Let's Electrify

Accelerating Electric Vehicle Adoption And Awareness In India

Position Paper

teri | The Energy and Resources Institute
Creating Innovative Solutions for a Sustainable Future


CHARGER 3

SUGGESTED CITATION

The Energy and Resources Institute (TERI). 2025.
Let's Electrify-Accelerating Electric Vehicle Adoption and Awareness in India.
New Delhi, India: TERI.

PRINCIPAL INVESTIGATOR

Mr Faiz Jamal, Associate Fellow

CONTRIBUTING AUTHOR(S)

Mr Faiz Jamal, Associate Fellow
Ms Ruchika Mattoo, Associate Fellow
Mr Abhishek S, Research Associate
Mr Arun Babu, Research Associate

REVIEWERS

Mr Shri Prakash, Distinguished Fellow
Mr I V Rao, Distinguished Fellow
Mr. Sanjay Seth, Senior Fellow & Senior Director
Mr Sharif Qamar, Fellow & Associate Director

PUBLISHED BY

The Energy and Resources Institute (TERI)

For more information:
Transport and Urban Governance Division, TERI, 3rd floor, Core 1(b),
TERI Library block, IHC Complex Lodhi Road, New Delhi 110 003, India.
Tel: +91 11 2468 2100 or 2468 2111 | Fax: +91 11 2468 2144 or 2468 2145.
Email: **nidhi.verma@teri.res.in** | Web: **www.teriin.org**

Table of Contents

List of Figures

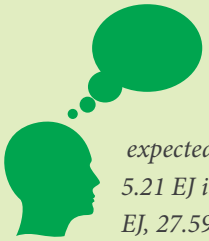
1. Introduction

1.1 Background

The transport sector plays a vital role in a nation's growth by providing access, facilitating the movement of people and goods essential for social and economic development and opening newer avenues of both direct and indirect employment opportunities. In India, however, the sector poses a major challenge to the country's climate goals. While India has committed under its updated Nationally Determined Contributions (NDCs) to reduce greenhouse gas (GHG) emissions intensity by 45% by 2030 compared to 2005 levels, the transport sector remains the third-largest emitter, accounting for nearly 12% of total GHG emissions. This challenge is further amplified by the country's rapidly growing population, accelerating urbanization, and expanding industrial and service sectors, all of which are driving transport demand at an exponential pace. According to TERI analysis, the passenger demand is expected to increase by more than four-folds and freight demand by more than twelve-folds by 2070–71 from 2019–20 levels, which will lead to higher emissions and a serious repercussion on the air quality.

Emissions from the transportation sector are mainly driven by fuel consumption in the road transport, which accounts for about 87% of passenger traffic and 60% of freight traffic movement in the country (TERI, 2024).

Under the Paris Agreement, different countries have committed emission reduction targets and marked the beginning towards shifting to net-zero. To achieve the net-zero goals set by different countries, considerable mitigation efforts are put to decarbonize transport sector through multitude of policies – promoting non-motorized transport, active promotion of electric vehicles (EVs), exploring possibility of hydrogen as fuel, biofuel blending with petroleum products, increasing market share of rail, investments in mass-transit, etc. In November 2022, India submitted its Long-Term Low Emission Development Strategy to the United Nations Framework Convention on Climate Change (UNFCCC), emphasizing the development of an integrated, efficient, inclusive low-carbon transport system in the country.



In BAU scenario, energy demand from transport is expected to increase from 5.21 EJ in 2019–20 to 12.27 EJ, 27.59 EJ, and 34.39 EJ in 2030–31, 2050–51, and 2070–71, respectively (TERI, 2024).

1.2 Aim and Objectives

The study aims to develop key awareness and elementary education about EVs, while converging on fast tracking their adoption in India. The focus has been in private vehicle segment because as per the (TERI, 2019) analysis, India will witness a significant shift towards personal vehicles and will be one of the key segments for electrification.

The study intends to provide the state of play of the EV-ecosystem in the country addressing key challenges, policy frameworks, and market trends that shape their adoption. By providing insights into government incentives, technological advancements, and infrastructure developments, the paper seeks to dispel common myths and highlight the benefits of transitioning to EVs.

Furthermore, it also explores the role of consumer awareness in accelerating EV adoption and outlines strategic measures to support India's long-term vision for vehicle electrification, in alignment with *Viksit Bharat* 2047 vision.

2. Need for Electric Mobility

The transport decarbonization will play a critical role in India's Net-Zero target by 2070. Exploring clean technologies and efficient low-carbon strategies is the need of the hour. The focus will be on the development of an integrated, efficient, inclusive and clean transport system, with a notable focus on electrification across various modes, signalling a push towards ZEVs (Jamal & Shukla, 2024).

Vehicle electrification has emerged as one of the leading technological innovation essential for achieving zero-tailpipe emissions and advancing the global goal of decarbonizing road transport sector. The adoption of EVs in India is crucial for several environmental, economic, and social reasons:

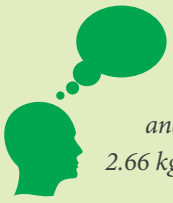
1) Environmental Benefits

- **Reduction in Air Pollution:** EVs have zero tailpipe emissions, significantly reducing air pollutants like NOx, COx and other particulate matter, which are the major contributors to urban air pollution in Indian cities.

- **Combatting Climate Change:** EVs, especially when powered by renewable energy (RE), can drastically lower GHG emissions, aiding India's efforts to meet its climate commitments under the Paris Agreement.

2) Economic Advantages

- **Reduction in Fuel Imports:** India is heavily dependent on crude oil imports with the country's import dependency for crude oil in 2023–24 reaching 87.7%.[1] Transitioning to EVs can reduce this reliance, saving valuable foreign exchange and improving energy security.



One litre of petrol burnt produces about 2.29 kg of CO_2 and every litre of diesel produces 2.66 kg of CO_2

- **Lower Operating Costs:** EVs have fewer moving parts than Internal Combustion Engine (ICE) vehicles, reducing maintenance costs. Additionally, electricity is often cheaper than conventional fuels, making EVs more cost-effective over time and integrating with RE could further lead to both financial and emission saving in the longer run.

3) Energy Independence

- **Promotion of Renewable Energy:** EVs encourage the use of clean energy sources by integrating renewable energies like solar into charging infrastructure, fostering energy independence and sustainability.

4) Technological Advancement and Industry Growth

- **Boost to Domestic Manufacturing:** Government initiatives such as the Production Linked Incentive (PLI) schemes and Make in India encourage EV manufacturing, creating jobs and fostering innovation.

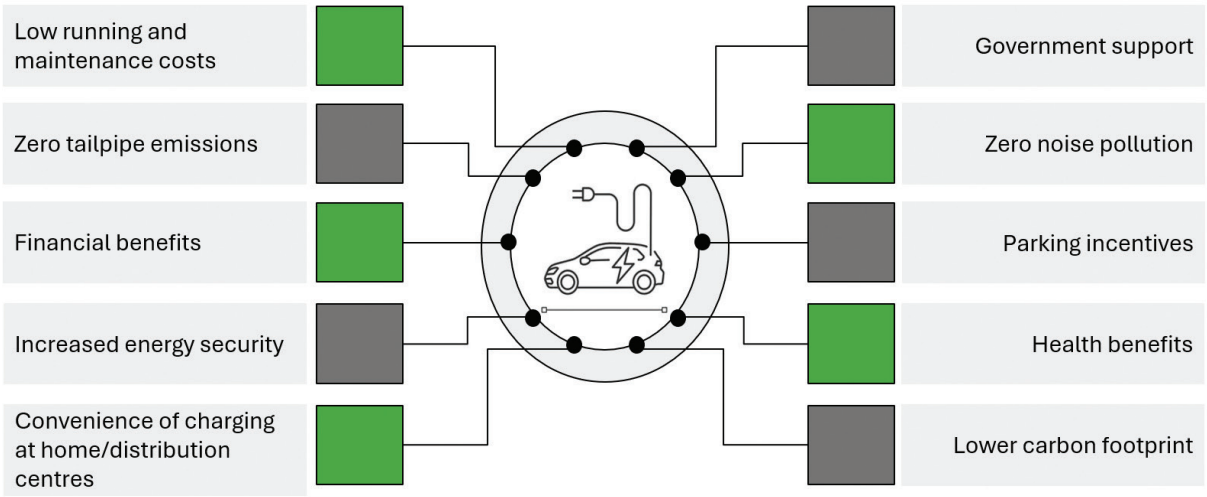
- **Development of New Ecosystems:** The rise of EVs promotes advancements in battery technologies, charging infrastructure, and smart mobility solutions.

5) Social Impact

- **Improved Public Health:** Reduced vehicular

[1] *Details available at: <https://ppac.gov.in/import-export>*

Figure 1: Benefits of EVs



Source: TERI

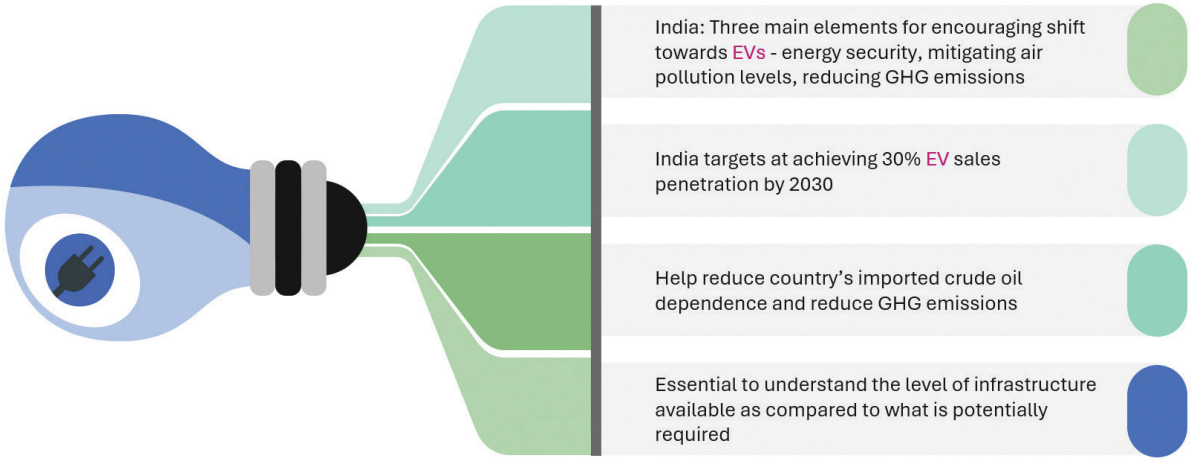
emissions lead to better air quality, lowering respiratory and cardiovascular diseases among the population.

- **Livelihood Opportunities:** The growing EV market is creating new jobs in manufacturing, sales, and maintenance, benefiting various sectors of the economy.

6) Government Support and Incentives

- **Policy Push:** The Government of India, along with state governments, is aggressively pushing for EVs through policy, fiscal and infrastructure supports. Steps such as waving registration fee, lower Goods and Services Tax (GST) rate for new EVs, and central schemes like Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles

Figure 2: EV need and targets in India



Source: TERI

(FAME-I & II), which is acting as a catalyst for the faster adoption of EVs.

- **Infrastructure Development:** Significant investments are being made in charging networks and battery swapping facilities, making EV usage convenient for consumers.

Adopting EVs is a transformative step towards a cleaner, greener, and more self-reliant India, addressing urgent environmental challenges while fostering economic growth and technological innovation.

Financial institutions like the Small Industrial Development Bank of India (SIDBI) are also facilitating this transition by designing funding mechanisms that lower the risks for financiers, enabling affordable lending for the EV market. Consequently, India has achieved over a million EV sales in each of the past two years, primarily driven by e-2Ws, e3Ws and passenger car segments. Additionally, growth in the electric bus sector has been instrumental in strengthening the indigenization of the electric vehicle in the country (Jamal & Shukla, 2024).

3. Plugging into the Future: Understanding the Electric Vehicles

3.1 What are Electric Vehicles (EVs)?

According to the Bureau of Energy Efficiency (BEE),[2] "All EVs, referred to as Battery Electric Vehicles (BEVs), have an electric motor instead of an internal combustion engine. The vehicle uses a traction battery pack to power the electric motor and must be plugged into a wall outlet or charging equipment, also called Electric Vehicle Supply Equipment (EVSE). As it runs purely on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank."

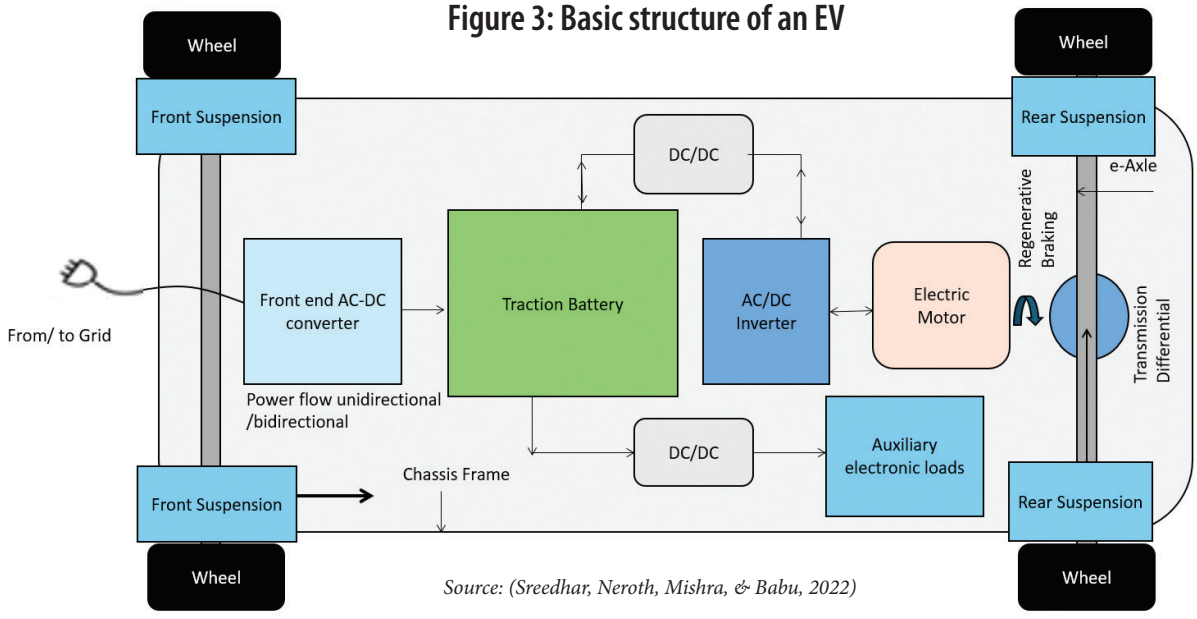
3.2 Key Components of an All-Electric Car

Major components of an All-Electric car are as follows: [3]

1) **Battery bank (all-electric auxiliary):** In an electric drive vehicle, the auxiliary battery provides electricity to power vehicle accessories.

2) **DC/DC converter:** DC/DC converter converts higher-voltage DC power from the traction battery pack to the lower-voltage DC power which is required to run vehicle accessories and recharge the auxiliary battery.

Figure 3: Basic structure of an EV



Source: (Sreedhar, Neroth, Mishra, & Babu, 2022)

[2] *Details available at: <https://evyatra.beeindia.gov.in/vehicle-type-details/electric-vehicle/#:~:text=All%2Delectric%20wvehicles%20(EVs),of%20an%20internal%20combustion%20engine.>*

[3] *Details available at: <https://evyatra.beeindia.gov.in/vehicle-type-details/electric-vehicle/#:~:text=All%2Delectric%20vehicles%20(EVs),of%20an%20internal%20combustion%20engine.>*

3) **Onboard charger:** Onboard charger converts AC to DC power for charging the traction battery. It also communicates with the charging equipment and monitors battery characteristics such as voltage, current, temperature, and state of charge while charging the pack.

4) **Transmission (electric)/Converter:** The transmission transfers mechanical power from the electric traction motor to drive the wheels.

5) **Electric traction motor/Transmission:** Using power from the traction battery pack, this motor drives the vehicle's wheels. Some vehicles use motor generators that perform both the drive and regeneration functions.

6) **Power electronics controller:** This unit controls the speed of the electric traction motor and its torque by managing the flow of electrical energy delivered by the traction battery.

7) **Thermal system (cooling):** This system maintains an optimum operating temperature range of the engine, electric motor, power electronics, and other components.

8) **Traction battery pack:** Stores electricity for use by the electric traction motor.

3.3 Types of Electric Vehicles

There are four types of electric vehicles available (NITI Aayog, 2024):

1) Battery Electric Vehicles:
Battery electric vehicles (BEVs) run entirely on a battery-powered electric drivetrain. The electricity used

Main Components of BEVs:
Electric motor, Inverter, Battery, Control Module, Drive train

Few Examples of BEVs:
MG ZS, TATA Nexon.ev, Mahindra Verito

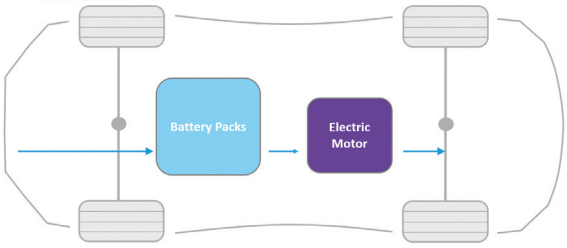
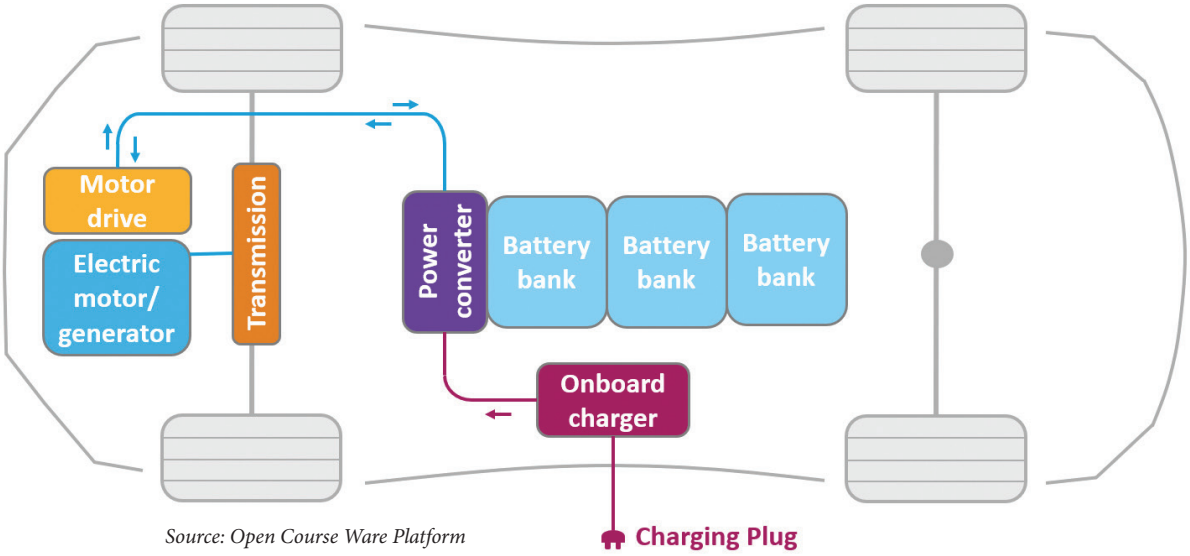


Figure 4: Key components of an EV



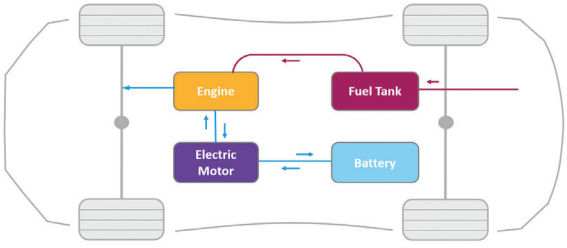
Source: Open Course Ware Platform

to drive the vehicle is stored in a large battery pack which can be charged by plugging into the electricity grid. The charged battery pack then provides power to one or more electric motors to run the electric car.

