EV/SINIDIA



The Road Ahead

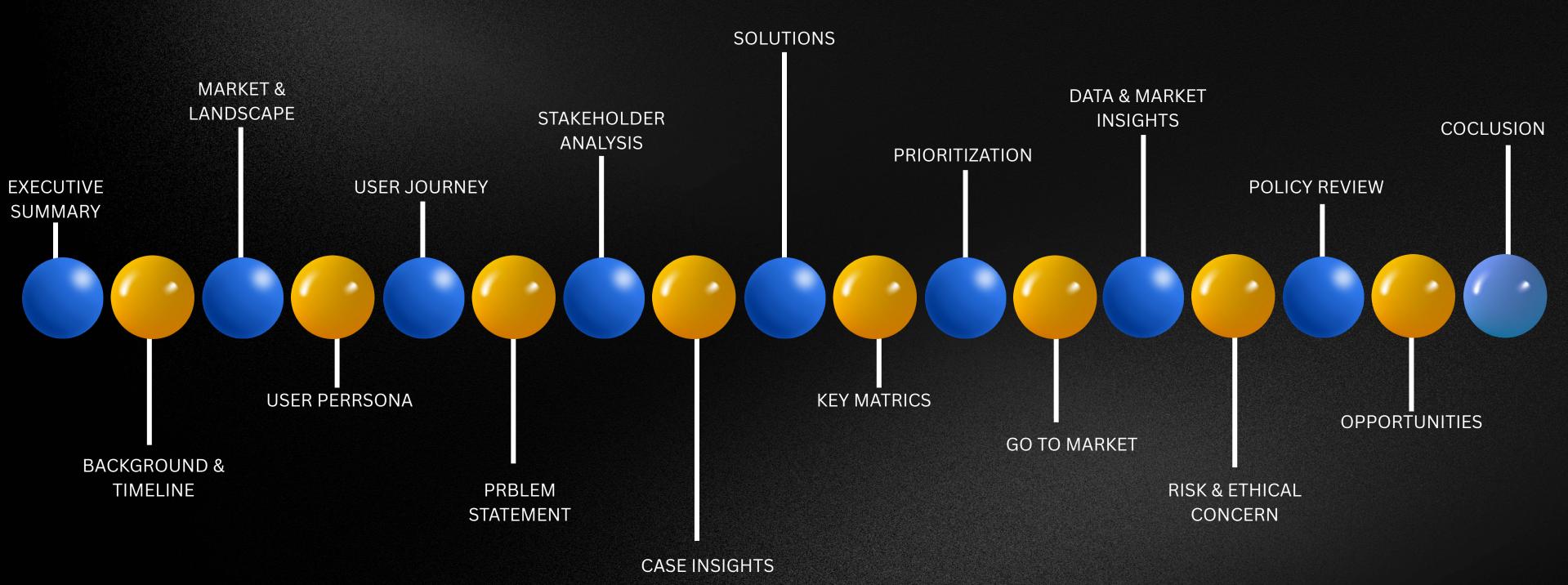






TIMELIME









EXECUTIVE SUMMARY ()



The global shift towards electric vehicles (EVs) represents one of the most significant transformations in the transportation and energy sectors of the 21st century. Driven by urgent climate imperatives, technological innovation, and evolving consumer preferences, countries across the globe are increasingly turning to EVs as a key solution to decarbonize mobility and reduce dependence on fossil fuels.

Leading global markets—notably China, the European Union, and the United States—have implemented aggressive strategies to phase out internal combustion engine (ICE) vehicles. These include substantial government subsidies, stricter emission standards, ambitious adoption targets (50–55% by 2030), and large-scale investments in public and private charging infrastructure. Collectively, they are setting the benchmark for EV innovation, affordability, and accessibility.

India, while comparatively nascent in its EV journey, is rapidly gaining momentum. With the support of national policies like the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) scheme, state-level EV policies, and Production-Linked Incentive (PLI) programs for batteries and components, India is beginning to lay the groundwork for a robust EV ecosystem.

Global Leaders

- 50-55% EV targets by 2030
 - Subsidies & infra
 - Leading battery tech
- Mandated ICE phase-outs

- □□ India Now □ India's Path Forward
- 2W/3W adoption strong
- EVs = \sim 6% of sales
- Infra concentrated in cities
- OEMs: Tata, Ola, Ather

- Scale charging infra
- Battery recycling & R&D
 - Fleet electrification
- Global EV export hub

Executive Summary

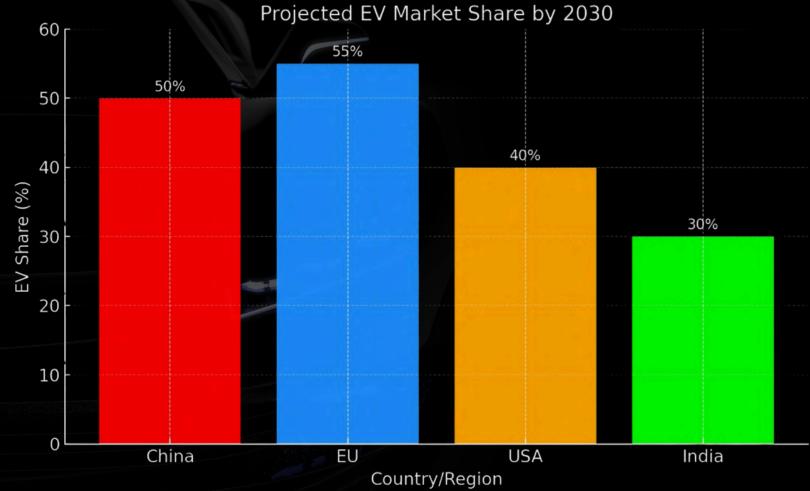
In this report, we examine the current state and future trajectory of the Indian EV market through the following lenses:



Mhat is the current state of the Indian EV ecosystem? India's EV adoption is currently concentrated in two-wheelers and three-wheelers, with growing attention to electric buses and passenger cars. Leading players like Tata Motors, Ola Electric, and Ather Energy are shaping the competitive landscape. Charging infrastructure, though improving, remains uneven across states.

