

# Powering the Electrification of Medium and Heavy- Duty Trucks in India's E-Commerce Sector



ISSUE BRIEF

Technical partner



<b>Suggested citation</b>	<i>Powering the Electrification of Medium and Heavy-Duty Trucks in India's E-Commerce Sector</i> . Climate Group. 2025. New Delhi.
<b>Disclaimer</b>	The views expressed in this study are those of the authors and do not necessarily reflect the views and policies of Climate Group.
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<b>Acknowledgment</b>	We would like to thank Shakti Sustainable Energy Foundation, EV100 members, Flipkart, IKEA, H&M, BLR logistiks, Tata Motors, Ashok Leyland, Volvo Eicher, IPLTech Electric Pvt Ltd, and Society of Indian Automobile Manufacturers (SIAM) for providing invaluable inputs and comments for this brief.
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# Highlights

- ➔ The e-commerce market in India is projected to reach approximately US\$ 292.3 billion, reflecting a 18.7% compound annual growth rate (CAGR).
- ➔ As e-commerce continues to expand, Medium and Heavy-Duty Trucks (MHDTs) are playing an increasingly critical role in logistics. MHDTs used for e-commerce parcel transport now account for around 15% of India's overall MHDT fleet.
- ➔ Electrification efforts have been primarily concentrated in two-wheelers and three-wheelers. E-commerce companies are actively exploring and piloting electric medium and heavy-duty vehicles as a strategy to manage freight costs.
- ➔ Obstacles to scaling electric MHDTs in the e-commerce sector include high upfront costs, inconsistent charging tariffs across states, prolonged homologation procedures and limited charging infrastructure.



# Messages from our partners

"India's logistics sector is undergoing a significant transformation. The rapid growth of e-commerce presents a compelling opportunity to develop cleaner, more efficient, and future-ready delivery systems. In this context, the electrification of transportation has become essential for ensuring long-term resilience.

At Flipkart, we acknowledge both the urgency and the responsibility to lead this transition by integrating electric mobility into our operations and reimagining the future of sustainable logistics. Since the deployment of 10,000 electric vehicles in November 2024, we have expanded our EV fleet by approximately 33%, with over 70% of our grocery deliveries now powered by electric vehicles. These initiatives underscore our commitment to a complete transition to electric fleets in alignment with our EV100 pledge. We are concurrently enhancing our charging infrastructure and introducing LNG-powered trucks to support longer-haul routes.

This Issue Brief by the Climate Group is particularly timely, offering valuable insights into the challenges and enablers associated with electrifying medium- and heavy-duty transportation—a sector that must evolve swiftly. We are proud to contribute to and shape this crucial dialogue as we collectively strive to build a cleaner, smarter, and more resilient logistics ecosystem for India's digital economy."

– Nishant Gupta, Head of Sustainability, Flipkart group

"As the largest IKEA retailer, operating in 31 countries, Ingka Group is committed to harnessing our size and scale to drive positive change. This includes our ongoing investment in the transition to zero-emission vehicles. Currently, IKEA products are delivered emission-free across 20 cities, in more than 300 IKEA locations, using a fleet of over 2,500 electric vehicles. To further accelerate progress, we will increase our investments, test innovative solutions, and continue to collaborate with industry partners."

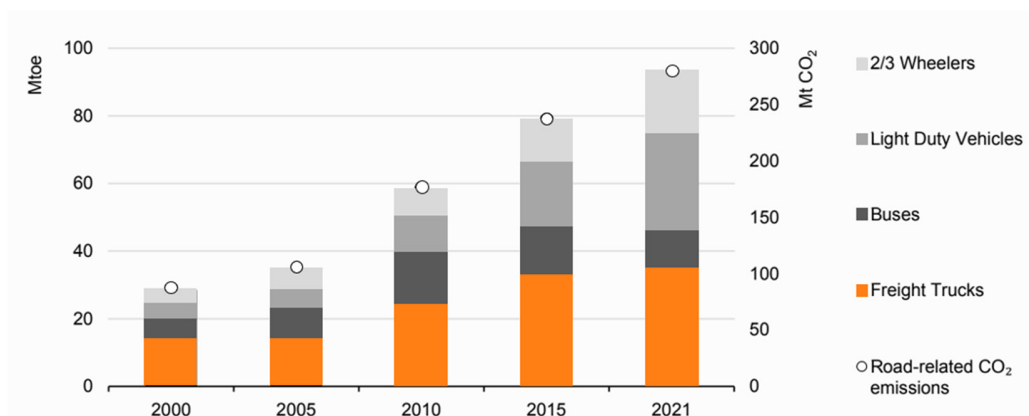
– Karen Pflug, Chief Sustainability Officer, Ingka Group





# Executive Summary

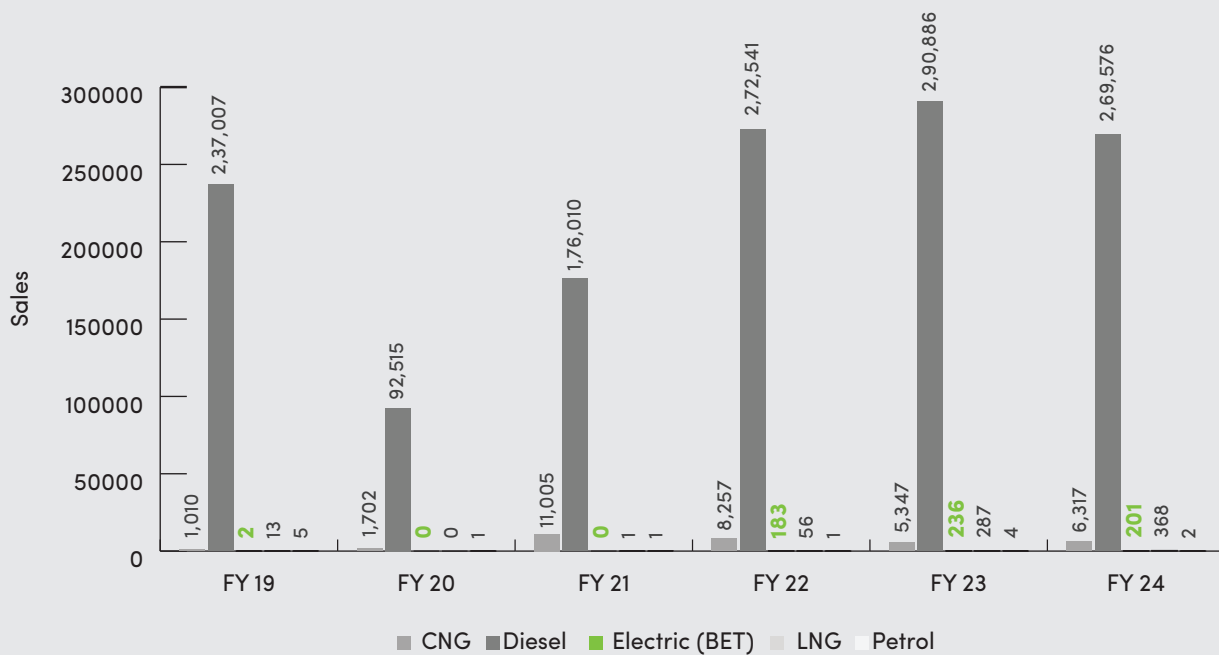
India has committed to limiting global temperature rise to 1.5°C above pre-industrial levels under the Paris Agreement. The country has set 2070 as its goal of achieving net zero, and aims to reduce the carbon intensity of its economy by at least 45% by 2030 under the Nationally Determined Contributions (compared to 2005 levels). Transportation holds significant decarbonisation opportunities. Dominated by freight trucks and passenger cars, India's energy demand and CO<sub>2</sub> emissions from road transport have more than tripled since 2000. In 2021, road transport contributed to 12% of India's energy-related CO<sub>2</sub> emissions of which trucks accounted for 38% of fuel consumption and CO<sub>2</sub> emissions (Insa Handschuch, Britta Labuhn et al, 2023).