2) Hybrid Electric Vehicles:
Hybrid electric vehicles (HEVs) have both conventional ICE and electric motor. The engine gets energy from fuel, and the motor gets electricity from batteries. The transmission is rotated simultaneously by both engine and electric motor. This then drives the wheels.

Main Components of HEVs:
Engine, Electric motor, Battery pack with controller & inverter, Fuel tank, Control module

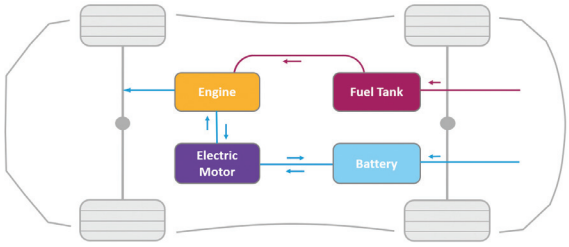
Few Examples of HEVs:
Toyota Urban Cruiser Hyryder, Maruti Grand Vitara, Toyota Innova HycrossVerito



3) Plug-in Hybrid Electric Vehicles:
Plug-in Hybrid Electric Vehicles (PHEVs) have both

Main Components of PHEVs:
Electric motor, Engine, Inverter, Battery, Fuel tank, Control module, Battery Charger (if onboard model)

Few Examples of PHEVs:
Volvo XC90, Land Rover Defender p400e



ICE and an electric motor. It could be driven by both the sources, i.e., conventional fuel or powered by a rechargeable battery pack with an external plug-in socket to be charged externally.

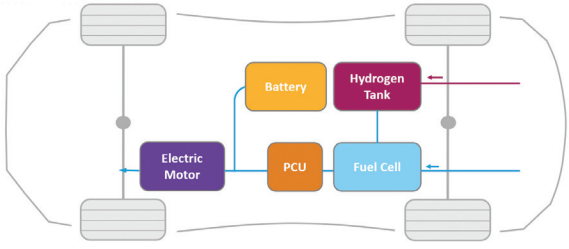
PHEVs can run in at least two modes:

a. All-electric mode, in which the motor and battery provide all the car's energy
b. Hybrid mode, in which both electricity and petrol/diesel are employed

4) Fuel Cell Electric Vehicles:
In Fuel Cell Electric Vehicles (FCEVs), electric energy is produced from chemical energy. Uses 'fuel cell technology' to generate the electricity required to run the vehicle.

Main Components of FCEVs:
Electric motor, Fuel-cell stack, Hydrogen storage tank, battery with converter and controller

Few Examples of FCEVs:
Toyota Mirai, Hyundai Tucson FCEV



4. All about EV Batteries and Charging Infrastructure

4.1 EV Battery

Electric vehicles are the major push for the transport sector, providing a sustainable alternative to ICE vehicles. The major factor of an EV is its power source – the heart, which is the battery. The battery is central to an EV's performance, range, cost, and environmental impact. Its longevity directly influences the total cost of ownership, reliability, and the overall sustainability of EV technology. Figure 5 explains the evolution of the batteries.

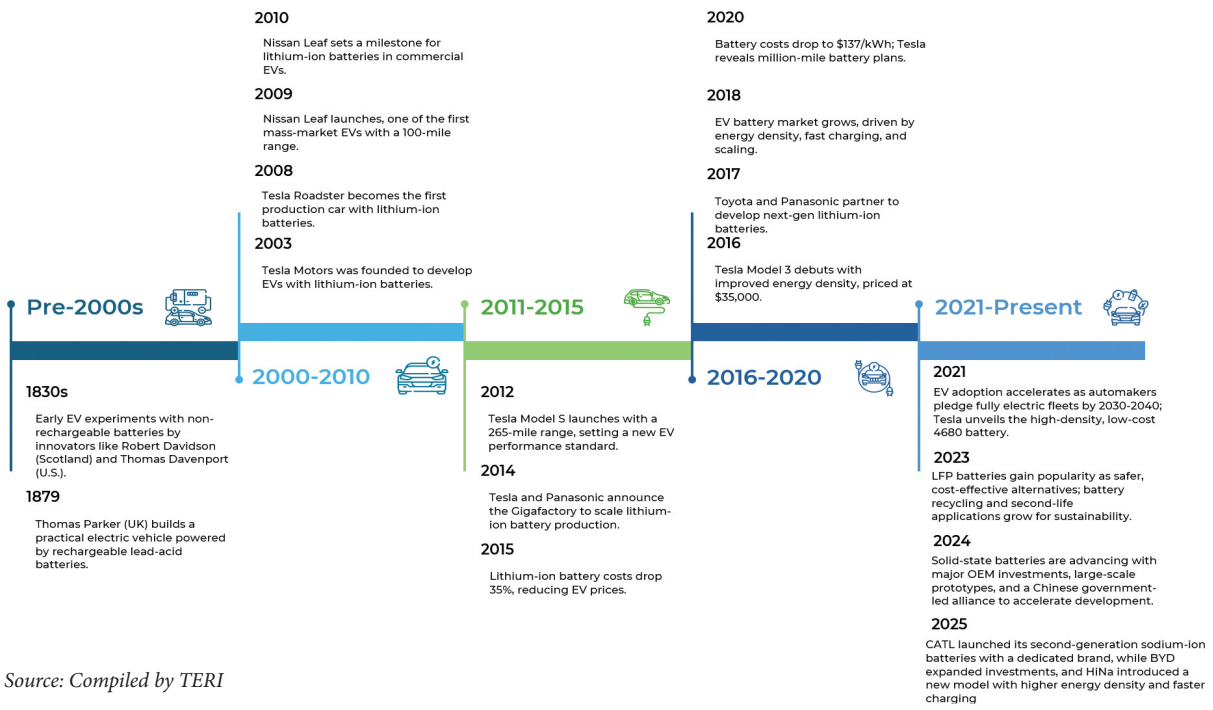
4.2 Types of Batteries

Technological innovations in this world are inevitable; research is being carried out constantly to make EV batteries more efficient and optimum. EVs can have different kind of batteries, from nickel-metal hydride to lead-acid to one of the most widely used lithium-ion (Li-ion) batteries. Some of the commonly used types of batteries, and their pros are given in Table 1.

Li-ion batteries, mainly lithium ferro phosphate (LFP) and nickel manganese cobalt (NMC), dominate Indian EVs. LFP batteries offer longevity, cost efficiency, and thermal stability, ideal for extreme climates. NMC batteries provide higher energy density and performance, suited for long-range, compact vehicles.

Cost is a major factor, with LFP being the most afford-

Figure 5: Global Battery Evolution



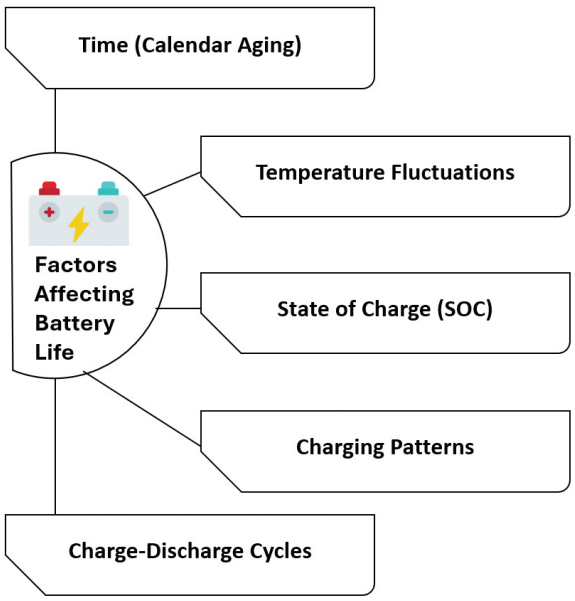
Source: Compiled by TERI

Table 1: Battery types and their pros and cons

Battery Type	Description	Pros	Cons
Lithium-Ion (Li-ion) Batteries	Commonly used in EVs due to high energy density, long lifespan, and low weight	High energy efficiency, good performance in various temperatures, low self-discharge	Expensive, sensitive to temperature, need careful management
Nickel-Metal Hydride (NiMH) Batteries	Used in HEVs for good cycle life and durability	Good cycle life, safe, environmentally friendly	Lower energy density, lower power-to-weight ratio, heavier, bulkier, memory effect
Lead-Acid Batteries	Oldest rechargeable battery, used for auxiliary purposes in EVs.	Low cost, widely available, recyclable.	Low energy density, lower power-to-weight ratio, inefficient, less durable, less safe.
Sodium-Ion Batteries	Sodium-ion batteries use sodium ions (Na+) to store and transfer energy, similar to Li-ion but with sodium as the primary active ion.	Abundance, low cost, can be manufactured using existing lithium-ion infra.	Low energy density and power-to-weight ratio, still in the development phase.

Source: TERI's compilation

Figure 6: Factors affecting battery life



Source: *EV Sahi Hai* platform by JSW MG Motors [4]

able, making it suitable for budget applications. NMC's cost balances affordability and performance, while Lithium Cobalt Oxide (LCO) and Nickel Cobalt Aluminum Oxide (NCA) prices, reflect their advanced energy density. Lithium Titanate Oxide (LTO) is the most expensive one justified by its exceptional features. Overall, the choice of battery chemistry depends on application-specific needs, balancing energy density, power delivery, lifespan, safety, and cost.

4.3 Factors Affecting Battery Life

Most EVs rely on Li-Ion batteries, which generally last 5–10 years[5] before requiring replacement or refurbishment, depending on usage and charging patterns. Several factors influence battery life, including aging due to usage, temperature fluctuations, state of charge

[4] *Details available at: <https://www.EV Sahi Hai.co.in/electric-vehicle-battery-life>*

[5] *Varies with charging cycle and use cases*

(SOC), charging habits, and charge-discharge cycles, etc. Operating the battery at very high or low charge levels also reduces its lifespan, as does frequent rapid charging, which generates heat and stress.

Battery health is often measured by its State of Health (SOH), which indicates how much capacity remains compared to a new battery. Over time, the SOH naturally decreases. For example, a battery with an 80% SOH may offer only 80 km of range on a full charge, compared to 100 km when new. On an average, SOH may drop by up to 30% in 8 years, depending on usage patterns.

The longevity of an EV battery is influenced by several factors:

1. Time (Calendar Aging): Over time, all batteries naturally lose capacity due to chemical aging, even when not in use.

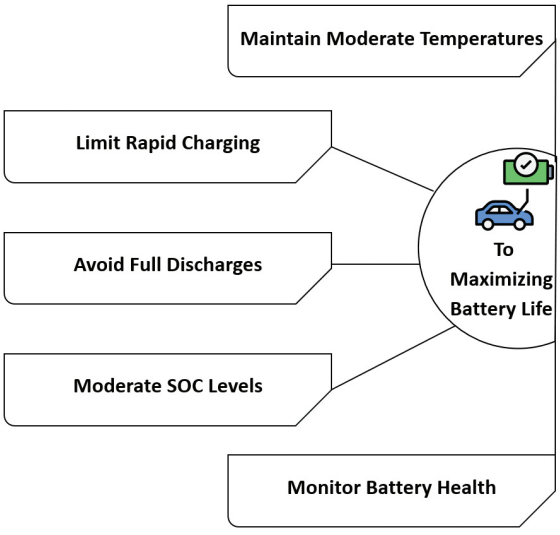
2. Temperature Fluctuations: Extreme temperatures cause thermal expansion and contraction, which can damage battery components. Hot climates or prolonged exposure to cold can accelerate degradation.

3. State of Charge (SOC): Operating the battery at very high or very low charge levels for extended periods harms its health. Keeping the SOC within a moderate range is beneficial.

4. Charging Patterns: Rapid charging, while convenient, generates heat and stresses the battery. Frequent charging to 100% can also reduce its life.

5. Charge-Discharge Cycles: Each full cycle of charging and discharging reduces the battery's capacity over time.

Figure 7: Factors to maintain the battery life



Source: *EV Sahi Hai* platform by JSW MG Motors [6]

To maximize battery life, it is recommended to maintain moderate SOC levels, ideally between 30%-80%, and reserve charging to 100% for long trips.

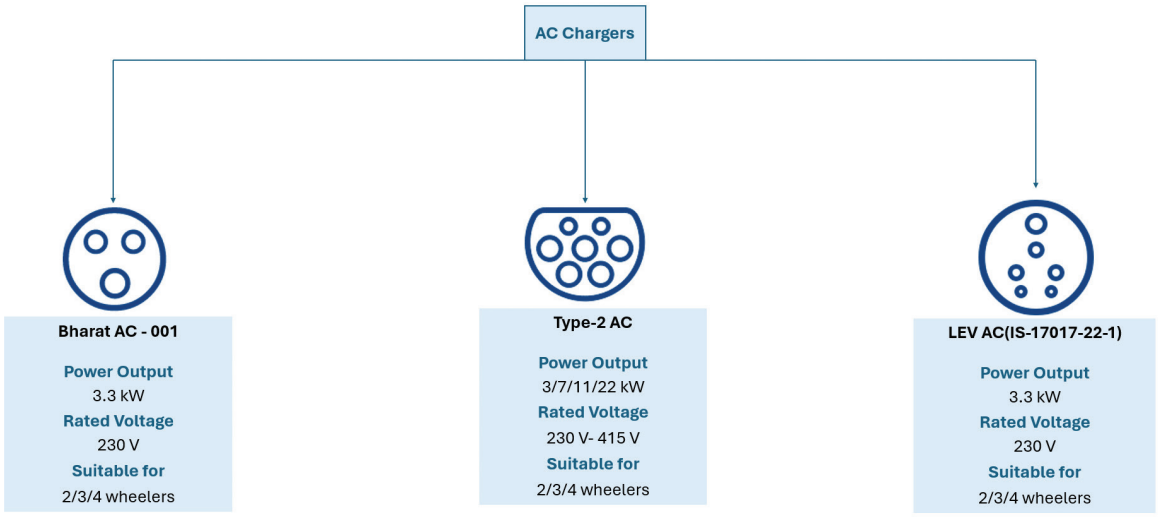
Additionally, slow and steady charging is better for longevity, while parking in shaded areas or protecting the battery from cold climates helps prevent temperature-related damage. Monitoring the battery's state of health (SOH) is also essential, as SOH indicates the remaining capacity compared to a new battery. Typically, SOH decreases by up to 30% over eight years, which affects the range of vehicles. Frequent use of the EV also improves overall efficiency, as the system performs better with regular operation. By following these practices, EV owners can ensure their batteries last longer, maintain performance, and support the sustainability of electric mobility.

[6] *Details available at: <https://www.EV Sahi Hai.co.in/electric-vehicle-battery-life>*

4.4 Types of Chargers

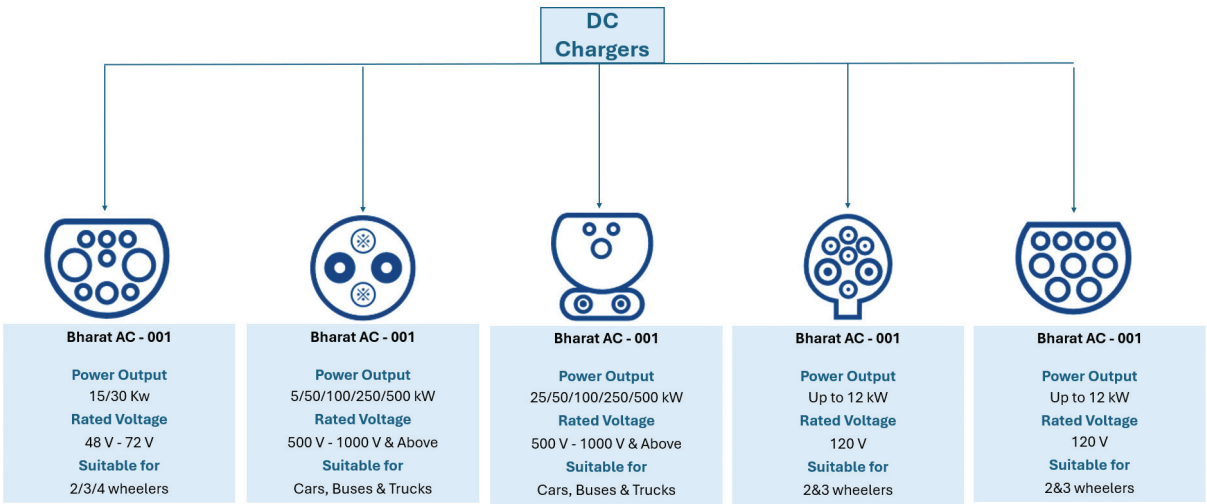
As per Indian standards, different types of chargers (AC and DC) with their compatibility are given below.

Figure 8: Types of AC chargers



Source: EVYatra, Bureau of Energy Efficiency

Figure 9: Types of DC chargers



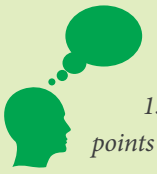
Source: EVYatra, Bureau of Energy Efficiency

5. Facts and Myths about EVs

Myths surrounding EVs can mislead public perception. One prevalent myth is that EVs have a net harmful effect on climate change. EVs are naturally more efficient than ICE vehicles. They convert more than 77% of the electricity from their batteries into power for the wheels, while gasoline cars only convert about 12% to 30% of fuel energy into movement (Glandorf, 2020). This high efficiency is a key reason why EVs will stay more climate-friendly than traditional cars (Eisenson, et al., 2024). However, studies show that EVs typically result in lower lifetime GHG emissions compared to conventional vehicles, particularly as the electricity grid shifts towards renewable energy sources (Gehring & Topf, 2022).