What challenges and opportunities lie ahead? Key barriers include high vehicle costs, limited charging stations, battery sourcing issues, and consumer hesitancy. However, opportunities abound in battery recycling, grid-integrated charging, domestic R&D, and integration of EVs in public transport and logistics.

What can India learn from global success stories? India can adopt best practices such as integrated policy frameworks, mandated charging infrastructure in real estate developments, and EV-only zones as seen in Norway, China, and parts of Europe. Collaborations with global OEMs and technology partners can also accelerate India's learning curve.



ndia has the potential not only to meet its goal of 30% EV penetration by 2030, but to become a global hub for affordable, scalable EV solutions suited for developing economies.

BACKGROUND & TIMELINE 🗘







Early Days

- 1990s: First electric scooters appear
 - 1996: Reva India's first electric car



Technology Growth

- Battery improvements
 - Rise of lithium-ion technology



- Charging stations expansion
- Private sector involvement

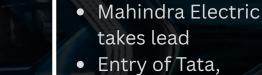




- 2010: First EV subsidy scheme
- 2013: NEMMP launch
 - 2015: FAME I introduced







Hyundai, MG



Infrastructure

Development

Government **Support**

Major **Manufacturers**





Two-Wheeler Revolution

- Ather, Ola, Hero
 Electric emerge
 - E-rickshaws gain popularity





- Electric buses in major cities
- State transport adoption

Current Challenges

- High costs
- Range anxiety
- Infrastructure gaps
- Battery recycling concerns









- 2030 target: 30% EVs
- Focus on local manufacturing

US

5

Public Transport Future Vision

MARKET LANDSCAPE (*)

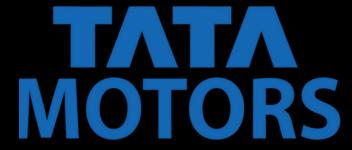


Key Players Driving India's Electric Vehicle Revolution

Tata Motors:

Leading the Electric Car Market

Tata Motors dominates India's electric car segment with 72% market share, led by the Nexon EV. The company plans 10 new electric models by 2025 and is investing USD 1.58B in a Gujarat lithium-ion cell factory to expand EV accessibility.



Ola Electric:

Electrifying India's Two-Wheeler Market

Ola Electric leads the twowheeler segment with 4,000 stores nationwide. Their #HyperService initiative and Network Partner Program aim to train 100,000 mechanics and onboard 10,000 sales partners by 2025, making sustainable urban mobility more accessible.



Ather Energy:

Innovating the Electric Scooter Experience

Ather Energy is developing two platforms: Zenith for electric bikes and EL for affordable scooters. With 239 Experience Centers across 175 cities and 2,000+ charging stations, they're partnering with Karnataka Government to add 1,000 more fast-charging points.







Major EV Charging Solution Providers in India

1. Exicom

- Offerings: AC chargers (1.1–22 kW), DC chargers (60–400 kW)
- Notable Projects: Partnered with BHEL for EV infrastructure; established charging stations at New Delhi's Rafi Marg EV Charging Plaza;
 supplied chargers for Tata Tigor and Mahindra e-Verito cars procured by EESL

2. Delta Electronics India

- Offerings: AC chargers (3.12–22 kW), DC chargers (15–150 kW)
- Applications: Solutions tailored for parking lots, workplaces, fleets, and residential buildings

3. Servotech Power Systems

- Offerings: AC and DC chargers
- Notable Projects: Supplied 4,000 EV chargers across India; secured a ₹120 crore order from Bharat Petroleum for 1,800 DC fast chargers (60 kW and 120 kW) under the BPCL E-drive Project





Major EV Charging Solution Providers in India

4. Quench Chargers

- Offerings: AC chargers (7.5–22 kW), DC chargers (30–240 kW)
- Notable Projects: Participated in the India pavilion at Dubai Expo 2022; facilitated over 80,000 charging sessions across various regions in India

5. Mass-Tech Controls

- Offerings: AC chargers (2–43 kW), DC chargers (10–200 kW)
- Notable Projects: Collaborated with Panasonic Life Solutions to provide 240 kW chargers for PMI Electro Mobility; completed DC fast charging station projects with Tata Motors in Mumbai

6. ABB India

- Offerings: AC chargers (3–22 kW), DC chargers (11–350+ kW)
- Specialization: EVSE for heavy commercial vehicles, including buses and trucks; offers smart monitoring, predictive maintenance, and integrated payment gateways





Major EV Charging Solution Providers in India

7. Tata Power

- Network: Operates one of India's largest EV charging networks
- Expansion Plans: Aims to increase charging points to 400,000 by 2027, including 30,000 new public charging stations and 500 'Mega Charger' locations

8. Statiq

- Role: Charge Point Operator (CPO)
- Collaborations: Works with Tata Motors to expand EV charging infrastructure across India

9. EVRE

- Focus: Develops EV charging solutions for infrastructure developers, fleet operators, and logistics companies
- Notable Projects: Established charging hubs in major metropolitan cities; partnered with MoEVing to add over 1,000 EV charging stations across India

USER PERSONA





1. Performance Seekers



Who they are: Drivers chasing speed, power, and a thrilling experience. A Priorities: Strong acceleration, sharp handling, emotional bond.

Vehicle types: Sports cars, performance sedans (e.g., Porsche 911, BMW M, Chevy Corvette).

Industry trend: Electric sports variants (e.g., Tesla Model S Plaid) are emerging to meet this demand

2. Eco-Conscious Drivers

capabilities.



Who they are: Buyers committed to sustainability and low emissions.

Priorities: Fuel efficiency, zero/low-emission technology, green manufacturing.

Vehicle types: EVs and hybrids (Tesla Model 3, Nissan Leaf, Toyota Prius).

Industry trend: Growth in battery tech, charging infrastructure, and government incentives; rise of long-range EVs and V2G

3. Family-Oriented Consumers



Who they are: Parents and families seeking safety and practicality.

