Green Wheels: The Role of Electric Cars in Reducing Emissions in India

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***Abstract*—The Indian electric vehicle market has seen significant success, with FY2026 witnessing a sales figure of 2.45 million, a whopping 25% increase from the previous fiscal year. This paper seeks to shed light on the contribution of electric cars to emission reduction and energy security in India, which sources more than 88% of its crude oil from other countries, making the adoption of electric vehicles crucial for the nation. The paper relies on industrial statistics gathered through Vahan retail sales data, Autocar Professional, and Autocar India to discuss the performance of different segments, their shares, and energy efficiencies. Key findings include the fact that the electric two-wheeler category leads in volumes at 1.4 million units (57%) and that electric passenger vehicles have recorded the fastest growth rate (84% YoY). In terms of energy efficiency, EVs use ~60% of energy generated in the grid while conventional vehicles record 17-21%, in addition to no tailpipe emission. However, battery production emission (~50% EVs carbon footprint), low battery recycling rates (5%), and cobalt extraction for batteries remain key concerns. However, the competition dynamics are changing, with Tata Motors being threatened by new competitors such as JSW MG Motor and Mahindra. The Indian promise to have 40% non-fossil fuels in its power generation capacity by 2030 will increase the benefits of EVs on emissions. Although it is not an answer in its totality, electric vehicles are definitely an important part of India's sustainable transport system.**

***Index Terms*—Electric Vehicles (EVs), India EV market, emission reduction, battery sustainability, energy security**

I. INTRODUCTION

The emergence of electric vehicles (EVs) can be considered one of the biggest changes in the field of personal mobility ever since the internal combustion engine came to prominence about one hundred years ago. Being driven by an electric motor running on power generated by rechargeable batteries, such vehicles have zero tailpipe emissions whatsoever. This quality opens a way to minimizing air pollution in cities, decreasing carbon emissions by cars, and reducing our dependence on oil resources.

Contrary to conventional cars, which run on gas or diesel fuel, EVs are powered from electrical sockets or charging stations. Progress in battery technology makes these vehicles more effective and convenient, offering new possibilities for people seeking to switch to alternative forms of mobility. At present, there is a revolution happening in the world's automotive industry, which involves considerable investments into the electrification of vehicles.

As one of the most important car markets globally, India is standing at a crossroads with regards to the future of transportation. With approximately 88% reliance on foreign oil, the switch towards EVs becomes not only environmentally but strategically vital to the well-being of the country (Autocar Professional, 2026). The push to adopt EV technology in Western countries is largely motivated by environmental considerations, while for India, the reasons are rather economic and strategic in nature. Less oil means a healthier balance of payments and protection against global fluctuations in oil prices.

One of the main advantages that make EVs superior engineering-wise lies in their mechanical simplicity. In particular, a typical EV motor has only around 20 moving parts as opposed to almost 2,000 in an internal combustion engine car. Such simplicity results in lower maintenance needs and less vulnerability to malfunctions. Owners of EVs never have to change oils, air filters, spark plugs, and exhaust pipes.

Essential parts of the electric vehicle consist of the electric motor, the battery pack, the inverter, and several other control systems. In most electric vehicles, lithium-ion batteries are used since they are highly efficient in terms of energy density and have long cycle life. An inverter converts direct currents provided by the battery to alternating currents needed by the motor, while the control system regulates current movement and braking. All these operate at an efficiency level that can never be achieved by internal combustion engines.

II. TYPES OF ELECTRIC VEHICLES

Electric vehicles are divided into several classes in the industry depending on specific requirements of users and facilities.

Table 1: Types of Electric Vehicles

Vehicle Type	Description	Plug-in Required	Zero Tailpipe Emissions
Fully Electric Vehicle (EV/BEV)	Operates solely on battery power; no internal combustion engine	Yes	Yes
Plug-in Hybrid Electric Vehicle (PHEV)	Combines electric motor with conventional engine; can run on electric power for shorter distances	Yes	Partial
Hybrid Electric Vehicle (HEV)	Uses both motor and engine; battery charges through regenerative braking	No	No
Mild Hybrid Electric Vehicle (MHEV)	Small electric motor assists combustion engine but cannot power vehicle independently	No	No

Source: Standard industry classification

The best options for emissions reduction and energy security are provided by fully electric cars. Hybrids and plug-ins can play an important role as transitional technologies in those countries which still lack adequate charging stations.