Another misconception is that the transition to EVs will lead to significant job losses in the automobile industry. While some jobs may be displaced, the shift towards electric mobility is expected to create new employment opportunities in EV manufacturing and infrastructure development (Drax, 2023). TERI study (TERI, 2025) finds that the transition will create more blue-collar jobs in electrical, electronics, and software-oriented sectors. Additionally, new opportunities will emerge in battery research and development, manufacturing and recycling, power electronics, and infrastructure development.

Range limitations are often cited as a drawback of EVs, yet many modern models offer ranges that are competitive with ICE vehicles, and ongoing advancements in battery technology continue to improve this aspect



JSW MG Motors has established a 6-way charging ecosystem with 15,000+ public and home charging points nationwide.

(Evans, 2023). Charging time is also a concern, however, fast chargers can recharge EVs to 80% in approximately 30 minutes, making them viable for long-distance travel.[7] The perception that EVs are prohibitively expensive is countered by the fact that, despite a higher upfront cost, they often result in savings over time due to lower operating costs and declining battery prices.[8]

There are also myths regarding battery lifespan, with claims that EV batteries need to be replaced every five years. In contrast, most EV batteries are designed to last 8–15 years or longer (Drax, 2023). However, concerns about battery disposal are valid, yet recycling processes for EV batteries are likely to emerge, allowing for the recovery and reuse of many materials (Evans, 2023). Additionally, while some believe that the electricity grid will struggle to meet the demand from EVs, the energy sector is rapidly transitioning towards renewable sources, and the grid can manage this increased demand (Gehring & Topf, 2022).

Lastly, misconceptions about EV performance persist, with claims that they are slower and less reliable than ICE vehicles. In fact, many EVs offer impressive acceleration and reliability due to their simpler mechanical

[7] *Details available at: <https://www.bbc.com/future/article/20230412-are-electric-vehicles-the-car-of-the-future>*
[8] *Details available at: <https://www.pluginindia.com/ >*

structure. Overall, addressing these myths with accurate information is crucial for fostering acceptance and understanding of EVs in society.

Apart from the above-mentioned myths, India being a very price sensitive market, citizens do have a number of myths with them, few are busted as follows:

1) Electric vehicles are uneconomical

The latest policy changes are aimed at reducing the initial cost of EV ownership (GoI, 2024):

- GST on EV chargers and charging stations has been reduced to 5%.
- Battery-operated vehicles receive green license plates and are exempt from permit requirements (MoRTH).
- State advisories recommend waiving road tax on EVs.
- With the launch of India's first Battery as a Service model by JSW MG Motors, the capital cost of vehicles is now at par with the ICE vehicles which makes them more affordable.

2) Lack of availability of the charging infrastructure

A well-developed charging infrastructure is essential for the widespread adoption of electric vehicles (EVs). Recognizing this need, the Indian government has taken proactive measures to accelerate the deployment of charging stations across the country. The National Electric Mobility Mission Plan (NEMMP) aims to establish 4,00,000 charging stations by 2026.

Beyond government-led efforts, the private sector has also played a significant role in expanding EV charging infrastructure in India. Leading companies such as Indian Oil Corporation, Tata Power, ChargeZone, JSW MG Motor, Sun Mobility, Jio-BP, Ather Energy, and ABB have committed to installing public charging stations nationwide and have already made substantial progress in their deployment.

Both the central and state governments have allocated funds under national schemes like Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) and various state-level EV policies to support the expansion of charging networks. In addition to financial incentives, several policy guidelines and initiatives have been introduced to facilitate the set-up of charging infrastructure nationwide. A more detailed discussion on this topic is provided in chapter 6.

3) EV battery life span is very short lasting a few years [9]

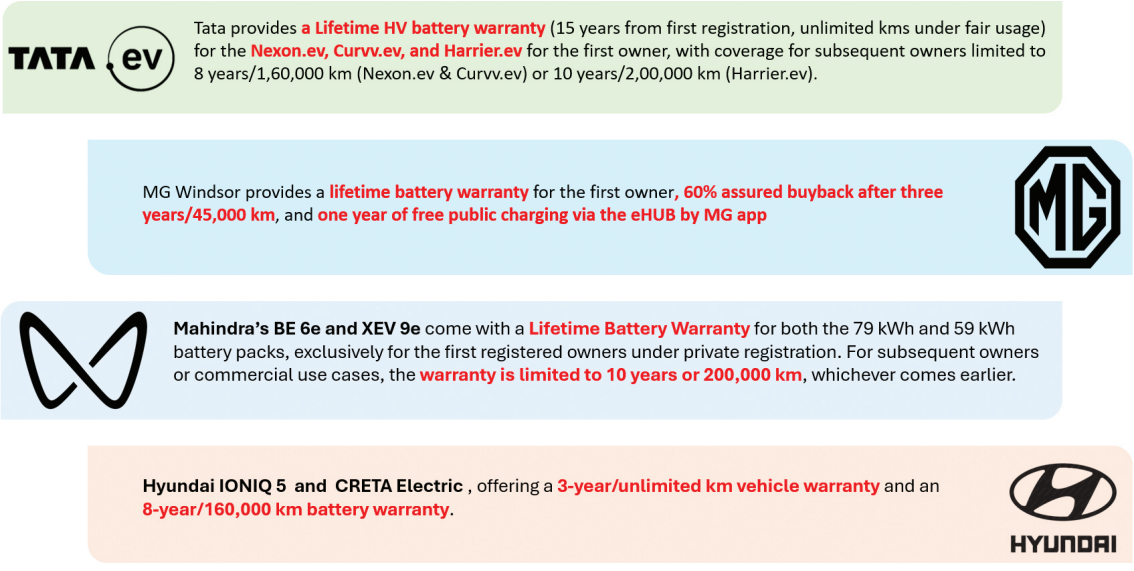
EV batteries are much larger and more powerful than regular batteries used in consumer electronics. The lifespan of an EV battery depends on how it's charged, the distance driven, and whether the owner follows the recommended maintenance schedule. New technology like battery monitoring systems, temperature control, and real-time tracking of charging and discharging has made EV batteries last much longer.

Typically, an EV battery can go through over 1,000 full charges (from 0% to 100%) before it starts losing capacity. To help the battery last longer, it's best suggested to mix both slow and fast charging, rather than only using fast charging every time.

Figure 10 highlights a few EV original equipment manufacturers (OEMs) that provide lifetime warranties for first owners, setting a strong benchmark for consumer confidence. For other EV models, manufacturers typically offer warranty coverage of up to 8 years/1,60,000 kms, which remains a substantial assurance of vehicle performance and battery reliability. In addition, many OEMs complement these warranties with extended service packages, roadside assistance, and flexible maintenance plans, further enhancing the ownership

[9] *Details available at: <https://www.timesnownews.com/auto/electric-vehicles/debunking-myths-around-ev-battery-life-article-113652552>*

Figure 10: EV manufacturers and their warranty (non-exhaustive list)



Source: Compiled from Company Website

experience and long-term value of their EV portfolios.

Over the last five years (up to July 2025), leading players in the electric vehicle market- Tata Motors, MG, Mahindra, and Hyundai have prioritized delivering reliable, high-quality vehicles that align with the changing preferences of today's consumers. These companies also back their offerings with strong warranty packages, reinforcing customer trust in the durability and performance of their EVs.

a) Tata provides a lifetime high-voltage battery warranty (15 years from the date of first registration, unlimited kilometers in regular usage) for the initial owner in Nexon.ev, Curvv.ev, and Harrier.ev models, and an extended warranty for the second owner limited to 8-year or 1,60,000 km (Nexon.ev and Curvv.ev) or 10 years or 2-lakh kms (Harrier.ev) for both the motor and battery. [10]

b) The MG Windsor offers a lifetime battery warranty for the first owner, an assured 60% buyback value after three years, and one year of complimentary public charging through the eHUB app by MG, ensuring a seamless and cost-effective ownership experience. [11]

c) Mahindra BE 6e and XEV 9e come with Lifetime

International Manufacturer

Tesla provides an **8-year battery and drive unit warranty** with mileage limits varying by model: **150,000 miles** for Model S, Model X, and Cybertruck, **100,000 miles** for Model 3 and Model Y Rear-Wheel Drive, and **120,000 miles** for other Model 3 and Model Y variants. The warranty ensures a minimum of **70% battery capacity retention during the coverage period.**

[10] *Data available at: <https://ev.tatamotors.com/service/warranty.html>*
[11] *Data available at: <https://www.mgmotor.co.in/media-center/newsroom/mg-motor-india-launches-comet-ev-the-smart-electric-vehicle-in-three-variants-pace-play-and-plush >*

Battery Warranty on 79 kWh and 59 kWh battery packs only for the first private owner registered. For the rest of the owners, or commercial use, the battery warranty is 10 years from the date of first registration or 200,000 km, whichever is earlier. Lifetime Warranty is not applicable on cars used as taxis, fleet cars, demo cars, or for commercial purposes. In all other valid cases, the warranty ensures a minimum State of Health (SOH) of 70% on the battery for the warranty period. [12]

d) Hyundai Ioniq 5 and CRETA Electric, offering a 3-year/unlimited km vehicle warranty and an 8-year/160,000 km battery warranty. [13]

4) EVs have low range with high charging time

Table 2 gives a glimpse of some of the long-range electric cars available in India along with their offered range and prices.

There exists a diverse range of EVs that have made their impact felt in the Indian market, differing in price range, body type, and driving range to cater to various consumer demands. In the budget category, the MG Comet EV, a micro car in a compact body, is offered with a 260km range for ₹7.2 lakh, whereas compact hatchbacks like Tata Tiago.ev are offered with up to 315 km range with an entry price of ₹10.19 lakh.

Example

A Curvv.ev with a 502 km range would typically require a full charge only once a week. Given that the average daily travel per person is 45–50 km, the vehicle would need recharging roughly every four days.

In subcompact SUVs, most sought – after options like Tata Punch EV (365 km, ₹9.99 lakh onwards) and Tata Nexon EV Max 453 km, ₹16.49 lakh onwards) strike a balance between price and range. Tata came forward with premium design, Tata Curvv.ev, a SUV- Coupe, provides a 502 km range with fast charging (40 minutes with a 70 kW DC fast charger) with starting price range of ₹17.49 lakh. Hyundai's latest entries, the Creta EV and the Ioniq 5, highlight the evolving EV landscape with diverse offerings in terms of range, charging speed, and pricing. The Creta EV delivers a 473 km range at an accessible ₹17.99 lakh onwards, while the premium Ioniq 5 offers an impressive 631 km range with ultra-fast charging at ₹44.95 lakh onwards.

Mid-size and crossovers like the Tata Harrier.ev, Mahindra BE6, and Mahindra XEV 9e has given the choice in the ₹21–25 lakh, with MG 's Comet, Windsor EV, and ZS EV are also gaining popularity in the mid segment. For seven-seater category the MG M9 offers 548 km range, priced from ₹69.90 lakh. At the high-end, sportier and Luxury versions offer far higher ranges and super quick charging. The MG Cyberster, a convertible roadster, offers 580 km offering premium features with fast charging. For the international EV enthusiast's luxury options like Q8 e-tron; G-Wagon, EQB and EQS variants by Mercedes India (including Benz and Maybach models) and BMW i7 sedan are in the Indian EV automobile market along with Tesla's Model Y.

Charging times across these models vary depending upon the battery capacity and charging type (slow/fast). This selection of EVs demonstrates a broad spectrum of options, making long-range electric mobility accessible at multiple price points in the Indian market.

---

[12] *Data available at: <https://www.mahindraelectricsuv.com/on/demandware.static/-/Library-Sites-eSUVSharedLibrary/default/dw59b87b22/ImportantDocs/Warranty%20&%20Service%20Guide_BE%206.pdf>*

[13] *Data available at: < https://www.hyundai.com/content/dam/hyundai/in/en/data/brochure/Creta-EV_Digital-Brochure-2025.pdf >*

Table 2: Different EV car models

Make	Car Model	Body Type	Driving Range (Km)	Charging Time (10% to 80%) *	Price (Ex-show-room, Delhi) (₹ Lakh onwards)
Tata Motors	Tiago.ev	Hatchback	315	60 min	10.19
	Nexon.ev Max	Compact SUV	453	56 min	16.49
	Punch.ev		365	56 min	9.99
	Curvv.ev	SUV-Coupe	502	40 min (with 70kW DC Fast Charger)	17.49
	Harrier.ev	Compact Crossover SUV	420-445*	~25 min (with 100kW 260A charger input)	21.49
Mahindra Electric Automo-bile Ltd.	BE6	Crossover SUV (Coupe-style)	557*	20min (with 140kW 400A charger input)	21.49
	XEV 9e		542 *		24.90
JSW MG Motors	Comet EV	Micro car	260	150 min	7.2
	Windsor EV	SUV	449	~45 min (45kW)	14
	ZS EV	Mid-size SUV	461	60 min	23.38
	Cyberster	2-door Convertible / Roadster	580	38 min	74.99
	M9	SUV (7-seater SUV)	548	30 min	69.90
Hyundai Motors	Creta EV	SUV	473	58 min (with 50kW DC fast charger)	17.99
	Ioniq 5	CUV	631	18 min	44.95
Kia India	EV6	Luxury Sedan	708	18 min	60.95
Mercedes India	EQB	SUV	447	32 mins	78.90
	EQS	Limousine; SUV	550-800 (varies with models)	32 mins	140
Audi India	Q8 e-tron	SUV/SUV Coupe	600	31 min	114
BMW India	i7	Luxury Sedan	625	34 min	195
Tesla	Model Y	SUV (Crossover)	622	Up to 238 km added in 15 minutes	59.89

**Fast charging; #All prices are ex-showroom*
Source: Non-exhaustive list compiled by TERI

5) Electric vehicles get damaged in waterlogged areas and are dangerous to charge in the rain

All EVs come with compliance to an Ingress Protection (IP) as standard. Most of the EVs have an IP67 rating or more; here 67 represents the protection against two elements – dust and water.[14] Indian auto industry is one of the most regulated sectors with set quality and safety standards by the government and technical institutions.

Automobiles are classified into various segments based on the number of wheels and their intended purpose. The primary categories include 2Ws, 3Ws (designed for both passenger and freight), and 4Ws (for passenger and freight), among others. Different set of standards are applicable for different segments of automobiles in the Indian market.

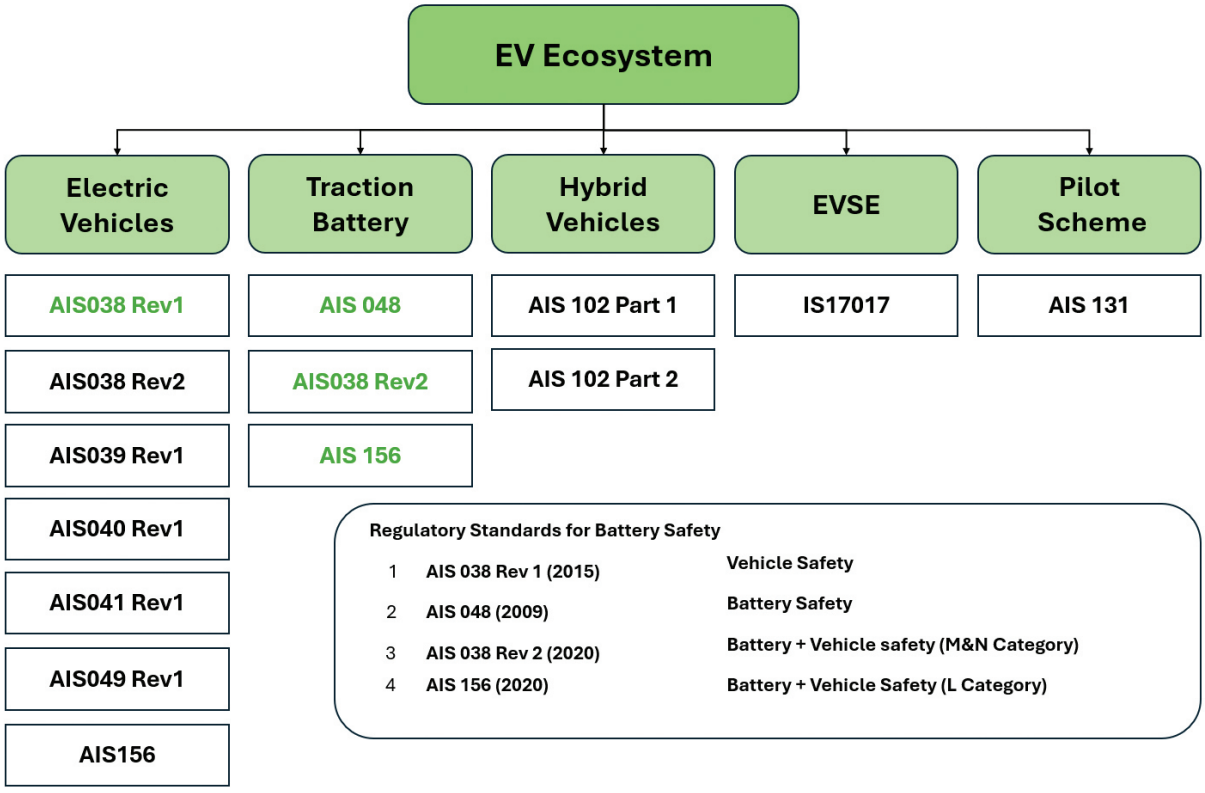
For electric vehicles standards like IS 17855: 2022 (testing of lithium-ion battery pack), IS 18590: 2024 & IS 18606: 2024 (safety standards for L, M, N category[15] vehicles), AIS049 (testing for the durability and long-term performance of EVs), among others as mentioned in Figure 11, are harmonized with global benchmarks like ISO and tailored to India's unique requirements, ensure the safety, reliability, and performance.

Central Motor Vehicle Rules (CMVR) certification is mandatory before the model can be released in the market for on-road use. Mandatory compliance with the automotive safety standards ensures a minimum level of performance from all the systems of the automobile thus meeting safety and environmental per-

[14] *Details available at: <https://e-amrit.niti.gov.in/busting-common-electric-vehicle-myths>*

[15] *L Category – Two-wheeled vehicles like mopeds, motorcycles, motor tricycles, and quadricycles*
M Category – A motor vehicle with at least four wheels used for carrying passengers
N Category – A motor vehicle having at least four wheels used for carrying goods which may also carry persons in addition to the goods subject to conditions

Figure 11: Battery safety standards in India



Source: ARAI

formance requirements. Every new developed model must go through various checks and tests by authorized test agencies for issuance of the type of approval certificate to allow the use of the vehicle on the road. This is further strengthened by an audit of the manufacturing unit for process checks to facilitate consistent production for compliance.