Priorities: Space, top-tier safety, reliability, comfort.

Vehicle types: SUVs, minivans, crossovers with ADAS and infotainment for kids.
Industry trend: Electrified family options and smart in-car tech are gaining popularity.

USER PERSONA





4. Luxury Consumers



Who they are: High-end buyers valuing prestige and elegance.

Priorities: Top-tier materials, cuttingedge tech, comfort, and status.

Vehicle types: Premium sedans/SUVs (Mercedes, BMW, Audi), now including luxury EVs (Tesla, Jaguar, Porsche). Industry trend: Focus on tech integration and vehicle personalization.

5. Tech-Savvy Buyers



Who they are: Early adopters engrossed in digital lifestyles.

Priorities: Infotainment, connectivity (Apple CarPlay/Android Auto), frequent software updates.

Vehicle types: EVs and hybrids with advanced tech packs.

Industry trend: "Connected car" revolution and OTA updates are key selling points.

6. Economical Buyers



Who they are: Budget-conscious individuals prioritizing cost-efficiency.

Priorities: Low purchase cost, fuel savings, minimal maintenance, high resale.

Vehicle types: Compact cars, hatchbacks, small SUVs (e.g., Toyota, Hyundai, Honda).

Industry trend: Fuel-efficient and hybrid options with budget-friendly features are rising.

USER PERSONA





7. Off-Road Enthusiasts



Who they are: Adventure seekers craving rugged terrains.

Priorities: Durability, off-road performance, high clearance, 4×4 systems.

Vehicle types: Jeeps, Broncos, Land Rovers,

Toyota 4Runner, Ford Raptor.

Industry trend: Factory off-road packages and tech (GPS, apps, traction control) are trending.

8. Fleet Buyers



Who they are: Businesses managing multiple vehicles.

Priorities: Reliability, cost-efficiency (fuel & maintenance), safety.

Vehicle types: Sedans, vans, trucks tailored to function over flair.

Industry trend: OEMs offering fleet-specific deals, custom configurations, service plans.

9. Urban Commuters



Who they are: City dwellers navigating congested streets daily.

Priorities: Compact size, maneuverability, fuel efficiency, tech convenience.

Vehicle types: Hatchbacks, compact sedans with agility and parking aids (e.g., VW Golf, Honda Civic).

Industry trend: Shared mobility partnerships and smart city-compatible vehicles.



USER JOURNEY







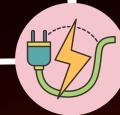
RESEARCH

- 95% of all car buyers perform some degree of online research before visiting a showroom; for EV buyers the figure rises to 68% doing significant research.
- Around 75% of general buyers have never driven or even sat in an EV, contributing to widespread misunderstandings.
- Successful EV brands (e.g., Tesla) focus on educating prospects and shifting from sales tactics to product knowledge.
- Buyers need to understand their usage patterns: EVs are ideal for city commutes but may struggle for long-distance travel due to charging constraints.



PURCHASE DECISION

- EV buyers report much higher satisfaction with in-person experiences (96%) compared to non-EV buyers (~39%).
- 71% of EV purchasers say the dealer relationship matters, compared to 40% for non-EV buyers.
- Dealers shifting to transparent, low-pressure, expert-led approaches—like EV brands—gain more trust and conversion.
- EVs carry a high upfront premium—sometimes doubling cost compared to ICE variants—which can mislead buyers into assuming lower total cost of ownership.
- Loan interest rates for EVs are marginally lower in India (≈8.15%) versus ICE (≈8.30%) but still need factoring into decisions.



CHARGING & USAGE

- EVs are cost-effective in cities, but long-distance trips trigger range anxiety, a lack of charging infrastructure, and unexpected expenses (like tow services costing ₹2,100 in one case).
- Public chargers are far less accessible than petrol pumps, and even fast chargers can require hours per session.
- Around 25% of public chargers are currently non-functional due to broken connectors, payment failure, or network issues.

USER JOURNEY







MAINTENANCE

- Annual servicing costs are lower (₹1,000-₹2,000) compared to ICE vehicles (₹4,000-₹5,000).
- However, insurance premiums are 25–60% higher for EVs due to expensive batteries, sensors, and limited repair infrastructure.
- Battery replacements can cost up to 60% of the vehicle's value (₹4–7 lakh), and may not be covered under warranty for second owners.
- Repairs require specialized tech and tools, adding to costs and service time.



UPGRADES

- EVs suffer accelerated depreciation as newer tech reduces resale value; one owner received only ~50% of original price after 2.5 years.
- EV batteries degrade and newer, more efficient models enter market, further impacting value.
- Continuous upgrades like Tesla's incremental battery/range updates make older models feel outdated—leading consumers to frequently seek newer versions.





PROBLEM STATEMENT ()



TARGETS BY NITI AAYOG

The NITI Aayog has laid specific targets by vehicle type in pursuit of its objective to achieve 30% EV sales penetration by 2030. The targets by specific vehicle type are:

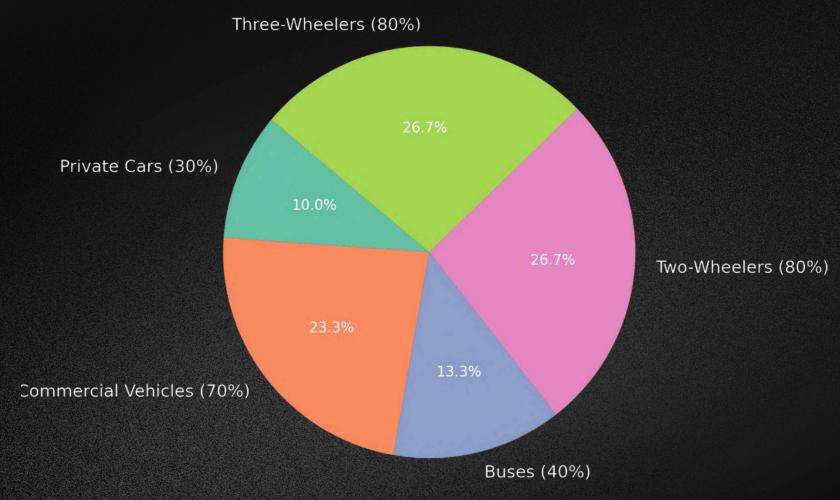
30% in Private cars

70% in Commercial vehicles

40% in Busses

80% in two-wheeler

80% for three-wheeler







COST PROBLEM IN EV INDUSTRY

Cost - High initial purchase price due to the battery of the Ev. The cost of replacing a Tata EV battery pack can range from approximately ₹3.5 lakh to ₹7 lakhs, depending on the specific model and battery capacity.