**Figure 1: Road transport fuel consumption and related CO<sub>2</sub> emissions, 2000–2021**  
(Source: International Energy Agency)

Although passenger cars and freight trucks make up 3% of the total vehicle fleet, they emit 53% of particulate matter (PM) in the country's road transport (Sudhendu J. Sinha et al, 2022).

Even as diesel trucks dominate the freight market, electric powertrains in Medium and Heavy Duty Trucks (MHDTs) have gained attention over the years. Battery operated trucks too have witnessed growth in sales in FY 2022 and 2023.



**Figure 2: Fuel wise sales trend of MHDTs in India**

(Source: Vahan Database, 2024)

India's transport sector is primarily driven by economic growth, urbanisation, developments in sectoral growth, shifts in consumer and producer preferences, and changes in demographics and technology (National Transport Development Policy Committee, 2014).<sup>1</sup>

Transport is essential to operations India's e-commerce sector which uses transportation in first mile (transportation of products from the manufacturer or supplier to the warehouse or distribution centres), line-haul (transportation of products from warehouses or local centres to regional distribution centres) and last mile deliveries (local distribution centres to end customers).

In India's e-commerce sector, line-haul operations account for 45% logistics cost as against first mile (8%) and last mile (45%) (Anujesh Singh, Devika Kapur et al, 2018).

It is expected that the Indian e-commerce market will grow from US\$125 billion in FY24 to US\$345 billion in FY30 (India Brand Equity Foundation, n.d.). The rapid growth in the e-commerce sector is also likely to add emissions in the future. In the global context, global e-commerce deliveries could emit up to 160 megatons of CO<sub>2</sub>/year by 2030, without any changes in fleet makeup (Devyani Singh, Greg Higgs et al, 2023). For India's e-commerce sector, clean transport interventions thus play a crucial role in curbing heavy logistics cost on account of rising energy costs and environmental impacts.

**This brief documents business insights on electric MHDT usage in India's e-commerce sector and draws on sector practices and recommendations for electric truck adoption with an aim to decarbonise transport. The brief excludes quick commerce.**

<sup>1</sup> India Transport Report, Moving India to 2032, National Transport Development Policy Committee



A white semi-truck is driving on a multi-lane highway. The background features a line of trees with vibrant autumn foliage in shades of orange, yellow, and brown. The sky is clear and blue. The text is overlaid on the left side of the image, partially covering the truck and the landscape.

**Trucks are  
vital to  
e-commerce  
logistics in  
India and rely  
on the growth  
in transfer of  
commodities  
across sectors.**

# Tracking the rise of e-MHDTs in India's e-commerce sector

Trucks are vital to logistics in India and rely on the growth in transfer of commodities across sectors. This section explores use cases for e-trucks. A situation analysis for their adoption in India's e-commerce sector has also been conducted.

## 1.1 E-truck use cases

The Central Motor Vehicle Rules categorise goods vehicles in accordance with their Gross Vehicle Weight (tonnage). Such vehicles fall under the "N" category of motor vehicles as they have at least four wheels, are used for carrying goods and may also carry persons.

### Category N1:

A motor vehicle with Gross Vehicle Weight not exceeding 3.5 tons used for carrying goods.

### Category N2:

A motor vehicle with Gross Vehicle Weight exceeding 3.5 tons but not exceeding 12 tons used for carrying goods.

### Category N3:

A motor vehicle with Gross Vehicle Weight exceeding 12 tons used for carrying goods.

There is further demarcation as per industry practices, as shown in Table 1.



**Table 1: Market demarcation**

GVW Range [MT]	Category	Range pre-fixes	Segment as per regulation	Segment as per industry
GVW ≤ 3.5	N1	N1A	LGV	SCV
3.5 < GVW ≤ 7.5	N2	N2A	MGV	LDT
7.5 < GVW ≤ 12		N2B		IDT
12 < GVW ≤ 18.5	N3 2-Axle Rigid	N3A	HGV	MDT
18.5 < GVW ≤ 28	N3 Multi-Axle	N3B		
28 < GVW ≤ 49	Rigid	N3C		HDT
30 < GVW ≤ 55	N3 Tractor	N3D		HDT-TT



For the purpose of this brief, only MHDs with Gross Vehicle Weight (GVW) of 12 tons and above have been considered. Growing e-commerce demand has also pulled along the demand for trucks. During FY 2020-21, Tata Motors' Medium and Heavy Commercial Vehicles and Ashok Leyland's haulage and Intermediate Commercial Vehicle (ICV) registered sales growth of 7-10% and 25% respectively (Economic Diplomacy Division, Ministry of External Affairs, Government of India, n.d.).

A World Business Council for Sustainable Development (WBCSD) study reveals that complete adoption of EVs for e-commerce deliveries in India by 2030 could prevent 44% of the total CO<sub>2</sub> emissions caused by equivalent ICE vehicle variants (Appurva Appan et al, n.d.).

Battery electric trucks (BETs) present a strong case for e-commerce logistics. This brief assesses the potential of e-MHDs in e-commerce and their sub-application, particularly within the parcel load application.

### 1.1.1 PRESENT LANDSCAPE

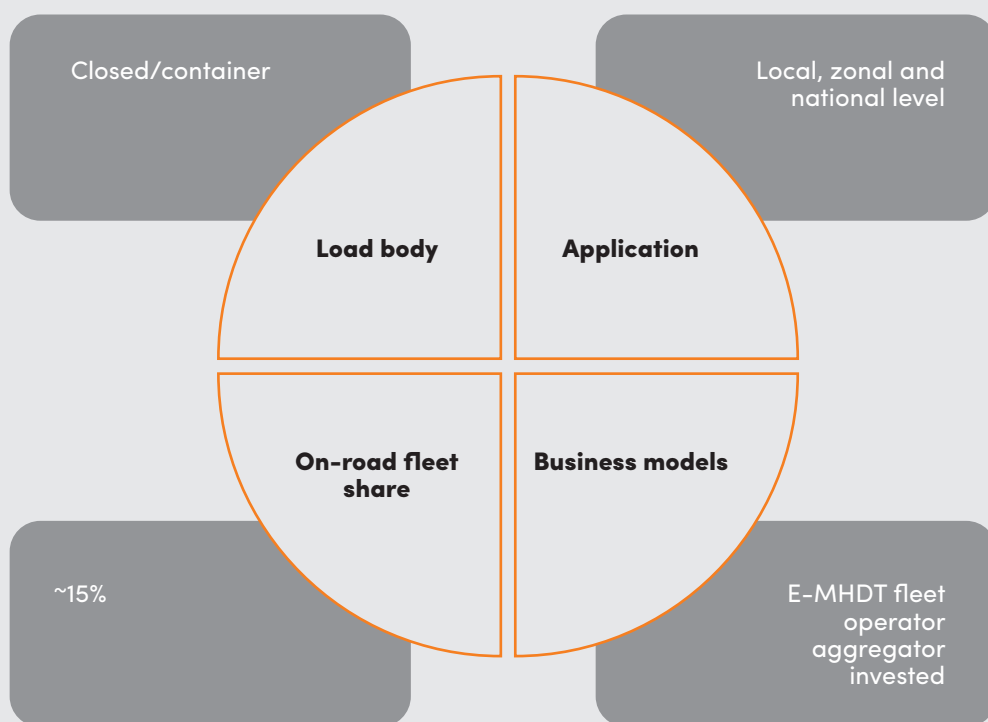
With the rise of e-commerce, MHDTs are becoming vital for logistics and delivery across local, zonal and national operations.

