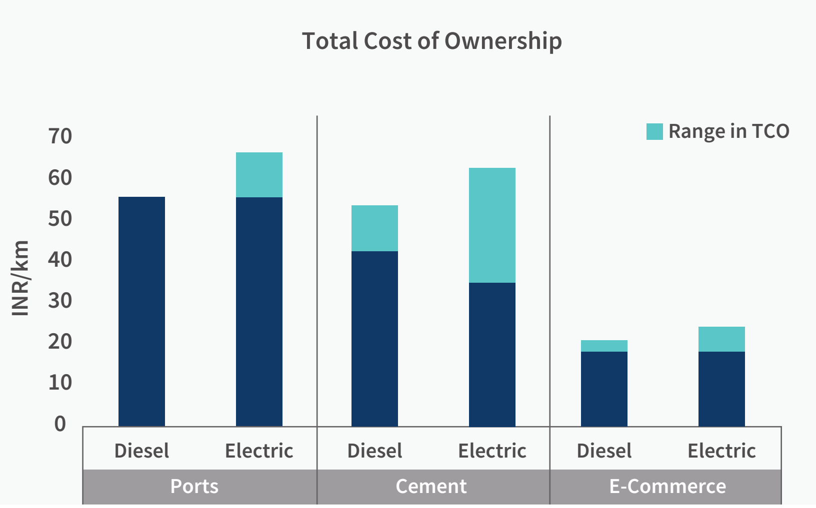
Truck movement in these sectors follows predictable schedules within closed-loop captive plants or along corridors, offers potential for high asset utilisation, and companies in these sectors have ambitious sustainability goals, making them favourable for early ZET adoption. The total cost of ownership (TCO) of ZETs in some of these sectors can be at par with diesel trucks, depending on factors such as distance travelled and electricity tariffs, among other influencing factors.

Image used for representative purposes.

Key Characteristics of Trucking Movement for Early-Moving Sectors

Sector	Typical Truck Type	Commonly Transported Goods
Cement	55T Tractor Trailer, 28 – 60T Tipper	Raw materials — limestone and fly ash Intermediary — clinker to cement plants and finished cement products to storage hubs, construction sites, and customers
Steel	55T Tractor Trailer, 28 – 60T Tipper	Raw materials — iron ore, semi-finished steel between plants, and finished rolled steel — to stockyard and customers
Ports	55T Tractor Trailer	Containers along with some bulk cargo
Mining	28 – 60T Tipper	Minerals like iron ore, zinc, and limestone
E-Commerce	14 – 18.5T Haulage Trucks	Mix parcel load from central hub (major city centre) to spokes (other cities)

TCO for Diesel Trucks vs. Electric Trucks for Some Early-Moving Sectors



Note: The analysis incorporates incentives available under the PM E-DRIVE scheme for electric trucks. The variation in TCO arises from differences in electricity tariffs for the ports use case and in daily distances travelled for the cement and e-commerce use cases. The TCO is calculated over a seven-year period and discounted to present value. The analysis assumes a 55-ton tractor-trailer for cement and port applications, and 18.5-ton truck for the e-commerce application.

Source: RMI Analysis, forthcoming publication

Action Items:

- ☐ Align demand-side players on ZET deployment goals and commitments.
- ☐ Aggregate demand in early-moving sectors and enable stakeholder information sharing.
- ☐ Standardise specifications and engage OEMs to develop ZETs that meet buyer needs.
- ☐ Implement a demand aggregation model via a nodal agency at the national/sub-national levels.

2. Mobilise Capital for Transition

Targeted financial tools are critical to funding ZET deployment and managing risks. Financial mechanisms help mobilise private capital to support the transition, while contractual agreements play a critical role in allocating risk and deployment responsibilities, making the investment case for ZETs viable. ZET-exclusive fleets and corporations with emissions reduction targets are expected to be early-moving ZET adopters. These actors present lower lending risks, particularly when ZETs operate in closed-loop, high-frequency routes with consistent revenue streams.