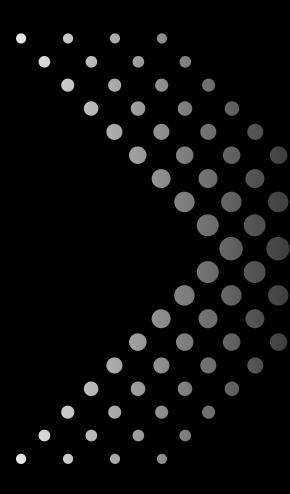


COSLIGHT









CHARGING INFRASTRUCTURE

Charging infrastructure is more prevalent in urban areas and along highways, leaving some regions underserved

India is working on building a better system for charging electric cars, but there are still problems to solve. The country needs a lot of money and a lot of space to set up charging stations and make batteries.

But the problem isn't just about having enough chargers—it's also about making sure they are actually used. Many chargers sit there unused because not enough people have EVs yet, different car brands don't always work with the same chargers, and power isn't shared efficiently.

BATTERY TECHNOLOGY

EV batteries are big and heavy, and that causes some problems for cars:

- Too Heavy: Since batteries are heavy, EVs need more energy to move, so they can't go as far on one charge.
- Takes Up Space: Batteries are large, so carmakers have to fit them in without making the car cramped or unsafe.
- Changes How the Car Feels: A heavy battery makes a car drive differently compared to lighter, fuelpowered cars.
- Finding Better Materials: Companies try to use lighter materials, but some are expensive or not strong enough.





CONSUMER AWARNESS

EV makers need to step up and help people understand the real benefits of electric cars. Hosting industry-wide seminars, running social media campaigns, and sharing real-life success stories can make a huge difference in building trust.

Imagine seeing how an EV owner saves money, drives with ease, and finds charging stations without trouble—that's the kind of practical proof that encourages more people to switch. Interactive events, like test drives and live Q&A sessions, can also help clear doubts and show the convenience of EVs in everyday life.



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STAKEHOLDER ANALYSIS 🗘



Stakeholder analysis is crucial for project success because it helps identify and understand the needs, expectations, and potential impact of individuals or groups involved in or affected by a project





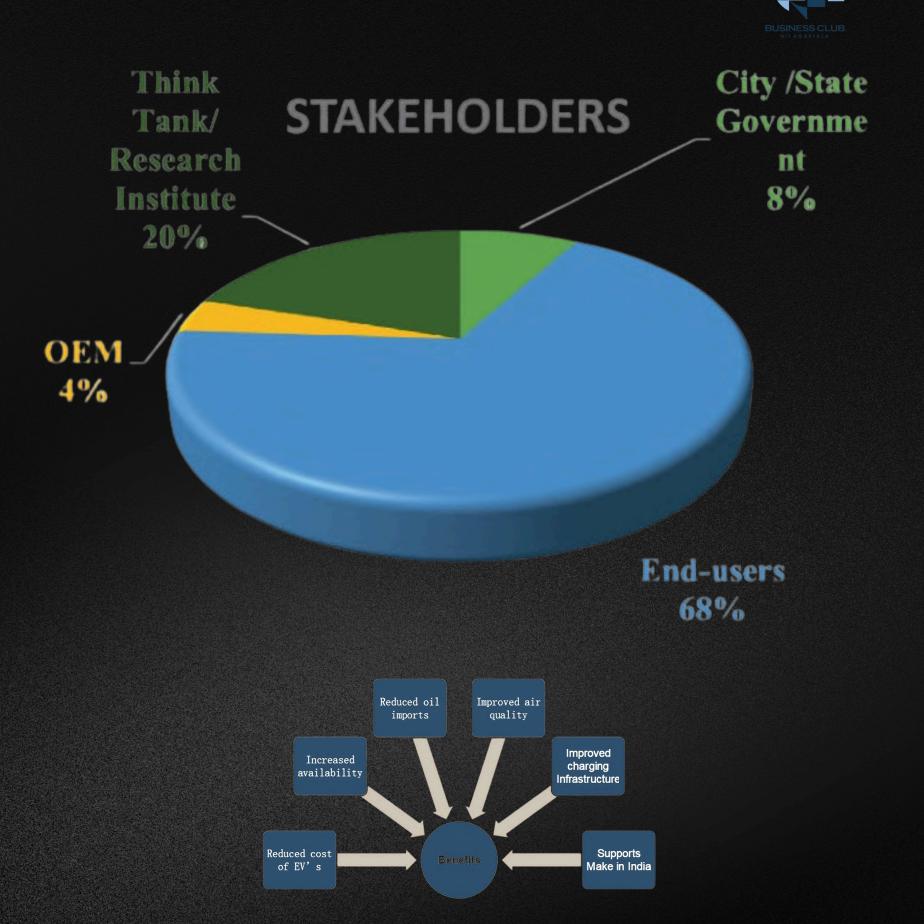
GOVERNMENT VIEW

1. Delhi EV Policy 2.0

3. Battery
Charging &
Swapping
Infrastructure

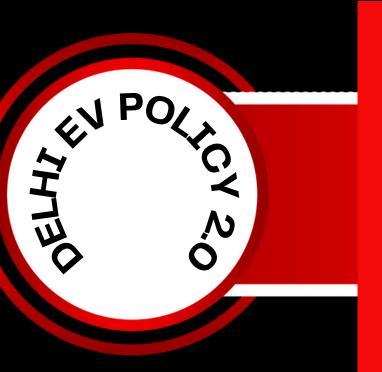
2.SPMEPCI (March 2024)

4."Manak Manthan" by BIS



BUSINESS CLUB NIT AGARTALA

DELHI EV POLICY 2.0



The Delhi Government engaged over 220 stakeholders to revise its EV policy, focusing on adoption targets, fleet electrification, battery recycling, and charging innovation. The consultation was highly inclusive, blending public and private sector insights to develop a people-centric roadmap for sustainable urban mobility.