Primary consultations and surveys with original equipment manufacturers (OEMs) and logistics service providers (LSPs) reveal that MHDTs in e-commerce parcel load make up approximately 15% of the total MHDT fleet in India.

Figure 3 is an overview of the key characteristics shaping MHDT operations within India's e-commerce logistics landscape. The sector predominantly utilises closed or container-type load bodies to ensure secure and weather-proof goods transportation. Aggregator-invested vehicle fleets dominate the sector rather than business-owned fleets.

Trucks are used considering the distance and applications type, indicating the sector's deep integration into multi-tier distribution networks. Local-level applications are typically smaller in size and have a lower GVW to navigate urban areas and narrow streets. Zonal-level applications (150–350 kms) cover longer distances – typically between cities or regions. National-level applications (>350 kms) involve transportation over long distances, typically between regions or countries.

**Figure 3 Overview of logistics in India's e-commerce**



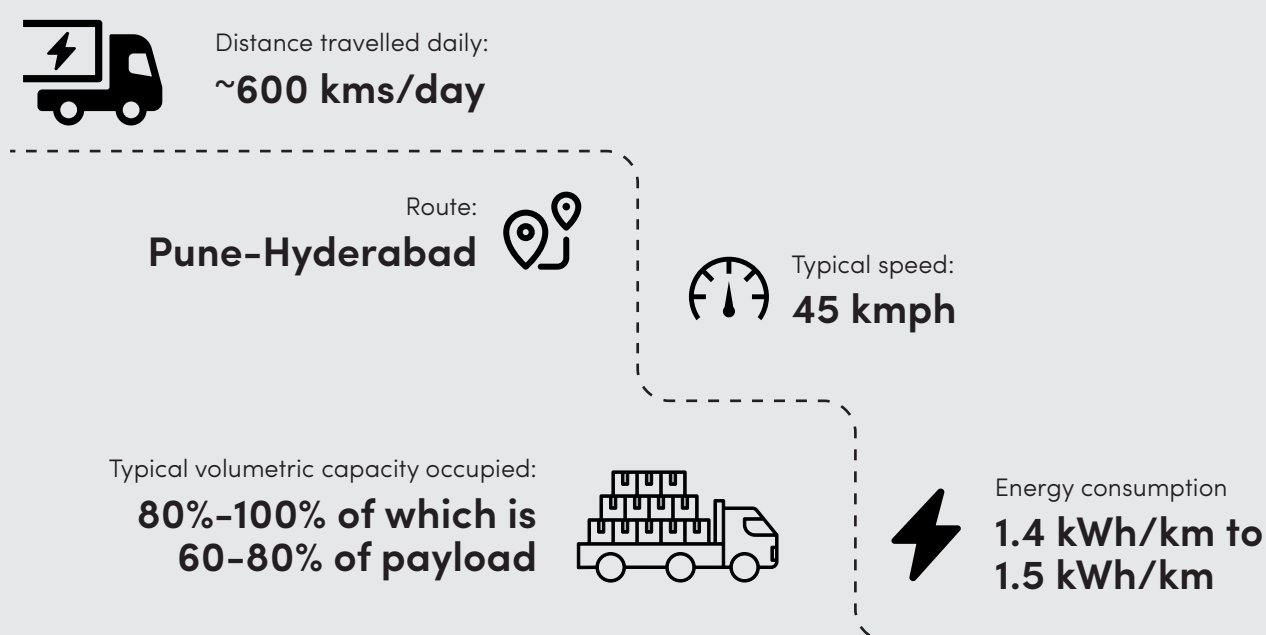
**Table 1 MHDT operational characteristics**

By application	Distance per day (kms)	Distance per trip (kms)	Average speed (km/h)	Average loading (% of payload)
<b>Local level</b> (< 150 kms)	50 – 150	10 – 25	20	70% – 80%
<b>Zonal level</b> (150 – 350 kms)	150 – 350	250 – 350	35	70% – 80%
<b>National level</b> (> 350 kms)	750 – 800	600 – 800	50	70% – 80%

For e-commerce, volumetric capacity is more relevant than payload capacity. Payload capacity is the maximum weight of cargo, including packaging and materials, that a vehicle can legally transport. Volumetric capacity is the total usable volume inside the truck body, usually measured in cubic feet (cu ft) or cubic meters (cu m). This ensures effective space utilisation, shipping costs and supply chain efficiency.

We estimated energy consumption of a typical use case on the parameters mentioned in Figure 4. Analysis was done on AVTR 55T 4X2 (a 55 ton electric truck model with average speed 20km/hr to 45 km/hr) which plies the Pune-Hyderabad route and covers a total distance covering ~600 kms. It consumed between 1.4 to 1.5 kWh per kilometre of energy.

**Figure 4 Key operational metrics of MHDTs for e-commerce in India**








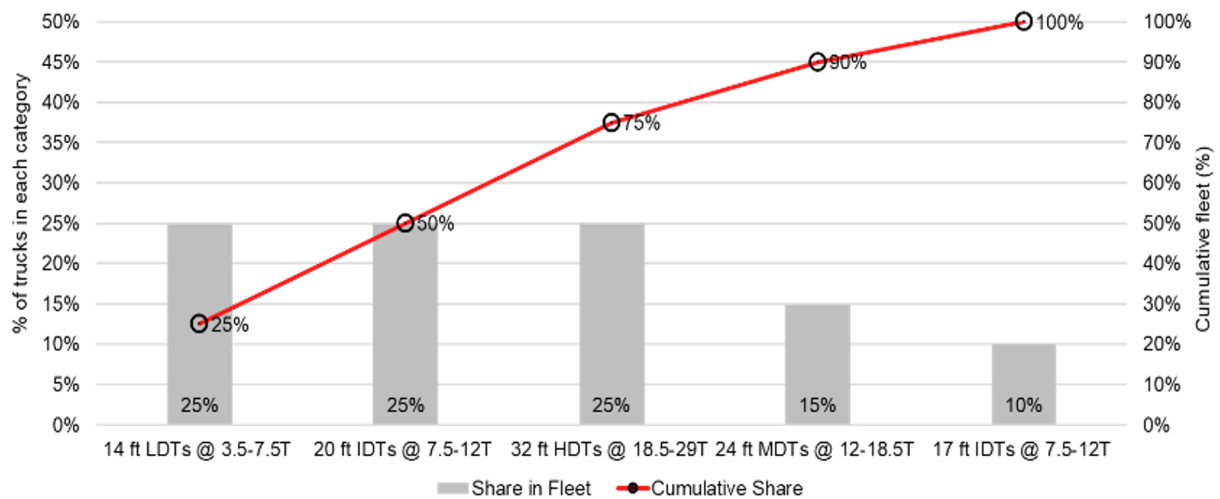
### 1.1.2 E-TRUCKS BEST SUITED FOR THE SECTOR

In our industry consultations, we found that electric truck models are being evaluated on their suitability in local, zonal and national level operations, distance they can travel, cargo type, payload capacity and body style. Table 2 outlines key characteristics of e-truck models across e-commerce applications.

