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Facts & Future Scenario: An analytical study of Eclectic Vehicles Market in India

[1]Dr. Netaji B. Kale, [2]Dr. Deepak Khati

[1]Asst. Prof. Head Dept. of Commerce, Tuljabhavani Mahavidyalya, Tuljapur Dist. Dharashiv (MS-India) Email: kalenetaji123@gmail.com
[2]Assistant Professor Department of Commerce, P.N.G. Government P.G. College Ramnagar (Nainital) Kumaun Unviersity, Nainital Email- deepakkhati79@gmail.com

ABSTRACT

As per the report of PNGRB 2024, the total number of vehicles in India stands at 36.83 crore, of which 82% run on petrol and 14% on diesel. This shows that in India, 96% of vehicles run on petrol or diesel, which only 4% run on electricity or CNG. Therefore, it is evident that issues related to air pollution, greenhouse gas emissions and energy security are rising significantly across India. Compared to traditional Internal Combustion Engine (ICE) vehicles, Electric Vehicles (EVs) have emerged today as a sustainable and eco-friendly alternative. To promote electric mobility, the Government of India has launched various policies and initiatives. Especially, NITI Aayog has provided significant strategic guidance for the development of the electric vehicle ecosystem.

On the basis of a literature review and drawing upon reports published by NITI Aayog and other Government report, this paper examines the development of the Electric Vehicle (EV) ecosystem in India. This study analyses trends in EV adoption, economic opportunities, future scenario, charging infrastructure, technological advancements, and policy-related challenges. Also, the research presents tables and graphs showing EV market growth, infrastructure development, and strategic objectives.

The study tells that, although India has made significant steps in the field of electric mobility, robust infrastructure, technological innovation, and the effective implementation of policies are imperative to achieve the target of 30% EV adoption by 2030.

*(**Keywords:** Electric Vehicles, Sustainable Transport, EV Policy, Green Energy, Electric Mobility, EVs Future, EVs Facts)*

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1. INTRODUCTION

As per the report, there are currently 1.644 billion vehicles worldwide, it is evident that the transportation sector has emerged as a major contributor to global greenhouse gas releases. In India, rapid urbanization, a growing population, and a continuous increase in the number of vehicles (according to the PNGRB 2024 report, the total number of vehicles in India stands at 378.3 million, of which 82% run on petrol and 14% on diesel) are more intensifying the severity of global environmental challenges. According to the 'Delhi Air Pollution Report 2025,' India has ranked as the second most polluted country in the world. In several cities, including Delhi and Mumbai, the 'Air Quality Index' (AQI) frequently exceeds the 300 to 400 mark during the winter months. This clearly shows that; air pollution and carbon emissions are assuming the form of very critical issues in India. Also, according to the 'Ministry of Petroleum and Natural Gas Report 2025,' India imports around 80 to 90 percent of its total fuel requirements; these statistics highlight the huge amount of India's dependence on fuel imports. Therefore, as a practical solution to these challenges, developing an eco-friendly transportation system has become the need of the hour.

Electric vehicles are vehicles powered by electricity, compared to traditional petrol and diesel vehicles, they are more energy-efficient and eco-friendly. An increase in the adoption of EVs can lead to a decrease in carbon releases as well as a reduction in dependence on fossil fuels.

In India, the development of electric mobility has taken place primarily under the strategic guidance of NITI Aayog. The NITI Aayog has published numerous policy reports and guidelines to simplify the explosion of electric vehicles. The Government of India aims to have electric vehicles account for 30% of total vehicle sales by 2030. But, compared to other countries such as China and the European Union, EV acceptance in India remains comparatively low. In 2024, EVs constituted 16.48% of total global vehicle sales, while in India, this figure stood at approximately 7.6%. This study explores the future expansion path of the Indian EV market and assesses the critical role of policymakers in creating a sustainable and sale reliant EV ecosystem.

2. SIGNIFICANCE OF THE STUDY

The significance of this study is evident in the following aspects:

A. It provides an in-depth examination of the development of India's electric vehicle industry.
B. It analyses the impact of EV policies.
C. It focused on EVs market in India during 10 years. .

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D. It provides useful information for policymakers and researchers.

3. REVIEW OF LITERATURE

Many research studies have been conducted globally regarding the development of electric vehicles (EVs). These studies have analyzed the economic, environmental, and technical implications of electric vehicles.

NITI Aayog (2025), According to the report titled "Unlocking $200 Billion Opportunity: Electric Vehicles in India," the electric vehicle industry in India has the potential to generate substantial economic opportunities by 2035. As per this report, the EV industry can provide a significant boost to India's manufacturing sector, reduce energy imports, and foster job creation.

International Energy Agency (2025), According to a report, the global adoption of electric vehicles is accelerating rapidly in 2024. In 2024, global EV sales exceeded 17 million units, reaching a sales share of more than 20%. This growth is contributing to a reduction in carbon emissions within the transportation sector. As per this report, the EV car sales is set to exceed 40% in 2030 under today's policy settings.

World Bank report (2022), according to the report titled "Mobility and Development: Innovations, Policies and Practices". This study suggests that electric vehicles can serve as a highly effective tool for mitigating air pollution in urban areas. Specifically, an increase in EV adoption, particularly in major cities can play a vital role in improving public health outcomes.

Gulati (2022) states that through the FAME I and II schemes, electric vehicles have been encouraged in India because they are now closer to petrol and diesel vehicles in cost. The study states that for faster electric vehicles to be within the reach of most people in India, the government policies need to continue to encourage electric vehicle owners to benefit from these schemes. The study looks at electric two-wheelers, three-wheelers, and four-wheelers and states that this financial support is important for India to achieve its clean energy, better cities, and climate goals. The study further states that government support is a strong push for the electric vehicle industry to flourish and build more electric vehicles in India. From the study, one can clearly see how government policies reduce the cost of electric vehicles for people in India.