Delhi EV dashboard

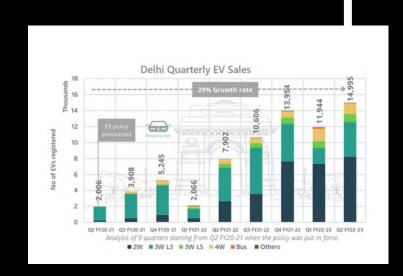
Sales of EVs since August 2020

26,787 Two-wheelers

31,506 Three-wheelers

5,266 Four-wheelers

> 323 Buses



EV Pledges

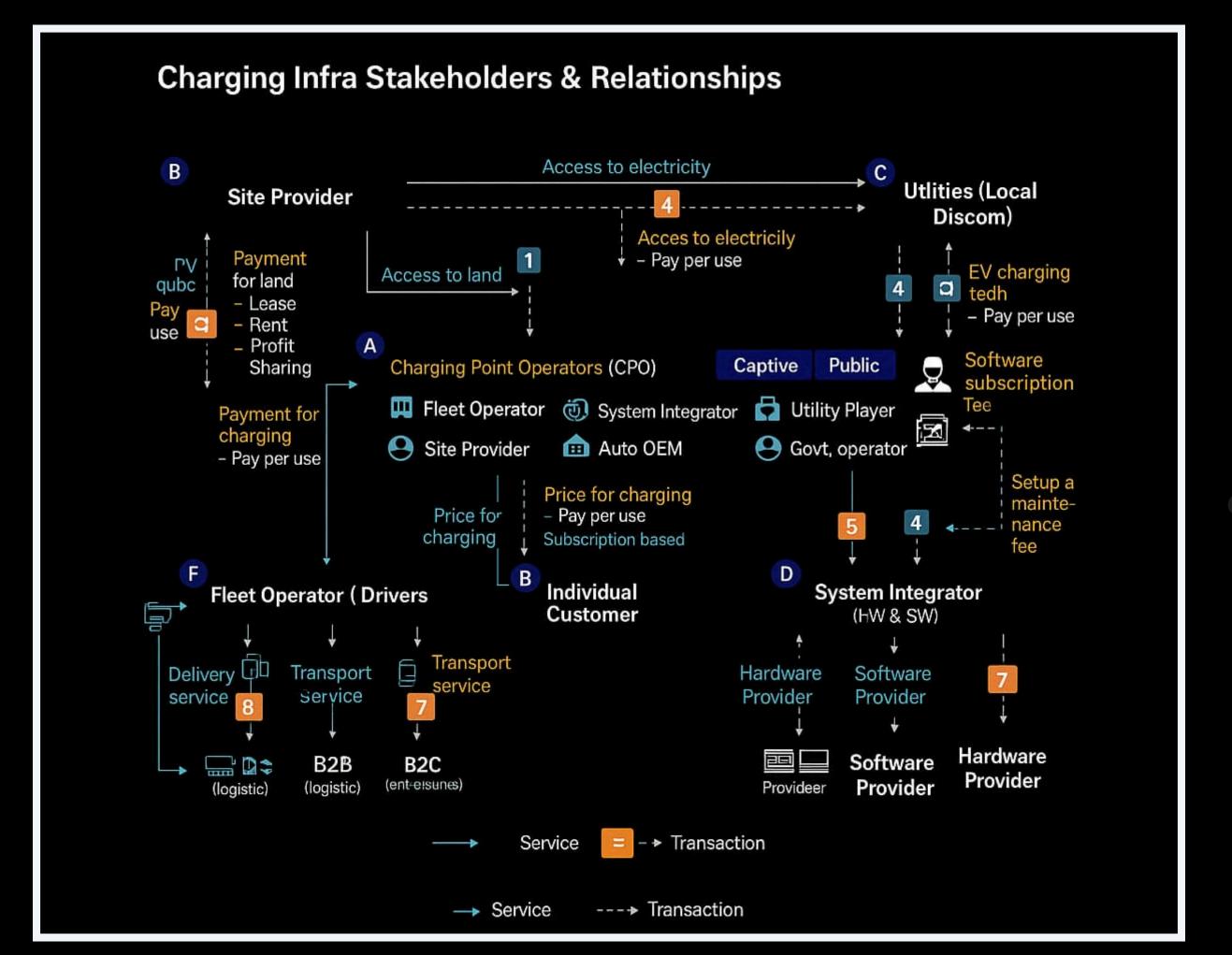
Pledges so far

12,278

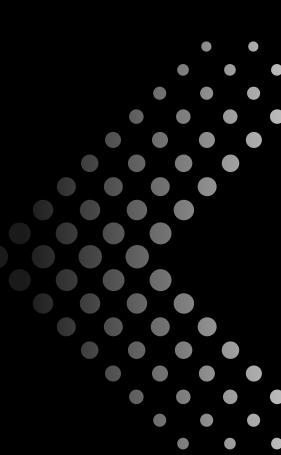




Stakeholder Analysis







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EV MANUFACTURING SCHEME – SPMEPCI (MARCH 2024)



Launched by the Ministry of Heavy Industries, this scheme mandates a ₹4,150 crore minimum investment to scale EV manufacturing. Global and Indian automakers must begin production within three years and meet localization targets. The policy was codesigned with manufacturers to ensure shared benefits and strict compliance.