**Table 2 E-truck product landscape**

Parameter		Local-level	Zonal-level	National-level [GVW > 12 T]
Axle		4 X 2	4 X 2	4 X 2
Body style		Rigid with closed load body	Rigid with closed load body	Rigid with closed load body and tractor trailer
Loading capacity	14 feet	Local: 7.5 T GVW		
	17 feet			
	20 feet			
	24 feet		Zonal: 19 T GVW	
	32 feet			National: 29 T GVW
		Representative image	Representative image	Representative image
				

As per discussions with major e-commerce players, MHDTs transport approximately 40% of the load in the sector. The fleet landscape ranges from 3.5 ton to 29 ton determined by accustomed contracts, business models and kilometres to be covered.



**Figure 5:**

**Fleet share in %**

LDTs: 25%  
I&MDTs: 50%  
HDTs: 25%

- Contracts are YoY basis with vendors who operate fleets for e-commerce companies.
- Utilises mixed pricing model (both Rs/km and Rs/ton-KM depending on the commodity)

**Kms travelled per day**

Local level: 50-100  
Zonal level: 150-350  
National level: 750-800



### 1.1.3 CURRENT E-TRUCK MODELS IN INDIAN MARKET

E-truck OEMs have built up the segment, but challenges persist. While the technology is available, as seen with e-buses, there is a shortage of BET models suited for e-commerce where container height often dictates cargo capacity. The lack of sufficient BETs on the road is a major reason for the delay in development of a sustainable electric truck ecosystem for the e-commerce sector.

Our primary consultations with OEMs and research institutions reveal that e-trucks are crucial to their future strategies. OEMs are also offering truck models for trial runs to gauge techno-commercial feasibility. Table 3 below outlines e-truck models available in the Indian market.

**Table 3 Available e-MHDT models in Indian market**

Manufacturer	Model	Segment	GVW [tons]	Battery capacity [kWh]	Range [kms]	Availability
<b>Ashok Leyland</b>	<a href="#">BOSS 14T EV</a>	MDT	14	201.5	230	Commercially available
	<a href="#">BOSS 19T EV</a>	MDT	18.5	201.5	194	Commercially available
	<a href="#">AVTR 55T EV</a>	HDT	55	301.5	185	Commercially available
<b>Electron EV</b>	<a href="#">Amber</a>	MDT	7-15	64	150	Launch date not disclosed
<b>Volvo Eicher</b>	<a href="#">Pro 3015</a>	MDT	16 – 19	–	400	Commercial launch is still planned
<b>IPLT</b>	<a href="#">Rhino 5538</a>	HDT	55	282	189	Available for pilots
<b>Volvo</b>	<a href="#">FH Aero Electric</a>	HDT	44	360–540	300	Commercially available
<b>Tresa Motors</b>	<a href="#">Model V0.2</a>	MDT, HDT	18–55	300	600	Pilot stage

The e-commerce sub-application is unique in two ways. Firstly, businesses typically employ lighter trucks – 14 ton and 19 ton – with 80–100% volumetric capacity utilisation (60–80% payload capacity utilisation), which can run long distances in a day. Secondly, even within e-commerce, companies employ vastly different truck fleets and usage patterns. For instance, trucks in the ranges of 14 ton and 19 ton or 40 ton above are common in the sector.

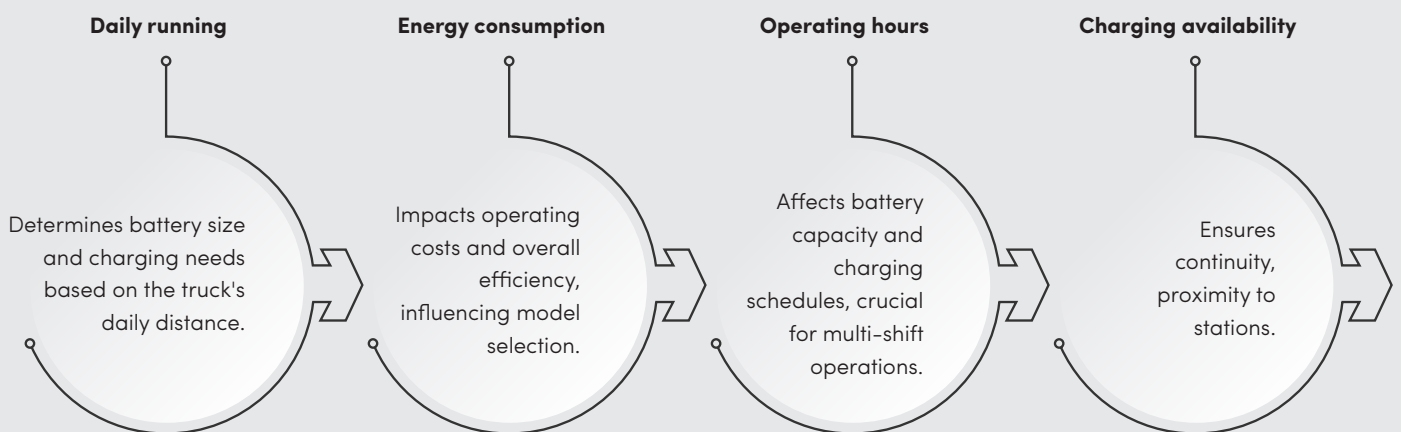
Retrofitted e-trucks are also being tried in certain use cases. However, the scalability of retrofitted trucks remains a challenge in the absence of appropriate regulations.



### 1.1.4 SELECTION CRITERIA USED BY BUSINESSES FOR BEST SUITED E-TRUCK MODEL

The selection of the best-suited e-truck for e-commerce logistics, particularly in the parcel load segment, depends on various factors. Based on industry consultations, we mapped the selection criteria guiding their decision-making to select an appropriate e-MHDT model as presented in Figure 5.