According to Ray (2026), India is still in the process of developing its role in the global value chain, especially for the electric vehicle industry. The conventional automotive industry is doing well, with good investment and policy initiatives, but the electric vehicle industry is still in the growing phase, facing challenges like the lack of key minerals and the need for batteries

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to be imported. The study states that the government initiatives have helped the electric vehicle industry grow, especially for two- and three-wheelers, but the challenges of infrastructure and logistics still exist. The study also states that incentives alone are not enough to help the industry grow, as India needs more research, better batteries, and strong raw material supply chains to grow in the electric vehicle industry.

Several research studies have also highlighted certain barriers to EV adoption. These include the high cost of batteries, a shortage of charging stations, technical limitations, and a lack of consumer awareness. Consequently, the sustained growth of the EV industry necessitates the implementation of long-term strategies and significant investment.

4. OBJECTIVES OF THE STUDY

The objectives of the study are as follows;

1. To study of the evaluation of Electronic Mobility policy in India.
2. To study the impact of EV policies in India.
3. To study about the Growth of Electric Vehicles Global & India
4. To examine the future trends in EVs Market in India.
5. To study about the challenges of EVs Market in India.
6. To provide suggestions and recommendation to develop ecosystem of EVs in Inda

5. RESEARCH METHODOLOGY

The descriptive and analytical research methodology has been used to conduct the study.

Sources of Data: this is a review, so the primary source of the study are secondary data. The data was collected through following sources:

a. NITI Aayog Reports

a) Government of India EV Policy Documents
b) Research Reports from International Organizations
c) Research Journals
d) Industry Reports

Data Analysis Methods: To analysed the data, the researcher used methods such as statistical tables, Graphical analysis, comparative analysis and policy analysis. With the help of these methods, the growth, challenges and potential of Indias EV industry have been analysed.

7. THE EVOLUTION OF ELECTRIC MOBILITY POLICIES IN INDIA

The evaluation of electric mobility policies in India has been designed with a view to transforming high-level, ambitious objectives into a granular and production-oriented

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industrial strategy aimed at achieving those very goals. This evolution can be categorized into five distinct phases:

a) The Visionary Phase (NEMMP)

b) The Market Activation Phase (FAMA I & FAMA II)

c) The Demand-side subsidise Phase (PLI and State-level Integration)

d) Decentralized Phrase (State-level EV Policies)

e) Battery Manufacturing and the Circular Economy phase

7.1.The visionary Phase: National Electric Mobility Mission Plan (NEMMP) 2020

NEMMP 2020 policy is known as a foundational "Vision Document" of the electric mobility in India. This policy has been launched by the Government of India in 2013, it is a first policy to focused on national energy security and vehicle pollution. This policy set an ambitious goal of achieving 6-7 million sales of hybrid and EVs annually by 2020. Also, the estimated a redacting in crude oil consumption by nearly 9,500 million litters, it was equivalent to a saving of approximately Rs. 62,000 crores.

This policy was framed on four key pillars i.e. Decline the upfront cost of EVs for consumers, provide incentives to local production of EV components to crate a Make in India ecosystem, investing in indigenous technology for batteries, motors and powertrains to reduce dependancy on imports and last one was developing a nationwide network of charging stations and battery-swapping facilities in India. The proper implementation and to ensure high-level coordination among various ministries such as power, road transport and finance ministries etc, the two critical bodies were established i.e. National Council for Electric Mobility (NCEM) & National Board for Electric Mobility (NBEM).

As we look at 2026, even though the target year of 2020 has passed, the NEMMP remains just as relevant today, serving as a foundational pillar—both legal and conceptual for achieving the goal of 30% EV adoption by 2030. The NEMMP continues to provide consistent guidance for the process of integrating new technologies—such as Advanced Chemistry Cell (ACC) batteries and hydrogen fuel cells—into India's broader mobility strategy.

7.2.The Market Activation Phase (FAMA I & FAMA II):

After the visionary Phase, the government of India introduced Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme to operationalization of NEMMP.

- **FAMA I (2015-2019):** This pilot phase was launched in April 2015 with a modest budget of Rs. 895 crores, the FAMA I phase focused on creating initial market demand through purchase incentives. The objective of this policy was technology-neutral—supporting

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hybrids alongside Battery Electric Vehicles—and it successfully supported approximately 250,000 vehicles while sanctioning around 500 charging stations. This pilot phase has been provided that Indian consumers were open to EVs, leading the government to drastically increase the budget for the next phase.

- **FAME II (2019–2024):** This phase marked a monumental leap in India's EV policy, involving a total budgetary allocation of Rs. 11,500 crores. It contrasts to the inclusive approach of the FAMA-I phase, the second phase focused primarily on public and shared transportation. This phase prioritized the electrification of e-buses, as well as commercial e-rickshawas and e-four wheelers. At the same time, however, it maintained the support provided to private e-two-wheelers. In this phase, the government adopted the Phased Manufacturing Program (PMP), requiring companies to source a high percentage of components locally to qualify for subsidies. By the conclusion of this initiative, it had aided over 1.6 million vehicles, including 1.4 million e-two-wheelers and approximately 5,000 e-buses.
- **PM E-Drive (2024-2026):** Upon the conclusion of FAMA II, the government introduced PM E-Drive (October 2024) to address the maturing market. Under this scheme has allocated total budget of Rs. 10,900 Crore and Rs. 2,000 crores specifically for public charging infrastructure. The goal of this scheme to install 72,300 public charging stations by March 2026.

Table 01: Comparative analysis of FAME I, FAME-II & PM E-Drive

Feature	FAME I (2015-2019)	FAME II (2019-2024)	PM E-Drive (2024-2026)
Budget outlay	Rs. 895 Crore	Rs. 11,500 Crore	Rs. 10,900 Crore
Duration	4 Years (Experimental)	5 Years (Scaling)	2 Years (Consolidation)
Focus Area	Technology & Pilot Projects	Public & Shared Transport	Mass Adoption & Infrastructure
Vehicles Covered	2W, 3W, 4W, Buses (Hybrid & EV)	2W, 3W, 4W, Buses (EV & PHEV)	2W, 3W, e-Trucks, e-Ambulances, e-Buses
Private 4W Support	Yes	Very Limited (Taxis only)	No (Shifted to Charging Infra)
Charging Stations target	520 Stations	7432 Stations	72,300 Stations
Vehicle Targets	2.8 lakh Vehicles (Achieved))	15.6 lakh vehicles (Exceeded upto 16.5 lakh)	24.8 lakh vehicles (Ongoing)
Infrastructure Outlay	Rs. 40 Crore	Rs. 800 Crore	Rs. 2000 Crore

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7.3.The Demand- Side Subsidies Phase (PLI and State-level Integration):

Identifying that demand-side subsidies alone cannot provide sustainable support for long-term transition; the government of India announced the Production Linked Incentive (PLI) schemes in 2021.