In addition, the test agencies pick the production vehicle from the factory to assess the conformity of production for compliance of the vehicle to the regulatory requirements. Non-compliance during COP checks may lead to the stoppage of production of these vehicles.

With the government's aggressive promotion of EVs in all segments a new set of safety standards has been formulated to supplement the safety standards already being used for certifying the current ICE models. These additional standards for EVs are as given in Table 3.

Table 3: The key standards that govern the manufacturing of electric vehicles (EVs) and hybrid electric vehicles (HEVs) in India

Standard	Description	Focus Area
IS 17855: 2022	Performance testing of lithium-ion traction battery packs and systems for electrically propelled vehicles	Harmonized with ISO 12405-4: 2018, tests battery performance, reliability, and electrical functionality in real-life scenarios (extended parking, shipping, and extreme temperatures)
IS 18590: 2024 & IS 18606: 2024	Safety standards for EVs in L, M, and N categories, focusing on powertrains and battery safety	Ensures high safety and performance for passenger and commercial EVs, including battery safety and powertrain reliability
IS 18294: 2023	Safety standards for emerging EVs like e-rickshaws and e-karts	Covers safety and functionality, including construction and passenger protection for e-rickshaws and e-karts
AIS 156 & AIS 119	Revised safety standards for electric vehicles, battery systems, and sleeper coaches, including fire protection	Stricter fire safety protocols for electric vehicles, including battery systems and sleeper coaches, with mandatory compliance for fire detection and suppression systems
AIS038	Safety and performance standards for electric powertrains in M and N category vehicles	Ensures compliance with requirements for electric powertrains in M and N category vehicles
AIS039	Battery systems for EVs	Covers specifications for battery systems ensuring safety, efficiency, and reliability
AIS040	On-board diagnostics for EVs	Ensures that on-board diagnostic systems meet safety and operational requirements
AIS041	Standards for EV charging stations and infrastructure	Establish safe and efficient charging standards for EVs
AIS048	Safety standards addressing the overall safety of EVs	Ensure EVs meet necessary safety standards to protect drivers and passengers
AIS049	Testing for the durability and long-term performance of EVs	Ensures EVs are durable and reliable over extended periods of use
AIS102 Part 1	Standards for the powertrain of HEVs	Covers the powertrain design and operational safety for HEVs
AIS102 Part 2	HEV powertrain (additional aspects)	Provides further specifications for HEV powertrains to ensure safety and efficiency

Source: Compiled by TERI [16]

[16] *Data available at: <https://enterclimate.com/blog/the-regulations-governing-the-manufacturing-of-electric-vehicles/#:~:text=This%20license%20acts%20as%20a,the%20respective%20state%20fire%20department>*

6. Electric Vehicle Ecosystem in India

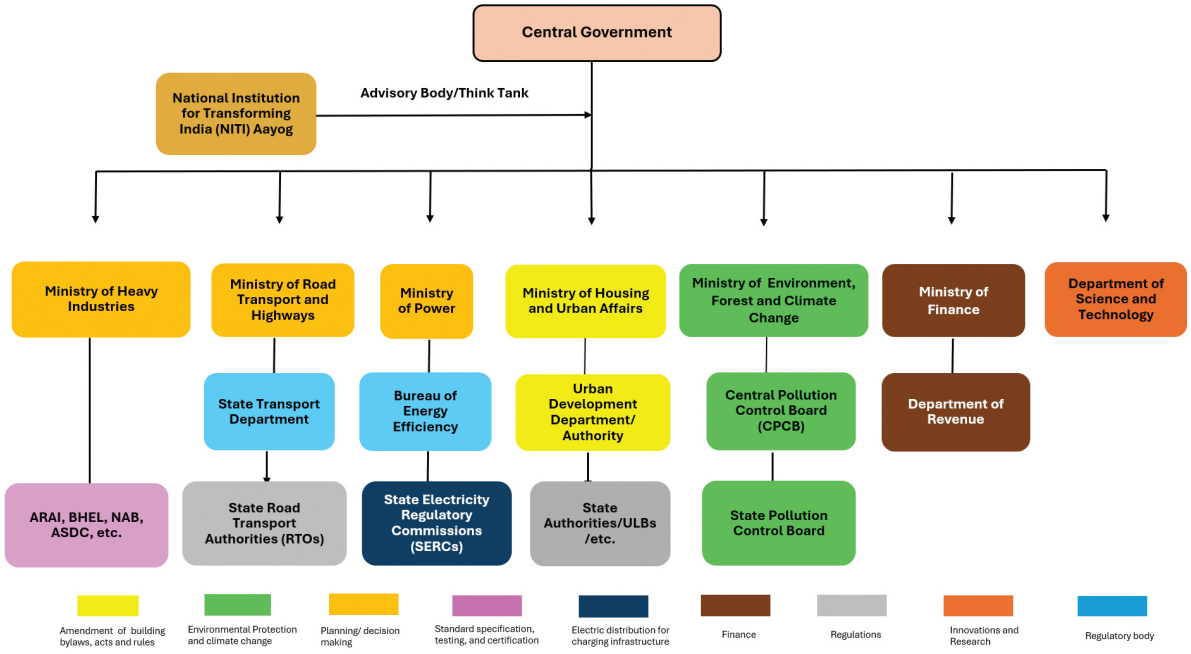
6.1 Electric Vehicles Institutional Framework

The EV ecosystem in India is supported by a wide network of government stakeholders operating at multiple levels. At the apex, the Prime Minister's Office (PMO) provides strategic oversight, with the Office of the Principal Scientific Adviser (PSA) offering scientific and technological guidance on advanced mobility solutions. NITI Aayog functions as the central policy think tank, coordinating EV roadmaps and inter-ministerial efforts. Key ministries, including Heavy Industries (MHI), Power (MoP), Road Transport and Highways (MoRTH), New and Renewable Energy (MNRE), Finance (MoF), and Environment, Forest and Climate Change (MoEFCC), shape policies ranging from demand incentives and charging infrastructure to standards, taxation, and climate commitments. Regulatory and technical bodies such as the Bureau of Energy Efficiency (BEE), Central Electricity Authority (CEA), Automotive Research Association of India (ARAI), and Bureau of Indian Standards (BIS) ensure robust certification, safety, and standardization frameworks.

At the state level, transport departments, DISCOMs, and nodal agencies drive policy implementation, while urban local bodies facilitate land allocation and last-mile approvals.

Public sector undertakings (PSUs) such as CESL, NTPC, and oil marketing companies further strength-

Figure 12: Key government stakeholders in EV ecosystem and their hierarchy



Source: Electric mobility in India, 2023

Data available at: <https://pib.gov.in/PressReleasePage.aspx?PRID=1836787>
Data available at: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2027948>
Data available at: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2036269>

en the ecosystem through procurement, infrastructure deployment, and financing support. Collectively, this multi-layered institutional structure ensures a coordinated approach to accelerating EV adoption in India.

6.2 National and State-level EV Policies and Schemes

6.2.1 National EV Policies and Schemes

The Faster Adoption and Manufacturing of Hybrid & Electric Vehicles (FAME) Scheme was launched in 2015. Two phases have till now been implemented to encourage adoption of EVs among end-users. FAME-I, from 2015 to 2019, had a total outlay of ₹895 crore out of which incentives worth ₹360 crore were given out in support of ~3 lakh EVs.[17]

Under the FAME-I, a total of 1,51,648 e-2Ws, 1,02,446 e-4Ws, 786 e-3Ws, and 425 e-buses were supported.

Table 4: Level of Incentives in FAME-I

Vehicle Segment	Incentive Under FAME-I (₹)
High Speed e-2Ws	Motor-Cycle - 29,000 Scooter - 22,000
Low Speed e-2Ws	Motor-Cycle - 23,000 Scooter - 17,000
e-2Ws Electric Cycle (EPAC)	–
High Speed e-3Ws/ Low speed e-3Ws	61,000 / 45,000
e-4Ws Passengers Cars	1,24,000 / 1,38,000
e-LCV	1,87,000
e-Bus	1,00,00,000 / 85,00,000
Strong Hybrid e-4Ws/LCV	70,000
Plug in Hybrid e-2Ws	15,600
Plug in Hybrid e-4Ws/LCV	1,18,000

Source: (MHI, 2025)

Table 5: Funds allocated and utilized under FAME-I

Financial Year	Fund Allocated (in ₹ crore)	Fund Utilization (in ₹ crore)
2015–16	75	75
2016–17	144	144
2017–18	165	165
2018–19	145	145
Total	**529**	**529**

#Note: ₹366 crore FAME-I Liability Transferred to FAME-II
Source: (MHI, 2025)

[17] *Details available at: <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/jul/doc202271169601.pdf>*

Table 6: Segment-wise incentives under FAME-II

Vehicle Segment	Type	Maximum Number of Vehicles	Approximate Battery Size (kWh)	Approximate Incentive Granted per Vehicle (in ₹ lakh)*	Total Fund (₹ crore)
e-Buses	EV	7,090	250	50	3,545
e-4Ws	EV	35,000	15	15	525
	Strong Hybrid	20,000	1.3	0.1	26
	Total	55,000	_	1.6	897
e-3Ws (including e-rickshaws)	EV	5,00,000	5	0.5	2,500
e-2Ws	EV	10,00,000	2	0.2	2,000

** Note: Incentive was granted at the rate of 10,000/kWh for all vehicles excluding buses and trucks for which the rate was 20,000/kWh.*
Source: (MHI, 2021)

Table 7: Physical and Financial progress of FAME-II as on 31/01/2025

Category	No of EVs supported	Allocation (₹ crore)	Expenditure (₹ crore)
e-2W	14,31,837	5,311	4,922
e-3W	1,64,908	987	1,110
e-4W	22,665	750	538
e-Buses	Sanctioned - 6,862 Rolled Out - 5,135	3,209	Sanctioned - 3,009 Amount Spent - 1,325
EVPCS	10,985	839	633
Admin	–	38	22
Liability of FAME-I	–	366	366
Total	**16,26,272**	**11,500**	**10,601**

Source: (MHI, 2025)

FAME-II was initiated in 2019, initially for a period of three years, and was extended for two additional years till March 31, 2024 (MHI, 2021).

Most of the subsidies implied increased purchasing propensity of consumers due to lower manufacturing cost which are mostly constituted by the cost of batteries. Along with this, to further boost consumer confidence, the scheme intended to build a robust charging infrastructure with ₹800 crore being attributed to setting up of public fast charging stations.

The above table 7, reflects the status of the physical and financial progress of the ₹11,500 crore FAME-II scheme which was succeeded by the PM E-DRIVE scheme.

PM E-DRIVE

PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE)' Scheme, approved by Cabinet recently with a financial outlay of ₹10,900 crore, has come into effect from October 1, 2024, and will remain in force until March 31, 2028. Its primary aim is to accelerate the adoption of EVs, establish charging infrastructure, and build a robust EV manufacturing ecosystem in the country.

The PM E-DRIVE initiative promotes mass mobility through the support of public transportation systems. The key objective is to speed up the transition to EVs by offering upfront incentives for EV purchases and encouraging the development of charging infrastructure. The scheme seeks to reduce transportation-related environmental impacts and improve air quality while also promoting an efficient and competitive EV manufacturing sector in line with the *Aatmanirbhar* Bharat initiative. This is to be accomplished through a phased manufacturing programme (PMP) designed to boost domestic manufacturing and strengthen the EV supply chain.

The following categories of vehicles are eligible for support:

a) Buses (only electric buses)
b) Three-wheelers (electric) including registered e-rickshaws & e-carts and L5
c) Two-wheelers (electric)
d) e-ambulances (electric, plug in hybrid & strong hybrid); and
e) e-trucks and other new emerging EV categories

6.2.2 State-level EV Policies and Schemes

The state government plays an important role in accelerating the transition to EVs in India. In line with the central EV policies, most of the states in India have finalized or/are finalizing state-specific EV policies which are crucial to create the conducive EV ecosystem for India's electric mobility vision. These policies typically extend direct incentives to the consumers by providing financial subsidies, exemption from road tax and registration fees, and low interest rates on loans for EV purchases. Additionally, manufacturers are also offered incentives, including capital subsidies across the EV supply chain, concessions on taxes, tariffs, and duties, interest-free loans, and reimbursements for employee provident fund contributions. Table 8 represents the state-wise policy initiatives.

Table 8: State-wise policy targets/initiatives

States	Key Policy Targets/ Initiatives
ANDHRA PRADESH	
Sustainable Electric Mobility Policy (4.0) 2024-2029	- Registering minimum 2 lakhs new e-2Ws by 2029 - Registering minimum 10,000 new e-3Ws by 2029 - Registering minimum 20,000 new e-4W BEVs by 2029
	Goal to establish charging infrastructure at a density of 1 charging station per 30 kms along the notified green channels and 1 charging station per 3x3 km grids in e-mobility cities
	100% E-Buses by 2029
	Clean production measures: (a) MSME – 35% subsidy on most – up to ₹ 7 crore (b) Large – 10% subsidy on cost – up to ₹ 35 lakh. Sustainable green measures: 25% subsidy of FCI – up to ₹ 50 crore. Auto cluster and automotive suppliers manufacturing centres (ASMC) – 50% of FCI – up to ₹ 20 crore. Stipend: ₹ 10,000/year – first 50 employees of a single company.
	Electricity duty exemption: Fixed power cost reimbursement: ₹ 1/ unit – with an annual cap of ₹ 15 lakhs per enterprises for 6 years. Subsidy: 50% of cost up to ₹ 2 crore. Electricity duty: 100% for 5 years
	All government vehicles, including corporation boards and government ambulances to be electric by 2024
ASSAM	
Electric Vehicle Policy, 2021	Battery Electric Vehicles (BEVs) in a manner where they contribute to 25% of all new vehicle registrations by 2026
	1 lakh e-2Ws, 75,000 e-3Ws and 25,000 e-4Ws
	Convert 100% PT fleet into EVs 2030
	Convert all government vehicles to electric vehicles by 2030
	As per February 2023, the electricity tariff for an EV charging station (LT) fixed rate of ₹ 140/ kW/month and energy charges are ₹ 6.50/kWh for HT the fixed rate is ₹ 170/kW/month and energy charges are ₹ 7.50/kWh[18]
BIHAR	
Electric Vehicle Policy, 2023	Achieve a target of 15% EVs among all new vehicles purchased and registered in Bihar by 2028
	100% EVs by 2030, aiming for 1 lakh EVs by 2024: e-2Ws 24,000, e-3Ws 70,000 and e-4Ws 4,000 and e-Bus 1,000
	Create normal/fast charging/swapping stations at every 25 km of SHs/ NHs in the state and every 3 km in the city
	Electric vehicle charging station (LT) 2024–25 ₹ 8.72/kVAh and (HT) ₹ 7.85/kVAh[19]

[18] *Details available at: <https://www.apdcl.org/website/docs/acts_and_rules/Tariff_notification_Feb23.pdf>*
[19] *Details available at: <https://berc.co.in/images/pdf/tariff-order/tariff-order-DISCOM-2024-25/Tariff-chart.pdf>*

States	Key Policy Targets/ Initiatives
CHHATTISGARH	
Chhattisgarh State Electric Vehicle Policy, 2022	Target 15% of all new vehicle registrations to be electric by 2027
	Offer subsidies of up to 10% of the EV cost or ₹ 1.5 lakh for five years
	Provide a 25% subsidy for the first 300 fast-charging stations
	Replace diesel buses with electric buses and promote e-rickshaws
	Support EV manufacturers with SGST reimbursements, capital subsidies, and dedicated EV parks
CHANDIGARH	
Chandigarh Electric Vehicle Policy 2022	Achieve 70% EV registrations by the end of the policy period
	Provide ₹ 5,000/kWh purchase incentives for E2Ws and up to ₹ 50,000 and ₹ 10,000/kWh for e-commercial cars
	Install one charging station in every parking area across the city
	Offer up to ₹ 5,00,000 for public fast-charging stations and exempt electricity duty
	Phased replacement of existing government and municipal fleets with EVs
	All new bus procurement for the Chandigarh Transport Undertaking (CTU) to be electric only
DELHI	
Electric Vehicle Policy, 2020	Last mile connectivity by delivery providers to convert 50% of their fleet operational to electric by 2023 and 100% by 2025
	Encourages the reuse and recycling of EV batteries that have reached the end of their lives
	Public charging infrastructure at every 3 km stretch travel from anywhere in Delhi
	Road tax and registration fees shall be waived off for BEV during the policy period
	The tariff rate fixed for electricity consumed through these EV charging points is ₹ 4.5 per unit (excluding taxes)[20]
GOA	
Goa Electric Mobility Promotion Policy, 2021	30% of annual vehicle registrations as EVs, 50% of ferries transitioning to electric by 2025
	Achieve 100% e-2Ws commercial activity by 2025 and 100% sales of e-2Ws by 2030
	Support manufacturing with up to 20% capital subsidy for large enterprises, and provide 50% subsidy for startups, along with SGST reimbursement and electricity duty exemptions
	Build charging stations every 25 km along highways and 3 km within city limits, promoting battery-swapping and solar-powered charging facilities.
	Ensure 50% of new buses are electric by 2025 and incentivize light commercial vehicles for urban deliveries

[20] *Details available at: <https://www.tatapower-ddl.com/corporate/ev-offering-overview#:~:text=The%20tariff%20rate%20fixed%20for,launched%20the%20Switch%20Delhi%20campaign>*

States	Key Policy Targets/ Initiatives
GUJARAT	
Electric Vehicle Policy, 2021	2 lakh EVs by 2025 comprises 1,10,000 e-2Ws, 70,000 e-3Ws and 20,000 e-4Ws (Private and Commercial)
	Tariff or LT connection EV charging (for load 100 kW): fixed charge ₹ 25/installation per month and energy charge ₹ 4.10 per unit
	HT demand charges up to contract demand ₹ 25 per kVA/ month, demand charge excess of billing demand ₹ 30 per kVA energy charges ₹ 4.00 per unit [21]
	Incentive of ₹ 10,000/kWh for e-2Ws (up to ₹ 1.5 lakh), e-3Ws (up to ₹ 5 lakh), and e-4Ws (up to ₹ 15 lakh) ex-factory price
	25% capital subsidy (up to ₹ 10 lakh/station) for the first 250 commercial EV charging stations (e-2W, e-3W, e-4W).
HARYANA	
Haryana Electric Vehicle Policy, 2022	Establish Haryana as a global hub for EV manufacturing, focusing on vehicles, components, and batteries
	Capital subsidies up to 25% of fixed investments, tax exemptions (SGST, stamp duty), and power subsidies. Support for R&D and employment generation within the state
	Purchase incentives (up to 15% for various EVs), tax exemptions (e.g., 100% for two-wheelers, 75% for buses), and discounted registration fees
	Convert 10% of buses to electric within two years, aiming for 50% by 2026 and 100% by 2030
	Achieve 50% government fleet conversion to EVs by 2026, with 100% by 2030
HIMACHAL PRADESH	
The Himachal Pradesh Electric Vehicle Policy, 2022	Reduce the average respirable suspended particulate matter (RSPM) to levels below the national standard of 60 micrograms per cubic metre
	A phased plan to electrify personal, public, and government vehicles while encouraging private adoption of EVs through incentives
	Establish a robust EV charging network across urban centres, highways, and tourist destinations, alongside planning for EV-friendly urban infrastructure
	Offer subsidies, reduced road taxes, and other financial incentives for EV buyers and manufacturers
	Increase the number of electric buses and taxis operated by Himachal Road Transport Corporation (HRTC)