III. ELECTRIC VEHICLE INDUSTRY PERFORMANCE IN INDIA (FY2026)

India has become one of the rapidly growing EV markets on a global scale, thus proving that high demand can be observed even in economically vulnerable developing countries. The total number of Indian EVs sold during FY2026 was the highest ever recorded according to the Vahan retail sales figures (Autocar Professional, 2026).

Market performance in general: The Indian electric vehicle industry managed to sell 2,452,194 electric vehicles in FY2026, showing a 25% growth compared to the previous year's 1,967,144 EVs. This growth is far higher than the average market growth rate, indicating accelerating consumer acceptance of the new technology.

Table 2: India EV Sales by Segment (FY2026)

Segment	FY2026 Sales (Units)	FY2025 Sales (Units)	YoY Growth (%)	Share of Total EV Market
Electric 2-Wheelers	1,402,138	1,150,781	+22%	57%
Electric 3-Wheelers	830,818	698,914	+19%	34%
Electric Passenger Vehicles	199,590	108,609	+84%	8%
Electric Commercial Vehicles	19,648	8,840	+122%	0.80%
TOTAL	2,452,194	1,967,144	+25%	100%

Source: Autocar Professional (2026, April 5)

Key highlights: (Autocar Professional, 2026)

Table 3: Key Performance Indicators – India EV Market (FY2026)

Metric	Value
Overall EV penetration in automobile market	8.27% (up from 7.52% in FY2025)

Electric 3-wheeler segment penetration	61%
Number of months with sales >200,000 units	5 months
All-time high monthly sales (March 2026)	280,093 units
e-4W registrations YoY growth	+91.3% (193,633 units)

Source: Autocar Professional (2026, April 5); Singh, A. (2026, April 1)

In case of passenger electric vehicles, Vahan data indicates that the registration of e-4Ws increased by 91.3% in fiscal year 2026 compared to fiscal year 2025, reaching 193,633 units (Singh, 2026). In the fourth quarter of fiscal year 2026 (January-March 2026), there was significant growth in e-4W sales, which grew by 53.2% on a month-over-month

Table 4: Monthly e-4W Registrations (Q4 FY2026)

Month (FY2026)	e-4W Registrations (Units)
March 2026	21,716
February 2026	14,177
January 2026	18,875

Source: Singh, A. (2026, April 1), Business Standard

IV. MARKET SHARE OF CARMAKERS IN INDIA (H1 FY2026)

As per the Vahan database analyzed by Autocar India (2025), the competitive scenario among electric passenger cars has witnessed a sea change during the first half of FY2026. It is an example of how fast markets can change when innovative products come into play. Total sales of electric passenger vehicles in H1 FY2026 (April-September 2025): 91,076 vehicles, up 108% from 43,847 vehicles in H1 FY2025 (Autocar India, 2025)

Table 5: EV Sales by Carmaker in India (H1 FY2026)

Carmaker	H1 FY2026 Sales (Units)	H1 FY2025 Sales (Units)	YoY Change (%)	Market Share FY2026	Market Share FY2025
Tata Motors	34,586	28,216	+23%	37.97%	64.35%
JSW MG Motor	26,640	8,329	+220%	29.25%	18.99%
Mahindra	19,436	3,078	+531%	21.34%	7.01%
Hyundai	3,558	387	+819%	3.90%	0.88%
BYD	2,975	1,337	+123%	3.26%	3.04%
BMW	1,510	455	+232%	1.65%	1.03%
Kia	1,141	117	+875%	1.25%	0.26%
Mercedes-Benz	553	419	+32%	0.60%	0.95%
Citroen	359	1,165	-69%	0.39%	2.65%
Volvo	192	223	-14%	0.16%	0.50%
Others	626	121	+417%	0.23%	0.34%
TOTAL	91,076	43,847	+108%	100%	100%

Source: Autocar India (2025, October 13). Based on Vahan data.

Important findings: Despite being a leader in the market, Tata experienced a considerable reduction in its market share from 64.35% to 37.97%. The fastest growing company in terms of volume was JSW MG Motor, which posted a +220% rise, while Mahindra had the highest growth rate (+531%) (Autocar India, 2025).

