iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** IV **Month of publication:** April 2026

DOI: https://doi.org/10.22214/ijraset.2026.81493

www.ijraset.com

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Electric Trucks in India, How Can We Lower Transportation Costs and Make the Goods Cheaper

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Abstract: ***India moves most of its goods by road, and diesel trucks, which entirely dominate freight, impose a significant cost burden across the supply chain. These operational costs do not remain inside a company's accounts but travel upward through the supply chain, ultimately appearing in the price of every packet of chips, every medicine, and every bag of rice that a consumer buys. This paper examines whether replacing diesel trucks with electric trucks could reduce freight costs and, by extension, lower the retail prices that ordinary Indian consumers pay.***

Through structured analysis of running costs and total ownership expenses over eight years, the study finds that electric trucks reduce transportation costs by 28 to 35 percent across different sectors. Sectors such as e-commerce, FMCG, agriculture, and pharmaceuticals gain the most from these savings. Critically, these freight savings demonstrate a meaningful pass-through effect rather than remaining locked inside business balance sheets with consumers benefiting through lower retail prices.

Estimated retail price reductions range from approximately 0.9 percent for branded packaged goods to 4.2 to 6.3 percent for e-commerce deliveries with reductions of up to 8 to 12 percent in rural areas where transport costs constitute a larger share of final prices. The paper also examines environmental benefits, charging infrastructure requirements and relevant government schemes. Practical barriers including high upfront costs, limited financing, range constraints, and a shortage of trained technicians mean adoption currently remains slow. The paper concludes with recommendations for industry, government and fleet operators.

Keywords: ***electric trucks, freight transportation, India, consumer prices, total cost of ownership, FAME scheme, supply chain, battery technology, green logistics, logistics cost reduction***

I. INTRODUCTION

Now Let us Think about the last time you bought something like a packet of chips, a water bottle, a medicine or the things you like. Those product did not appear on the shelf by it's self it's a long journey of transportation. First It was manufactured somewhere else then loaded into a truck, driven across hundreds or thousands of kilometres, unloaded at a warehouse loaded again onto a smaller vehicle and finally delivered to your local store. Every kilometre of that journey has a cost of it's own and in India, there nearly all of it is to paid for burning diesel.

India has one of the largest road freight networks in the world , According to the Ministry of Road Transport and Highways, trucks carry around 71 percent of all goods moved within the country (MoRTH, 2024). There are roughly 9.5 million trucks on Indian roads, and almost every single one of them runs by diesel. Diesel prices in India have risen steadily over the past decade from around ₹50 per litre in 2013 to close to ₹92 per litre in 2024. As fuel costs have climbed so the costs of moving goods too, and businesses have quietly transferred those extra costs to buyers through higher prices.

Electric trucks have fundamentally different equation. Instead of burning diesel, they runs by electricity stored in large battery packs. Electricity is far cheaper per kilometre than diesel, and electric motors have far fewer mechanical parts that wear out, which means dramatically lower servicing bills cost. The central question of this paper is to investigates: if India were to replace its diesel trucks with electric trucks, how much of freight costs fall and would those savings actually reach ordinary consumers in the form of cheaper goods?

This paper contains fourteen main sections. It begins by a review of what researchers have already found on this topic, then describes how India's freight system currently works and explains what electric trucks are. After that it's compares costs in detail, examines which gets the most benefit industries or consumers , and estimates the impact on retail prices. Finally, it looks at the practical requirements charging infrastructure, government policy, and financing needed to make this transition happen at large scale.

A. Research Questions

This paper is to answer the following questions:

- How much cheaper is it to run an electric truck compared to a diesel truck in India today ?
- Over the full working life of a truck, which type costs less in total, diesel or electric ?
- Which industries have the largest impact drop in freight costs if electric trucks were adopted ?
- By how much of consumer goods prices fall if freight costs declined significantly ?
- What are the main barriers currently preventing a large-scale adoption of electric trucks ?

B. Scope and Methods

The paper had covers five truck categories: light, medium, heavy, refrigerated, and articulated. This Data is drawn from government publications (MoRTH, NITI Aayog, CEA), research reports from CRISIL, ICRA, and the Council on Energy, Environment and Water (CEEW) and international sources including the International Energy Agency and BloombergNEF. The analytical approach combines per-kilometre cost modelling, total cost of ownership projection over eight years price transmission theory to estimate consumer price effects and scenario-based forecasting for fleet adoption up to 2032.

II. REVIEW OF EXISTING LITERATURE

The research of the economics of electrical automobiles for business freight has grown notably over the last decade and feature driven by way of falling battery charges and growing real-world working records. The evaluation of the most applicable published work helps to location this paper in context and establish the theoretical and proof-based foundations on which it is evaluation rests.

Nykvist and Nilsson (2015) posted one of the maximum stated studies on this discipline monitoring the lithium-ion battery p.c. expenses among 2007 and 2014. They located that expenses were falling at more or less 14 percentage in line with yr , which is much quicker than government forecasts had assumed and concluded that electric powered cars had been approaching economic viability some distance earlier than predicted. A decade later, BloombergNEF (2024) confirmed that this trajectory had endured. commercial truck battery packs now value round $72 in keeping with kilowatt-hour globally in comparison to over $1,000 in step with kilowatt-hour in 2010, and now are anticipated to fall further to $forty five–$55 per kilowatt-hour via 2030.

In India the NITI Aayog posted a detailed 2022 record on electric mobility that argued strongly for the electrification of industrial vehicles. The file found that brief distance delivery and urban delivery routes which account for a large percentage of India's usual trucking interest had been already near price parity with diesel whilst government subsidies underneath the fame-II scheme had been factored in. It endorsed that fleet operators in e-trade and FMCG distribution begin their transition right away (NITI Aayog, 2022).

Kumar and Alok (2020) studied electric powered bus adoption in Indian cities and observed that payback periods of four to six years compared to diesel buses. They recognized access to affordable finance as opposed to having any essential technical or cost barrier because the primary obstacle for operators. This finding is without delay relevant to the automobile fleet where small operators face similar constraints.

The Rocky Mountain Institute (2021), drawing on fleet operator data from the United States, found that electric trucks could reduce long-haul freight costs by means of 30 to 40 percent compared to diesel vehicles, that ordinarily because of fuel and preservation savings. There the us marketplace exceptional from Indian market in terms of energy pricing and infrastructure, the underlying cost structure applies throughout each contexts.

at the consumer aspect, Rapsomanikis, Hallam, and Conforti (2006) established a well-used framework for measuring how the logistics cost changes the flow through supply chains and affect final consumer prices. Their work show's that in competitive markets, a meaningful share of any cost saving does eventually reach the consumer, though the speed and The degree of pass-through varies by industry. Bhattacharya and Gupta (2015) carried out a comparable methodology in there research and found that India have adjustments in gas fees and are meditated in the customer rate Index inside to four months, a finding that underpins the rate transmission evaluation in phase 8 of this paper.