- **PLI for Automobile and Auto Components (₹25,938 crore):** This scheme focuses on the manufacturing of 'Advanced Automotive Technology' (AAT) products. Specifically, for Zero Emission Vehicles (ZEVs), the scheme offers financial incentives ranging from 13% to 18% on incremental sales.
- **PLI for Advanced Chemistry Cell (ACC) Battery Storage (₹18,100 crore):** This is perhaps the most transformative policy measure within the current ecosystem. By incentivizing the domestic establishment of a 50 GWh battery manufacturing capacity, the government aims to manufacture the most expensive component of an EVs right within the contrary. Through this insulating, the Indian market from global supply chain volatility and reducing the Total Cost of Ownership (TCO).

7.4.Decentralized Phrase (State-level EV Policies)

A defining characteristic of the post-2020 evolution is the emergence of robust state-level EV policies. By 2026, more than 25 states have notified dedicated policies that complement central schemes. These policies address regional logistical nuances:

- **Financial Incentives:** States such as Maharashtra and Uttar Pradesh offer 100% waivers on road tax and registration fees, thereby significantly lowering the barrier to entry for consumers.
- **Infrastructure and Logistics:** Recent state updates (e.g., Maharashtra's 2025–2030 policy) have introduced non-financial benefits, such as toll-free travel for EVs on state expressways and mandatory "EV-ready" building codes. This "competitive federalism" has transformed states into laboratories for infrastructure innovations, such as battery-swapping networks and dedicated "Green Zones" within urban centers.

7.5.Closing the Loop: Battery Manufacturing and the Circular Economy

The latest stage in this evolution is the integration of the circular economy. Current incentive schemes for battery manufacturing are now being linked with battery waste management regulations, which mandate Extended Producer Responsibility (EPR). By early 2026, the policy focus is set to expand to include incentives for "urban mining" (battery recycling), ensuring that materials utilized in the first generation of EVs can be recovered for the subsequent cycle of PLI-driven Gigafactories.

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8. CURRENT SCENARIO OF EVS: GLOBAL VS INDIA

8.1.Growth of Electric Vehicles Global & India

During the period from 2016 to 2024, global sales of Electric Vehicles rushed from 9,18,000 to 18.17 million. Parallel, the total EV stock also witnessed a massive expansion, reaching an estimated 62.21 million vehicles in 2024. Similarly, during this same period, the pace of EV sales in India also increased significantly. As observed in Table 02 below, these sales rose from 50,000 vehicles to 2.08 million vehicles and stock were 2.72 time of sales.

Table 02: Global Vs India Scenario in Sales & Stocks (Figures thousand)

Year	Global EV Sales	Global EV Stock	India EV Sales	India EV Stock	India Sales YoY Growth	Global Sales YoY Growth	Sales Ratio (India/Global)
2016	918	2,269	50	50	-	-	5.45%
2017	1,430	3,159	87	137	74.00%	55.80%	6.08%
2018	2,248	6,099	130	267	49.40%	57.20%	5.78%
2019	2,421	8,294	167	434	28.50%	7.70%	6.90%
2020	3,159	11,447	125	559	-25.10%	30.50%	3.96%
2021	6,866	17,787	332	891	165.60%	117.30%	4.84%
2022	10,637	27,892	1,025	1,916	**208.70%**	54.90%	9.64%
2023	14,386	42,424	1,532	3,448	49.50%	35.20%	10.65%
2024	**18,786**	**61,210**	**2,008**	**5,456**	31.10%	30.60%	**10.69%**
CAGR	**45.84%**	**50.96%**	**58.66%**	**79.78%**			

(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India)

As compare to the world, India is growing significantly faster than the global average. Particularly, the number of electric vehicles in India is increasing at an annual rate of 79.78% nearly, it is a 30% faster than the global number and this is indicative of India's rapid 'catch-up' phase in this sector. Figure 01 below clearly shows how indies EVs sales are growing in comparison to global trends. During the period from 2021 to 2021, EV sales consistently remained higher then global sales. This situation took a decisive turn during the years 2021 & 2022, when an increase of 165.60% and 208.70%, respectively was recorded in EV sales.

By observing year-over-year (YoY) growth percentages in figure 01, we can identify certain specific "tipping points" within the market.