[21] *Details available at: <https://e-veg.gujarat.gov.in/incentive.php>*

States	Key Policy Targets/ Initiatives
JHARKHAND	
Electric Vehicle Policy, 2022	10% share in the EVs in overall new registration in the state by 2027; e-2Ws 10%, e-3Ws 20% and e-4Ws 10%
	3kmX3km grid or 50 charging stations per million population whichever is higher
	Public charging stations at 25 km stretch of both sides of the NHs and SHs
	Target for conversion of 15 years old government owned (leased vehicles for EVs)
	The electricity tariff for EVs charging station 9 am to 4 pm ₹ 7.86/kWh and remaining hours ₹ 11.79/kWh[22]
KARNATAKA	
Karnataka Clean Mobility Policy 2025-30	Auto rickshaws, cab aggregators, corporate fleets and school buses/vans to achieve 100% electric mobility by 2030
	100% of 3Ws and 4Ws moving goods will be encouraged to transition to electric by 2030[23]
	BMRCL, BMTC, KSRTC, and BBMP to set up charging/swapping stations to boost last-mile connectivity
	Fast charging stations for 2Ws, 3Ws, cars and buses to be provided with a capital subsidy of 25% up to ₹ 10,00,000 per station
KERALA	
Electric Vehicle Policy, 2023	15% of electrification of public transport by 2025. KSRTC to convert its existing bus fleet to 25% electric fleet
	Set up public charging stations on highways at 25 km distance (on both sides of the high-ways). These stations should cater to charging requirements of long-haul passenger and freight vehicles like e-buses, e-trucks, etc.
	Electricity tariff for fixed charge (₹/kW or part thereof per month) ₹ 100 and energy charge (₹/kWh) 5.50[24]
	Aim for 20% of new vehicle registration as EVs in the state by 2025 for e-2Ws- 15%, e-3Ws- 25%, e-4Ws-10%
	Minimum of 15% of the fleet operators of the state by 2025

[22] *Details available at: <https://jserc.org/pdf/tariff_order/jbvnl2024b.pdf>*
[23] *Details available at: <https://kerc.karnataka.gov.in/uploads/media_to_upload1722331998.pdf>*
[24] *Details available at: <https://kseb.in/uploads/Downloadtemsuppy/Tariff%20Revision%20Circular%202023-24-1700134451843511849.pdf >*

States	Key Policy Targets/ Initiatives
LADAKH	
Electric Vehicle and Allied Infra-structure Policy, 2022	EVs in public transportation and government fleets
	Aiming for ~500 EVs in all vehicular segments by 2027
	Provide fiscal incentives, including subsidies up to 50% on vehicle purchases and early-bird offers to boost adoption
	Provide capital subsidies for setting up EV charging facilities, capped at ₹ 5,00,000 for the first 15 stations
MADHYA PRADESH	
Madhya Pradesh Electric Vehicle (EV) Policy 2025[25]	**e-2Ws** - Achieving 40% of all new registrations - 100% for all new registrations in the commercial fleet
	e-3Ws - 80% of all new registrations by the end of the policy period
	e-4Ws - Achieving 15% of all new registrations
	e-Buses - Achieving 40% of all new registrations - 80% of all forms of State government vehicles, including vehicles under Government Corpo-rations, Boards and Government Ambulances, etc.
MAHARASHTRA	
Electric Vehicle Policy, 2025[26]	Aim for 30% of new vehicle registrations as EVs by 2030.
	40% of the fleet operated by STUs to be electric and 15% buses penetration of non-STU buses.
	Charging stations to be installed every 25 km along national and state highways
	Electricity Tariff charges HT ₹ 6.60/ kVAh and demand charges are ₹ 80/KVA/month and for LT ₹ 4.60/kVAh demand charges are ₹ 80/KVA/month[27]
	Electric vehicles are fully exempt from toll charges on major government-managed expressways
MEGHALAYA	
Electric Vehicle Policy, 2021	15% electric vehicles by 2025
	Electricity tariff for electric vehicle charging stations for all units (kWh) ₹ 970 paisa/unit[28]
	₹ 10,000/kWh subsidy for the first 3,500 e-2Ws (max ex-factory price ₹ 1.5 lakh); ₹ 4,000/ kWh subsidy for the first 200 e-3Ws (max ex-factory price ₹ 5 lakh). And ₹ 4,000/kWh subsidy for the first 2,500 e-4Ws (max ex-factory price ₹ 15 lakh); ₹ 4,000/kWh subsidy for the first 30 e-buses (max ex-factory price ₹ 2 crore)

[25] *Details available at: < https://mpurban.gov.in/Uploaded%20Document/News%20&%20Events/10012025041428Final_Draft%20MP%20EV%20policy%202025.pdf>*
[26] *Details available at: < https://gr.maharashtra.gov.in/Site/Upload/Government%20Resolutions/Marathi/202505231834008229....pdf>*
[27] *Details available at: <https://merc.gov.in/wp-content/uploads/2024/03/Press-Note-TPC-D-English.pdf>*
[28] *Details available at: <https://meecl.nic.in/wp-content/uploads/2021/05/TariffOrder2021English-1.pdf?x54110>*

States	Key Policy Targets/ Initiatives
ODISHA	
Electric Vehicle Policy, 2021	20% Battery EVs in all new vehicle registrations by 2025
	Electricity tariff for charging EVs under general purpose single tariff- ₹ 5.50/unit[29]
	25% capital subsidy to first 500 public charging stations
	10% subsidy (up to ₹ 20 lakh) for state-registered e-buses
	15% subsidy for e-2Ws (up to ₹ 5,000), e-3Ws (up to ₹ 12,000), and e-4Ws (up to ₹ 1 lakh)
PUNJAB	
Electric Vehicle Policy, 2022[30]	Increase share of EVs to reach the share of 25% each of e-2Ws and e-3Ws over policy period
	Replacing 25% of the buses to E-buses
	100% waiver on the registration charges and tax over the policy period
	Electricity tariff for EVs charging stations for all units are ₹ 6.28/kVAh; also fixed charges per month are not applicable for FY-24[31]
	100% exemption from electricity duty for 10 years
	Aim for strategic initiatives – R&D and innovation for the latest battery technology/solar PV port charges and other latest technologies
RAJASTHAN	
Electric Vehicle Policy, 2022	15% e-2Ws, 30% e-3Ws, 5% e-4Ws share in the new vehicle registration
	Manufacturing: Target 35 lakh unit per year in the next 5 years
	Vehicles to be incentivized: 1 lakh e-2Ws, 25,000 e-rickshaws, e-3Ws, and e-goods carrier category and 3000 retrofit, 1000 personal and commercial e-4Ws, 2000 e-maxi cabs and e-goods carrier, 2000 retrofit vehicles, 500 e-buses and 200 retrofit vehicles
	Public charging station (LT) ₹ 6 per unit and fixed charges ₹ 40/HP/month
	Public charging station (HT) ₹ 6 per unit and fixed charges ₹ 135/KVA/month
	15% rebate from 11 am to 6 pm[32]

29 Details available at: <https://www.orierc.org/CuteSoft_Client/writereaddata/upload/DISCOMs%20Tariff%20Notification%202023-24.pdf>
30 Details available at: <https://punjabtransport.org/Punjab%20Electric%20Vehicle%20Policy%20-%202022.pdf>
31 Details available at: <https://www.pspcl.in/pdfs/twenty-nineteen/10/TariffStructure20233107.pdf>
32 Details available at: <https://istart.rajasthan.gov.in/public/pdf/REVP_2022.pdf >

States	Key Policy Targets/ Initiatives
TAMIL NADU	
Electric Vehicle Policy, 2023	The Government of Tamil Nadu declared six cities Chennai, Coimbatore, Trichy, Salem, Madurai and Tirunelvi as EV cities.
	Conversion of auto rickshaws and buses to electric within 10 years in a phased manner.
	Charging station at every 25 km of NHs & SHs on both sides of the road
	Share of e-buses to 30% by 2030
	Tariff applicable for public EV charging stations (FY-24)
	High tension tariff
	Time slot and charges
	6 am to 9 am and 6 pm to 10 pm: ₹ 9/kWh unit
	9 am to 4 pm: ₹ 6/kWh unit
	4 pm to 6 pm and 10 pm to 6 am: ₹ 7.5/ kWh unit[33]
TELANGANA	
Electric Vehicle and Electric Storage Policy, 2020–2030	100% exemption of road tax and registration fee for first 2 lakh e-2Ws & e-3Ws, 5000 e-4Ws commercial and private, 500 e-Buses and 10,000 e-3W Goodsww
UTTAR PRADESH	
Electric Vehicles Manufacturing and Mobility Policy, 2022	100% transition of public transportation to EV in these cities by 2030
	State Government shall target 100% transition of Govt. vehicles (for official use) to EV by 2030
	Public charging stations and state road transport EV charging station
	EV charging station (LT): ₹ 7.70/kWh
	EV charging station (HT): ₹ 7.30/kWh[34]
UTTARAKHAND	
EV Manufacturing, EV usage promotion & related services Infrastructure Policy, 2018	500 E-buses by 2023
	The electricity tariff for the public charging station is ₹ 5.50/kWh[35]
	Skill development compensation: ₹ 1,000/month for the first 50 trainees
	100% exemption for the first 100,000 commercial vehicles
	100% exemption on motor vehicle tax

[33] *Details available at: <http://www.tnerc.tn.gov.in/PressRelease/files/PR-040920231104Eng.pdf>*
[34] *Details available at: <https://uppcl.org/site/writereaddata/siteContent/20241015195313773OPress%20English_FY%202024-25.pdf>*
[35] *Details available at: <https://www.upcl.org/wp-content/uploads/2021/08/3107-public-notice-tariff-implementaion-2021-22.pdf>*

States	Key Policy Targets/ Initiatives
WEST BENGAL	
Electric Vehicle Policy, 2021	10 lakh EVs by 2026
	Public and semi-public charging stations: 1 lakh by 2026
	EV to public charging point ratio - 8:1
	Setting up 'Innovation Challenge Fund' and organizing Hackathons to boost EV innovation and enhance scalability of affordable and innovative solutions
	Electricity tariff for the public charging station could be around ₹ 6/ kWh (per unit), with a single-part tariff to keep the end-user service charge from those public charging stations attractive for EV owners

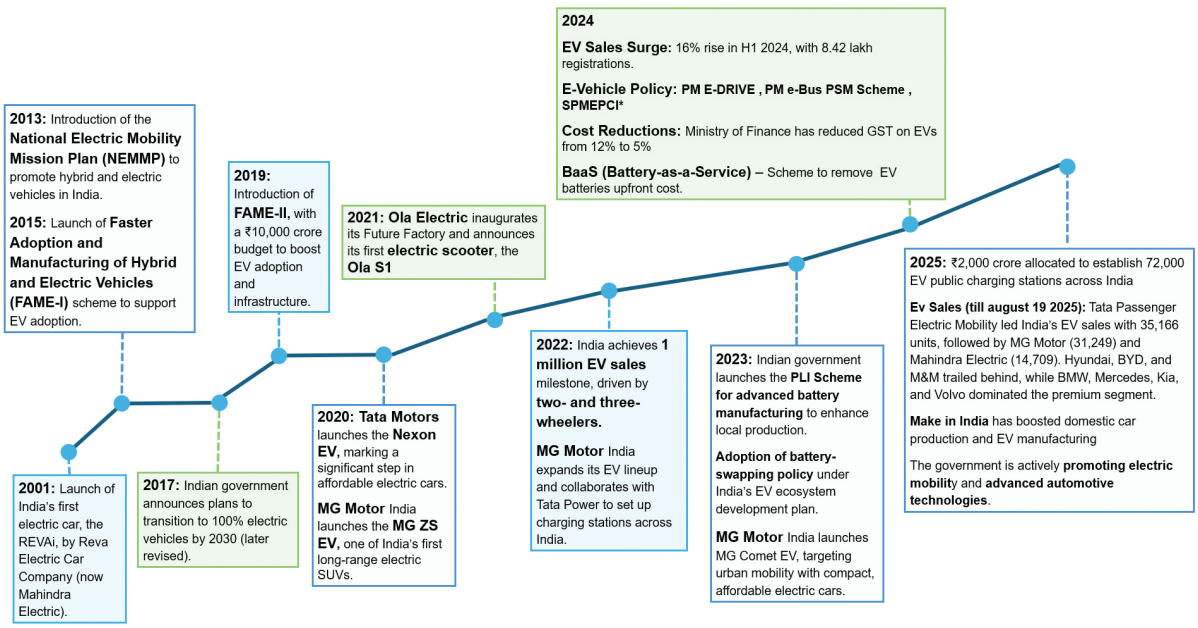
Source: List compiled by TERI

6.3 India's EV Success Over the Years

The EV market has gained traction due to various international commitments to which India is a signatory. A substantial increase in EV adoption has been observed in the Indian market in EVs with a rise in the total registered vehicles from 0.13 million in calendar year (CY)'18 to 1.95 million in CY'24. Although a dip in CY'20 has been observed due to the COVID-19 pandemic and from CY'21 sizable growth of three folds in the registered EVs has been observed in one year. The EV sales which accounted for only 0.67% of the total vehicle sales during CY'20 jumped to 7.44% in CY'24. The table below outlines a linear projected sales based on the past sales data from CY'20 – CY'24 for different vehicle categories in CY'25 and their progress as of July.

An analysis of the sales figures reveals a segmented per-

Figure 13: Key milestone in Indian EV industry



Source: Electric mobility in India, 2023

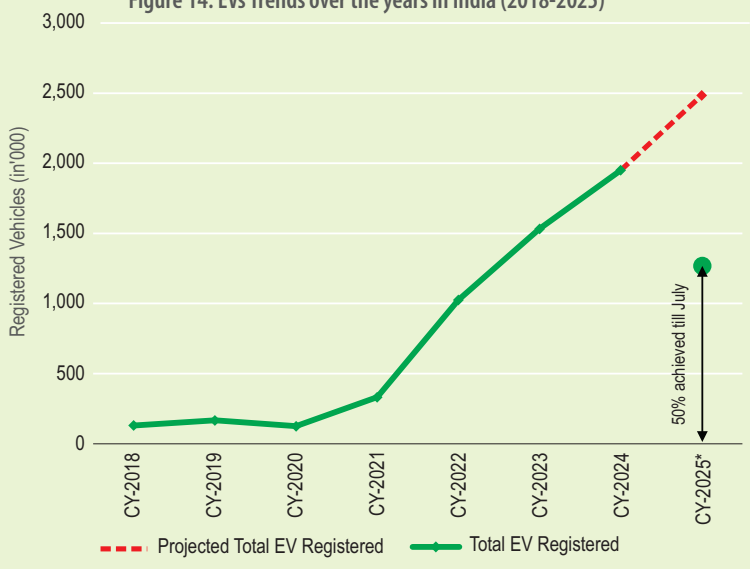
Table 9: Projected sales of EVs by CY'25

Category of Vehicle	Sales in CY-2024	Projected Sales for CY-2025	Sales in CY-2025 till July	Percentage of sales achieved till July 2025
e-LMV	99,771	1,28,997	91,497	71%
e-LMHGV	6,222	6,809	4,563	67%
e-MHPV	3,878	4,535	2,493	55%
e-3Ws	6,91,313	8,94,630	4,30,829	48%
e-2Ws	11,49,391	14,35,947	7,09,551	49%
Total EV Registered*	**19,50,663**	**24,82,952**	**12,39,162**	**50%**

Source: Vahan portal, August 2025

formance across the EV market. By mid-year, the overall sector has reached 50% of its annual expected sales by July, certain categories are notably outperforming others. Light Motor Vehicles (LMV) and Light, Medium, and Heavy Goods Vehicles (LMHGV) are leading the way, having already fulfilled 71% and 67% of their respective sales projections. This strong showing indicates robust demand and a promising pace of adoption in these segments which is expected to grow even further considering the upcoming festival seasons. In contrast, the 2Ws and 3Ws categories, which make up the largest share of total sales volume, are slightly behind at 49% and 48% of their annual goals. The Medium and Heavy Passenger Vehicle (MHPV) segment shows a similar trend, recording 55% progress by July.

Figure 14: EVs Trends over the years in India (2018-2025)[36]



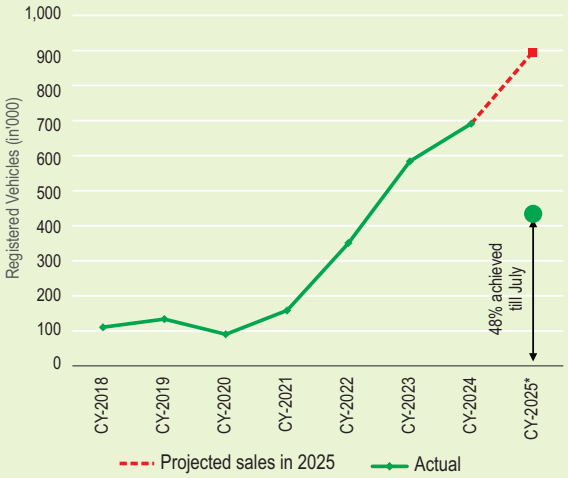
Source: Vahan portal, August,2025

**Telangana state is not included*

The vehicle registration trends from CY'18-24 reveal distinct growth patterns across all segments, with significant shifts during the COVID-19 pandemic and the subsequent recovery. Pre-pandemic, most vehicle categories experienced steady growth, reflecting stable economic conditions and consistent demand. However, the pandemic caused a temporary decline in registrations due to reduced mobility needs, disruptions in industries, and shifting consumer behaviour. The post-pandemic period, however, saw a robust recovery across all segments, fuelled by economic revival, evolving transportation needs, and shifting consumer and business priorities.