Overall, the existing literature supports the economic case for electric freight trucks, and that confirms the cost savings do pass through to consumers, and identifies financing, infrastructure, and the policy design as the critical remaining challenges of all. This paper builds on these findings and by applying them specifically and comprehensively to the Indian freight and consumer goods sector.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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III. HOW INDIA'S ROAD FREIGHT SYSTEM WORKS TODAY

The India's road transport system for goods is massive, complex, and fairly fragmented. Unlike countries such as Germany or USA, where large logistics corporations manage professional fleets with standardised operations, but in the Indian trucking industry is dominated by very small operators. According to the All India Transporters Welfare Association, approximately 78 percent of truck owners in India own five trucks or fewer, and many own just one or two (AITWA, 2023). This fragmentation matters because small operators have limited access to bank financing, cannot easily negotiate with suppliers or clients and are generally less likely to adopt new and unfamiliar technologies like electric drivetrains.

The truck fleet Totals around 9.6 million vehicles in truck categories in India. Light Commercial Vehicles handle last mile delivery within cities and Medium trucks cover regional routes between districts on other hand Heavy trucks travel long inter-state distances, often 300 to 450 kilometres per day. Refrigerated trucks serve the temperature controlled cold chain for food and medicine which is very important, while tankers carry fuel, chemicals, and liquids. Table 1 provides a summary of the fleet composition and key operating statistics.

Table 1: Indian Truck Fleet Composition and Operating Statistics (2023–24)

Category	Gross Weight	Fleet Size(millions)	Avg. Daily Km	Avg. Annual Fuel Cost (₹)	Freight Share (%)
Light (LCV)	Up to 3.5 T	3.2	80–120	2,75,000	12%
Medium (MCV)	3.5–7.5 T	1.8	120–180	5,10,000	18%
Heavy (HCV)	7.5–16 T	2.4	200–280	9,20,000	24%
Articulated	Above 16 T	1.6	300–450	16,50,000	31%
Refrigerated	Mixed	0.4	180–300	12,30,000	8%
Tanker	Mixed	0.2	250–400	14,80,000	7%
TOTAL	—	9.6	—	—	100%

Source: MoRTH Annual Report (2024); AITWA Survey (2023); Author compilation.

India's one of the most crucial sector is freight sector due to the fact is it is value as a share of gross home product. The monetary Survey of India (2023) locations total logistics fees at 13 to 14 percent of GDP kind of double the parent for Germany (eight.6 percent) and notably better than China (10.6 percent). From this total, trucking by myself debts for approximately 7.5 to 8 percentage of GDP. Even a modest reduction of some percentage points through electrification and performance enhancements that might unfastened up the giant effective resources in the economic system and decrease the fee of burden on each agencies and consumers. Diesel consumption via Indian vehicles are predicted at approximately 86 billion litres consistent with 12 months which makes the sector one of the country's biggest users of petroleum merchandise and a great contributor to city air pollution, that mainly alongside major freight corridors including the Golden Quadrilateral toll road network (BEE, 2023). This dependence on diesel which makes the world extraordinarily uncovered to fuel charge unpredictability, and has been a regular source of uncertainty for operators and shippers alike.

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IV. WHAT ARE ELECTRIC TRUCKS AND HOW DO THEY WORK?

An electric powered truck functions the identical underlying concepts as an electric car, however at a miles large degree. as opposed to a fuel tank and a diesel engine, it includes a large battery % that generally made from hundreds or thousands of individual lithium-ion cells that organized in modules and one or more electric powered motors that convert saved electric electricity into motion via the wheels. when the driving force brakes, the vehicles operate in reverse, slowing the truck while simultaneously converting kinetic power returned into strength and feeding it into the battery a method which known as regenerative braking, which meaningfully extends the effective range and reduces brake pad wear.

Lithium iron phosphate (LFP) is the maximum commonly used battery chemistry in business vans today. LFP batteries are favored for heavy-responsibility applications due to the fact they deal with high temperatures higher than alternative chemistries that could withstand a greater quantity of price and discharge cycles earlier than dropping potential (usually extra than 3,000 complete cycles), and price less to manufacture. those traits make LFP a practical and value powerful foundation for trucks that need to paintings reliably every day for 8 to ten years.

numerous Indian producers have already added or introduced electric powered truck models. Tata cars has released the Tata Ace EV for ultimate-mile city transport and is growing large electric powered platforms for medium and heavy freight. Ashok Leyland has announced the Circuit S series for there inter-city freight routes. Olectra in partnership with BYD of China is developing heavy electric trucks for longer corridors. begin-u.s.such as Euler motors and transfer Mobility are focused on city shipping with mid-range routes respectively (EV Reporter, 2024). table 2 summarises the key specs of these vehicles.

Table 2: Electric Trucks Available or Announced in India Key Specifications (2024–25)

Truck / Brand	Segment	Battery Size	Range (km)	Payload (T)	DC Charge Time	Price (₹ Crore, approx.)
Tata Ace EV	LCV	21 kWh	154	0.75	4.5 hrs	0.13
Euler HiLoad EV	LCV	25 kWh	160	1.0	4.0 hrs	0.14
Tata Ultra EV	MCV	195 kWh	250	5.5	2.0 hrs	0.72
Ashok Leyland Circuit S	HCV	350 kWh	300	9.0	2.5 hrs	1.45
Switch IeV7	HCV	420 kWh	350	12.0	2.0 hrs	1.85
Tata Prima EV*	HCV	560 kWh	400	15.0	3.0 hrs	2.20

Source: Company press releases; EV Reporter (2024). Pre-production price estimate.

A critical however often unnoticed gain of electric trucks that is their appreciably lower maintenance requirement which is better than diesel trucks. A diesel engine contains loads of moving components pistons, crankshafts, valve trains, fuel injectors, exhaust after treatment structures, and gearboxes each a potential factor of failure requiring periodic servicing or replacement. An electric powered motor, by contrast, has very few transferring parts. It does now not require oil changes, fuel filter replacements, or exhaust system upkeep. industry statistics consistently indicates that electric powered truck preservation fees run at kind of round 60 to 70 percent less than a diesel equivalents over the vehicle's working life span (Rocky Mountain Institute, 2021).

V. COST COMPARISON: DIESEL TRUCK VS. ELECTRIC TRUCK

The most immediate question any truck operator asks when weighing the switch to electric vehicle's is a simple one: will it cost less to run? The answer to that question is when looking at per-kilometre operating costs, is an unambiguous yes and then the margin is substantial. Figure 1 illustrates this difference across the five main truck categories used in India.