Figure 5 Selection criteria for best suited e-truck model



## 1.2 Government initiatives and market dynamics to leverage e-truck adoption

India's e-commerce and logistics sectors are set to benefit from supportive government initiatives and evolving market dynamics. This section contains the key initiatives influencing this shift:

- **PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE):** The Indian government's PM E-DRIVE has included e-trucks in the subsidy scheme, the first time this has been done. The scheme outlays ₹500 crore for e-trucks with an indicative year-wise, component-wise fund allocation. While e-trucks have gained some focus under the scheme, this scheme can be a strong lever if unveiled at scale<sup>2</sup>.
- **State EV policies:** At present, 28 states have notified their electric vehicle policies to promote sustainable electric mobility and reduce transport emissions. The policies cover 2W, 3W, 4W (electric goods carrier with GVW not exceeding 3.5 tons) with incentives for these categories. However, these policies currently lack focus on e-trucks.
- **Retrofitment:** Retrofitting ICE vehicles with electric kits offers a cost-effective way to transition to electric vehicles, extending the life of existing fleets while reducing emissions. There are some guidelines and regulations for retrofitting of ICE vehicles with electric drivetrains, for categories excluding heavy duty trucks. There are instances of MHDTs being retrofitted for specific use cases, but the coverage is limited. Extending regulations for retrofitment to MHDTs may support faster adoption of e-trucks across wider use cases.
- **Scrappage policy:** Effective from 2024, the Scrappage policy provides incentives for retiring older commercial vehicles. The scrapping of 15–20 million vehicles is envisioned over the next decade. The Voluntary Vehicle Fleet Modernization Program (VVMP) under the Scrappage policy encourages the voluntary replacement of older vehicles with newer, cleaner ones through incentives such as tax rebates and discounts on new vehicle purchases.
- **PM Gati Shakti:** This initiative is aimed to strengthen the country's logistics infrastructure by developing integrated logistics hubs and expanding charging networks. Leveraging PM Gati Shakti, e-trucks can be integrated in policy implementation to address range anxiety concerns and streamline operations<sup>3</sup>.
- **Production Linked Incentive (PLI):** Aiming to boost domestic manufacturing, the PLI scheme for auto components and advanced chemistry cells supports the electric vehicle sector. The National Programme on Advanced Chemistry Cell (ACC) battery storage has been allocated a budget of ₹18,100 crores to foster battery manufacturing in India with emphasis on maximum domestic value addition<sup>4</sup>.
- **National Logistics Policy:** Launched in 2022, this policy aims to streamline efficiency in processes, digital systems and regulatory improvements. The policy's focus is on reducing logistics costs, and e-trucks can play a key role in achieving this objective.

<sup>2</sup> PM E-Drive Scheme

<sup>3</sup> PM Gati Shakti – National Master Plan for Multi-modal Connectivity

<sup>4</sup> <https://heavyindustries.gov.in/pli-scheme-national-programme-advanced-chemistry-cell-acc-battery-storage>



**Other regulatory regimes:** The Central Motor Vehicles Rules (CMVR) play a crucial role in shaping the India's e-truck industry .

- CMVR provides a framework for the registration and permitting of e-trucks. The rules set limits on vehicle weights and dimensions. These regulations are particularly significant for e-trucks as battery weight can potentially impact payload capacity which is a crucial consideration for fleet operators and manufacturers.
- Indirect regulations such as emission control and Constant Speed Fuel Consumption norms for Heavy Duty Vehicles of GVW 12 tons or more further encourage the transition to fuel efficiency. However, these regulations have been unable to directly push for e-trucks.

**Other factors that must be considered to assess the favourability and barriers to e-truck adoption in e-commerce are:**

- **Service Level Agreements (SLAs) and time period:** Meeting SLAs is essential for maintaining customer satisfaction. E-truck use must ensure delivery efficiency without disruptions. Adequate charging infrastructure, range extension technologies and strategic route planning are vital to ensuring e-trucks can compete with ICE vehicles.
- **Vehicle turnaround time:** Transitioning to e-trucks also involves an understanding of the model turnaround time — the period between a truck completing a delivery cycle and commencing the next. Charging times, battery range and operational efficiency are key factors. Ultra-fast charging and battery swapping technologies can significantly reduce turnaround time, enhancing suitability for high-frequency delivery operations.
- **Contracting arrangements between shippers and LSPs:** The nature of contracts between off-takers and LSPs (vehicle aggregators) significantly influences the transition decision. Long-term contracts with load assurance provide greater certainty for investment in e-trucks, whereas short-term or ad hoc arrangements may deter LSPs from taking the financial risk associated with new technologies.
- **Drivers:** The shift to e-trucks necessitates training and welfare for drivers as they have different driving dynamics compared to ICE vehicles. The operational shift might impact working hours, especially if charging times extend working periods. Drivers are key to maximising e-truck range and time efficiency.
- **Charging infrastructure:** Adequate public and private charging infrastructure, including charging points along key freight corridors and urban routes are essential for long and shorthaul deliveries. Inadequacy of charging infrastructure currently hampers the scalability of e-trucks in the e-commerce sector.

# 2

## Corporates driving e-MHDT ambition in India

India's e-commerce sector has logistic challenges and opportunities in order to prioritise speed and convenience, and ensure supply chain efficiencies..

E-commerce companies play an important role considering India's e-commerce industry's projected growth of US\$ 292.3 billion in 2028 from US\$ 123 billion in 2024, a compound annual growth rate (CAGR) of 18.7% (E-Commerce Industry Insight Report, 2023).



## 2.1 Corporate goals

Leading e-commerce players like Amazon India, Flipkart and IKEA are accelerating the transition to e-trucks, in sync with their corporate sustainability goals. Corporate goals refer to strategic objectives that businesses set to align their operations with Environmental, Social and Governance (ESG) criteria, particularly to reduce carbon emissions. Currently, corporate goals are driven by government regulations namely Business Responsibility and Sustainability Reporting (BRSR), corporate social responsibility, and business strategies to reduce climate risks.

Global campaigns like EV100 and EV100+, led by Climate Group, encourage full EV adoption by 2030. EV100+ focuses on electrifying heavy-duty transport. Similarly, initiatives like Drive to Zero which is part of the Global Commercial Vehicle Drive to Zero campaign fosters partnerships across industries and governments to accelerate the adoption of zero-emission commercial vehicles. Listed below are the fleet electrification commitments of major e-commerce companies.

### Corporate goals and targets:

#### AMAZON INDIA:

Amazon has committed to achieving net-zero carbon emissions by 2040, a decade ahead of the Paris Agreement's goal. They aim to deploy 10,000 EVs in their delivery fleet by 2025. The company has also kickstarted the development and deployment of zero-emission medium and heavy-duty electric trucks and charging infrastructure through the Laneshift initiative (Press Release, Amazon, 2023).

#### FLIPKART:

The company's EV fleet for last-mile deliveries has seen a 70% year-on-year growth. Flipkart has committed to 100% EV fleets through its strategic partnership with Climate Group's EV100 initiative. Collaborations with leading OEMs such as Hero Electric, Mahindra Electric and Piaggio aims to achieve 100% last-mile electric fleet by 2030 (Flipkart stories, 2024).

#### IKEA:

With an aim to cut greenhouse gas emissions in all stages of its value chain, the company has doubled its EV fleet each year globally, with FY22 being an exception (IKEA, n.d.). Over 500 zero emission trucks are operated globally for IKEA through more than 40 partners (INGKA newsroom, n.d.). IKEA, with its four global companies, has committed to EV100+ to transition to zero-emission electric trucks by 2040 (IKEA, 2022).



# 3

## Comparative analysis: e-trucks vs ICE trucks in e-commerce

**With ambitious sustainable commitments towards zero-emission vehicles, companies are leading efforts in decarbonising e-commerce logistics. Their initiatives highlight the importance of corporate leadership in addressing climate change and transport electrification. These efforts will also enable development of the EV ecosystem.**

This section makes a detailed comparison of evaluating cost, homologation time, salvage value, financing and charging/fuel time for both ICE and e-trucks. The analysis highlights the feasibility of e-truck adoption.