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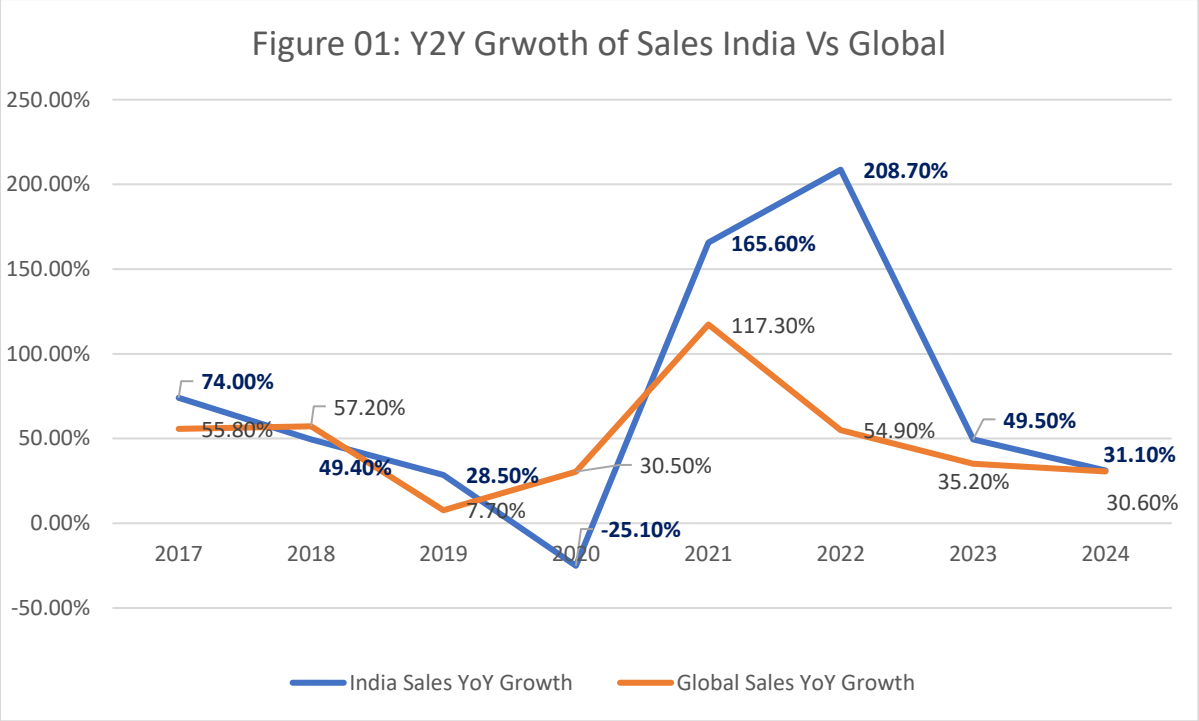
During the period from 2021 to 2022, India witnessed its most significant surge in sales, recording a staggering jump of 208.7%. This growth aligns with the post-pandemic economic recovery and the enhanced incentives provided under the 'FAME II' scheme.



(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India)

While global sales raised by 30.5% in 2020, India's sales declined by 25.1%. This suggests that, relative to the global market, the Indian EV market proved more susceptible to supply chain disruptions or localized lockdowns during the pandemic period. In 2024, the growth rates for both the global (30.6%) and Indian (31.1%) markets have begun to converge. This indicates that the Indian market is now maturing and is moving in tandem with global trends.

8.2.EV Penetration Rate: Global Vs. India and its CAGR

Following figure 02 shows the EV Penetration Rate and CAGR. The fast progress of India's electric vehicles industry has been marked by a number of critical shifts that have signaled a fundamental change in India's automotive market. The first critical shift came in 2021, which has been referred to as the "2021 Inflection Point." This was when electric vehicles market penetration recorded a massive jump from 0.67% to 1.76%. This was mainly driven by a strategic boost to FAME-II subsidies, as well as a notable improvement in environmental awareness among consumers as a result of the global pandemic. This was followed by a Rapid Acceleration Phase that lasted between 2022 and 2024, during which market penetration was boosted to 7.66% within three years, up from 4.75%.

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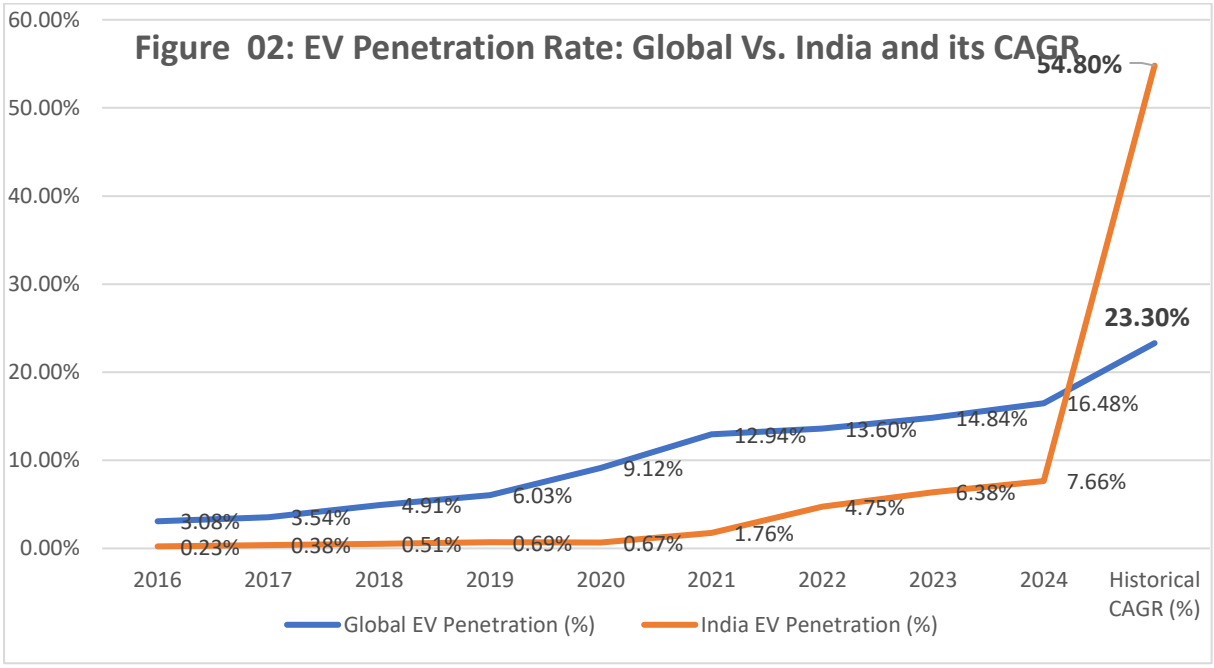
When viewed from a global viewpoint, India's growth is unprecedented. Considering the global benchmark for Electric Vehicle (EV) adoption, it currently stands at 16.5%. For a developing nation facing infrastructural challenges, the fact that India has achieved nearly half of this global benchmark for EV adoption by 2024 is truly remarkable. Consequently, this indicates that India has not merely become a country emulating the global phenomenon of EV adoption, but has also emerged as a competitor—and one with a rapidly narrowing time lag.



