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Electric Vehicle Adoption Trends in India: Barriers and Enablers

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Abstract

India's electric vehicle (EV) market has moved from the margins of the automotive sector to a meaningful share of new vehicle sales within a single decade. In calendar year 2025, EVs accounted for approximately 8 percent of the 28.2 million new vehicle registrations recorded on the government's VAHAN portal, and total EV sales in fiscal year 2025-26 crossed 2.55 million units. This paper examines the trajectory of EV adoption in India across vehicle segments, identifies the principal barriers that continue to constrain adoption, and analyses the policy and market enablers that have driven recent growth. Drawing on registration data from the VAHAN portal, Ministry of Heavy Industries disclosures, and independent assessments by research organisations including CEEW, IEEFA, ITDP, and JMK Research, the study finds that adoption is heavily concentrated in the two-wheeler and three-wheeler segments, which together account for over 85 percent of EV sales. The dominant barriers are high upfront cost, inadequate and unevenly distributed charging infrastructure (with an EV-to-public-charger ratio of roughly 235:1 against a global average near 6:1 to 20:1), resale value uncertainty, and continued dependence on imported battery cells. The principal enablers are sustained central demand incentives under FAME II and its successor PM E-DRIVE, state-level policies, a favourable total cost of ownership in the two- and three-wheeler segments, and the beginning of domestic cell manufacturing under the Production Linked Incentive scheme. The paper concludes with policy recommendations focused on charging infrastructure densification, financing innovation, and battery ecosystem localisation.

1. Introduction

Transport is one of the fastest growing sources of greenhouse gas emissions in India, contributing roughly 10 to 14 percent of the country's energy-related emissions, with road transport responsible for about 90 percent of the sector's total [12, 13]. India has committed to reducing the emissions intensity of its economy by 45 percent from 2005 levels by 2030 and to achieving net zero emissions by 2070, pledges made at COP26. Within this framework, the electrification of road transport occupies a central position. India is a signatory to the EV30@30 campaign of the Clean Energy Ministerial, which sets an aspiration of a 30 percent sales share for electric vehicles in new vehicle sales by 2030 [12].

Beyond climate policy, electric mobility addresses two persistent structural problems: urban air quality, with Indian cities regularly ranking among the most polluted in the world, and dependence on imported crude oil, which exposes the economy to price and currency volatility. Electrification of passenger and goods mobility can materially reduce the oil import bill while providing cleaner air in cities [12].

This paper addresses three questions. First, what is the current state and trajectory of EV adoption in India across vehicle segments? Second, which barriers most significantly constrain further adoption? Third, which policy and market enablers explain the growth observed to date, and what do they imply for the 2030 target? The analysis covers the period up to mid-2026, capturing the transition from the FAME II subsidy regime to the PM E-DRIVE scheme and the first year of its operation.

2. Data and Methodology

The study is based on analysis of secondary data. Primary quantitative sources are vehicle registration records from the Government of India's VAHAN portal, which covers registrations in most states and union territories, and disclosures by the Ministry of Heavy Industries, including data placed before Parliament on charging infrastructure. These are supplemented by published assessments from the Council on Energy, Environment and Water (CEEW), the Institute for Energy Economics and Financial Analysis (IEEFA), the Institute for Transportation and Development Policy (ITDP), JMK Research and Analytics, and the Observer Research Foundation (ORF), as well as reporting by the automotive trade press. Peer-reviewed literature on consumer attitudes and adoption barriers in India provides the framework for classifying barriers and enablers [11]. All figures are attributed to their sources in the reference list. Where fiscal year (FY) figures are used, the Indian fiscal year running April to March applies; FY2026 refers to April 2025 through March 2026.

3. EV Adoption Trends

3.1 Aggregate growth

EV adoption in India has grown from a negligible base in the mid-2010s to a substantial market. In calendar year 2025, total EV sales reached approximately 2.3 million units, accounting for 8 percent of the 28.2 million new vehicle registrations recorded on the VAHAN portal [1]. On a fiscal year basis, India sold 2,550,865 electric vehicles across categories in FY2025-26, the first time annual sales crossed the 2.5 million mark [2]. Registered electric two-wheelers accounted for 57.8 percent of total EV sales in FY2026, with passenger electric three-wheelers contributing roughly a further 29 percent [3]. The passenger car segment, though growing fastest in percentage terms, remains a small share of the total.