### 3.1 Business landscape

The analysis is to support fleet operators, logistics providers, and financial institutions in comprehensively assessing the Total Cost of Ownership (TCO), operational efficiency, and long-term viability of e-trucks. Understanding the trade-offs, financial implications, and practical considerations is vital when adopting electric trucks in the e-commerce sector.

**Table 4 Comparative analysis: ICE and e-trucks**

Aspect	ICE trucks	E-trucks
<b>Homologation time</b>	Streamlined process; quicker time-to-market due to well-established regulations.	Lengthier and costlier due to newer fuel technologies and evolving regulations, leading to delays in market entry.
<b>Cost</b>	<ul style="list-style-type: none"> <li>Lower upfront costs due to mature manufacturing processes and economies of scale.</li> <li>Key factors affecting OpEx are regular maintenance, fuel expenses.</li> </ul>	<ul style="list-style-type: none"> <li>3-4 times higher upfront costs primarily due to expensive batteries, which account for 40-45% of the total truck cost.</li> <li>Key factors affecting OpEx are new technology, reliance on OEMs, EV battery packs.</li> </ul>
<b>Financing</b>	<ul style="list-style-type: none"> <li>Well-developed financing options, with banks offering loans covering 90-100% of the truck's value.</li> <li>Interest rates range from 7% to 22%, benefiting from established market trust.</li> <li>Established contract tenures, providing predictability for financing options.</li> <li>Payback periods typically range from 1 to 7 years, reflecting established market norms.</li> </ul>	<ul style="list-style-type: none"> <li>Limited options, with NBFCs financing only 70-80%. Mainstream banks are less involved, indicating a need for more government support.</li> <li>Higher interest rates due to the perceived risks associated with newer technology.</li> <li>Longer contract tenures (3 years or more) are often required for e-trucks, instilling more confidence in lenders and allowing better financing access.</li> <li>Payback periods are currently being explored and may extend to longer periods due to novelty of technology.</li> </ul>
<b>Business models</b>	Traditional models with strong supply chains, parts availability, and service networks.	Emerging models like battery leasing and subscription services reduce upfront costs. As infrastructure grows, new business models will drive adoption.



Aspect	ICE trucks	E-trucks
<b>Payload capacity</b>	Generally higher payload capacity due to established designs and heavier build.	Reduced payload capacity due to the weight of the battery and electric components which may pose a challenge. However, this is less significant in e-commerce, where volumetric load is common, allowing for effective utilisation of 60-80% of the payload.
<b>Energy consumption</b>	Generally higher energy consumption due to the inefficiencies in internal combustion engines.	Typically more energy-efficient, with electric drivetrains converting over 80% of energy into movement, compared to around 20-30% for ICE trucks. E-trucks also benefit from regenerative braking, which can reduce overall energy use.
<b>Charging/Fueling time</b>	15-20 minutes for refueling, allowing for higher uptime and efficient long-haul operations.	2-2.5 hours for charging, leading to longer idle times. Battery swapping and ultra-fast charging stations could mitigate this, but infrastructure is still limited.
<b>Uptime</b> (Amount of time a vehicle is operational and available for use.)	High uptime due to established refueling infrastructure and quick refueling.	Potentially lower uptime due to longer charging times and limited charging stations.
<b>Idle time</b> (Duration a vehicle is not in motion.)	Low idle time as refueling is quick and widely accessible.	Higher idle time due to longer charging durations and lack of fast-charging options.
<b>Vehicle productivity</b>	High productivity due to established infrastructure and long range.	Potentially lower productivity due to range limitations and charging needs.
<b>Maintenance and reliability</b>	Regular maintenance required for engine, fuel, and exhaust systems; well-established service network.	Lower maintenance needs because of fewer moving parts; emerging service infrastructure.
<b>Second life</b>	Established secondary market with well-defined salvage values, allowing for easier resale and parts recovery.	Still in a nascent stage, with limited understanding of salvage value; battery recycling and repurposing infrastructure are not yet well-established, making it challenging to assess the long-term value of e-trucks.

Aspect	ICE trucks	E-trucks
Driver	Drivers are well acquainted with conventional diesel trucks. Continuous availability of work attracts drivers.	Technology is new thus drivers need specialised training. E-truck trials conducted by industry reveal that driving skills have major impact on efficiency of e-truck operations.
Salvage value	Diesel trucks come with an attractive salvage value due to established infrastructure and a mature market.	As per industry insights, the salvage value for e-trucks is currently unclear; lean e-truck market and infrastructure.

While e-trucks offer long-term cost savings and environmental benefits, key challenges such as high upfront costs, lengthy homologation processes, limited charging infrastructure, and uncertain salvage value need to be addressed. Improved financing options, faster regulatory approval, and better scrappage incentives will be crucial in increasing viability for fleet operators and facilitating a smoother transition to e-trucks in the e-commerce and logistics sectors.



# Global case studies

In the global transition to zero-emission trucking, countries have adopted diverse approaches. Table 5 highlights case studies from Germany, the United States and China, each showcasing key policy initiatives that have enabled MHDТ adoption by e-commerce.

**Table 5 Global case studies**

Country	Approach	Key impact factors related to e-commerce	Learnings
<b>Germany</b> Federal Ministry of Transport and Digital Infrastructure (BMVI), 2020 <sup>5</sup>	Federal Ministry of Transport and Digital Infrastructure's Roadmap of Measures based on the phase wise approach for drivetrains technologies including electric vehicles.	Vehicle distance travelled by electric drive train vehicles to be approximately one-third of the mileage in heavy road haulage by 2030. Emphasis on:  Regional Operations <ul style="list-style-type: none"> <li>• Developing charging infrastructure by year 2023.</li> <li>• BEVsTs (&lt;26T) ideal for urban e-commerce logistics.</li> <li>• Spatial compaction and capacity enhancement till 2030.</li> </ul>	Federal ministry focuses on funding of vehicles, infrastructure deployment and regulatory framework during the period 2020 to 2030 and beyond.

<sup>5</sup> An Overall Approach to Climate Friendly Commercial Vehicles, Federal Ministry for Digital and Transport, Germany, Dec 2020

Country	Approach	Key impact factors related to e-commerce	Learnings
		<p>Long distance operations</p> <ul style="list-style-type: none"> <li>• Focus on research and development for ultra-fast charging, demonstration of technology, standardisation, scaling (from 2020 to 2024).</li> <li>• R&amp;D/testing of battery sizes, ranges ~400kms, demonstration projects (from 2020 to 2024).</li> <li>• Deployment of charging networks on long-distance routes (2024 to 2030 and beyond).</li> <li>• Market ramp-up of BEVs in long-distance operations (2024 to 2030 and beyond).</li> <li>• In 2018, federal subsidy scheme for electric trucks in Germany. Grants ranging from €12,000 to €40,000 depending on the trucks' weight.</li> <li>• 2020: Federal government doubled electric vehicle subsidies, support for diesel removed. €1.2 billion were opened for private and municipal operators for bus and truck fleet modernisation programme to switch to alternative (Dan Welch, Cristiano Façanha et al, 2020).</li> </ul>	