(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India)

From Figure 02, it is evident that, "In terms of quantitative analysis, the adoption of Electric Vehicle (EV) technology over the period ranging from 2016 to 2024 shows a considerable variation in growth rates. The global EV industry registered a constant Compound Annual Growth Rate (CAGR) of 23.3%, while the Indian EV industry recorded an enormous growth of 54.8%, reflecting an exponential growth curve. This highlights that the Indian industry is presently undergoing the 'vertical ascent' phase of the technology adoption curve. For researchers and policymakers, these statistics clearly point out that the 'generating demand' phase is over, and the real issue at hand is 'expanding infrastructures' to cope with this growth of over 50%."

9. EV FUTURE MARKET IN INDIA

Moreover, the 30% CAGR model aligns closely with NITI Aayog's "30@30" vision. It shows a transition that is ambitious but still realistic. India aims for 30% EV penetration by 2030. However, our estimates suggest (figure 03) a slightly lower figure of 23.7%. This gap reflects

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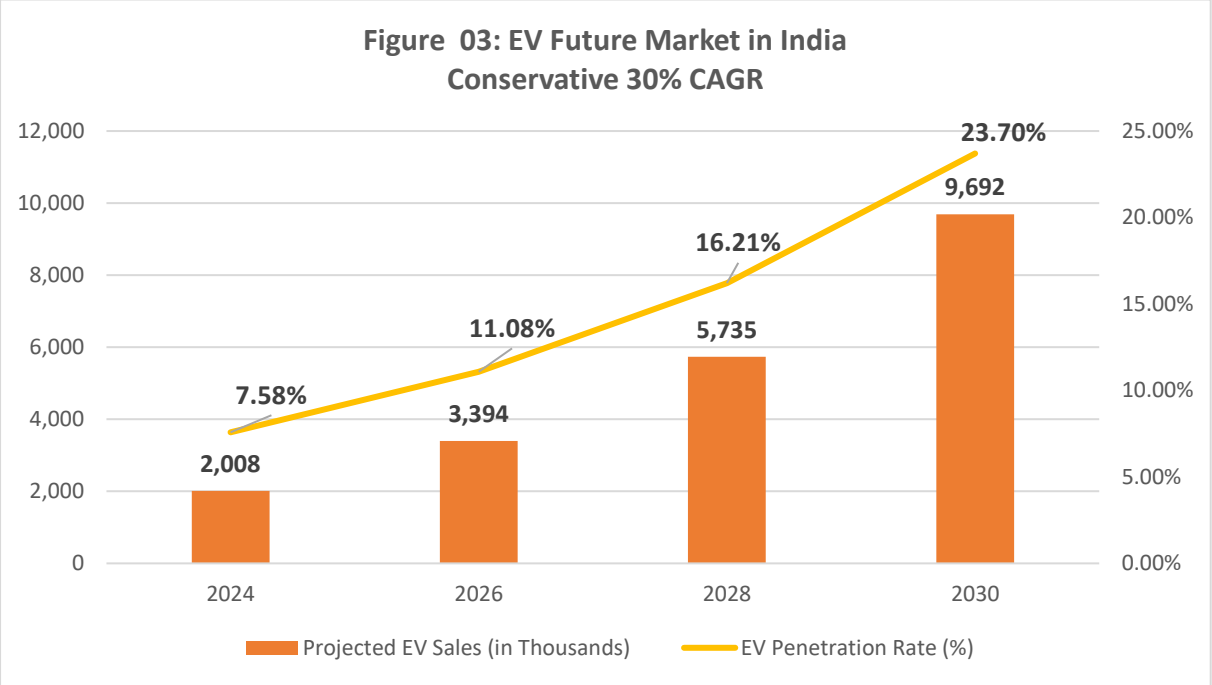
real challenges. These include slower adoption in heavy vehicles and limited charging infrastructure in Tier-2 and Tier-3 cities.



(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India & Conservative 30% CAGR)

Even with this gap, the outlook is strong. Annual EV sales could reach 9.69 million by 2030. This is a major industrial achievement. Higher growth models like 50% or 80% CAGR may stress the power grid and lithium supply. In contrast, the 30% path offers steady and sustainable growth.

9.1. EV 2/3w Future Market in India

The growth of India's electric 2/3-wheeler market follows a clear upward shape shown in figure 04. It has moved from an early experimental stage to rapid expansion. Between 2015 and 2020, growth was slow. Market penetration stayed below 1%. This was due to limited options and low consumer trust.

Things changed in 2021–2022. This was the turning point. Stronger FAME-II subsidies and a boom in delivery services pushed demand. Sales jumped by over 206% in just one year. By 2024, annual sales reached 1900 thousand units. Market penetration rose to 9.60%. This shows a shift from early adopters to the early majority.

The future looks even stronger. With a steady 30% CAGR, the market will expand rapidly. By 2030, penetration is expected to reach 30%. This matches NITI Aayog's "30@30" target. Growth will continue beyond that. By 2034, penetration could reach 64.19%. This means two out of three vehicles sold may be electric.