Table 6: Segment-Wise Performance Summary (FY2026)

Segment	Sales (Units)	YoY Growth	Penetration	Key Development
Electric 2-Wheelers	1,402,138	+22%	6.54%	TVS, Bajaj, Ather surpassed Ola Electric
Electric 3-Wheelers	830,818	+19%	61%	Highest penetration of any segment
Electric Passenger Vehicles	199,590	+84%	~3-4%	Fastest-growing mass segment

Electric Commercial Vehicles	19,648	+122%	<1%	Highest growth rate among all segments

Source: Autocar Professional (2026, April 5); Singh, A. (2026, April 1)

Electric Two Wheelers:
Despite being the largest segment in terms of number of units, the category continued to witness rapid developments. During FY2026, EV sales amounted to 1.4 million units with 6.54% penetration within the total two-wheeler market share (Autocar Professional, 2026). Within FY2026 itself, TVS Motor Co, Bajaj Auto and Ather Energy had surpassed Ola Electric in monthly unit sales at several points. The milestones during FY2026 include achieving 10 out of 12 six figure monthly sales with March 2026 clocking 190,941 units and Y-o-Y increase of 45%.

Electric Three Wheelers:
This category witnessed the highest penetration amongst all EV categories with 61% of the three wheelers sold in India being electric (Autocar Professional, 2026). Passenger segment recorded the highest numbers at 78,057 units in December 2025. Cargo segment continues to witness consistent rise on account of Total Cost of Ownership benefits from a Last Mile Delivery perspective.

Electric Commercial Vehicles:
Light Goods Carriers accounted for the highest penetration of units at 13,767 (70%) with 167% year-on-year growth. Electric Buses accounted for 5,039 units (50% growth). Heavy Goods Carriers witnessed fastest growth with 318% year-on-year growth (840 units) (Autocar Professional, 2026).

Efficiency and the Environment
As regards energy efficiency, electric vehicles have many more strengths than weaknesses. For instance, the amount of electricity generated in the grid that is converted into useful work by electric cars is about 60%. Petrol or diesel vehicles can utilize only between 17 and 21 percent of their energy source for useful work.

Table 7: Energy Efficiency Comparison

Parameter	Electric Vehicle	Petrol/Diesel Vehicle
Energy conversion efficiency	~60%	17-21%
Energy waste	~40%	~80%
Tailpipe emissions	Zero	Significant CO_2, NOx, PM
CO_2 emissions (including electricity/fuel production)	Baseline (1x)	~3x higher

Source: NITI Aayog (e-amrit.niti.gov.in)

Decarbonisation Targets for Grid Electricity in India:
Further decreasing the effects of EV charging on the environment, India has pledged to attain about 40% cumulative electricity installed capacity from non-fossil fuel sources by 2030 (Government of India).

V. MANUFACTURING EMISSIONS AND SUSTAINABLE BATTERIES

Manufacturing emissions:
The Union of Concerned Scientists (n.d.) reports that manufacturing electric vehicles emits more carbon emissions than manufacturing petrol and diesel vehicles because of battery manufacturing.

Table 8: Battery Sustainability Metrics

Metric	Value	Source
Global cobalt reserves in DRC	~60%	The Guardian (2019)
Environmental impact from battery production	~50% of total EV impact	Greenly.earth (n.d.)
Lead-acid battery recycling rate (US)	99%	US EPA (2016)
Lithium-ion battery recycling rate (global)	~5%	Chemical & Engineering News (n.d.)
Potential second-life duration for used EV batteries	10+ years	MIT News (2020)

Mining cobalt in the Democratic Republic of Congo has been shown to harm biodiversity and raises human rights issues, including the use of child laborers (The Guardian, 2019). Second life applications for batteries: "For vehicles, once the battery drops below, say, 80 percent of its original capability, the range gets limited," Amol Phadke from UC Berkeley explained. "That is not a problem for stationary energy storage." According to researchers at MIT, spent batteries from electric vehicles can be reused for solar energy storage for up to a decade or more (MIT News, 2020).

VI. POLICY FRAMEWORK AND STRATEGIC SIGNIFICANCE

Table 9: India's EV Policy Framework

Policy Target	Goal	Timeline
Non-fossil fuel power capacity	40% of installed capacity	By 2030
EV penetration	Significant increase from current 8.27%	Under various state and central policies

Source: Government of India

Importance from a strategic perspective:
India is still reliant on imported crude oil by 88%, which makes the adoption of electric mobility strategically important in addition to the obvious environmental gains (Autocar Professional, 2026).