Mobilising Investment and Managing Risk to Enable ZET Adoption

Reducing Likelihood of Default	
PRODUCT	**Warranties and Buyback Guarantees:** Agreements that outline liability and, in some cases, include a buyback provision in the event of a ZET failure or repair help safeguard against product failures.
CUSTOMER	**Mezzanine Facility:** A structured finance mechanism that bridges up-front ZET costs. **Revenue Assurance Contracts:** Multi-year freight agreements with corporate aggregators ensure predictable cash flows, stabilising revenue streams for loan repayments.
OPERATIONS	**Service-Level Agreements (SLAs):** Contracts covering maintenance, spare parts availability, and penalties for noncompliance, safeguarding fleet performance. **Charging-as-a-Service:** Agreements with charging providers to develop, maintain, and operate charging infrastructure, transferring installation and operational risks.
Reducing Losses in The Event of A Default	
RESIDUAL	**Residual Value Guarantees:** A guarantor secures a stipulated resale value.
REMAINING	**Residual Sharing Facilities:** Reduce financier's liability in case of default.
Reducing Interest Costs	
STOP-GAP	**Concessional On-Lending:** Concessional capital is offered to financiers to on-lend for ZET procurement, mobilising capital, and incentivising lending to ZETs.
Enabling Insurance Coverage	
INSURANCE	**Comprehensive Insurance Products:** Comprehensive insurance covers specific ZETs and batteries as well as residual risk, and the financier can claim compensation for the vehicle in case of an accident or theft.

Source: RMI[2]

Action Items:

- ☐ Use tools such as concessional debt and blended finance to attract private capital and accelerate ZET adoption. Develop contracts (e.g., lease-to-own, charging access, maintenance services) to allocate risk and support financing.
- ☐ To scale ZET financing, focus first on reducing default risk by addressing product, customer, and operational risks before disbursing loans. Once loans are issued, use loss mitigation strategies, such as securing resale value, to limit financier losses.
- ☐ To scale ZETs in India, stakeholders must tackle the core implementation challenges of charging deployment by reducing cost uncertainty, improving utilisation forecasts, and unlocking fit-for-purpose financing.
- ☐ Targeted financial tools such as concessional debt, blended finance, and government-backed incentives — paired with clear deployment models such as public–private partnerships and charging-as-a-service models can enable stakeholders to manage risk better and align incentives to unlock investment and accelerate infrastructure rollout.[3]
- ☐ Capturing how early ZET adopters managed risk can provide powerful proof points that build lender confidence and accelerate broader market investment.

3. Deploy Charging Infrastructure along Priority Corridors

Scaling ZETs depends on a reliable infrastructure network and robust grid support. Prioritising infrastructure deployment along high-potential ZET corridors can effectively aggregate demand, increase asset utilisation, and de-risk investments. Identifying priority corridors with high traffic density, resilient grid infrastructure, and strong stakeholder interests is essential to kickstart ZET corridor development.

10 High-Priority Corridors for ZET Deployment

230 corridors

Phase 1: Assessment based on truck traffic, industrial clusters, and logistics hubs