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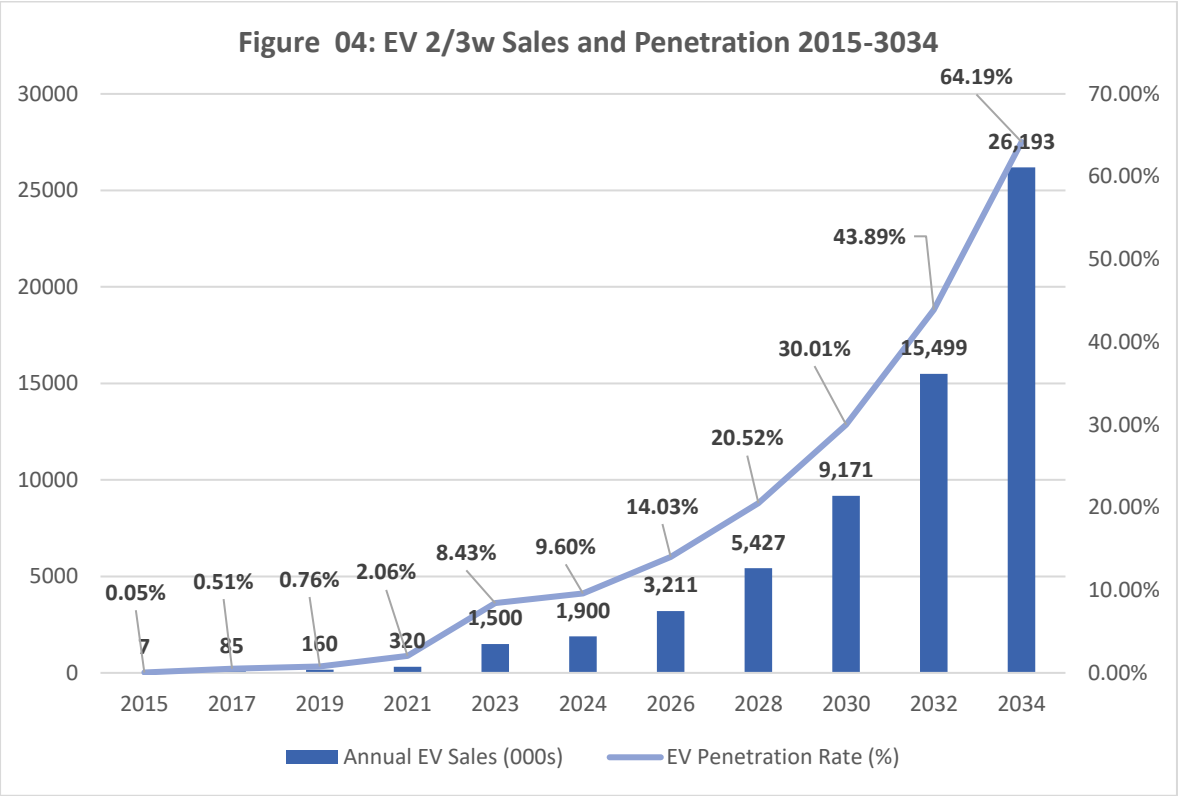

(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India & Conservative 30% CAGR)

In total, over 110 million EVs could be on the road. This will reshape India's cities. It will require more charging stations and better battery recycling. At the same time, it will reduce dependence on imported fuel and support a cleaner future.

9.2. E-Bus Future Market in India.

Figure 05 indicates that, India is moving progressively toward electric public transport. From 2015 to 2019, electric buses made up less than 1% of the market it India. They were mostly used in small pilot projects.

After 2021, things changed quickly. Government support, especially the FAME-II scheme, boosted sales. By 2024, annual sales reached 3,740 buses. This brought market share to 3.74%. If the market grows at 30% each year, the share could reach 13.47% by 2030. This matches national goals set by NITI Aayog. By 2034, the share may rise to 31.65%. Around 217,480 electric buses could be on the road by then. This shift is not just about new technology. It will cut diesel use, lower pollution, and make public transport cleaner and more efficient.

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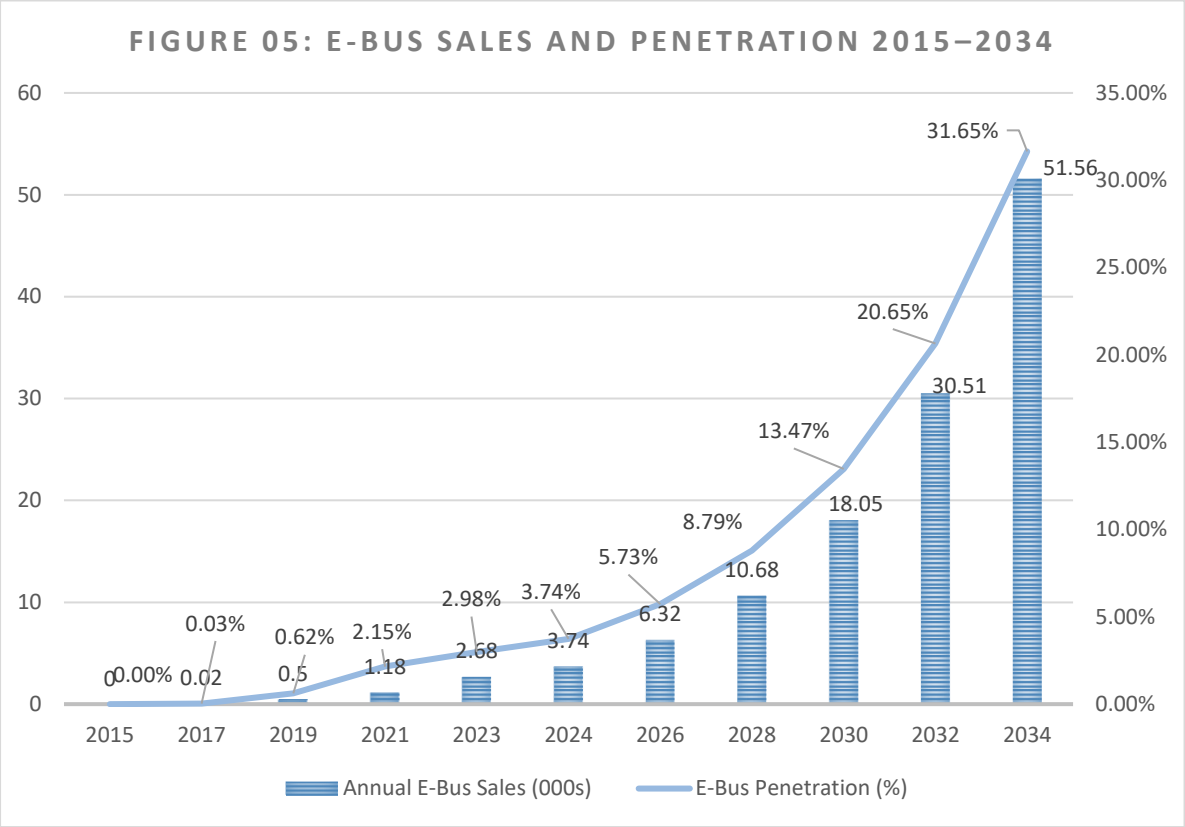

(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India & Conservative 30% CAGR)

9.3.E-4w Future Market in India

Following figure 06 shows that, India's car market is slowly shifting from petrol and diesel to electric. From 2015 to 2020, electric cars were very rare in India. Their share stayed below 0.1%. High prices and fear of limited driving range held people back.