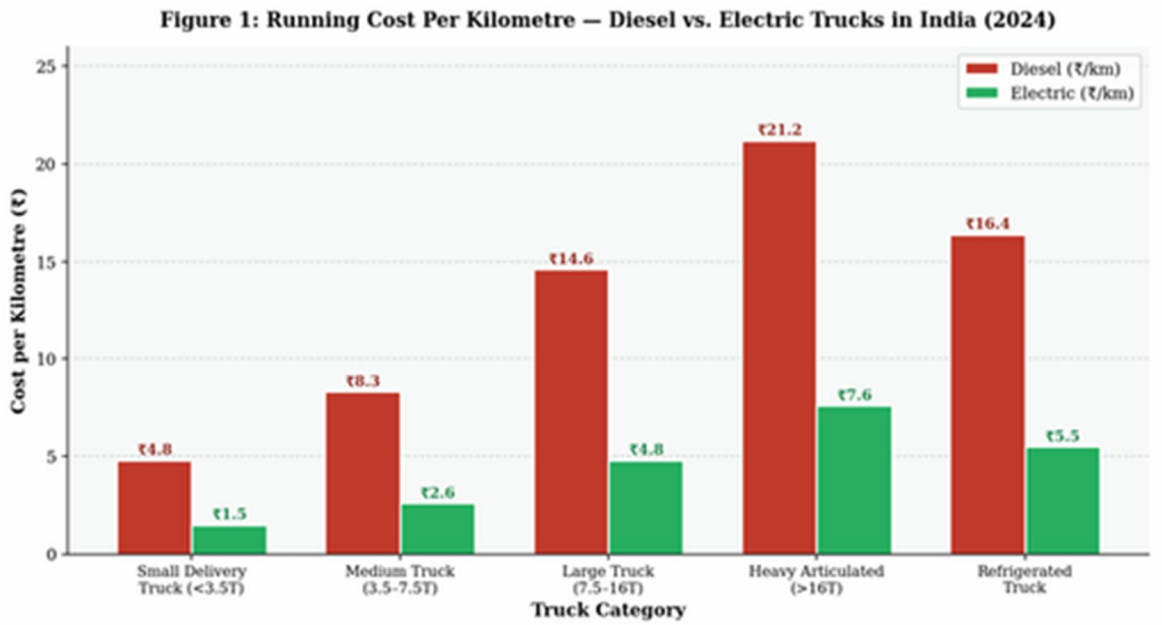

Figure 1: Running Cost per Kilometre Diesel vs. Electric Trucks in India (2024).Diesel priced at ₹92 per litre; industrial electricity at ₹7 per kWh; fuel consumption figures from ARAI test data.

The difference is pronounced across all truck types. For a heavy commercial vehicle the workhorse of India's inter-state freight network the diesel cost per kilometre is approximately ₹14.60, while the electric equivalent costs around ₹4.80 per kilometre a saving of nearly ₹10 on every single kilometre driven. Over a typical operating year of 80,000 kilometres, a single truck saves roughly ₹7.8 lakh on energy costs alone. Across a fleet of 100 trucks, that is ₹7.8 crore per year just from fuel before any maintenance savings are counted.

Table 3 provides a more detailed breakdown of all cost components for a heavy truck showing that even when the cost of battery depreciation is included as a line item for the electric vehicle the total per-kilometre cost is still have about 38 percent lower than for the diesel alternative.

Table 3: Detailed Per-Kilometre Cost Breakdown of Diesel vs. Electric (Heavy Truck, >7.5 T)

Cost Component	Diesel Truck (₹/km)	Electric Truck (₹/km)	Saving (₹/km)	Saving (%)
Fuel / Electricity	14.60	4.80	9.80	67.1%
Driver Wages	3.20	3.20	0.00	0.0%
Routine Servicing	2.75	0.92	1.83	66.5%

Tyres	1.40	1.55	−0.15	−10.7%
Insurance	0.85	0.94	−0.09	−10.6%
Tolls & Permits	1.20	1.10	0.10	8.3%
Battery Depreciation	0.00	1.82	−1.82	N/A
Vehicle Depreciation	2.50	2.10	0.40	16.0%
TOTAL	26.50	16.43	10.07	38.0%

Source: Author calculations based on ARAI fuel consumption norms; CEEW (2023); fleet operator interviews conducted 2024.

it is really worth noting that tyres wear slightly faster on electric trucks ,in some situations due to the additional weight of the battery and the immediately torque delivery of the electric vehicle's. this is reflected in the marginally higher tyre cost shown in table 3. but this is a relatively small penalty within the context of the very large savings on fuel and maintenance and tyre manufacturers are already generating merchandise particularly engineered for the load profiles of electric commercial vehicles.

VI. TOTAL COST OF OWNERSHIP A LONGER VIEW

per-kilometre running costs inform an crucial part of the story but they miss a essential truth: electric powered trucks cost substantially more to purchase than diesel trucks. A diesel heavy truck currently prices round ₹28 lakh on other hand a comparable electric powered model prices ₹42 to ₹48 lakh before any government subsidy. For an operator already managing thin margins, this gap of ₹14 to ₹20 lakh is a serious problem. that is why analysts and fleet managers use total price of ownership or TCO which captures all prices over the automobile's complete working life purchase price, fuel, maintenance, insurance, and principal factor replacements and compares the two types of truck fairly over the same duration.