BATTERY CHARGING & SWAPPING INFRASTRUCTURE (APRIL 2024)



Jointly led by DPIIT and MHI, this consultation brought together OEMs, energy providers, and infra firms. Key discussions covered charging format standardization, battery swapping for 2W/3W vehicles, and PPP models. The dialogue emphasized practical deployment strategies and solving ground-level challenges in India's EV infrastructure.









MANAK MANTHAN

EV STANDARDS MEET (MAY 2024)

Organized by the Bureau of Indian Standards, this technical meeting focused on creating uniform EV safety and interoperability standards. With input from tech experts and R&D firms, it aimed to establish consistent specifications for batteries, chargers, and connectors—laying the foundation for long-term consumer trust.



Manufacturer







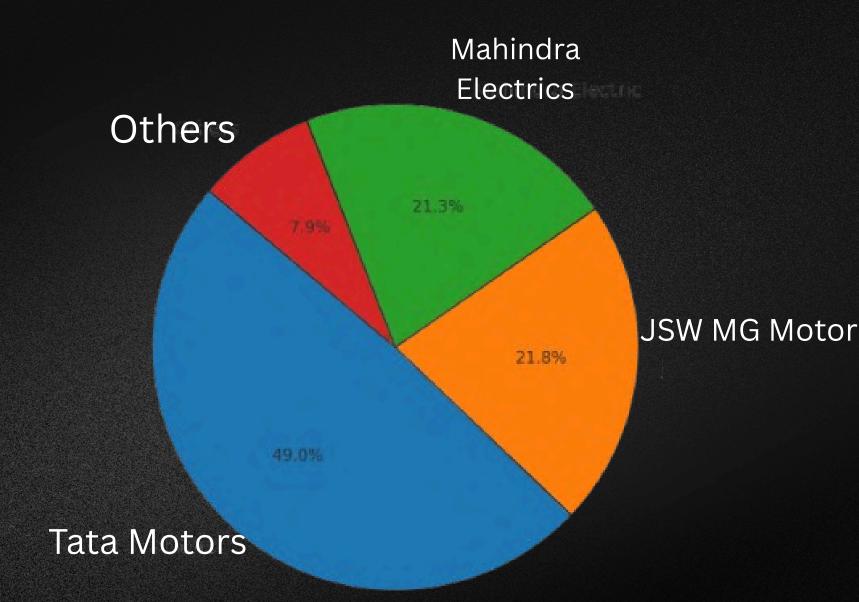


EV market share (passenger vehicles): 2.5% in 2023, projected 29–38% by 2030–31.

Tata Motors: 49% market share in 2024 (down from 73% in 2023).

Mahindra Electric: 21.3% market share in May 2025; fastest growth at 2,476% in 2023.

JSW MG Motor India: 21.75% market share in 2024; 125% YoY growth.