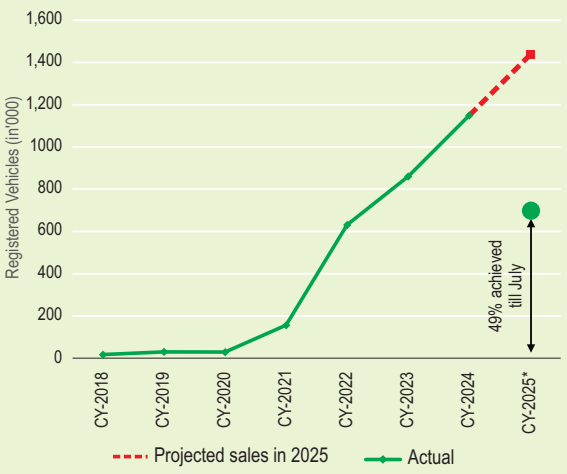
[36] *Battery-operated vehicle (BOV) and Pure EV were considered. Vehicle segments considered e-2Ws and e-3Ws for both Transport (T) and Non-Transport (NT), Medium and Heavy Passenger Vehicles (MHPV), Light, Medium, and Heavy Goods Vehicle (LMHGV), and Light Motor Vehicles (LMV).*

Figure 15: e-3Ws trends in India (2018–2025)



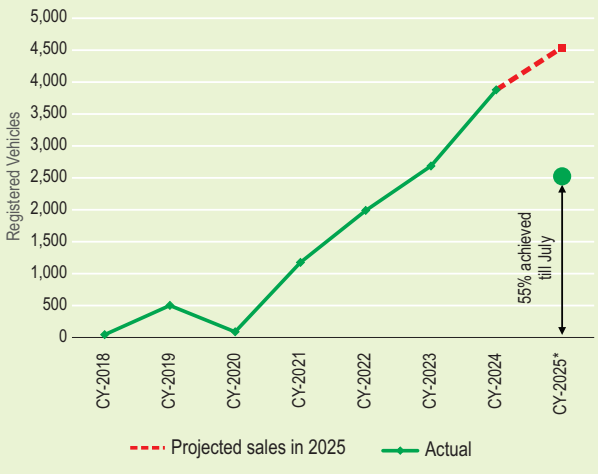
Source: Vahan portal, August,2025 *Telangana state is not included

Figure 16: e-2Ws trends in India (2018–2025)



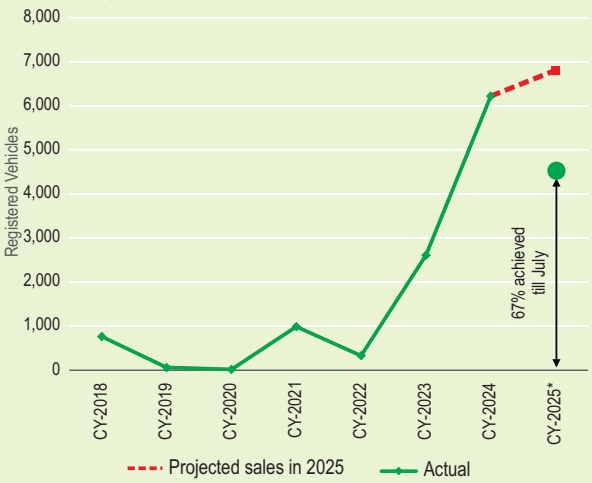
Source: Vahan portal, August,2025 *Telangana state is not included

Figure 17: e-MHPVs trends in India (2018–2025)



Source: Vahan portal, August,2025 *Telangana state is not included

Figure 18: e-LMHGVs trends in India (2018–2025)

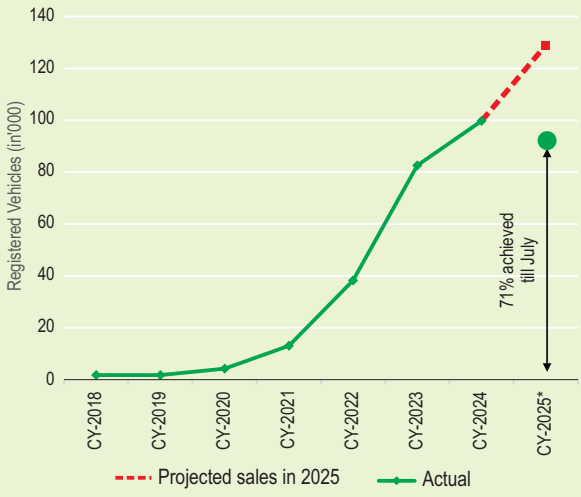


Source: Vahan portal, August,2025 *Telangana state is not included

e-2Ws and e-3Ws, closely tied to personal and commercial transport, witnessed the sharpest rebounds. e-2Ws registrations grew by ~3800% during CY'20 to CY'24, which will further expected grow to ~4800% in CY'25, driven by heightened demand for personal mobility as people avoided public transport and turned to safer, more convenient options. The rise in electric 2Ws adoption also contributed significantly to this growth. Similarly, 3Ws saw an increase of ~660% during CY'20 to CY'24 and is expected to increase 220% by CY'25, reflecting their growing role in last-mile delivery and shared transport solutions as e-commerce expanded and businesses recovered.

Medium and Heavy Passenger Vehicles (MHPV) and Goods Vehicles (LHGV) followed a parallel recovery trajectory but cater to different sectors. MHPV registrations remained below thousand units until CY'20, reflecting limited fleet expansion in public transport. However, post-pandemic, the category experienced extraordinary growth of ~230% from CY'21 to CY'24, driven by increased investments in public transport

Figure 19: e-LMVs trends in India (2018–2025)



Source: Vahan portal, August,2025 **Telangana state is not included*

and rising demand for passenger services. Meanwhile, LHGV registrations, linked to logistics and industrial activity, grew by whooping ~1700% from 328 units in CY'22 to 6,222 units in CY'24, and expected to grow ~1900% by the end of 2025 underscoring the recovery of supply chains, the rise of e-commerce, and the surge in industrial output. These trends reflect how the logistics and public transport sectors adapted to post-pandemic requirements.

The graphs clearly show these changes, with a sharp rise in vehicle numbers starting from FY'20 across all categories. While CY'20 saw a slowdown due to the pandemic, the strong growth afterwards highlights how quickly the automotive and transport sectors bounced back. This recovery is linked to the overall economic revival, shifts in consumer preferences, and more investment in both personal and commercial transport. Goods vehicles, 2Ws, and 3Ws had the biggest percentage jumps in terms of sales numbers in the last five years (CY'20-CY'24), showing their increasing importance for e-commerce, logistics, and last-mile deliveries.

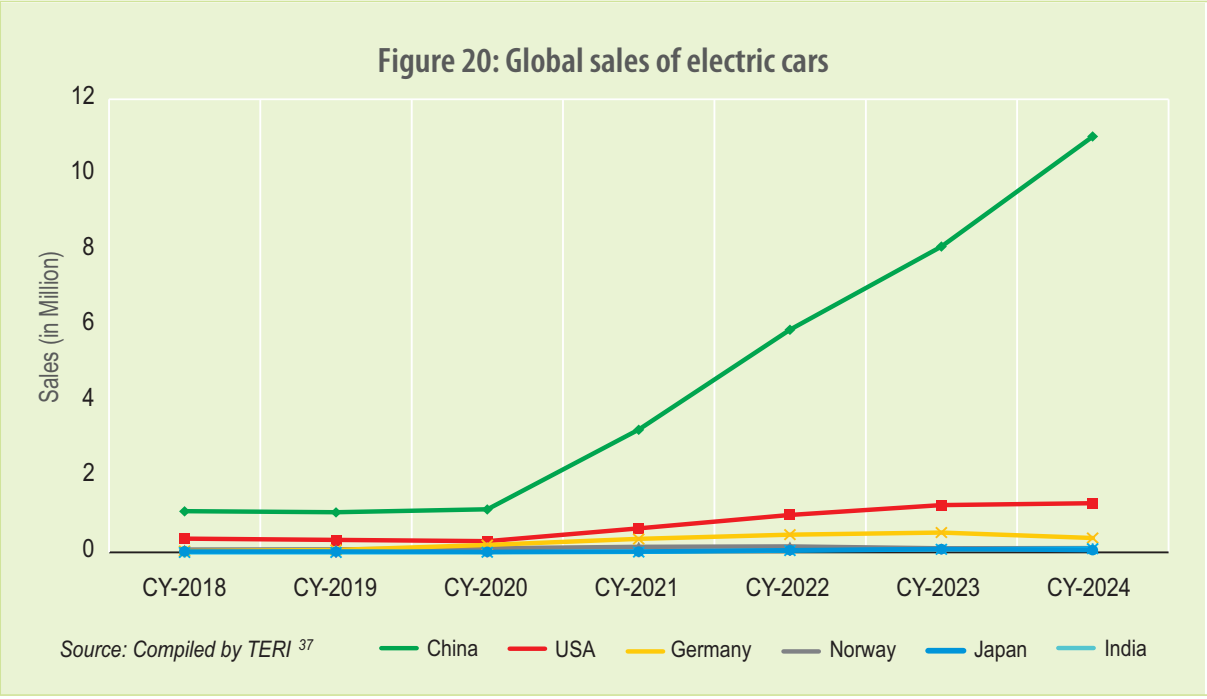
When it comes to light motor vehicles (LMVs) there has been a steady growth in sales from CY'18 to CY'20, however, the segment witnessed a sharp rise post-pandemic, from only 4,216 units sales in CY'20 to reaching nearly 1 lakh units by CY'24. However, even with this growth rate, the segment only achieved a year-on-year growth rate of 20.78% from CY'23 to CY'24 leaving a lot of potential to grow.

6.3.1 Electric Car Penetration – A Potential Game Changer

The passenger transport demand is driven massively by private ownership of vehicles, especially cars and jeeps (TERI, 2024). India has made notable progress in electrifying its 2Ws and 3Ws segments, but the EV car market within the light motor vehicle (LMV) category remains at an early stage. Compared to the rapid adoption of smaller vehicles, the relatively low ownership and penetration of EV cars underscore this segment's unique challenges. The Vahan portal data for the CY'24 vehicle registrations highlight this disparity, with only 1.94 million EVs registered, making up just 7.44% of the total 26.19 million registered vehicles. In contrast, petrol-powered cars dominate with 76.13% of the market share, followed by diesel cars with a 10.06% share. Additionally, out of the total registered EVs in CY'24, the majorly adopted 2Ws, and 3Ws make up 58.92% and 35.46% respectively, leaving EV cars in the LMV category with a relatively small share of 5.10%. This imbalance highlights the focus on the large-scale adoption of the 2Ws and 3Ws segments and the significant gap in EV car penetration.

6.3.2 Electric Car Penetration – Global Examples and India's Position

Analysing global trends in EV car adoption and comparing India's trajectory with leading markets such as China, the USA, Norway, Germany, and Japan help in understanding the diverse factors that influence adoption, including policy support, infrastructure development, and market readiness. China exhibits a remarkable surge in sales, with an increase of 860% from 1.14 million in CY'20 to 11.02 million in CY'24, reflecting its dominance in the EV market. This rapid growth can be attributed to strong government incentives, extensive infrastructure development, and the expansion of domestic EV manufacturing.



Source: Compiled by TERI [37]

The USA follows a steady upward trend reaching annual sales of 1.3 million in CY'24, supported by increasing consumer demand, federal and state subsidies, and improved charging infrastructure.

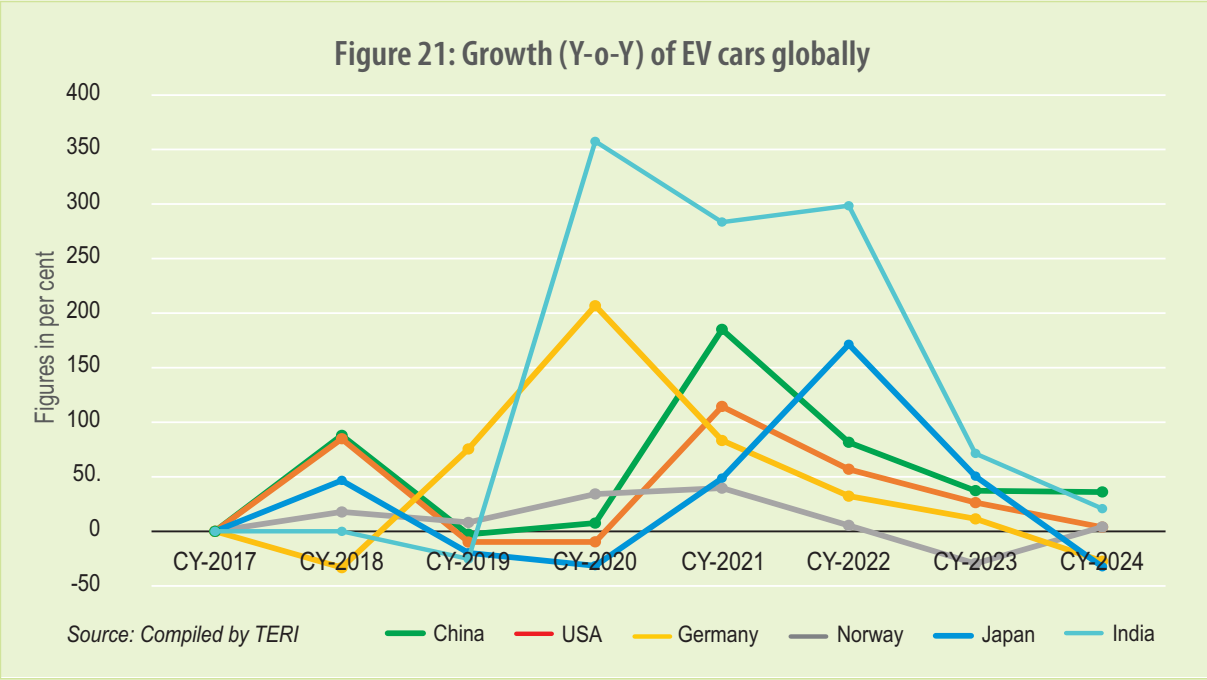
Among European countries, Norway particularly shows significant progress in EV penetration with 89% market share in CY'24. Norway's early adoption of EV-friendly policies and high market penetration of EVs demonstrate its leadership in the transition to clean mobility. Germany and Japan showed significant growth till CY'23 and in CY'24 both faced a fall of 27.40% and 32.51% in their market share, even after Germany benefitted from robust automotive manufacturing and government-driven initiatives. Japan's growth, while modest, aligns with its focus on hybrid technology and gradual transition towards fully electric vehicles.

In India, this reflects the nascent stage of EV adoption, influenced by emerging policy support, cost considerations, and infrastructure development.

However, the year-on-year (YoY) variation graph reveals distinct regional trends. India demonstrates the most remarkable fluctuations, with a YoY spike of over 350% in CY'20, driven by the government support, which provided financial support for EV purchases and infrastructure support. However, subsequent declines may reflect the market corrections but with the launch of new models in the affordable range and customer-centric offers, the penetration growth is evident.

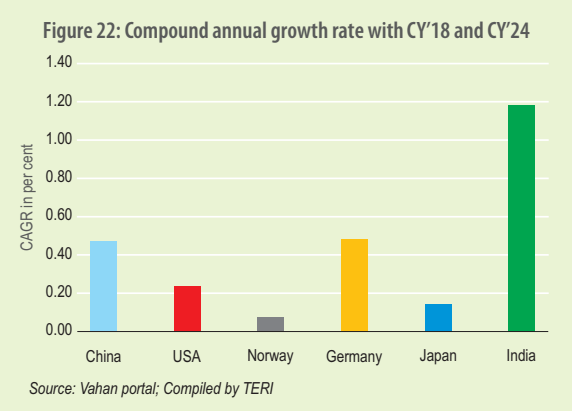
---

37 Data available at: <https://www.iea.org/data-and-statistics/data-tools/global-ev-data-explorer>
Data available at: <https://evboosters.com/ev-charging-news/overall-results-global-ev-sales-2024/>
Data available at: <https://www.edmunds.com/electric-car/articles/how-many-electric-cars-in-us.html>
Data available at: <https://in.investing.com/news/world-news/ev-dominate-norways-new-car-market-in-2024-4595327>
Data available at: <https://www.best-selling-cars.com/germany/2024-full-year-germany-best-selling-electric-cars-by-brand-and-model/>
Data available at: <Vahan data 22/1/25 - 11:30 (BOV, Pure EV, Plugin/ LMV, LPV/ Motor car, cabs)>
Data available at: <https://www.statista.com/statistics/571899/new-registrations-of-battery-electric-cars-in-japan/> < https://www.carscoops.com/2025/01/japans-ev-sales-crash-by-33-in-2024-but-foreign-brands-shine / >



The compound annual growth rate (CAGR) analysis further highlights India's exceptional growth potential, with a CAGR of 1.18 between CY'18 and CY'24. This growth underscores the impact of policies, government incentives, market forces, new affordable models with impressive driving range, charging infrastructure, etc.

India with its one of the largest policy support programmes and on-going progress of EV support infrastructure has the potential to become a market leader in EVs. This steady progress will depend on a comprehensive approach that includes consistent policy support, robust infrastructure development, and initiatives to enhance the affordability and accessibility of EVs. The following section gives a glimpse of the current electric car market in the country which evidently projects the growth in the future because of the factors like availability of models, battery prices, better range, heavy investment on the charging infrastructure by both the government and the private sectors, etc.