VII. CHALLENGES AND CONSIDERATIONS FOR INDIA

Table 10: Key Challenges for EV Adoption in India

Challenge	Description	Current Status
Charging Infrastructure	Requires widespread charging stations vs. familiar gas stations	Rapidly expanding but concentrated in urban areas
Grid Carbon Intensity	Benefits depend on electricity source	40% non-fossil target by 2030; currently significant coal dependence
Battery Manufacturing	Carbon-intensive process; reliance on imported rare earth elements	Domestic manufacturing developing under PLI scheme
Recycling Infrastructure	Low lithium-ion battery recycling rates globally (~5%)	Early stage; under development
Upfront Cost	Higher initial purchase price than conventional vehicles	Gap narrowing with FAME subsidies and declining battery costs
Range Anxiety	Concern about running out of charge	Improving with longer-range models entering market

VIII. CONCLUSION

The growth of India's EV market can be characterized as spectacular, given that the number of EV sales in FY2026 amounted to 2.45 million units, representing an increment of 25% when compared to the sales in the previous fiscal year (Autocar Professional, 2026). As far as volume is concerned, electric two-wheelers take precedence with 1.4 million units sold, while electric passenger cars witnessed the highest growth rate of 84%.

Table 11: Summary of Key Findings

Parameter	Value
Total EV sales (FY2026)	2.45 million units
YoY growth	+25%
EV penetration	8.27%
Highest segment penetration	Electric 3-wheelers (61%)
Fastest-growing segment	Electric commercial vehicles (+122%)
Largest segment by volume	Electric 2-wheelers (57% of market)
Market leader (passenger EVs)	Tata Motors (37.97%)
Fastest-growing major manufacturer	Mahindra (+531%)

Competitive dynamics are changing fast. While Tata Motors continues to dominate the passenger EV market at 37.97%, the emergence of competitors like JSW MG Motor (29.25%) and Mahindra (21.34%) has seen them make considerable headway (Autocar India, 2025). The most impressive progress was witnessed in the penetration of electric three-wheelers, having made up 61% of their respective markets (Autocar Professional, 2026).

Environmentally, there are obvious benefits when it comes to energy efficiency, with electric vehicles using around 60% of grid electricity as compared to 17-21% used by traditional ones (NITI Aayog, n.d.). Zero tailpipe emissions are evident in fully-electric cars, and taking electricity production into account, traditional vehicles produce almost three times more CO_2 emissions on average than the latter (NITI Aayog, n.d.).

There still exist issues in this field. Battery production is responsible for almost half of the carbon footprint of an electric car (Greenly.earth, n.d.). Additionally, recycling of lithium-ion batteries takes place rarely worldwide (only 5%), despite all efforts (US EPA, 2016; Chemical & Engineering News, n.d.). The pledge of India to ensure 40% of non-fossil-fuel power by 2030 would greatly contribute to emissions reduction from the use of EVs. Nevertheless, electric cars are not the whole answer to the problems of transport in India, but judging by the information presented above, they are one of the key parts of sustainable development.

REFERENCES

[1] Autocar India. (2025, October 13). *India's EV sales double to 91,076 units in H1 FY2026.*

[2] Autocar Professional. (2026, April 5). EV sales in India surpass 2.45 million units in FY2026, all 4 segments register double-digit growth.

[3] Chemical & Engineering News. (n.d.). The time for serious recycling of lithium-ion batteries is here.

[4] Government of India. (n.d.). Policy announcement on non-fossil fuel power capacity target by 2030.

[5] Greenly.earth. (n.d.). Electric cars: Are they really ecological?

[6] MIT News. (2020, May 22). Solar energy farms could offer second life for electric vehicle batteries.

[7] NITI Aayog. (n.d.). Benefits of electric vehicles. Retrieved from e-amrit.niti.gov.in

[8] Singh, A. (2026, April 1). Electric vehicle sales saw surge in FY26 on strong year-end push. Business Standard.

[9] The Guardian. (2019, December 16). Apple and Google named in US lawsuit over Congolese child cobalt mining deaths.

[10] Union of Concerned Scientists. (n.d.). Driving cleaner. Retrieved from ucsusa.org

[11] US Environmental Protection Agency. (2016). *2014 SMM factsheet.*