CASE INSIGHTS 🗘



CASE STUDY ON OLA ELELCTRIC LAUNCH

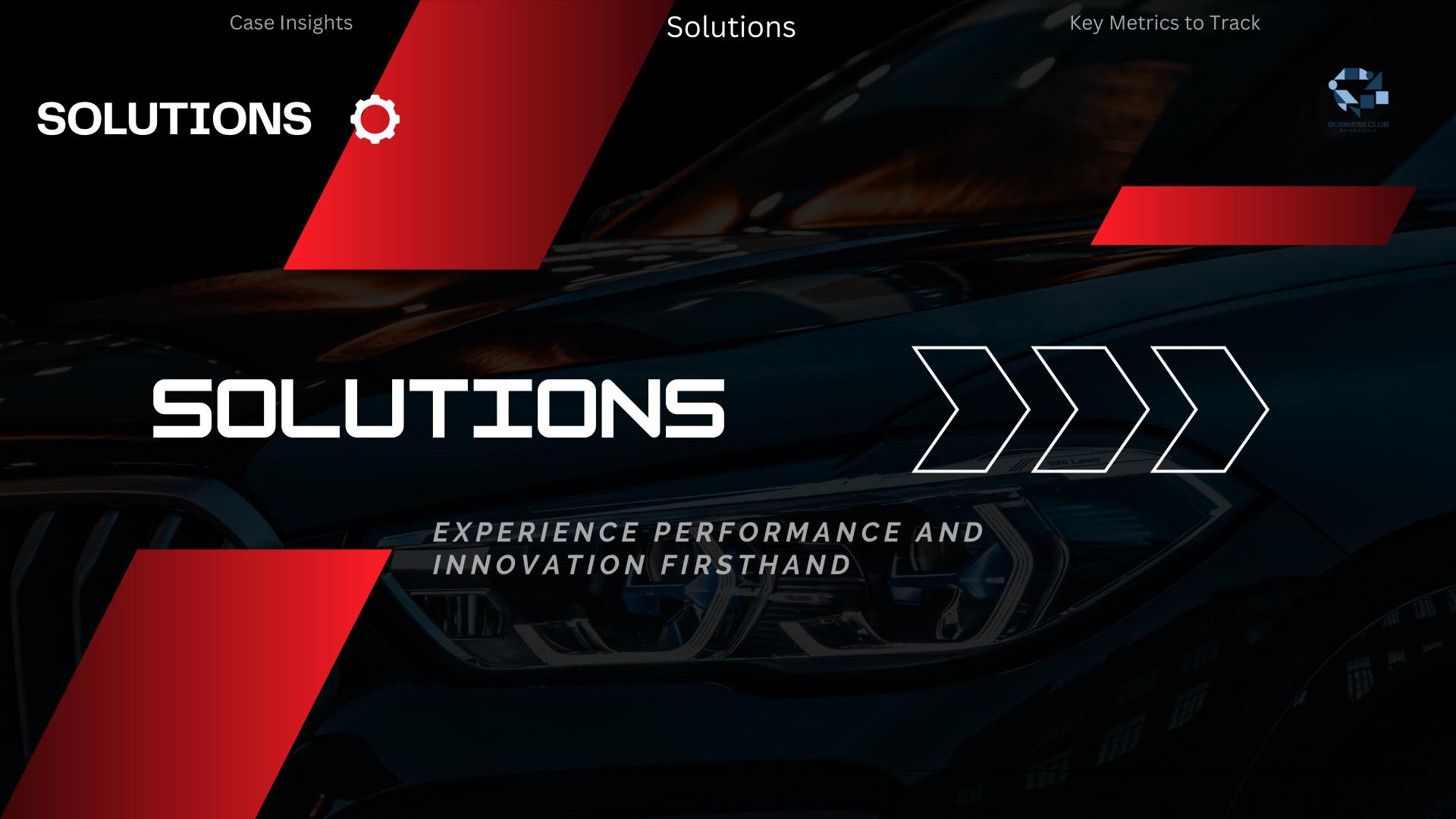


Ola Electric began selling its S1 and S1 Pro scooters in 2021 and quickly became a hit, earning ₹600 crore in a single day. They built a huge factory in Tamil Nadu and created many scooter parts and software themselves. Ola sold directly to customers through its app and set up many charging stations across India. In 2024, they raised ₹5,500 crore through their IPO and reached a \$7 billion valuation. Soon after, they launched electric bikes and even considered making an electric car, but later decided to focus on scooters, bikes, and batteries. Over time, the company faced growing competition, dropped in sales, and lost market share—even though it remains a trusted brand.





Ola faced a huge backlash when in recent times there scooters started to not perform upto the users expectations. There are many cases of engine blast, fire in the engine that gave a danger to the human life and people started to lift their beliefs from the company As of now the current scenario of the company Ola Electric has shifted its focus from electric cars to electric scooters and motorcycles. While the plan for an electric car was scrapped, the company continues to develop and launch new electric two-wheelers, including the Roadster series, with deliveries commencing in May 2025.



PM E-DRIVE SCHEME (2024-2026)



Objective:

Accelerate adoption of electric mobility via incentives, infrastructure, and ecosystem development.

- 💰 Budget & Duration:
 - Outlay: ₹10,900 crore.

Valid: From Oct 1, 2024 to Mar 31, 2026.

1. Vehicle Incentives:

- e-2 Wheelers: Incentives for ~24.79 lakh advanced battery vehicles (private & commercial).
- e-3 Wheelers: ~3.2 lakh commercial vehicles.
- e-Ambulances: ₹500 crore outlay; performance/safety guidelines in progress.
- e-Trucks: ₹500 crore allocation; linked to scrappage certificates.
- e-Buses:
 - ₹4,391 crore for 14,028 buses across 9 metro cities.
 - 0
 - Priority for buses replacing scrapped STU fleets.

2. Charging Infrastructure:

- ₹2,000 crore allocation for:
- 22,100 fast chargers for e-4Ws.
 - 1,800 chargers for e-buses.
 - 48,400 chargers for e-2Ws/e-3Ws.
- Target: High EV-density cities + select highways

3. e-Voucher System:

- Digital incentive claiming via e-KYC Aadhaar FACE-authenticated vouchers.
- Signed and submitted digitally by both customer and dealer.
- Essential for OEMs to claim subsidy

4, Incentive Disbursal:

- Demand Incentives:

 - ∘ FY 2025-26: ₹2,500/kWh.
 - Cap: 15% of ex-factory price or defined max limit.
- Only advanced battery EVs below set price cap qualify.
- Govt purchases not eligible for incentives (to avoid fund transfers).





Challenges in EV Adoption



- Slow Growth of Pure EVs:
- EV sales grew only 7% in the first 8 months of 2024.
- In contrast, hybrid (petrol/diesel + battery) vehicle sales rose ~20%.
- EVs account for only 2.5% of new car sales; mild hybrids stand at 11%

- **Policy Distractions:**
- Government focus has shifted towards hybrids under the FAME scheme.
- States like Uttar Pradesh and
 Karnataka have scrapped
 registration taxes on hybrids,
 not EVs.

Inadequate Charging Infrastructure:

- Only 1 charging station per 135 EVs in India.
- Global standard: 1 per ~20 EVs (e.g., China, USA).
 - This causes range anxiety, deterring buyers.



MARKET IMPACT (EARLY INDICATORS)













• Surge in adoption seen post-PM E-DRIVE launch in Oct 2024.











TIMMERMAN INDUSTRIES



CONCLUSION & OUTLOOK



Strategic Shift: India's pivot from hybrid-favoring policies back to full EVs via PM E-DRIVE shows renewed commitment to sustainability.

Infrastructure Investment: Charging network expansion and bus fleet electrification are long-term enablers.

Environmental Goal: Supports India's Net-Zero by 2070 vision.

Sectoral Impact: Stimulates EV manufacturing, after-sales service, battery innovation, and job creation.

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INTRODUCTION TO EV SALES VOLUME

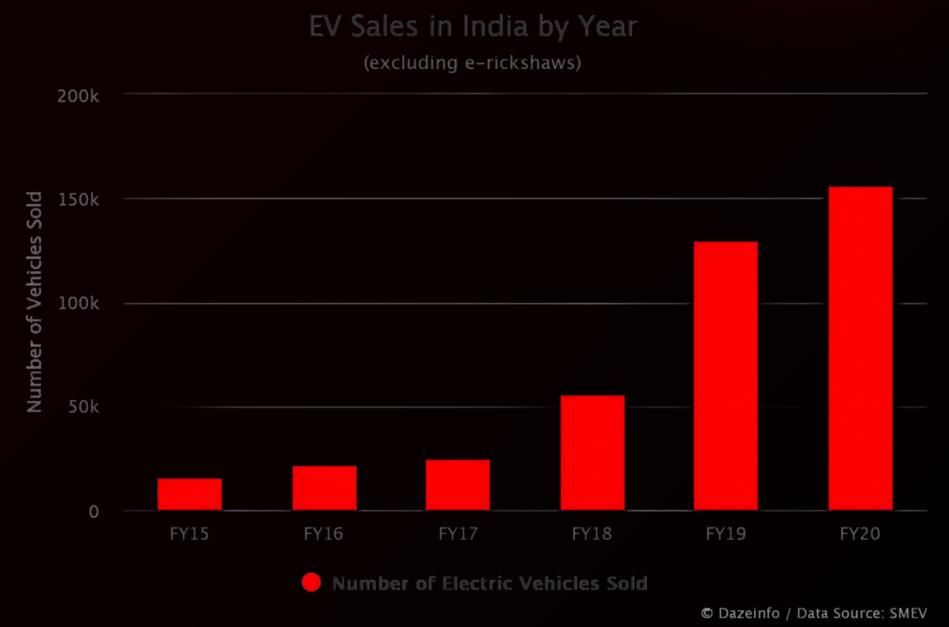
What is EV sales volume?