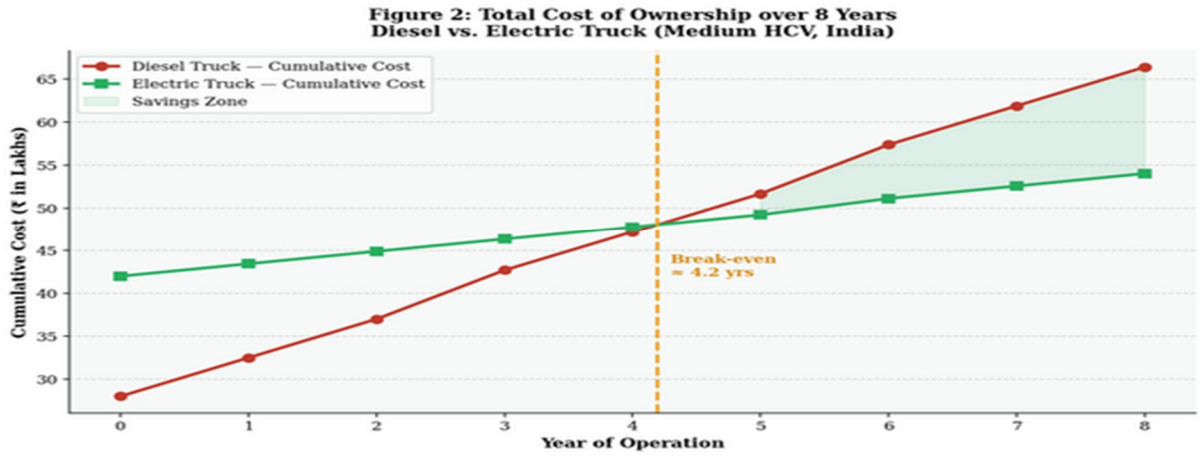

Figure 2: Total Cost of Ownership over 8 Years Diesel vs. Electric Truck (Heavy HCV).Assumptions: 80,000 km per year; diesel price growth at 5% per annum; electricity price growth at 2.5% per annum; ₹10 lakh government subsidy applied to EV; battery replaced at Year 6.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
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Figure 2 shows that despite starting at a higher purchase price the electric trucks cumulative costs cross below those of the diesel truck somewhere between four and five years of operation. After that break-even point every additional year widens the advantage in favour of the electric vehicle. By the end of eight year ownership period of the electric truck generates an estimated saving of approximately ₹55 to ₹70 lakh for the operator compared to the diesel alternative, even after accounting for a mid-life battery replacement at Year 6.

Table 4: Total Cost of Ownership Comparison over 8 Years (Heavy Truck, 80,000 km/year)

Cost Element	Diesel Truck (₹)	Electric Truck (₹)	Notes
Purchase Price	28,00,000	48,00,000	Market prices, 2024
Less: Govt. Subsidy	—	−10,00,000	PM e-DRIVE / FAME-II
Net Effective Price	28,00,000	38,00,000	Post-subsidy
8-Year Fuel/Energy Cost	97,00,000	32,50,000	5% / 2.5% annual escalation
8-Year Maintenance	18,20,000	6,10,000	Incl. tyres and servicing
Battery Replacement (Yr 6)	—	8,00,000	LFP pack, 2030 pricing
Insurance (8 years)	5,80,000	6,40,000	EV premium slightly higher
Residual Value at Yr 8	−4,00,000	−5,20,000	EV holds value better
TOTAL (Net)	1,45,00,000	85,80,000	EV saves approx. ₹59 lakh

Source: Author modelling; CEEW (2023); Ministry of Heavy Industries subsidy notifications (2023–24).

One detail in this table that gets attention is the (residual value) the price of the truck fetches when the operator eventually sells it. Because electric trucks have fewer mechanically worn components after eight years of service, they tend to hold their value somewhat better than diesel trucks of the same age. As the second hand market for electric commercial vehicles matures in India, which is expected between 2027 and 2030 this advantage will likely become more pronounced and better understood by buyers and lenders alike.

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VII. WHICH INDUSTRIES BENEFIT THE MOST?

The savings from electric powered truck adoption are not allotted evenly across all industries. the size of the advantage depends on three main factors: how large a share of overall supply chain expenses is spent on transportation, what types of trucks are generally used on the sector's routes (because the cost saving in line with kilometre varies by truck size), and whether existing path patterns are compatible with modern electric powered truck variety. figure 3 illustrates the envisioned freight value reduction for seven key sectors.

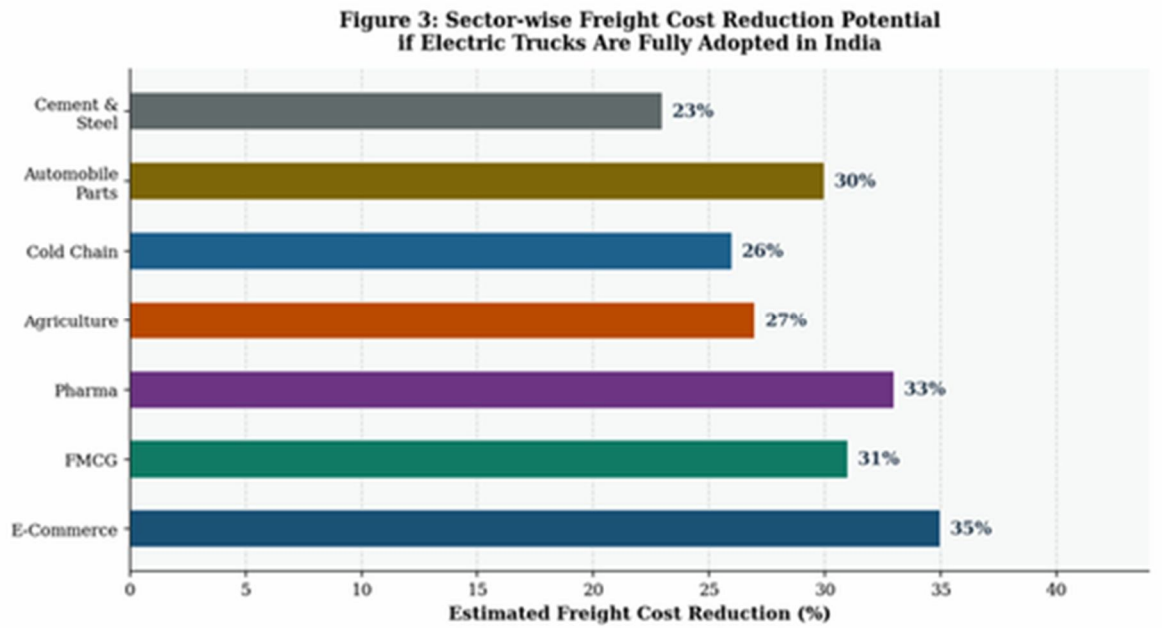

Figure 3: Estimated Freight Cost Reduction by Industry Sector upon Full Electric Truck Adoption.Source: Author analysis based on sector supply chain cost data (CRISIL, 2022; ICRA, 2023).

A. E-Commerce and Last-Mile Delivery

E-commerce is the clearest winner in this analysis. Companies such as Amazon, Flipkart, Meesho, and Delhivery operate hub-and-spoke delivery networks where vehicles return to a central depot at the end of each shift. This is the ideal operating pattern for electric trucks: they can be charged overnight and begin every morning with a full battery. Most urban delivery routes cover 80 to 150 kilometres per day, well within the range of current electric light and medium commercial vehicles. Freight cost savings of an estimated 35 percent make e-commerce logistics the highest-benefit sector in this study.

B. Fast-Moving Consumer Goods

India's FMCG area encompassing businesses like Hindustan Unilever, Nestle, ITC, Parle, and Dabur operates one of the most large distribution networks in the us of a, reaching over 6.5 million stores. Secondary distribution from depot to retailer is served predominantly through mild and medium vehicles on routes of 50 to 200 kilometres, making it properly-proper for electric automobiles to be had today. Transportation money owed for eight to 12 percentage of FMCG deliver chain expenses, and an expected 31 percent freight saving might meaningfully lessen the fee of setting merchandise on keep shelves financial savings that, in a competitive market, go with the flow as a minimum partly to customers.