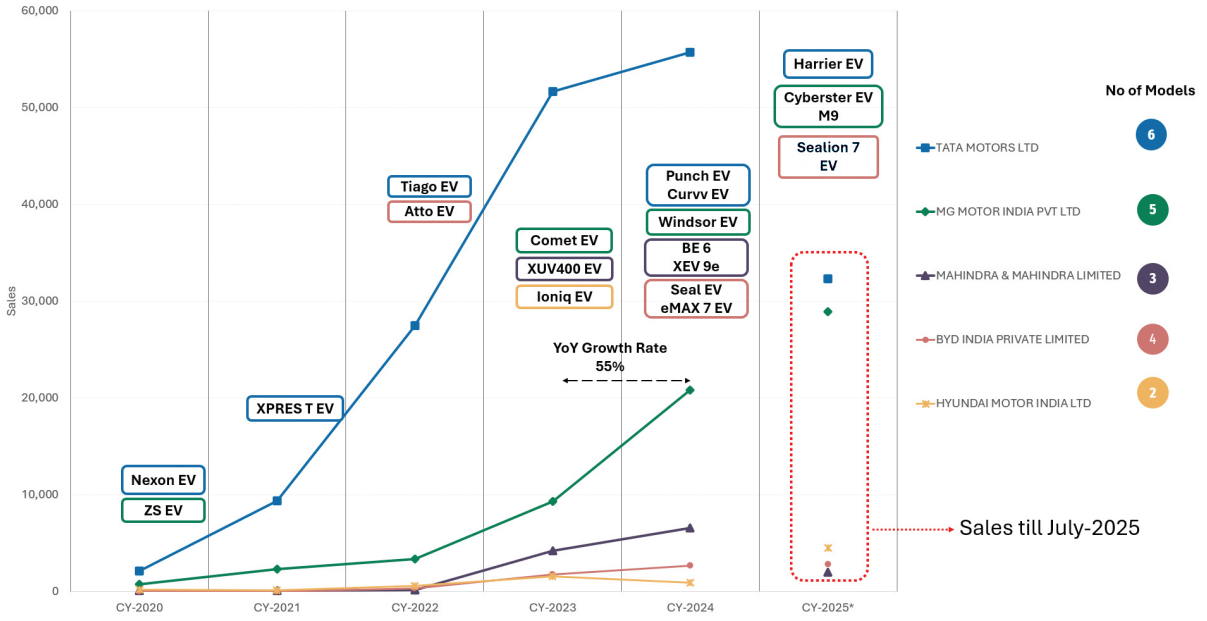


6.3.3 Electric Car Market in India

The Indian EV market has witnessed exponential growth between 2020 and 2024, driven by rising consumer demand, supportive government policies, and the growing acceptance of electric mobility.

The top five EV manufacturers during this period are Tata Motors, JSW MG Motor, Mahindra & Mahindra, BYD India, and Hyundai Motor India. Among these, Tata Motors has emerged as the clear market leader in terms of sales volume and model diversity, offering five EV models: Nexon.ev, Tiago.ev, Punch.ev, Curvv.ev and Harrier.ev. Tata Motors started with sales below 3,000 units in 2020 but showed remarkable growth, crossing 55,000 units in 2024, and in 2025 till July they

Figure 23: Top 5 manufacturers by annual EV sales (Data till July,2025)*



**Note: September 2025: VinFast debuts in India with VF6 and VF7 electric SUVs* *Telangana state is not included*
Source: Vahan Dashboard, August,2025; Compiled by TERI

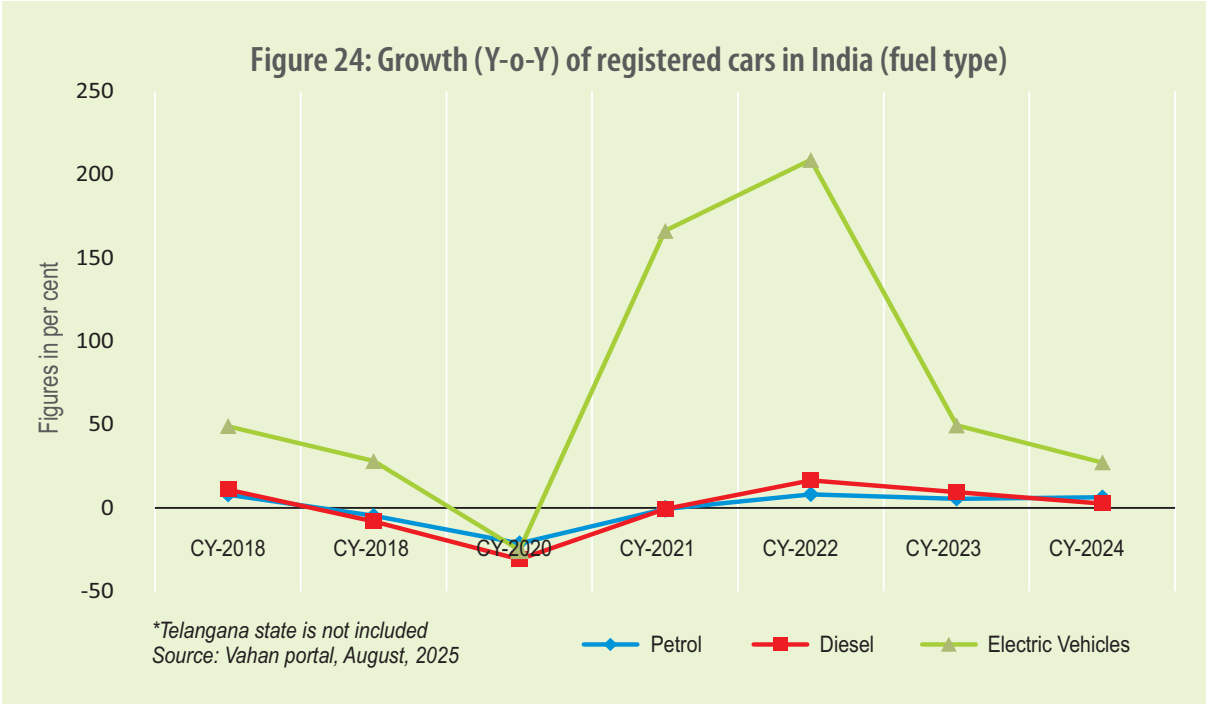
have crossed 32,000 units already. This success was fuelled by strategic launches, including the XPRES T EV in 2022 and Tiago.ev in 2023, followed by the introduction of the Punch.ev and Curvv.ev, which further solidified their market dominance with the new Harrier.ev opening a new segment of EVs for Tata Motors.

JSW MG Motor India is a strong contender, with a significant rise in sales driven by their three models: ZS EV, Comet EV, and Windsor EV. From 2020 to 2023, JSW MG Motor exhibited steady growth, with the ZS EV achieving total sales of around 9,300 units in 2023. In 2024, the company recorded the highest year-on-year growth rate of 55%, reaching sales of approximately 20,000 units. This surge was supported by the launch of the Comet EV in 2023 and the Windsor EV in 2024. The increase in demand for the Windsor EV led JSQ MG Motors to launch a Pro variant for it in 2025 called Windsor EV Pro with a bigger battery and better range.

Mahindra & Mahindra shows gradual but consistent growth, achieving sales of over 6,600 units for its XUV400 EV in 2024. The company has expanded its portfolio to three models, including the newly launched BE 6 and XEV 9e. Meanwhile, BYD India and Hyundai Motor India remain niche players with limited market penetration. BYD India, offering four models (Atto EV, Seal EV, eMAX 7 EV, and Sealion 7 EV), recorded sales above 27,000 units by 2024. Hyundai Motor India, with its single model Kona EV started in 2019, now they have two models in the market. The Hyundai Kona EV was discontinued in 2024 after the release of the Hyundai Ioniq 5 a SUV in 2023. The new Creta EV was launched in 2025, which reported a boost in sales, with more than 4,000 units sold till now. This has resulted in a total sale over 8,000 units between the years 2020- July 2025.

Overall, the EV market in India has grown exponentially between 2020 and till July-2025, supported by increased consumer interest, government incentives, and advancements in EV technology.

Figure 24 shows how the registration of cars by fuel type changed over the years. Petrol vehicles remained the most popular, with steady growth, reflecting their affordability and availability. Diesel vehicle registrations, however, decreased over time, showing a shift



away from diesel-powered cars due to stricter emissions rules and growing environmental concerns and withdrawal of subsidy on diesel fuel.

On the other hand, EVs saw a sharp increase, especially in CY'20 to CY'24 showing more than a ~1460% growth. In comparison to EVs over the CY'20 to CY'24 petrol has seen a growth of ~21% and diesel increased by ~30%. This rise in EVs matches the overall growth in LMVs, suggesting that more people are choosing electric cars as part of the shift towards greener options, and this has been possible due to several national and state-level initiatives by the government with supporting hands from the whole industry ecosystem.

Battery cost of EVs accounts for the major cost, hence, decoupling of battery from EVs is one way to ensure affordability. ***Battery as a Service*** *is an excellent choice in this case, offering both swapping and leasing models.*

BaaS (Battery-as-a-Service) – Unique Ownership Programme

This flexible plan removes the upfront battery cost, allowing customers to pay per kilometre—at just 40% of conventional fuel costs. By significantly reducing the initial price and lowering running expenses, BaaS makes owning a full-size electric SUV as affordable as a compact manual SUV.

- JSW MG Motors provides a lifetime battery warranty for the first owner of the Windsor.
- The eHUB by MG app ensures convenience with one year of free public charging, while the 3-60 buy-back plan guarantees 60% value retention after 3 years or 45,000 km.

6.4 Current Infrastructure Availability in India

Country's rapid adoption of EVs aims to achieve an EV sale of 80% in the 2Ws and 3Ws segment, 70% for all commercial cars, 30% for private cars, and 40% for buses by the year 2030 (NITI Aayog and Rocky Mountain Institute, 2019). It comes with the challenge of providing energy infrastructure to support charging stations efficiently and sustainably. The deployment of electric vehicle charging infrastructure (EVCI) depends on various variables such as policy framework, availability of resources, extent of EV adoption, and stakeholder coordination.

Under FAME-II, 2877 charging stations were sanctioned in 68 cities, out of which 36 had been installed by March 2022.

Additionally, 1,576 charging stations were sanctioned in 16 Highways and 9 Expressways. To facilitate electric transition for long distance travels like trucks and buses, provision of at least one fast charging station at every 100 km, on each side of the highways has been laid out.

Under FAME-II Scheme, MHI sanctioned 7,432 public fast charging stations. Norms for charging points included one fast charger (FC) per 10 e-4Ws, one FC per 10 electric buses (NITI Aayog)[38] and one slow charger per each electric bus (TERI, 2024).

Phase II scheme involved the installation of 10,985 EVPCS with an investment of 912.5 crores. Among these, 10,585 were set up by Oil Marketing Companies (OMCs) and 400 were set up by other organizations.

Of the total allocated budget under PM E-DRIVE, ₹2,000 crore has been kept for the installation of Electric Vehicle Public Charging Stations (EVPCS).[39]

The Ministry of Power (MoP) is constantly taking several initiatives to accelerate the deployment of public EVCI in the country. As of August 2025, there are 29,277 public EV charging stations installed nationwide.[40] Karnataka has the highest number of EV charging stations, followed by Maharashtra, Uttar Pradesh, Delhi, Tamil Nadu followed by other states. A recent Confederation of Indian Industry (CII) report emphasized the necessity of establishing at least 1.32 million charging stations in India by 2030 to facilitate the rapid growth of EVs, requiring over 4,00,000 installations.[41]

Apart from government initiatives for the charging stations, there are various private players initiatives which are enhancing India's EV charging infrastructure, with a strong focus on home charging solutions to facilitate seamless EV adoption.

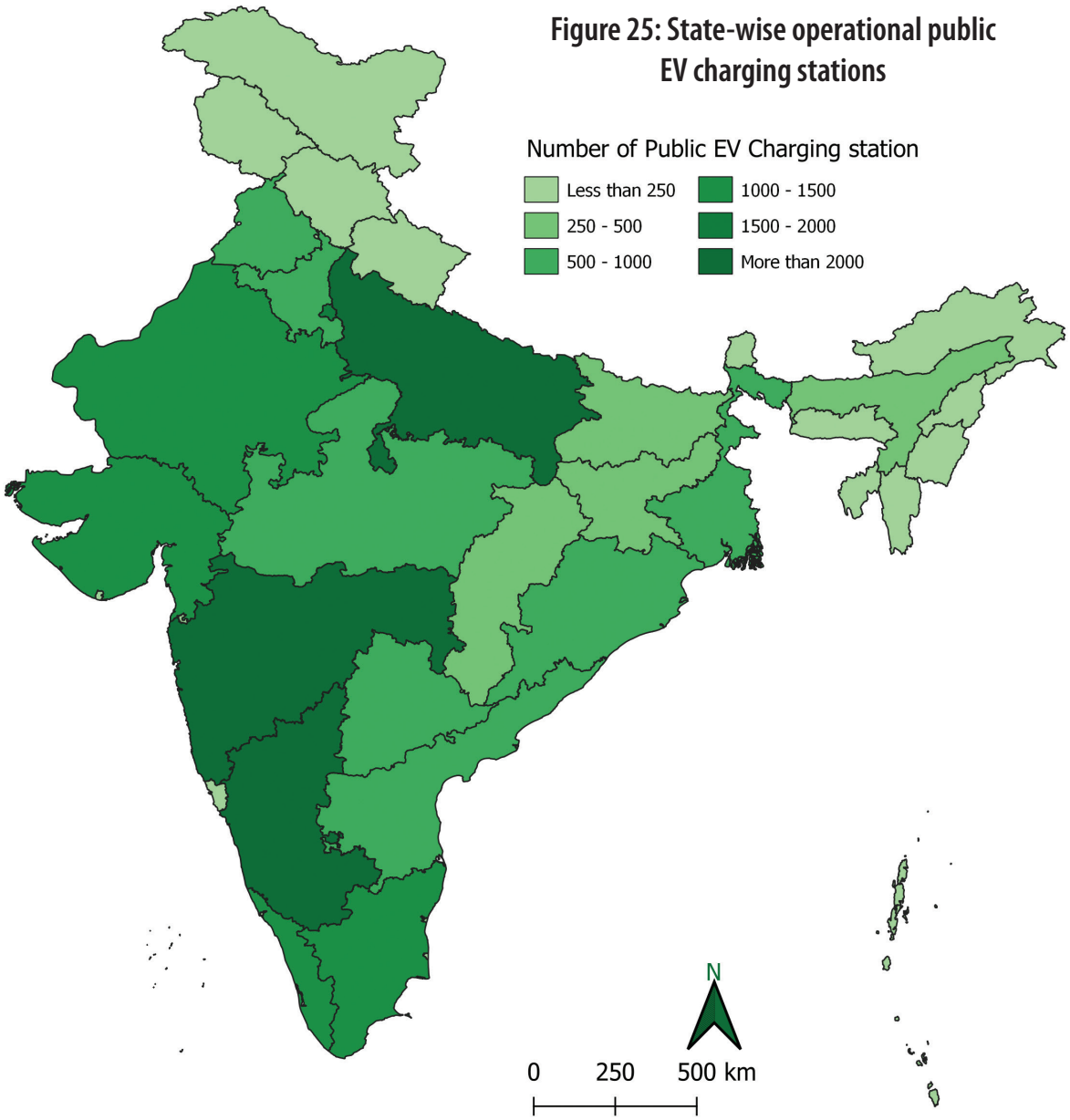
For instance, Tata Power has installed over 1,00,000 home EV chargers across more than 550 cities, offering end-to-end solutions that include installation and maintenance services.[42] JSW MG Motor India are providing complimentary home charger installations with their EVs, ensuring customers have immediate and convenient charging access upon vehicle purchase and have successfully installed over 1,00,000 chargers. Hyundai Motor India has partnered with Tata Power to equip its dealerships with 60kW DC fast chargers and assist customers in setting up home charging stations, thereby expanding the home charging ecosystem.[43] Additionally, Ather Energy has developed the Ather Grid, a network of fast-charging stations, and offers home charging solutions to its scooter owners, contributing to the growing home charging infra-

---

[38] *Details available at :<https://www.niti.gov.in/sites/default/files/2021-08/HandbookforEVChargingInfrastructureImplementation081221.pdf>*
[39] *Details available at:< https://www.pib.gov.in/PressReleasePage.aspx?PRID=2147042#:~:text=The%20PM%20Electric%20Drive%20Revolution,a%20period%20of%20two%20years >*
[40] *Details available at: < https://www.pib.gov.in/PressReleasePage.aspx?PRID=2154127#:~:text=Ministry%20of%20Heavy%20Industries,EVCS%20on%20pan%2DIndia%20basis>*
[41] *Details available at: < https://sansad.in/getFile/loksabhaquestions/annex/184/AU3297_q4ARQK.pdf?source=pqals >*
[42] *Details available at: <https://www.tatapower.com/ezcharge>*
[43] *Details available at: <https://nsearchives.nseindia.com/corporate/TATAPOWER_17052022110230_20.PressReleaseTataPowerpartnerswithHyundaiMotorIndiatoPowerupEVchargingInfrastructureinIndia17.05.2022.pdf>*

structure.[44] Apart from this, there are more examples from ChargeZone, Statiq, and Magenta Power which have services for affordable and smart home chargers, enabling EV owners to charge conveniently at home. These collaborative efforts by private players are crucial in addressing range anxiety and promoting the widespread adoption of EVs in India.

Figure 25: State-wise operational public EV charging stations



Source: Ministry of Road Transport and Highways and Ministry of Power (Updated till August, 2025); Compiled by TERI

[44] *Details available at: <https://www.atherenergy.com/charging>*

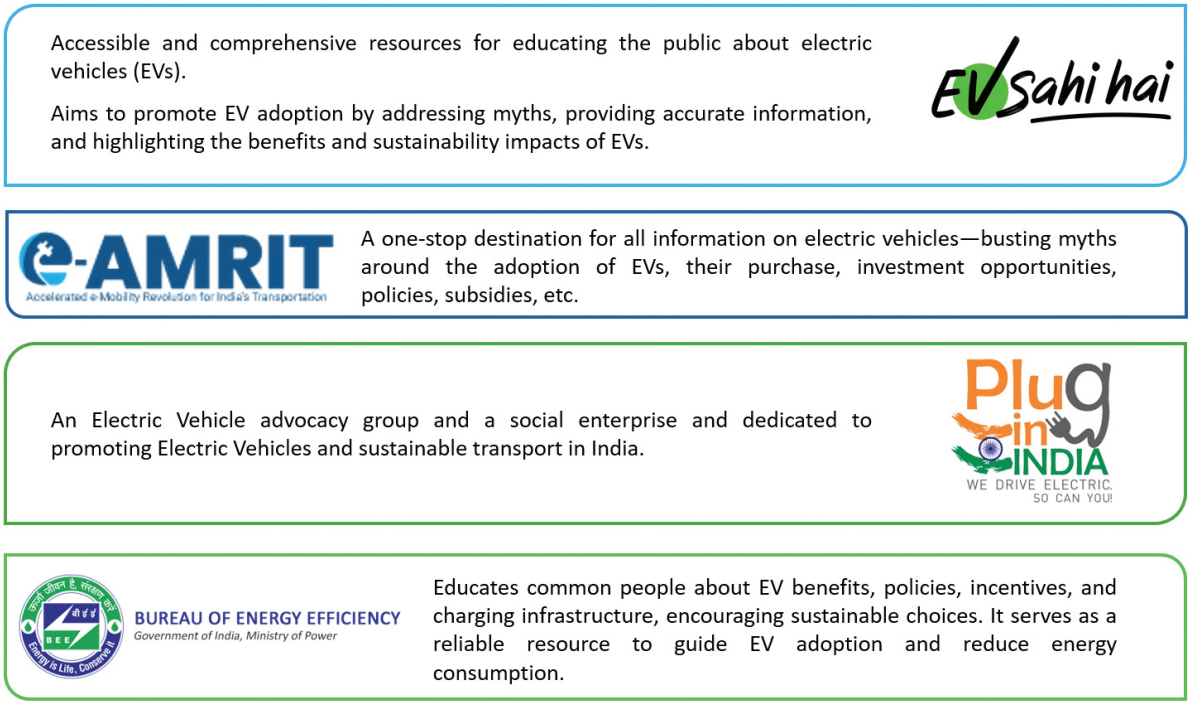
7. Recent Campaigns/Initiatives by Government/CSOs/Private Players

Government, think tanks, industries and many private players have come together to support the electrification drives in India with very important and crucial initiatives/campaigns and events that have played a crucial role in designing and uplifting the EV uptake in the country.