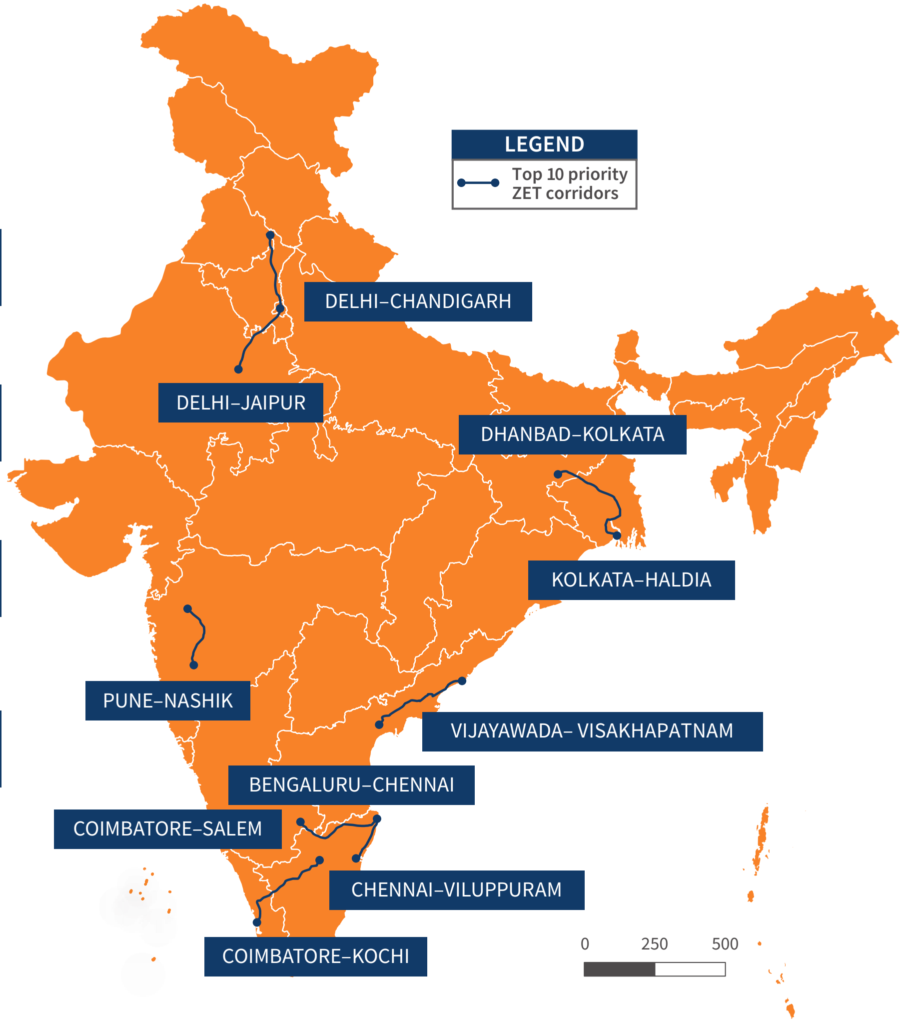
50 corridors

Phase 2: Prioritisation based on stakeholder votingresults

24 corridors

Phase 3: Field research to evaluate key use cases, grid preparedness, and wayside amenities

10 high-priority corridors



Source: Office of the Principal Scientific Adviser to the Government of India with support from RMI, CoEZET, and pManifold, India's Priority Corridors for Zero-Emission Trucking, https://psa.gov.in/CMS/web/sites/default/files/ publication/India's%20Priority%20Corridors%20for%20Zero%20 Emission%20Trucking_1.pdf.

Action Items:

- ☐ Allocate central and state funding for ZET infrastructure along priority corridors.
- ☐ Streamline approvals and provide clear guidelines for corridor charging development.
- ☐ Ensure early coordination among distribution companies (DISCOMs), charge point operators, and fleets for efficient infrastructure planning.
- ☐ Assess charging demand and associated grid upgrade needs and plan proactively to provide power for the requisite loads.
- ☐ Standardise charging protocols to improve interoperability across providers.
- ☐ Control charging costs through managed charging, optimal site selection, renewable access, and shared use with buses.

4. Scale Local Manufacturing and Innovation

India's ZET shift depends on strong local manufacturing and innovation in vehicles, batteries, powertrains, and charging systems. Building resilient supply chains will cut import reliance, lower costs, and position India as a global ZET manufacturing hub.

Market Levers to Build India's ZET Manufacturing Ecosystem

Market Lever	Typical Truck type
Introduce new ZET models	India currently has about 18 ZET models available, which is about 5% of all ZET models available globally.[4,5] OEMs can prioritise offering new models to enhance choices and meet fleet operators' varying needs.
Enhance local supply chains	The large scale of the trucking market positions India to develop localised ZET manufacturing and supply chains, serve domestic and global markets, minimise import dependency, and reduce up-front costs of ZETs.
Prioritise battery, fuel cell, and component manufacturing	India can focus on building domestic manufacturing capability for batteries while investing in alternative chemistry battery development to reduce reliance on imports for lithium and cobalt.
Strengthen battery recycling programmes	Given the larger battery packs and trucking stock, ZETs can serve as a significant source for recycled batteries. India can focus on developing enablers for battery recycling, including efficient mineral recovery and promoting circularity.