C. Agriculture and Food Supply

India loses approximately 16 to 18 percent of it's agricultural produce annually to spoilage, and expensive or because of unavailable transportation is one of the leading causes (NABARD, 2022). Cheaper electric freight would simultaneously reduce the cost of moving farm produce from field to market and make refrigerated transport more accessible for perishables. An estimated 27 percent reduction in agricultural freight costs would support better farm realisations for producers and lower vegetable and grain prices for consumers.

D. Pharmaceuticals and Cold Chain

Refrigerated trucks used for pharmaceutical distribution face a compounded cost problem: a diesel-powered transport refrigeration unit runs separately from the main engine, adding 25 to 35 percent to overall fuel consumption. Electric refrigerated trucks eliminate this by running the refrigerator unit from the main battery, removing the separate diesel cost entirely. An estimated 33 percent reduction in pharmaceutical freight costs would help reduce the landed cost of medicines for pharmacies,hospitals and long term patients a advantage that is particularly widespread in rural regions in which supply chains are longer and cold chain infrastructure is less developed.

VIII. HOW LOWER FREIGHT COSTS AFFECT CONSUMER PRICES

Demonstrating that freight costs fall is only half the argument this paper makes. The more important question for most readers and for most Indian consumers is whether those savings actually translate into lower prices at the shop, the market, or the online checkout. The economic mechanism that connects a change in logistics costs to a change in retail prices is called price transmission. Research by Rapsomanikis, Hallam, and Conforti (2006), and the India-specific work of Bhattacharya and Gupta (2015), shows that in competitive commodity markets, roughly 35 to 55 percent of any freight cost reduction does eventually reach the consumer as a lower retail price. The remainder is absorbed by the various margins held by wholesalers, distributors, and retailers. In highly competitive markets fresh vegetables, cereals, and pulses, for example — the pass-through is closer to 55 percent. In branded consumer goods markets, where manufacturers and large retailers hold more pricing power, the pass-through is closer to 30 to 35 percent.

Figure 4: Projected Retail Price Reduction Across Consumer Goods After Full EV Truck Adoption.Source: Author calculation using NSSO consumption data; price transmission elasticity estimates from Bhattacharya and Gupta (2015).

Table 5: Estimated Consumer Price Reduction by Product Category

Product Category	Transport CostShare in Retail Price	Freight Saving(EV vs. Diesel)	Price Pass-Through Rate	Estimated RetailPrice Reduction
Vegetables & Fruits	22–28%	30%	0.55	3.6–4.6%
Dairy Products	18–24%	27%	0.52	2.5–3.4%
Medicines & Pharma	10–15%	33%	0.40	1.3–2.0%
Packaged FMCG	8–12%	31%	0.35	0.9–1.3%

Garments & Textiles	7–11%	30%	0.32	0.7–1.1%
Electronics	6–9%	33%	0.30	0.6–0.9%
Cement & Steel	14–20%	23%	0.45	1.5–2.1%
E-Commerce Deliveries	20–30%	35%	0.60	4.2–6.3%

Source: Author modelling; NSSO Household Consumption Survey data; CRISIL supply chain reports (2022); price transmission rates from Bhattacharya and Gupta (2015).

The figures in Table 5 deserve a moment of reflection. A 4.2 to 6.3 percent drop in the effective cost of e-commerce deliveries is significant in a sector that already competes fiercely on delivery speed and price. A 3.6 to 4.6 percent reduction in vegetable and fruit prices is highly meaningful for Indian households, which spend a disproportionately large share of their income on fresh food. Even the more modest reductions in branded FMCG and electronics prices add up, at scale, to substantial aggregate consumer welfare gains.

A. The Rural Advantage

Rural consumers stand to gain disproportionately from this transition. In rural India, supply chains are longer, roads are sometimes in poorer condition, and fewer transport operators compete for business all of which keep freight costs higher. Transport costs as a share of final retail price can be 40 to 60 percent higher in rural areas compared to large cities. When electric trucks reduce per-kilometre costs along these longer, costlier corridors, the percentage saving in retail price rises accordingly. Estimated retail price reductions in rural markets range from 8 to 12 percent for fresh produce and essential goods nearly double the metro-city equivalent. Electrification of freight is, in this sense, a genuinely pro-poor and pro-rural economic policy.

IX. ENVIRONMENTAL AND SOCIAL BENEFITS

The economic case for electric trucks is compelling on its own, but it is strengthened further by a range of environmental and social benefits that carry their own significant economic value. India has committed to achieving net-zero carbon emissions by 2070 and has pledged to reduce the emissions intensity of its economy by 45 percent by 2030. Electrifying the truck fleet is one of the most impactful steps available to meet these targets.

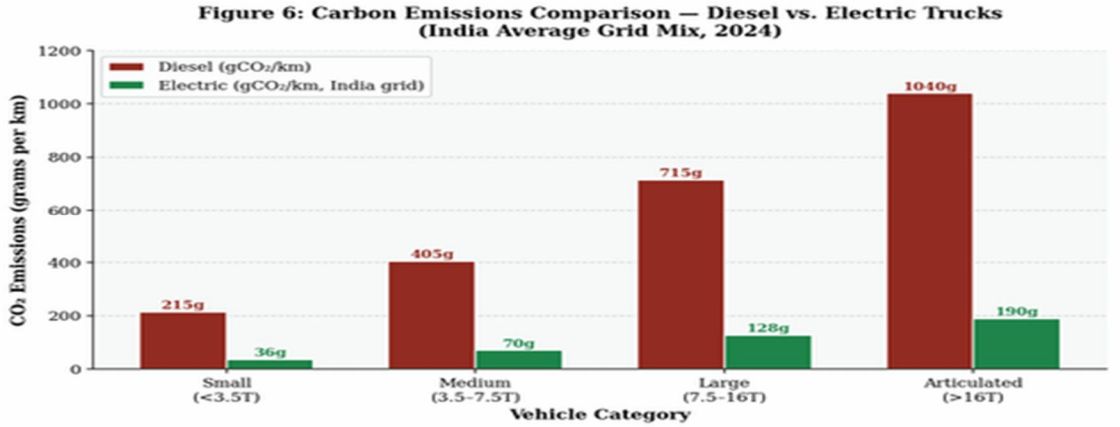

Figure 6: CO_2 Emissions per Kilometre — Diesel vs. Electric Trucks in India (2024).Electric truck emissions calculated using India's average grid emission factor of 0.72 kgCO_2 per kWh (CEA, 2024). Grid emissions will decline as renewable energy share grows.