Country	Approach	Key impact factors related to e-commerce	Learnings
United States <sup>6</sup>	Tax credits for clean vehicle, applicable for businesses and tax-exempt organisations.	<p>US \$7,500 for all street electric vehicles, other than compact car PHEVs, with a GVWR of less than 14,000 pounds.</p> <p>US \$40,000 for all other vehicles with a GVWR of 14,000 pounds or more (US Department of Energy, n.d.).</p> <p>California's Advanced Clean Trucks regulation: A regulation approved by the California Air Resources Board (CARB). It encourages manufacturers to sell medium and heavy-duty vehicles with electric drivetrains as the eligible category, between 2024 to 2035. Uses cap-and-trade mechanism to facilitate manufacturers to comply with the rules (ACT, n.d.).</p>	<p>Tax credits for businesses and tax-exempt organisations to strengthen demand side.</p> <p>Supply side regulatory push with market based mechanism.</p>
China (Lingzhi Jin, Shiyue Mao, 2024)	NEV mandate in China aims to promote new energy vehicles (NEVs). Country is promoting swap-capable electric trucks.	<p>Promotion of swap-capable trucks: In 2023, BEVs witnessed growth in sales of 27% with 15,200 units sold. Country's promotional efforts have been supporting the growth of swap capable trucks.</p> <p>Fast adoption of BETs in key provinces like Guangdong.</p>	<p>More emphasis has been given to the infrastructure side. A conducive environment for swap-capable trucks, brings favourable changes in operational dynamics.</p>

Drawing broad lessons from above global case studies, direct incentives at supply side, demand side, and reinforcing charging infrastructure will be essential to promote electric trucks.

<sup>6</sup> The Beachhead Strategy: A Theory of Change for Medium and Heavy-Duty Commercial Transportation, CALSTART, Oct 2022



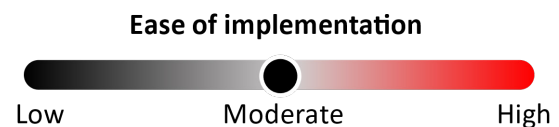
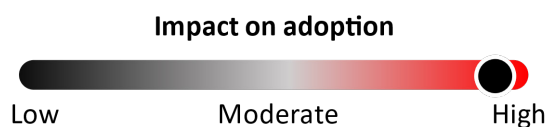
# Policy roadmap and recommendations

## 5.1 Sectoral Targets

### ESTABLISH SPECIFIC E-MHDTs TARGETS FOR E-COMMERCE

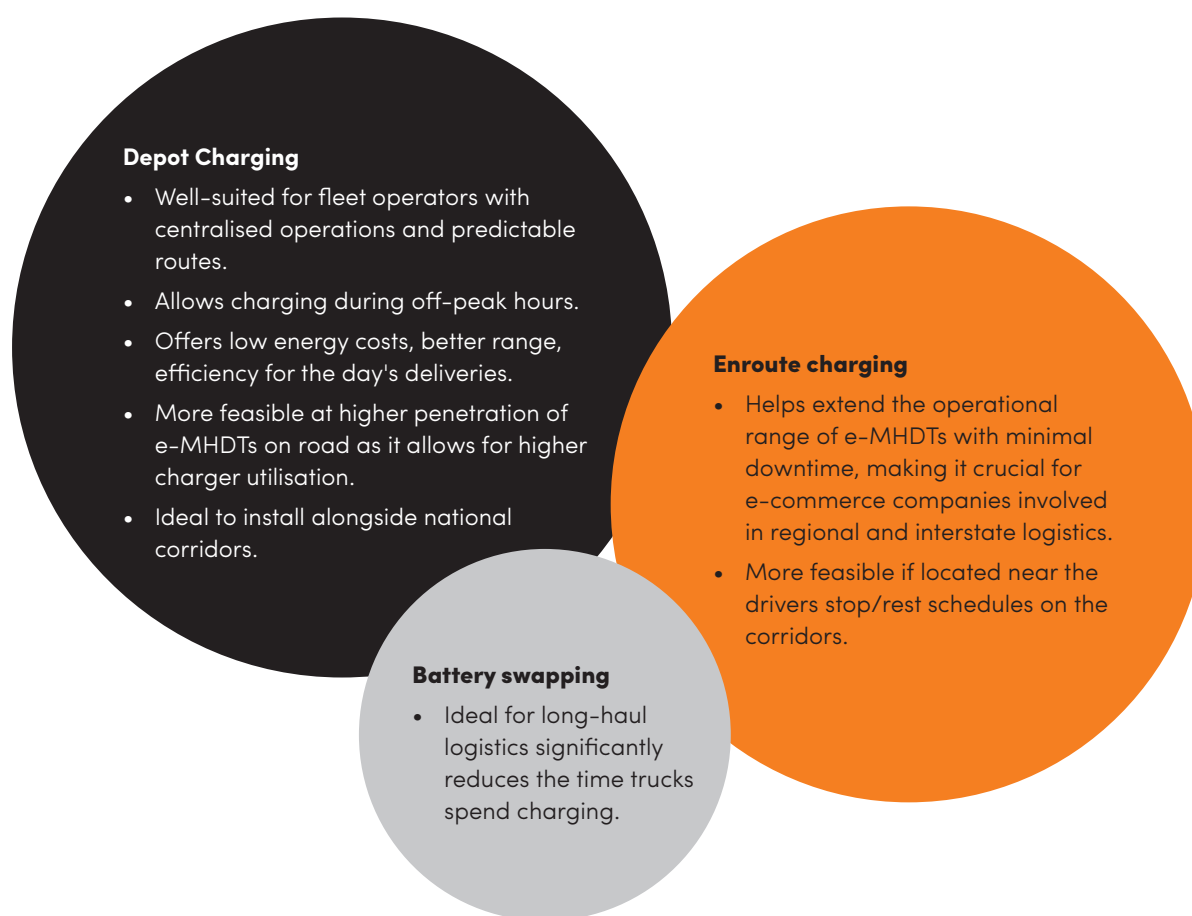
The Government of India has set targets to electrify 70% of commercial vehicles, 30% of private cars, 40% of buses, and 80% of two-wheelers and three-wheelers by 2030. However, e-MHDT targets remain vaguely defined and this is also true specifically for different use-case applications. Setting clear targets will drive demand aggregation for e-MHDTs, charging infrastructure development and regulatory push in e-commerce. Considering diverse supply chain operations, revenue dependencies and other regulations like CMVR, implementation may require a phased approach.

- **Key enablers are:** Ministry of Commerce and Industry, Ministry of Road Transport and Highways
- **Other enablers are:** Ministry of Finance, Ministry of Power, OEMs, and LSPs

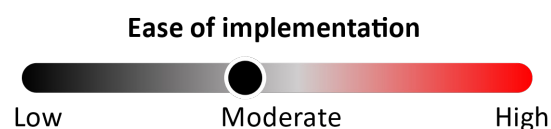
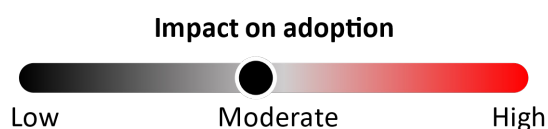


## 5.2 Reinforcing charging infrastructure

Handling diverse shipping processes such as milk run, mother-to-delivery hub logistics, interstate deliveries, depot charging guidelines, alongside ultra-fast enroute charging and battery swapping, offer practical solutions for reducing the downtime in e-commerce logistics. Currently, highway charging infrastructure predominantly comprises 60 kW chargers with minimal penetration of 120 and 240 kW chargers. To support deployment of trucks along corridors, penetration of ultrafast DC chargers (240 kW), and battery swapping is preferable. Further, integrating charging points at e-commerce hubs and warehouses will directly support the electrification of e-MHDTs in the sector. Expedited approvals and single-window clearance for energy related licenses and permits including the LT-HT line provision, will enable short distance movement of e-MHDTs between warehouses and hubs and will reduce dependency on enroute charging as well as allow for more strategic infrastructure planning.