Between 2021 & 2023, things began to change. Indian companies launched better electric SUVs. Charging stations also became more common in cities. By 2024, sales grew quickly and reached 158,080 units.

If this growth continues at 30% each year, electric cars could make up about 13% of all car sales by 2030. By 2034, yearly sales may cross 2.1 million cars. Electric cars could become a normal part of city life. This shift is not just about cars. It changes how families travel every day. People can charge at home instead of worrying about fuel prices. In the long run, around 9 million electric cars could be on the road. This will reduce oil use, cut pollution, and make cities quieter and cleaner.

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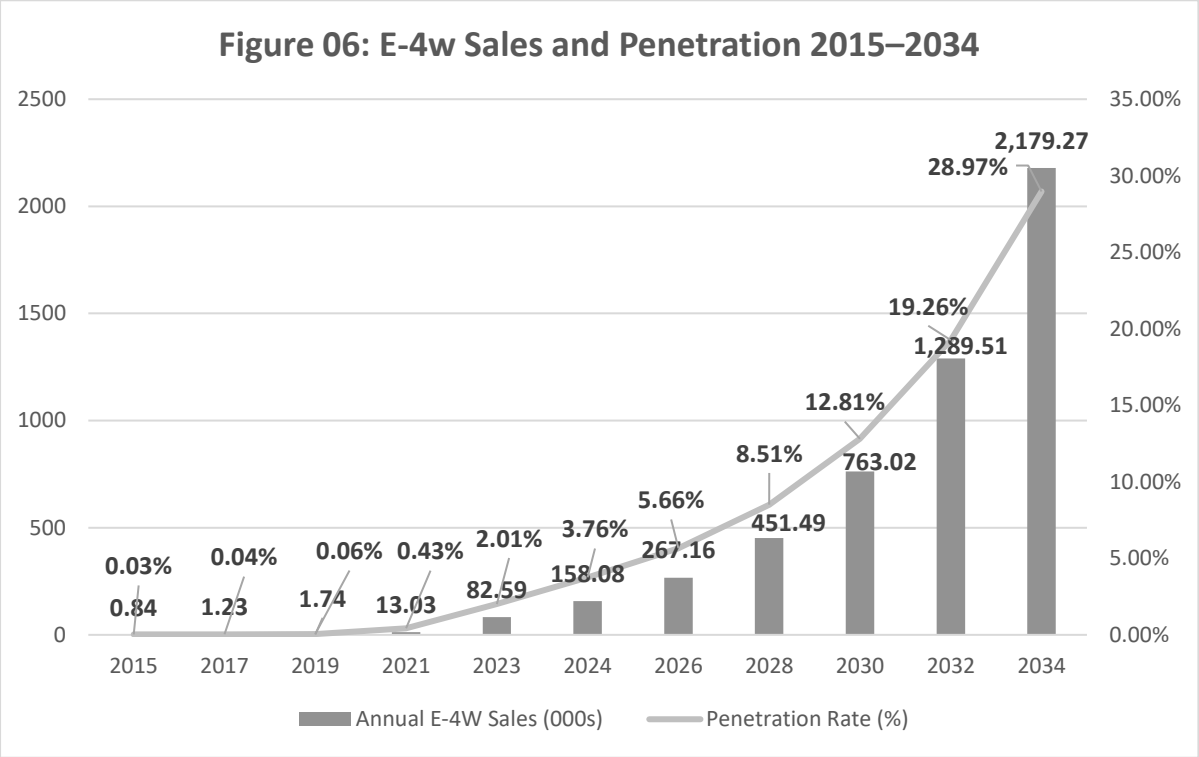

(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India & Conservative 30% CAGR)

9.4.E-Truck Future Market in India

Figure 07 described the India's truck industry is the toughest part of going electric. Unlike two-wheelers, electric trucks are still in early testing. From 2015 to 2022, almost nothing changed. The market stayed quiet. The main problems were high costs and lack of fast charging on highways. This made it hard for transport companies to adopt them.

A small change appeared in 2023 and 2024. Some industries started showing interest. This was mostly in places like mining, ports, and waste transport. These areas have fixed routes and easier charging options.

Even with steady growth of 30% each year, electric trucks may reach only 0.53% of the market by 2034. This slow progress shows a bigger issue. Truck electrification is not just about replacing vehicles. It needs a whole new charging system. India may need very fast charging or battery swapping for heavy trucks. Even though the numbers are small, the impact is big. By 2034, around 12,770 electric trucks could be on the road. Each electric truck can cut a large amount of pollution. One truck pollutes much more than several cars, so the benefits add up quickly.