Initiatives have included target setting, EV deployments, awareness programmes, technological interventions like EV apps, dashboards to name some. Table 8 provides a glimpse of some such campaigns along with their key details.

India has witnessed a surge in apps designed to simplify the lives of EV users by providing seamless access to charging infrastructure. Prominent apps like Tata Power EZ Charge, Statiq, and Charge Zone allow users to locate, book, and pay for charging stations across the country. Platforms such as PlugShare and Charzer provide detailed information about nearby stations, including user reviews and station availability. Companies like Bolt.Earth and ChargeMOD focus on building extensive networks of charging points in urban and semi-urban areas, while GO EC caters specifically to regions like Kerala. These apps not only enhance convenience for EV owners but also support the transition to a sustainable, electric mobility ecosystem in India.

Figure 26: EV Knowledge Hub: your one-stop resource for electric vehicles in India



Source: Non-exhaustive list compiled by TERI

Table 10: List of campaigns/initiatives on EVs

Campaigns/ Initiatives	Lead Organization	Partners	Aim/Objectives
EV30@30 Campaign	NITI Aayog	Various partners	To ensure that 30% of new vehicle sales are electric by 2030, supporting global decarbonization goals.
Switch Delhi Campaign	Delhi Government	Citizen groups and OEMs	To promote awareness and adoption of EVs among residents of Delhi.
EV Yatra	Bureau of Energy Efficiency (BEE)	Various partners	A web-portal, website & mobile application with the objective of creating awareness and to promote e-mobility in the country.
e AMRIT	NITI Aayog	Various partners	A portal that provides information on EVs, including how to buy, invest in, and use them. The portal also aims to help people switch to EVs by providing information on insurance, financing, and more.
Shoonya: Zero Pollution Mobility Campaign	NITI Aayog and Rocky Mountain Institute (RMI)	Various partners	Aims to improve air quality in India by accelerating the deployment of EVs for ride hailing and deliveries.
e- FAST India: Electric Freight Accelerator for Sustainable Transport	NITI Aayog and WRI India	Industry/CSO like TERI, SSEF, RMI, Smart Freight Centre India, etc.	First platform to facilitate collaboration between government stakeholders and private sector partners—Original Equipment Manufacturers (OEMs), Logistic Service Providers (LSPs), financers, producers, and Charge Point Operators (CPOs)—to shape strategies and actions that support freight electrification at scale.
EVReady India (EV Dashboard)	OMI Foundation	-	It aims to harness the power of data and AI to equip stakeholders with insights needed for the rapid adoption of EVs in India.
Electrify & Connect	The Energy and Resources Institute	ICCT India, Shakti Sustainable Energy Foundation	More than 50 EV owners from the Delhi-NCR participated in the event by driving their vehicles to the lush green Campus at TERI Gwal Pahari, which is a zero-emission zone to share their EV experience.
Tech Trial Runs	National Highway for Electric Vehicles	Various partners	A pilot programme adopted by the Govt of India; initially supported by the Ministry of Commerce & Industry to upgrade highways into E-Highways. It conducted Tech-Trials on 2 pilot corridors, namely Delhi-Agra (Yamuna Expressway – 2020) and Delhi – Jaipur (NH48 – 2022) out of 12 National Corridors proposed by the Ministry of Power for electrification in its Guidelines and standards dated 14.12.2018 to be converted into E-highway.
EV100	The Climate Group	Various partners	EV100 is a global initiative bringing together companies committed to switching their owned and contracted fleets up to 3.5t and 50% of their fleet between 3.5 and 7 tonnes to EVs and installing charging infrastructure for employees and customers by 2030.
EZ Charge Network	Tata Power	Various partners	Offers over 5,500 EV charging stations to support your journeys and your fleet's operations.
EV SAHI HAI and eHUB app	JSW MG Motors India	Various partners	*EV SAHI HAI* is an educational platform designed to increase awareness and knowledge about EVs. The 'eHUB platform is introduced for locating, reserving, and paying for charging stations.
Hyundai's 'Beyond Mobility' Initiative	Hyundai Motors India	Local agencies, charging providers	To promote sustainability and EV adoption through advanced technology and customer awareness programmes.

Source: Non-exhaustive list compiled by TERI

Table 11: List of applications for EV users

App Name	Features
Charge Zone	Helps users locate nearby EV charging stations across India
Statiq EV Charging	Allows users to find and book nearby EV charging stations
GO EC	Provides fast and reliable EV charging solutions, primarily in Kerala
Tata Power EZ Charge	**Wide Charging Network:** Extensive network of public EV charging stations across India **Smart Charging App:** Locate stations, check availability, and monitor charging status **Eco-Driving Tips:** Suggestions for optimized driving and improved fuel efficiency
Bolt Earth	Offers a network of EV charging stations across various Indian cities
Charzer	Enables users to find and use EV charging stations, with a network of over 300 stations nationwide
eHUB by MG	**Vehicle Monitoring:** Check battery status, tire pressure, and vehicle location **Charging Station Locator:** Find nearby charging stations with real-time updates **Trip Analysis:** Insights into driving patterns, energy consumption, and efficiency **Maintenance Alerts:** Get notifications for service needs and software updates **Eco-Driving Tips:** Suggestions for optimized driving and improved fuel efficiency **Sustainability Dashboard:** Views environmental impact data, including reduced carbon emissions.

***This does not represent an exhaustive list of all the features and tools available.*
Source: Non-exhaustive list compiled by TERI

8. Is India EV Ready? – Challenges in the Current EV Ecosystem

India's EV ecosystem, while growing rapidly, still faces a number of challenges that impede its full-fledged adoption. Here's an analysis of the critical bottlenecks, framed to address the readiness of India for an electric future:

User Perception about EVs

Despite several awareness campaigns, numerous potential users are still hesitant due to concerns about range anxiety, lack of charging infrastructure, and high upfront costs. EV adoption in Tier 2 and Tier 3 cities is particularly slow due to the unavailability of proper service centers and charging stations.

Skill Upgradation for Drivers and Operators

Transitioning to EVs requires specialized skills for handling, operating, and maintenance especially for freight and public passenger mobility segment. Basic training programmes for drivers, operators and maintenance staffs are still in short supply. Skill gap hampers large-scale adoption.

Affordable EV model category and society-charging ecosystem

At present, the availability of EV models priced below ₹10 lakh is quite limited, restricting options for cost-sensitive/first-time buyers.

Challenge compounded by the lack of adequate charging infra in residential areas.

In many cases, RWAs support is very limited

Maintenance of Public Charging Infrastructure

Many public charging stations are poorly maintained, leading to technical malfunctions and reduced reliability. The absence of regular upkeep and inconsistent electricity supply discourages EV users from depending on public charging.

High Dependence on Coal-Based Electricity

While EVs have zero tailpipe emissions, their environmental benefits are offset by India's reliance on coal for electricity generation. To truly decarbonize the transport sector, a shift towards renewable energy integration in the grid is vital.

Policy and Regulatory Frameworks

Policy and regulatory hurdles, such as high battery costs and the absence of a streamlined single-window system for securing high-load connections for charging infrastructure providers, continue to pose significant challenges.

Resale Value of EVs

EVs currently face poor resale value compared to ICE vehicles, primarily due to uncertainties around battery life and performance.

Uniformity in Charging Sockets

The lack of standardization in charging sockets and connectors adds complexity for EV owners. Uniform standards are critical to creating a robust charging network, ensuring convenience for users and accelerating adoption.

India's EV ecosystem is at a pivotal stage, with strong government push and large-scale private sector participation. However, overcoming the challenges and bottlenecks is critical for scaling adoption and achieving the national targets. A collaborative effort involving technological innovation, policy initiatives and alignment, infrastructure investment, and user awareness and education will establish India's readiness for an EV-future.

9. Roadmap for Future – *Viksit Bharat* 2047

India's ambition to lead the global EV transition is central to its broader vision of sustainable development and becoming a developed nation by 2047. With milestones such as achieving Net-Zero emissions by 2070, attaining 50% renewable energy capacity by 2030, and building an inclusive green economy, the coming decade is decisive. To realize these ambitions, the EV ecosystem must be positioned as a core driver of economic competitiveness, energy security, and environmental resilience.

9.1 Policy and Regulatory Frameworks: Accelerating Transformation

The introduction of clear, time-bound adoption targets, complemented by electricity tariff reforms and standardized battery policies, is critical for creating certainty in the EV sector. Establishing a single-window clearance mechanism for securing high-load DISCOM connections would help address infrastructure bottlenecks that currently slow down deployment. Equally important is the need to set mandatory battery recycling targets, which would not only address environmental concerns but also strengthen long-term resource security and sustainability in the EV ecosystem.

9.2 Private Sector: Pioneering Growth and Innovation

The private sector is already demonstrating its transformative role in advancing EV adoption through investments, innovation, and partnerships. Companies such as JSW MG Motors and Mercedes-Benz Research and Development India (MBRDI) have launched initiatives like *EV Sahi Hai*-a digital awareness campaign, and Future-In-Charge-a skilling program aimed at strengthening India's charging infrastructure respectively. Similarly, Tata Motors' Automotive Skill Labs initiative nurtures over 4,000 students annually, equipping them with future-ready automotive skills that are vital for the EV transition.

At the same time, logistics and e-commerce companies such as Zomato, Swiggy, Amazon, and Flipkart are integrating EVs into their last mile/quick commerce fleets, reducing both operational costs and carbon footprints. By continuing to support government policies, investing in EV-friendly infrastructure across urban and rural areas, and advancing next-generation technologies in batteries and recycling, the private sector can help India position itself as a global hub for EV manufacturing and innovation.

9.3 Skill Development and Community Engagement: Building a Future-Ready Workforce

Skill development and community engagement play a pivotal role in preparing a workforce equipped for India's EV transition. TERI's recent report (TERI, 2024), highlights that the shift to EVs is steadily gaining momentum in the country. To support this transition, existing workers can be re-skilled, related sectors will need extensive re-skilling efforts, and numerous new job roles with specific skill requirements will emerge, as emphasized in the report.

Upskilling programmes, such as converting ICE mechanics to EV technicians, are vital to meet workforce needs. Localized incentive programmes and grassroots campaigns, particularly in rural areas, can further accelerate adoption. Together, these efforts ensure a skilled workforce and engaged communities to support India's EV future.

9.4 Charging Infrastructure in Residential Areas: The Role of RWAs

For EV adoption to scale, charging access at the residential level is indispensable. Resident Welfare Associations (RWAs) must be mandated to facilitate charging infrastructure within housing societies in accordance with existing government policies and guidelines, such as the Ministry of Housing and Urban Affairs' amendments to the Model Building Byelaws (MBBL–2016). By actively enabling charging installations, RWAs can eliminate a key barrier for urban households, making EV ownership both convenient and practical. This step is particularly vital in cities where personal parking space is limited, and collective action through RWAs is necessary to mainstream EV usage.

9.5 Fiscal Incentives: Sustaining Affordability with 5% GST

One of the strongest drivers of EV adoption in India has been the concessional Goods and Services Tax (GST) rate of 5%. One of the prominent reasons of EV-uptake in the country has been concessional GST rates along with the demand incentives by the GoI. To sustain momentum, it is imperative that this reduced tax rate be continued and not increased in the near term. Raising GST would undermine affordability, especially given India's price-sensitive consumer base, and could slow down the progress achieved so far. Retaining the concessional GST on EVs aligns with India's global climate commitments and ensures that clean mobility remains within reach for middle-class households and first-time buyers.

9.6 Affordable Small EVs: Unlocking Mass Adoption

India's history of small car ownership, driven by affordability and suitability for congested urban roads, offers a clear lesson for EV adoption. To replicate this success, OEMs should be encouraged to develop compact and affordable EVs, ideally priced under ₹10 lakh. Such models would serve as the entry point for mass-market adoption, especially for first-time car buyers in India's cities. By promoting affordable small EVs, India can achieve both scale and inclusivity in the transition to clean mobility, while also strengthening domestic demand for locally manufactured vehicles.

9.7 Call for Action

Achieving the vision of a sustainable and inclusive EV ecosystem requires collective action. The government must ensure policy stability, consistent financing mechanisms, and regulatory clarity to create a predictable environment. The private sector must drive innovation, invest in scalable solutions, and align business models with sustainability goals. Communities must adopt EVs as a mainstream mobility choice, while academia and research institutions should focus on knowledge creation, innovation, and capacity building. By aligning the efforts of all stakeholders, India can set a global benchmark in EV adoption, moving decisively towards the vision of a sustainable, inclusive, and prosperous *Viksit Bharat* by 2047.

10. References

1) *CESL. (n.d.). The Grand Challenge for Electric Bus Deployment.*

2) *Deepty, J. (2022). Viability assessment of electric cars for personal use in India. IATSS Research, 241-222.*

3) *drax. (2023, April 28). Drax. Retrieved from https://energy.drax.com/insights/electric-vehicle-myths/*

4) *Eisenson, M., Elkin, J., Fitch, A., Ard, M., Sittinger, K., & Lavine, S. (2024). Rebutting 33 Flase Claims About Solar , Wind and Electric Vehicles. New York: Sabin Center for Climate Change Law, Columbia Law School.*

5) *Evans, S. (2023, 10 24). CarbonBrief. Retrieved from CarbonBrief Clear on Climate: https://www.carbonbrief.org/factcheck-21-misleading-myths-about-electric-vehicles/*

6) *Fortune Business Insights. (2024, 11 04). Retrieved from Fortune Business Insights: https://www.fortunebusinessinsights.com/india-electric-vehicle-market-106623*

7) *Gehring, L., & Topf, J. (2022, July). Sustainable Development Solution Network. Retrieved from https://www.unsdsn.org/news/shifting-gears-from-ev-myths-to-science-backed-facts/*

8) *Glandorf, J. (2020). On the Move: Unpacking the Challenges and Opportunities of Electric Vehicles. Washington, DC: Environmental and Energy Study Institute. Retrieved from https://www.eesi.org/articles/view/on-the-move-unpacking-the-challenges-and-opportunities-of-electric-vehicles*

9) *GOI. (2024, 02 02). Ministry of Heavy Industries. Retrieved from https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2003003*

10) *GoI. (2024, 08 06). Press Information Bureau. Retrieved from https://pib.gov.in/PressReleseDetail.aspx?PRID=2042174&reg=3&lang=1*

11) *GoI. (2024, 08 2). Sansad. Retrieved from Questions-and-Answers: https://sansad.in/getFile/annex/265/AU1356_OXQGNk.pdf?source=pqars*

12) *IBEF. (2024). Retrieved from https://www.ibef.org/industry/electric-vehicle*

13) *IEA. (2023). Transitioning India's Road Transport sector. International Energy Agency. Retrieved from https://iea.blob.core.windows.net/assets/06ad8de6-52c6-4be3-96fc-2bdc3510617d/TransitioningIndiasRoadTransportSector.pdf*

14) *IEA. (2023). World energy outlook. International Energy Agency. Retrieved from https://iea.blob.core.windows.net/assets/86ede39e-4436-42d7-ba2a-edf61467e070/WorldEnergyOutlook2023.pdf*

15) *IEA. (2024). World Energy Outlook. International Energy Agency. Retrieved from https://iea.blob.core.windows.net/assets/6a25abba-1973-4580-b6e3-ba014a81b458/WorldEnergyOutlook2024.pdf*

16) *Jamal, F., & Shukla, P. (2024, October 05). Our local post offices can become a central piece in India's EV revolution. Retrieved from Deccan Herald: https://www.deccanherald.com/opinion/our-local-post-office-can-become-a-central-piece-in-indias-ev-revolution-3220661*

17) *MHI. (2021). Scheme for Faster Adoption and Manufacturing of Electric Vehicles in India Phase II (FAME India Phase II. Ministry of Heavy Industries, GoI.*

18) *MHI. (2025). Sansad Unstarred Question No.113. GoI. Retrieved from https://sansad.in/getFile/loksabhaquestions/annex/184/AS113_rP8ueR.pdf?source=pqals#:~:text=FAME%20I%20scheme:,are%20given%20in%20Annexure%20I.*

19) *NITI Aayog. (2024). e-Amrit Portal. Retrieved from e-Amrit Portal: https://e-amrit.niti.gov.in/types-of-electric-vehicles*

20) *NITI Aayog and Rocky Mountain Institute. (2019). India's Electric Mobility Transformation. NITI Aayog and Rocky Mountain Institute. Retrieved from https://rmi.org/wp-content/uploads/2019/04/rmi-niti-ev-report.pdf*

21) *Sreedhar, M., Neroth, A. J., Mishra, S., & Babu, B. (2022). Route Towards Road Freight Electrification in India: Examining Battery Electric Truck Powertrain and Energy Consumption. Chinese Journal of Electrical Engineering.*

22) *TERI. (2019). Faster adoption of electric vehicles in India: Perspective of consumers and industry. New Delhi: The Energy and Resources Institute. Retrieved from https://www.teriin.org/sites/default/files/2019-11/Faster%20adoption%20of%20electric%20vehicles%20in%20India.pdf*

23) *TERI. (2024). Comprehensive Assessment of Job Impacts and Skill Gaps while Transitioning from ICE to Electric Trucks. New Delhi: TERI.*

24) *TERI. (2024). Roadmap for India Energy Transition. New Delhi: TERI.*

25) *TERI. (2024). Roadmap for India Energy Transition. The Energy and Resources Institute.*

26) *TERI. (2025). Comprehensive Assessment of Job Impacts and Skill Gaps while Transitioning from ICE to Electric Trucks. New Delhi: The Energy and Resources Institute. Retrieved from https://teriin.org/files/ZET_Skill_Gap_and_Job_Impact.pdf*

THE ENERGY AND RESOURCES INSTITUTE
Creating Innovative Solutions for a Sustainable Future

The Energy and Resources Institute (TERI)
3rd floor, Core 1(b), TERI Library block, IHC Complex Lodhi Road, New Delhi 110 003, India. Tel: +91 11 2468 2100 or 2468 2111
Fax: +91 11 2468 2144 or 2468 2145. Email: nidhi.verma@teri.res.in | Web: www.teriin.org