Source: NITI Aayog and RMI, *Transforming Trucking in India: Pathways to Zero-Emission Truck Deployment*

Action Items:

- ☐ Implement measures to enhance the supply and manufacturing of ZETs and components at national and sub-national levels.
- ☐ Form consortia among Indian and global OEMs to share knowledge and enhance collaboration, thereby spurring investment in ZET manufacturing.
- ☐ Allocate funds for research and development of advanced chemistry batteries, fuel cells, and other components, as well as battery recycling technologies.
- ☐ Enhance collaboration among OEMs, battery manufacturers, battery recycling and waste management firms, and end users of recycled batteries to create a seamless circularity network.
- ☐ Prioritise skill development to train the workforce in ZET and component manufacturing by strengthening industrial training institutes and government universities and upgrading the existing curriculum.

5. Align Policy and Incentives for Impact

Robust, forward-looking policies are essential to drive investment and expand ZET adoption. National and state governments should work in tandem to reduce cost barriers, create demand signals, and build a robust supply chain. Coordinated fiscal and non-fiscal instruments, ranging from purchase subsidies and public procurement to sales mandates and localisation-linked incentives, can unlock investment, strengthen domestic manufacturing, and drive ecosystem-wide ZET adoption.

Levers to Scale Demand and Supply		
Lever	**Description**	**Primary Impact**
Market Signals	Non-binding targets for 2030/2040/2050	Guides industry investment planning
Public Procurement	ZET targets for government fleets	Creates anchor demand and boosts OEM confidence
Purchase Incentives	Subsidy for ZETs and associated infrastructure	Reduces up-front cost, bridges TCO gap, and eases deployment
Interest Subvention	~5% rate buy-down on loans	Lowers monthly loan installment burden for fleet operators/buyers
Tax and Toll Waivers	100% road tax + 50% toll waivers	Reduces operational cost
Credit Programme	ZET sales-credit programme to meet minimum sales thresholds	Creates market pull and OEM accountability
Fuel Standards	Tighten fleet-average fuel consumption norms	Drives OEM compliance via ZETs
R&D Support	Grants and innovation challenges	Accelerates tech localisation and cost drops
Vehicle Regulation	Increased gross vehicle weight rating (GVWR) and length allowances	Offsets payload limitations in ZETs
Energy Tariff Reforms	Discount on high tension EV tariffs	Lowers charging costs

Action Items:

- ☐ Establish an inter-ministerial ZET task force to align incentive design, approval processes, and adoption targets.
- ☐ Support states in designing PM E-DRIVE-aligned policies suited to local freight needs, use-cases, and corridors.
- ☐ Engage anchor fleets, shippers, and platforms to signal near-term ZET demand and pool procurement.
- ☐ Design performance-based incentives that reward localisation of high-value ZET components such as motors, drivetrains, and battery modules.
- ☐ Integrate domestic content requirements into public and large-scale fleet procurements to prioritise locally built ZETs and boost *Make in India* outcomes.
- ☐ Develop dedicated ZET manufacturing zones with bundled support such as concessional land, capital subsidies, and fast-track clearances.

Supporting the Transition: RMI's Work on ZETs

RMI supports India's ZET transition through five levers

1

Enabling Ecosystems: Enabling ecosystems by addressing systemic barriers

Enabling modal shift to rail freight, improving logistics efficiency, and electrifying trucks are the key levers to clean and cost-effective freight transport in India.[6]
ZETs can lead to 2.8–3.8 gigatons of cumulative CO_2 savings through 2050.[7]

2

Policy Insights: Informing policies through data-driven insights

Well-designed policies are key to unlocking ZET adoption and scaling impact.[8]

3

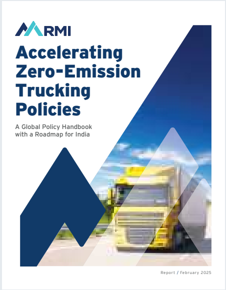
Infrastructure Readiness: Charging technology and corridor readiness

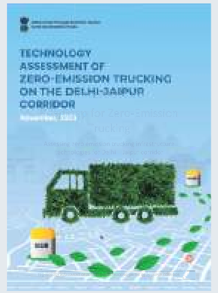
Compares seven charging technologies across economic, technical, and operational parameters.[9]
Highlights the top 10 corridors for ZET deployment.[10]