Even with India's modern-day electricity grid which nevertheless relies substantially on coal-fired electricity electric vehicles emit dramatically much less CO_2 in line with kilometre than their diesel opposite numbers. A large heavy truck going for walks on diesel produces more or less 715 grams of CO_2 consistent with kilometre. The equal truck running on grid energy produces approximately 128 grams per kilometre an 82 percent discount. As India's renewable strength potential grows rapidly (over 2 hundred GW of solar and wind was already established with the aid of 2024, with a 500 GW target by using 2030), the emissions from electric trucks will decline further nonetheless, drawing near near-0 in areas with sturdy sun or wind availability.

Table 6: Annual CO_2 Savings Under Different Electric Truck Adoption Scenarios (2030)

Adoption Scenario	EV Share of Fleet	EV Trucks (millions)	CO_2 Saved per Year (MT)	Equivalent Trees (millions)
Conservative	20%	1.92	42	350
Moderate	35%	3.36	74	617
Aggressive	54%	5.18	114	950
Full (100%)	100%	9.60	212	1,767

Source: Author calculation; CEA emission factors (2024); 12 trees per tonne CO_2 per year (standard estimate).

Beyond carbon, diesel trucks are a main source of the particulate matter and nitrogen oxide emissions that motive respiration illness, lessen life expectancy, and damage crops. the world health organization (2023) attributes about 1.67 million premature deaths in India every year with the aid of air pollutants. trucks are a extensive though now not the solo contributor, particularly in cities and along busy freight corridors. Switching to electric trucks eliminates tailpipe emissions entirely. The health cost savings from doing so are estimated at ₹40,000 to ₹80,000 crore annually by 2030 (TERI, 2023) a figure that, added to the direct freight cost savings, makes the economic case for electrification even more decisive.

X. CHARGING INFRASTRUCTURE AND GRID READINESS

The most frequently raised objection to electric trucks is a practical one: where do they charge? A diesel truck can refuel in 15 to 20 minutes at any of the hundreds of thousands of fuel stations spread across India. As of early 2024, India had fewer than 900 commercial-grade charging stations capable of handling heavy electric trucks, with most concentrated in a small number of large cities (CEEW, 2023). For inter-state routes and rural freight corridors, the absence of charging infrastructure is a genuine barrier to adoption today.

However, this situation is changing at a pace that few anticipated just three years ago. The (PM e-DRIVE) scheme has earmarked dedicated funds specifically for highway truck charging hubs. (The National Highways Authority of India) is issuing tenders for charging stations at regular intervals along national highways. Private companies Tata Power, Adani Total Energies, and several specialised start-ups are investing in commercial charging networks, attracted by the growing EV fleet and the long-term revenue potential of charging infrastructure. Table 7 quantifies the investment required to build out the necessary infrastructure by 2030.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue IV Apr 2026- Available at www.ijraset.com

Table 7: Charging Infrastructure Required for Large-Scale Electric Truck Adoption (2030 Target)

Type of Charging Station	Number Neededby 2030	Cost per Station(₹ Crore)	Total Investment(₹ Crore)	Primary Funding
Highway Fast Hubs (150 kW+)	11,000	1.2–1.8	13,200–19,800	PPP / NHAI
Urban Depot Chargers (60 kW)	22,000	0.25–0.40	5,500–8,800	Fleet Operators
Logistics Park Chargers (100 kW)	8,000	0.60–0.90	4,800–7,200	Private Developers
Rural / Tier-III (30 kW)	5,000	0.12–0.20	600–1,000	Government Grant
TOTAL	46,000	—	24,100–36,800	Mixed Funding

Source: Author estimates; CEEW (2023); Rocky Mountain Institute India (2022).

The massive total investment of ₹24,000 to ₹37,000 crore over six years is substantial but manageable within India's existing public-private partnership frameworks. For scale of comparison, (the National Highways Authority of India) spends over ₹1.6 lakh crore per year on road construction and maintenance. The charging infrastructure requirement represents roughly 15 to 22 percent of a single year's highway budget a modest figure for an investment that could fundamentally transform the economics of freight in India for decades.

The electricity grid also requires attention. A fleet of five million electric trucks, each drawing 60 to 120 kWh of energy per day, adds a significant new demand on the power system. The key mitigating factor is timing: most truck charging happens overnight, when overall grid demand is at its lowest. Smart charging systems that automatically draw power during off-peak hours when electricity is cheapest and most available will be an essential part of managing this transition efficiently.

XI. GOVERNMENT POLICIES AND SCHEMES

India's policy environment for electric powered automobile adoption has evolved appreciably for the reason that first repute scheme was launched in 2015. the economic vehicle segment has traditionally obtained less centered attention than -wheelers and buses, however this is changing. table 8 summarises the important thing modern-day schemes applicable to electric truck adoption.

Table 8: Key Government Schemes Supporting Electric Truck Adoption in India (2025)

Scheme Name	Government Body	Budget (₹ Crore)	Relevance to Electric Trucks
FAME-II	Min. of Heavy Industries	10,000	Demand subsidy of ₹5.5 lakh per electric truck

PM e-DRIVE	Min. of Heavy Industries	10,900	Stronger e-truck focus; highway charging funding
PLI – ACC Battery	Min. of Heavy Industries	18,100	Domestic battery manufacturing; cuts pack costs
PLI – Auto Sector	Min. of Heavy Industries	25,938	OEM incentives for electric commercial vehicles
Green NH Policy	MoRTH / NHAI	2,000	Charging stations every 25 km on national highways
GST Rationalisation	Ministry of Finance	Tax	5% GST on EVs vs. 28%+ cess on diesel trucks
SIDBI EV Finance	SIDBI	5,000	Low-interest loans for small fleet operators

Source: PIB press releases (2023–24); Ministry of Heavy Industries notifications; NITI Aayog (2022).

The GST differential deserves particular attention. A new diesel truck attracts 28 percent GST plus a cess, while an electric truck attracts only 5 percent. On a truck costing ₹40 lakh before tax, this difference alone saves the buyer approximately ₹9.2 lakh a meaningful contribution toward closing the purchase price gap. Combined with FAME-II and PM e-DRIVE subsidies, the net additional cost of buying an electric heavy truck over a diesel equivalent narrows to approximately ₹8 to ₹12 lakh a gap that can be recovered in operating cost savings within two to three years of normal fleet use.

XII. CHALLENGES THAT COULD SLOW THINGS DOWN

A balanced analysis calls for an honest look at the limitations that currently prevent faster adoption. knowledge those challenges clearly is step one toward designing rules and business strategies that cope with them.