- **Key enabler is:** Ministry of Power
- **Other enablers are:** Warehousing Development and Regulatory Authority, Ministry of Power, URDPFI, DPIIT, NHAI, State Public Works Departments, and regional authorities, alongside distribution companies, charge point operators, and OEMs.





## 5.3 Financing Instruments

Introduce provisions for soft loans and micro-financing for small and medium fleet operators, along with green bonds or low-interest loan options for e-commerce companies to accelerate transition to sustainable logistics solutions.

- **Key enabler is:** Reserve Bank of India.
- **Other enablers are:** Banks and financial institutions, the Ministry of Heavy Industries, and the Ministry of Finance.



Industry consultations reveal that re-financing options for battery replacement and truck repurposing could enable operators to manage long-term costs more effectively and potentially extend vehicle lifespan beyond the typical 5-year replacement cycle.

## 5.4 Dedicated programme for electric truck pilots in e-commerce sector

Currently, e-commerce companies are volunteering on electric truck pilots as part of strategy to meet their sustainability goals. Electric trucks are instrumental in business sustainability as well as climate mitigation.

Initial pilot programmes can focus on AMRUT (Atal Mission for Rejuvenation and Urban Transformation) cities with a phased implementation approach. Real time pilots would be instrumental in assessing feasible routes and infrastructure requirements.

- **Key enablers are:** Ministry of Housing and Urban Affairs, Ministry of Commerce and Industries, Ministry of Finance, Ministry of Road Transport and Highways
- **Other enablers are:** OEMs, e-commerce companies, Ministry of Power, and fleet operators



## 5.5 Public-private collaboration

At present, e-commerce logistics is driven by the ambitious logistics excellence, advancement, and performance shield (LEAPS) initiative. It is Anchored by the Department for Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry. The initiative spans achievements, sustainability, ESG alongside green logistics.

Considering the growth of the e-commerce sector in the future, a dedicated working group can be created by DPIIT, to bring e-commerce companies, LSPs and other relevant stakeholders onboard.

- **Key enablers are:** Ministry of Commerce and Industries, e-commerce companies, LSPs.
- **Other enablers are:** Ministry of Power, Ministry of Finance, Ministry of Housing and Urban Affairs.



## 5.6 Easing road entry permits and taxes

Entry permits and taxes for heavy-duty trucks in Indian cities regulate urban traffic flow and generate local revenue. While reforms like GST and e-way bills aim to streamline processes and address environmental concerns, restrictions such as time-based entry might help in reducing congestion but increase logistics costs due to non-productive truck hours. A comprehensive incentive structure, based on city tiers will enhance e-commerce electrification by increasing productive hours of e-trucks in urban environments, potentially reduce operational costs and support the transition to e-MHDT fleets.

- **Key enablers are** the Ministry of Road Transport and Highways, Ministry of Housing and Urban Affairs, NHAI, state governments, municipal corporations.
- **Other enablers are** the Ministry of Commerce and Industry, trucking associations, and logistics service providers.



## 5.7 Standardisation and guidelines

- **Standardisation of battery pack parameters for interoperability:** Standardising battery pack parameters across e-truck models is crucial for enhancing interoperability and enabling seamless integration within the ecosystem. Uniform specifications would simplify battery replacements and upgrades, reduce costs and enhance operational efficiency.
- **Battery safety and recycling standards:** Developing stringent standards for battery end-of-life management, and prioritising recycling and safe disposal to minimise environmental impact is

important. Mandatory battery health monitoring systems provide real-time diagnostics and extend battery lifespan.

- **Adequate regulations for retrofits in the current framework:** While retrofitment presents an economical solution to new electric trucks, our stakeholder consultations with shippers and logistic service providers revealed the requirement for proper regulation. Given the diverse operational range of trucks, incorporating retrofitment in Central Motor Vehicle Rules along with truck standardisation would create better opportunities for retrofitted e-trucks.
- **Key enablers are:** Bureau of Indian Standards (BIS), Bureau of Energy Efficiency (BEE), testing agencies like Automotive Research Association of India, Ministry of Road Transport and Highways.
- **Other enablers are** Ministry of Heavy Industries and OEMs.



## 5.8 Research and Development

### HIGHER INVESTMENTS IN RESEARCH, DEVELOPMENT, AND TECHNOLOGY INDIGENISATION

Expanding investments in research, development, and technology indigenisation is crucial for the growth of the e-truck sector in India. Key focus areas should be battery technology development, including:

- Exploration of alternative chemistries;
- Vehicle design and engineering that allows modifications and upgrades based on e-commerce needs.
- Research in charging infrastructure for reducing downtime while strengthening local manufacturing capabilities to reduce dependence on imports and enhance supply chain resilience.
- **Key enablers are** the Ministry of Commerce and Industries, Ministry of Finance, Ministry of Heavy Industries and Ministry of Road Transport and Highways, in collaboration with NITI Aayog and Ministry of Science and Technology.
- **Other enablers are** private sector partners, academia and logistics companies.



# Abbreviations and acronyms

<b>E-commerce</b>	Electronic commerce
<b>MHDTs</b>	Medium and Heavy-Duty Trucks
<b>ICE</b>	Internal Combustion Engine
<b>e-MHDTs</b>	Electric Medium and Heavy-Duty Trucks
<b>CO<sub>2</sub></b>	carbon dioxide
<b>ZET</b>	Zero Emission Trucks
<b>CNG</b>	Compressed Natural Gas
<b>LNG</b>	Liquefied natural gas
<b>CMVR</b>	Central Motor Vehicle Rules
<b>FY</b>	India Financial Year
<b>SCV</b>	Small Commercial Vehicle
<b>LDT</b>	Light-Duty Trucks
<b>IDT</b>	Intermediate Duty Truck
<b>MDT</b>	Medium-Duty Trucks
<b>HDT-TT</b>	Heavy Duty Tractor-Trailer truck
<b>LGV</b>	Light Goods Vehicles
<b>HGV</b>	Heavy Goods Vehicles
<b>MGV</b>	Medium Goods Vehicles
<b>BET</b>	Battery electric trucks
<b>OEMs</b>	Original Equipment Manufacturers
<b>LSPs</b>	Logistic Service Providers
<b>GVW</b>	Gross Vehicle Weight
<b>E-Buses</b>	Electric Buses
<b>TCO</b>	Total cost of ownership
<b>OPEX</b>	Operating expenses
<b>NBFC</b>	Non-Banking Financial Company
<b>DC Charger</b>	Direct Current Charger
<b>URDPFI</b>	Urban and Regional Development Plans Formulation and Implementation
<b>DPIIT</b>	Department for Promotion of Industry and Internal Trade
<b>NHAI</b>	National Highways Authority of India
<b>ESG</b>	Environmental, social and governance
<b>GST</b>	Goods and Services Tax



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