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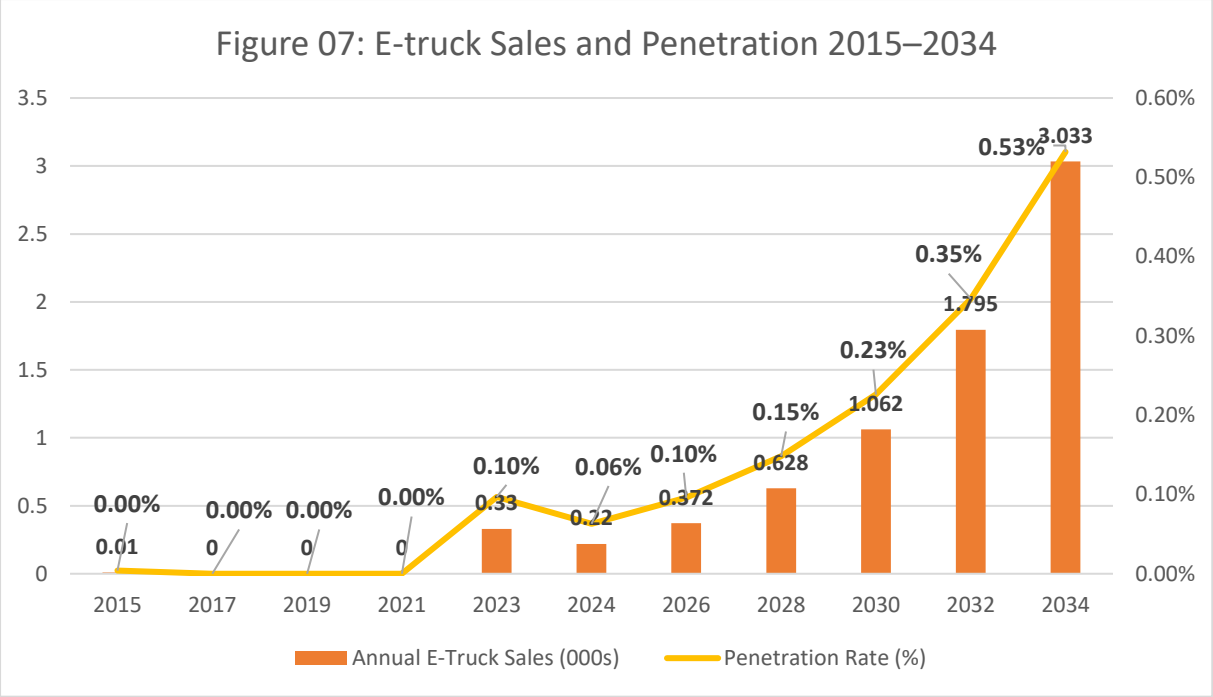

(Source: NITI Aayog, 2025- Report on Unlocking a $200 Billion Opportunity: Electric Vehicles in India & Conservative 30% CAGR)

10. CHALLENGES OF SWITCHING TO EVS IN INDIA

Switching to electric vehicles (EVs) in India is not easy task. There are many challenges slowing things down. it can be classified into four segments i.e. infrastructure, supply, demand, and Investment.

a) **Infrastructure Barriers:** Charging is still a big concern in India. Fast chargers need a lot of power (50kw- 250kw), and many local transformers cannot handle this load. According to NITI Aayog (2025), India's top cities will need around 18,000 charging stations by 2030, but setting them up is slow due to high costs and approvals.

Also, the charging points are also unequally spread. Big cities have some coverage, but highways and rural areas still lack proper facilities. In fact, many existing chargers do not work due to maintenance or power issues. States like Maharashtra are trying to fix this. New policies aim to place charging stations every 25 km on highways and offer financial support to private players.

b) **Supply and Technical Challenges:** EVs will be success when batteries capacity & modern technology. Batteries at the centre of the problem. According to the Economic survey 2025-26, India depends fully on imports for materials like lithium and cobalt. This makes the industry vulnerable to global supply issues, especially from countries like China.

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Research published in Jnanabha (2024), India's hot climate adds another challenge. High temperatures can affect battery life and safety, so better cooling systems are needed. Many advanced solutions are still being tested.

According to ICRA 2025 report, the cost of batteries is another big problem in India. They make up about 35% to 45% of the vehicle cost. Prices may stay high until local production increases in the coming years.

c) **Demand and Consumer Concerns:** India is a developing country so the Indian people still have doubts about EVs. There is no clear system to check battery health in used vehicles. This makes resale value uncertain, and the second-hand EV market is very small.

d) **Investment and Industry Impact:** The shift to EVs also affects the wider economy in India. If India does not produce its own batteries, it could miss out on economic value. EV manufacturing also creates fewer jobs than traditional vehicle production. This means workers will need new skills.

11.SUGGESTIONS FOR INDIA'S EV TRANSITION

Recent studies by NITI Aayog, the World Economic Forum, and other researchers highlight key steps India should take to speed up EV adoption.

1. EV loans should be made cheaper and easier to access. Including them under Priority Sector Lending can help more people afford EVs.
2. India should introduce a battery tracking system. This will improve trust in used EVs and support recycling.
3. All new buildings should be EV-ready with proper charging setup. Older buildings should be supported with incentives to install chargers.
4. Battery-swapping and leasing models should be encouraged. This can reduce the upfront cost of EVs and make them more attractive.
5. More charging stations are needed, especially on highways and in smaller towns. Fast-charging corridors will also help electric trucks grow.
6. India should invest in new battery technologies like sodium-ion. This will reduce dependence on imported materials.
7. Cheaper electricity during night hours can promote EV charging and reduce pressure on the grid.
8. Charging systems should be standardized so that all EVs can use the same infrastructure.
9. Strong recycling policies are needed to recover valuable materials from old batteries.

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10. The government should support EV industries in smaller cities. This will create jobs and build a strong supply chain across the country.

CONCLUSION

India's move to electric vehicles (EVs) has grown from a policy idea into a real market trend. Different vehicle segments are moving at different speeds.

Two-wheelers and three-wheelers are growing very fast. They could reach over 85% share by 2034. It shows that, India can be become huge markets & provide more opportunities in 2w & 3w production. But cars and trucks are still slower to adopt and need more support of government. If EVs grow at a steady pace, India could have over 140 million EVs on the road by 2034. This will reduce the country's dependence on imported fuel.

However, some challenges still continue. People worry about charging range and high upfront cost of EVs. Battery performance in high temperatures is also a concern. India also depends heavily on other countries for battery materials like lithium and cobalt. This creates risks for long-term growth. Local production and recycling will be important solutions of these problems in India. To speed up adoption, several steps are needed. Cheaper loans, better resale systems, and strong charging networks are important. Special freight corridors can also help electric trucks & Buses grow.

In the end, success will depend on more than just making EVs. India needs a full ecosystem. This includes clean energy, better batteries, and strong infrastructure. The next decade will not just be about using EVs, but about fully integrating them into everyday life. This shift can make transport cleaner, cheaper, and more sustainable for the future.

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