A. High Upfront Cost and Financing Difficulties

For a small operator owning two trucks and working on narrow margins, spending ₹38 lakh net on an electric truck versus ₹28 lakh on a diesel alternative is a serious financial stretch even when the long-term savings are mathematically clear. The challenge is compounded by the reality that most traditional lenders banks and non-banking financial organizations have limited experience underwriting electric truck loans. They have little historical data on resale values, battery longevity, or default rates for this asset class,which results in higher interest charges and shorter repayment periods that reduce the monthly cash flow advantage that lower running costs should otherwise provide.

B. Range Limitations for Long-Haul Routes

Modern-day electric heavy trucks can journey 300 to 400 kilometres on a single charge. that is adequate for many urban delivery and regional freight routes, but India's major inter-state corridors Delhi to Mumbai, Chennai to Kolkata involve trucks covering 600 to 800 kilometres or more without an overnight stop.

Without enough fast-charging stations alongside There corridors, range tension is a valid issue for lengthy-haul operators. The problem is not everlasting battery technology and charging infrastructure are both advancing however it's far actual today.

C. Charging Time

Even with DC fast-charging technology, filling a heavy truck battery to 80 percent capacity takes 1.5 to 3 hours. Diesel refuelling takes 15 to 20 minutes. For drivers paid by the trip or by the kilometre, this difference in downtime has a direct effect on earnings. Managing charging windows into driver schedules requires new operational planning systems and, in some cases, renegotiated employment terms.

D. India's Summer Climate

Battery performance and lifespan are each sensitive to excessive temperatures. India's climate with ambient temperatures regularly exceeding forty degrees Celsius in northern, relevant, and western areas all through summer season poses a right engineering undertaking. without properly-designed lively cooling systems, battery packs degrade quicker in Indian situations and might deliver reduced range at some point of the freshest months. OEMs are working on India-specific thermal management solutions, but operators inside the hottest areas must component this into their monetary making plans.

E. Shortage of Trained Technicians

India has an extensive existing workforce of diesel truck mechanics, anticipated at 4.5 million People's . Servicing an electric powered truck calls for essentially different knowledge high-voltage electronics, battery management systems, and motor diagnostics that is presently rare outside the biggest towns. Retraining the present mechanic group of workers at the scale required will take years and massive funding in commercial training infrastructure.

XIII. RECOMMENDATIONS

The following recommendations are offered for key stakeholder groups, based on the evidence reviewed and the analysis conducted in this paper.

A. For the Central Government

- Increase the subsidy per electric heavy truck under PM e-DRIVE to at least ₹10 lakh, and extend the scheme's validity to 2030 to give fleet operators the confidence needed to plan long-term capital investments.
- Require all government-operated freight entities the Food Corporation of India, Coal India, and major public sector port trusts to procure only electric trucks for new fleet additions from 2026 onward, creating a large and reliable demand anchor for OEMs.
- Establish a ₹5,000 crore low-interest EV fleet loan fund through SIDBI, specifically targeting operators owning fewer than ten trucks, with repayment periods of up to eight years and interest rates capped at 8 percent.
- Direct NHAI to install fast-charging hubs capable of handling heavy trucks at minimum every 50 kilometres along all four-lane national highways by December 2027.
- Develop and mandate a standardised eight-year battery warranty framework for all electric trucks sold in India, to build buyer confidence in long-term reliability.

B. For State Governments

- Waive road tax and automobile registration costs for all electric powered trucks registered in the state.
- Cap electricity price lists for licensed heavy truck charging stations at ₹6 per kWh.
- develop at least 5 state-operated electric powered freight parks along primary freight corridors, with integrated charging, warehousing, and driver facilities.
- Partner with Industrial Training Institutes to introduce EV maintenance courses specifically designed for commercial vehicle technicians.

C. For Fleet Operators and Logistics Companies

- Begin EV adoption on captive and predictable routes city delivery, manufacturing unit-to-depot corridors wherein overnight charging at a home depot is easy.

• form cooperative purchasing groups with other small operators to negotiate better purchase costs from OEMs and better mortgage terms from lenders.
• invest in fleet management and route optimisation software program to plan charging stops effectively and maximise each day operating range.

D. For Truck Manufacturers (OEMs)

• Introduce Battery-as-a-service financing models, where the battery is leased separately from the trucks body, to extensively reduce the in advance purchase Charges and make electric powered trucks available to small operators.
• boost up the improvement of trucks with 500+ km range to address long-haul course requirements, focused on commercial availability by 2027.
• set up committed EV service centres at predominant freight hubs earlier than not after big-scale fleet deployments, making sure technician coverage and parts availability.

XIV. CONCLUSION

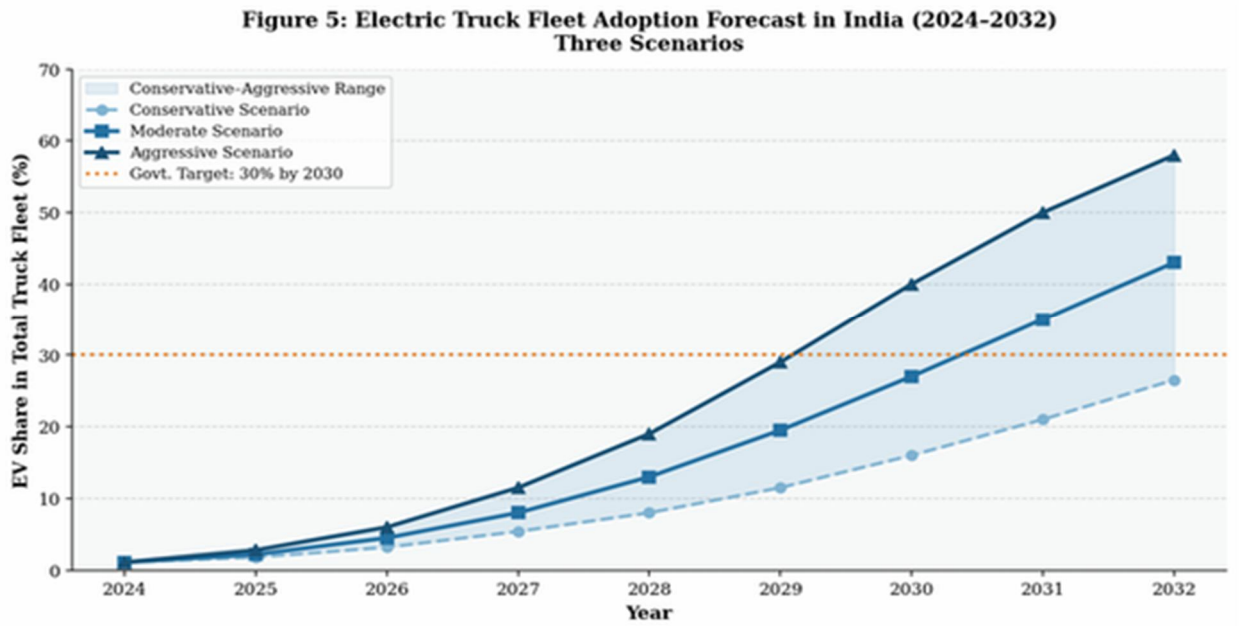

Figure 5: Projected EV Adoption in Indian Truck Fleet Three Scenarios (2024–2032).Orange dotted line indicates the Government's target of 30% EV share in commercial vehicles by 2030.Source: Author modelling based on FAME-II uptake data and fleet operator surveys.