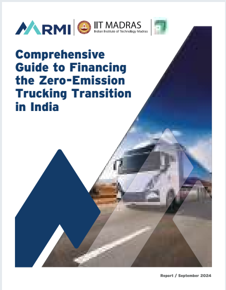
4

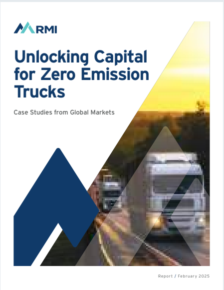
Facilitating Finance: Unlocking capital by de-risking investments

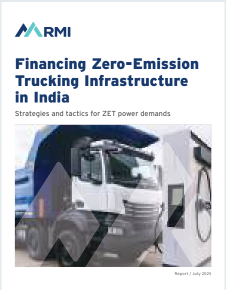
A comprehensive assessment outlining solutions to mitigate risk, share losses, and unlock ZET financing.[11]











Scan to read

5 Deployment Enablement: Demonstrating feasibility through pilots and partnerships

Telangana and Tamil Nadu Zero-Emission Trucking Accelerator aimed at fostering the ZET ecosystem.

ZET-related frameworks for driving adoption at ports.

India's Path Forward

The Moment Is Now: Why ZETs are India's Strategic Bet

- **Global tailwinds:** CALSTART's Global MoU on zero-emission medium- and heavy-duty vehicles (ZE-MHDVs) targets 30% ZET sales by 2030 and 100% by 2040, backed by governments, OEMs, fleets, and financiers worldwide.
- **Policy momentum:** PM E-DRIVE offers incentives for electric trucks and chargers; Telangana, Maharashtra, Madhya Pradesh, and Tamil Nadu are scaling action through state-led accelerators and policies.
- **Industry readiness:** OEMs like Ashok Leyland and TATA Motors have launched certified models, while start-ups such as IPLT, Olectra, and Kalyani Powertrain are also deploying ZETs. Fleet operators, including Billion Electric, Switch Labs, and Transvolt, are running ZETs for ports, e-commerce, and cement. Furthermore, charging players like ChargeZone, Statiq, and JioBP are scaling high-capacity infrastructure.
- **ZET-specific financing is also gaining momentum:** The Electric Mobility Financiers Association of India has pledged to finance 1,000 ZETs, and domestic banks and NBFCs have begun designing dedicated loan and lease products for ZETs and charging infrastructure.
- **Strategic advantage:** Strong domestic manufacturing, cohesive policy, and early deployments can position India to lead the global shift to clean freight.

Five Priority Actions for this Decade	
Strategic Pillar	**2030 Outcome**
1. Unlock demand for early-moving sectors	Large buyers in steel, cement, ports, mining, and e-commerce pool long-term purchase commitments, giving OEMs clear production signals.
2. Mobilise capital for the transition	Blended finance structures lower lending risk and open new debt and equity channels for trucks and charging assets.
3. Deploy charging infrastructure along priority corridors	High-power charging and timely grid upgrades are installed along India's key freight corridors.
4. Scale local manufacturing and innovation	Domestic value-addition rises across batteries, e-axles, and power electronics lowering costs and building a skilled workforce.
5. Align policy and incentives for impact	A unified national framework harmonises subsidies, sales-credit trading, toll-tax waivers and performance standards, with transparent review cycles.

Image used for representative purposes.

A National Opportunity for Global Leadership

India stands at the cusp of a logistics transformation. With policies in place, pilots underway, and industry mobilising, the pieces are aligned. The task now is to scale up — by aggregating demand, unlocking finance, building infrastructure, and backing domestic manufacturing. With focussed action this decade, India can lead the global ZET transition, powering clean freight, industrial growth, and energy security.

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Rocky Mountain Institute (RMI) is an independent, nonpartisan nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to secure a prosperous, resilient, clean energy future for all. In collaboration with businesses, policymakers, funders, communities, and other partners, RMI drives investment to scale clean energy solutions, reduce energy waste, and boost access to affordable clean energy to enhance security, economics and improve people’s livelihoods. RM is active in over 60 countries and has been supporting India's clean energy transition since 2016.

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