3.2 Two-wheelers

The electric two-wheeler segment is the centre of gravity of Indian electric mobility. Retail sales reached approximately 1.4 million units in FY2026, a growth of about 22 percent over the previous year [5, 6]. By March 2026, roughly one in ten two-wheelers sold in India was electric [4]. The competitive structure of the segment shifted markedly during 2025 and 2026. TVS Motor Company led the segment with 341,513 units in FY2026, followed by Bajaj Auto and Ather Energy; the top three players collectively accounted for nearly 62 percent of registered sales [3]. Ather Energy grew 82.3 percent year on year to about 239,000 units, and Hero MotoCorp's Vida brand nearly tripled sales to 144,000 units. In contrast, Ola Electric, the market leader in earlier years, saw sales decline by 52.3 percent to 164,295 units [5]. The entry and scaling of legacy manufacturers with established distribution and service networks has been a defining feature of this phase of the market.

3.3 Three-wheelers

Electric three-wheelers, including e-rickshaws and cargo variants, represent the most commercially mature EV segment in India. Passenger electric three-wheelers alone held an approximate 29 percent share of total EV sales in FY2026 [3]. Adoption in this segment is driven almost entirely by economics rather than environmental preference: for a commercial operator running high daily mileage, the operating cost advantage of electricity over petrol, diesel, or CNG produces a payback period short enough that electrification is the default commercial choice.

3.4 Passenger cars

Electric passenger car sales grew 83.6 percent in FY2026 to 199,923 units, against 108,873 units in FY2025, taking EV penetration in the passenger vehicle market to 4.3 percent [4, 3]. Tata Motors remained

the market leader with 77,658 units and a 39.2 percent share, though this was substantially lower than its 53.4 percent share in FY2025. MG Motor held second position with 52,408 units, and Mahindra and Mahindra was the fastest growing player, with registrations increasing roughly fivefold to 42,006 units and its share rising from 7.8 percent to 21.2 percent [4]. EVs comprised about 12 percent of Tata's total passenger vehicle sales in FY2026, well above the industry average, indicating that manufacturer commitment materially shapes segment outcomes [4].

Table 1 summarises segment-level performance in FY2026.

Segment	FY2026 sales (units)	Share of EV sales	Year-on-year growth
Two-wheelers	~1,400,000	57.8%	+21.8%
Three-wheelers (passenger)	~740,000	~29%	steady growth
Passenger cars	199,923	~7.8%	+83.6%
Buses, trucks, others	remainder	~5%	policy-driven
Total	2,550,865	100%	n.a.

Table 1: EV sales by segment, FY2025-26. Sources: [2], [3], [4], [5].

4. Barriers to Adoption

4.1 High upfront cost

The purchase price premium of electric vehicles over comparable internal combustion engine (ICE) vehicles remains the most frequently cited barrier in consumer surveys, particularly for middle-income buyers [11]. Although the total cost of ownership of an electric two-wheeler or three-wheeler is generally lower than its petrol equivalent over the vehicle's life, the higher initial outlay is a decisive obstacle in a market where the majority of two-wheeler purchases are financed tightly against household budgets. The battery pack constitutes the largest single component of vehicle cost, and imported cells carry a cost premium that flows directly into showroom prices. The withdrawal of central purchase subsidies compounds this barrier: the PM E-DRIVE incentive for electric two-wheelers, reduced to Rs 2,500 per kWh with a cap of Rs 5,000 in its final phase, closed on 31 July 2026, leaving electric scooters purchased from August 2026 without central cash support [7].

4.2 Charging infrastructure

Charging infrastructure is the second dominant barrier, and arguably the binding constraint for the four-wheeler segment. According to the Ministry of Heavy Industries, India had 29,151 public charging stations as of December 2025, of which 27,737 were installed and 22,753 operational by March 2026 [14]. Against a stock of several million EVs, ITDP estimated India's EV-to-public-charger ratio at approximately 235:1 in July 2025, far from the global average in the range of 6:1 to 20:1 [9]. The distribution is also highly uneven: growth is concentrated in metropolitan areas such as Delhi, Mumbai, and Bengaluru, while highways, smaller towns, and intercity corridors lag substantially [9, 10]. A Confederation of Indian Industry assessment estimates that India requires at least 1.32 million charging stations by 2030, implying more than 400,000 installations per year, an order of magnitude above the current pace [14].