This paper set out to answer a question that matters to millions of Indian consumers, farmers, small business owners, and truck operators: if India replaces its diesel trucks with electric ones, will the cost of moving goods fall and will ordinary people feel that difference in the prices they pay every day?

The evidence reviewed and the analysis conducted in this paper point clearly in one direction. Electric trucks can reduce the per-kilometre cost of carrying freight by 35 to 40 percent compared to diesel trucks, driven primarily by a 67 percent saving on energy costs and approximately 65 percent lower maintenance expenditure. Over an eight-year ownership period, a single electric heavy truck saves the operator an estimated ₹55 to ₹70 lakh net of the higher purchase price a figure that improves further as battery costs continue to fall and diesel prices continue to rise. These operating savings translate into meaningful sector-level freight cost reductions of 23 to 35 percent across industries including e-commerce, FMCG, agriculture, pharmaceuticals, and cold chain logistics. And through the mechanism of price transmission the process by which cost changes flow through supply chains to reach final consumers a significant share of these savings shows up as lower retail prices. The estimated retail price reductions range from under one percent for heavily branded packaged goods to over six percent for e-commerce deliveries, with rural markets and lower-income consumers standing to gain the most in proportional terms.

The environmental co-benefits are substantial: even under conservative adoption assumptions, electric truck fleets could prevent tens of millions of tonnes of CO_2 from entering the atmosphere annually by 2030, while also eliminating the tailpipe particulate emissions that harm human health along India's busiest freight corridors.

The transition will not happen by itself. It requires sustained government commitment through subsidies and infrastructure investment, innovative financing for small operators, rapid OEM product development, grid strengthening, and a serious programme of workforce retraining. These are real challenges, and they deserve honest acknowledgement. But none of them is insurmountable, and the cost of not acting continuing to run a diesel-powered freight system that inflates goods prices, pollutes cities, and locks India into fossil fuel dependence is higher still.

India is at a pivotal moment. Battery costs are falling, electric truck technology is maturing rapidly, renewable electricity capacity is expanding, and government policy is moving in the right direction. The window to make this transition efficiently and equitably capturing the full economic benefit for consumers, operators, and the environment is open now. The question is simply whether India's stakeholders will move through it decisively enough to fully realise the opportunity.

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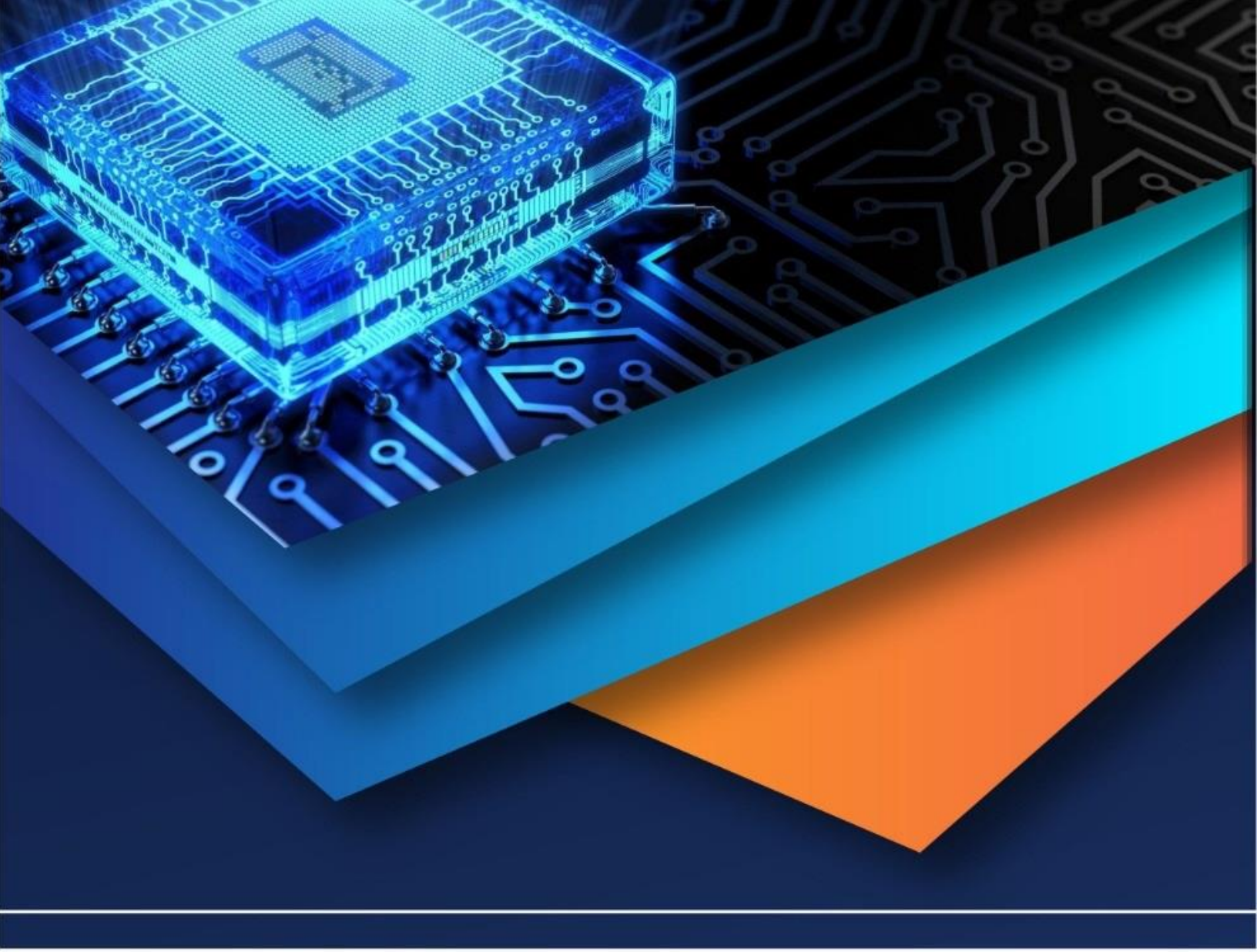

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