A further structural difficulty is residential charging. A large share of urban Indians live in apartment complexes or dense neighbourhoods without dedicated parking, making home charging, the backbone of EV use in Western markets, difficult to replicate. Retrofitting residential buildings is slow, and public chargers are often unreliable, with surveys reporting broken or occupied chargers as a common experience [10]. Industry commentary increasingly argues that the operative problem in 2025 and beyond is not range anxiety in the abstract but charging reliability and user experience [15].

4.3 Resale value and battery replacement uncertainty

Consumers face genuine uncertainty about what an EV will be worth after five to eight years, principally because battery degradation is difficult for a lay buyer to assess and replacement costs are high relative to the residual value of the vehicle. Research on Indian consumer attitudes identifies resale anxiety, alongside upfront cost, as a major barrier [11]. The used EV market is nascent, and the absence of standardised battery health certification depresses residual values, which in turn raises the effective cost of ownership and deters first purchases.

4.4 Supply chain and cell import dependence

India remains overwhelmingly dependent on imported lithium-ion cells, primarily from China. The Production Linked Incentive scheme for Advanced Chemistry Cells (ACC PLI), launched in 2021 with an outlay of Rs 18,100 crore and a target of 50 GWh of domestic cell capacity, has delivered slowly: as of October 2025, only about 1.4 GWh, or 2.8 percent of the target capacity, had been commissioned within the stipulated timeline, all of it by Ola Electric [8]. Domestically produced cells currently carry a cost premium of roughly 25 to 30 percent over Chinese cells at equivalent energy density, a gap the PLI incentive of 18 to 20 percent on net sales only partially closes [16]. Until domestic capacity scales, Indian EV prices remain exposed to import costs, currency movements, and geopolitical supply risk.

4.5 Financing, awareness, and institutional barriers

Interest rates on EV loans are frequently higher than on comparable ICE vehicle loans because lenders lack data on residual values and default behaviour. Fleet operators and low-income commercial buyers, precisely the segments with the strongest total cost of ownership case, face the highest financing friction. In addition, policy instability at the state level, where road tax waivers have been rolled back in some states such as Karnataka and allowed to expire in others such as Uttar Pradesh, creates uncertainty that dampens both consumer and investor confidence [15, 17].

5. Enablers of Adoption

5.1 Central demand incentives: FAME II to PM E-DRIVE

Central purchase incentives have been the single most important policy enabler. The FAME II scheme, in force until its discontinuation in September 2024, provided demand incentives of Rs 10,000 per kWh for electric two-wheelers at its peak. Its successor, the PM E-DRIVE scheme, ran from 1 October 2024 with a total outlay of Rs 10,900 crore, covering electric two-wheelers, three-wheelers, ambulances, trucks, and buses, with Rs 4,391 crore allocated for the procurement of 14,028 electric buses and Rs 2,000 crore for public charging infrastructure [7]. Notably, PM E-DRIVE halved the per-vehicle incentive relative to FAME II, to Rs 5,000 per kWh initially and Rs 2,500 per kWh in its final phase, yet delivered 1.13 million subsidised EVs in its first year, roughly 3.4 times the annualised volumes achieved under FAME II [6]. This outcome, documented by CEEW, suggests the market has begun to stand on improving economics rather than subsidy alone, an encouraging signal for post-subsidy sustainability [6].

5.2 State policies

State governments have layered substantial incentives on top of central schemes. Maharashtra's EV Policy 2025, approved with an outlay of Rs 1,993 crore, targets 30 percent EV penetration by 2030 and offers buyer subsidies of up to Rs 1.5 lakh for electric cars alongside toll waivers on major expressways; it also mandates one EV charger for every five parking spots in new developments [17]. Karnataka's Clean Mobility policy, launched in February 2025, aims to attract Rs 50,000 crore of investment and offers 25 percent capital subsidies for public charging stations [17]. Uttar Pradesh became the first state to subsidise the upstream cost of charging stations with a 20 percent capital subsidy of up to Rs 10 lakh [15]. Delhi's policy focus on two-wheelers, scrappage incentives, and registration fee waivers has made it a consistently high-penetration market. The heterogeneity of state policies has effectively created natural policy experiments whose results can inform national design.

5.3 Favourable operating economics in the two- and three-wheeler segments

For high-utilisation vehicles, the operating cost advantage of electricity is decisive. An electric two-wheeler's per-kilometre energy cost is a small fraction of petrol cost, and for commercial three-wheeler operators the payback period on the EV premium is often under two years. This is why adoption has concentrated in these segments and why the three-wheeler segment electrified earliest and deepest. As battery prices continue their long-run decline, the price-parity frontier moves progressively up-market toward cars.

5.4 Model availability and manufacturer commitment

The widening of consumer choice has been a material enabler. The entry of TVS, Bajaj, and Hero MotoCorp into electric two-wheelers brought trusted brands, dealer networks, and after-sales service to a market previously served mainly by startups, and coincided with the segment's fastest absolute growth [5]. In passenger cars, the arrival of multiple models from Tata, MG, and Mahindra across price points, with Mahindra's registrations growing fivefold in FY2026, demonstrates that supply-side commitment generates demand [4].

5.5 Emerging domestic battery ecosystem

Although ACC PLI progress has lagged targets, the direction is meaningful: Ola Electric's gigafactory is producing cells at 5 GWh annual capacity with plans to scale, Exide Industries is commissioning its lithium-ion cell factory in Bengaluru by the end of FY26, and Amara Raja's giga corridor has begun producing LFP cells aimed at two-wheelers, three-wheelers, and commercial vehicles [16, 8]. Domestic cell production at scale would compress vehicle costs, insulate the market from import shocks, and anchor an industrial ecosystem around electric mobility.

6. Discussion

Three patterns stand out from the evidence. First, Indian EV adoption is economically led rather than aspiration led. The segments that electrified fastest, three-wheelers and two-wheelers, are those where total cost of ownership is unambiguous, while the passenger car segment, where the upfront premium is largest and charging dependence greatest, lags at 4.3 percent penetration. Policy that improves the economics, through charging density, financing cost, and battery cost, will therefore outperform policy that appeals to preference.

Second, the market has shown resilience to subsidy reduction. The CEEW finding that PM E-DRIVE delivered 3.4 times FAME II's annual volumes with half the per-vehicle subsidy indicates that the demand base has broadened beyond subsidy-sensitive early adopters [6]. The true test begins after July 2026, with

central two-wheeler incentives withdrawn; the trajectory of sales through FY2027 will reveal how much of current demand is self-sustaining.

Third, infrastructure is the binding constraint on the next phase. At roughly 235 EVs per public charger against a global norm near 6 to 20, and with the CII estimate of 1.32 million chargers needed by 2030 against about 29,000 today, the infrastructure gap is the clearest quantitative shortfall in the ecosystem [9, 14]. Unless charger deployment accelerates by an order of magnitude and extends beyond metros to highways and smaller cities, the EV30@30 aspiration for cars is unlikely to be met, even as two- and three-wheelers may approach it.

7. Policy Recommendations

First, shift the centre of policy spending from purchase subsidy to charging infrastructure, prioritising reliability standards, uptime disclosure, and deployment on highways and in tier-2 and tier-3 cities, while mandating charging provision in new residential and commercial construction as Maharashtra has begun to do.

Second, address financing cost directly. Priority sector lending status for EV loans, credit guarantee mechanisms for fleet electrification, and publication of standardised battery health certification would lower interest rates, support residual values, and unlock the used EV market.

Third, sustain and enforce battery localisation. The ACC PLI timeline shortfall suggests a need for stricter milestone enforcement combined with support for the upstream supply chain, including cell materials and recycling, so that cost reductions from localisation reach consumers.

Fourth, stabilise state-level policy. Road tax waivers and registration benefits that are withdrawn abruptly undermine consumer confidence; states should commit to multi-year glide paths so that buyers and investors can plan.

Fifth, invest in the data infrastructure of the transition: comprehensive, public, registration-linked data on EV usage, charging utilisation, and battery health would improve targeting of both public policy and private investment.

8. Conclusion

India's EV transition is real, rapid, and uneven. With 2.55 million EVs sold in FY2026 and an 8 percent share of new registrations in 2025, electric mobility has crossed from experiment to mainstream in the two- and three-wheeler segments, while passenger cars are at an earlier inflection point. The barriers that remain, upfront cost, charging infrastructure, resale uncertainty, and import dependence, are all tractable, and the enablers now in place, from PM E-DRIVE's demonstration that volumes can grow on falling subsidies to the first domestic cell factories, suggest a market approaching self-sustaining momentum in its leading segments. Whether India meets its EV30@30 aspiration will depend less on announcing new targets than on executing the unglamorous work of building chargers, cheapening credit, and making batteries at home. For a country that imports most of its oil and breathes some of the world's most polluted air, few industrial projects matter more.

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