EV sales volume refers to the total number of electric vehicles sold in a specific period. It includes all EV types like two-wheelers, three-wheelers, four-wheelers, and electric buses

Why track it? (growth, market demand, policy impact, carbon goals)

Tracking EV sales volume helps to:

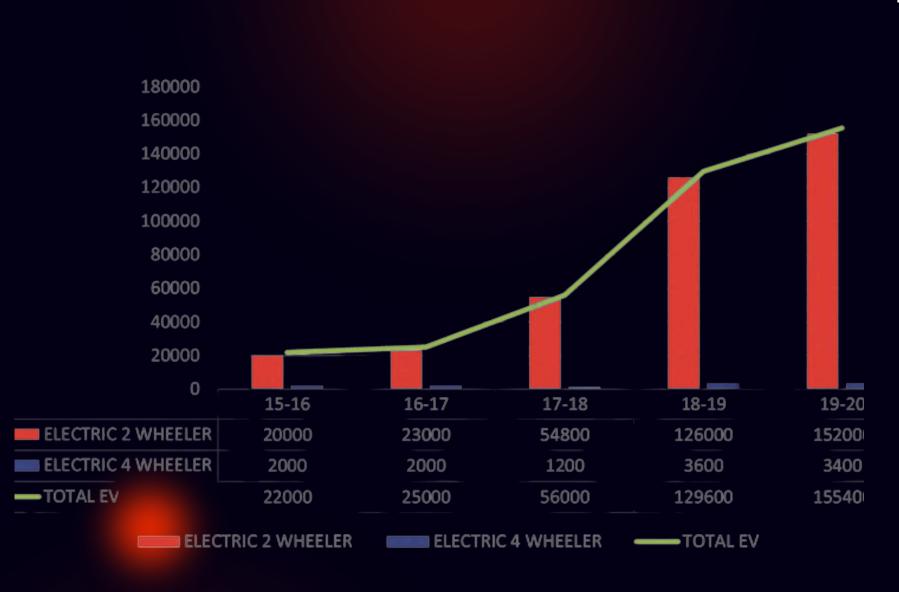
- Measure market growth and adoption rate
- Understand consumer demand and preferences
- Evaluate government policy effectiveness (e.g., FAME-II)
- Track progress toward carbon emission reduction goals

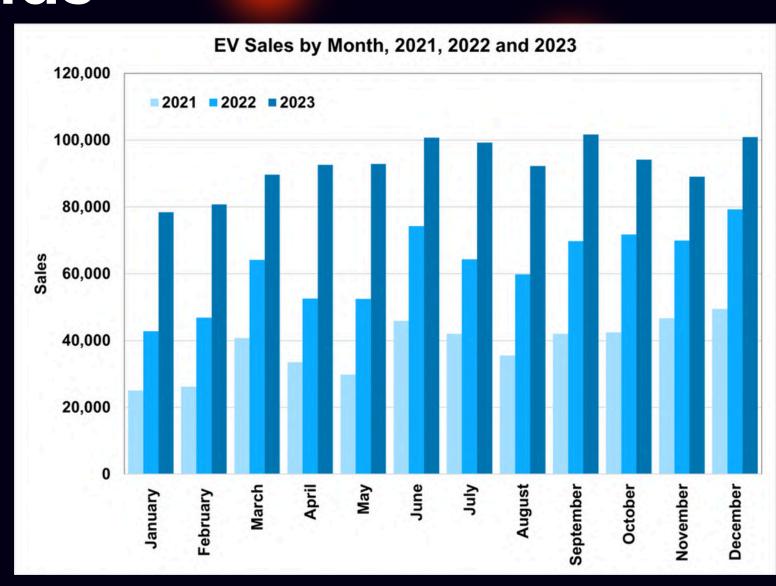




Total EV Sales in India – Yearly & Monthly Trends







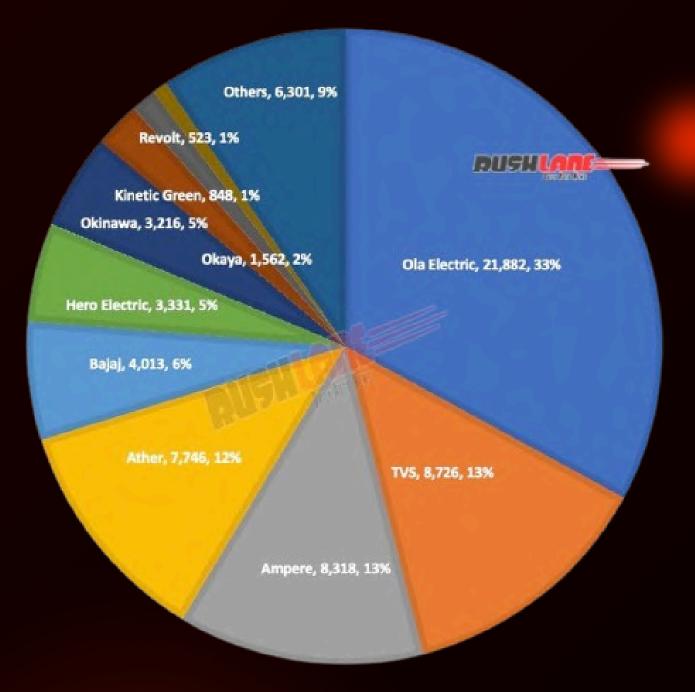
Total EV sales: Year-wise (2015-2025)

Monthly breakdowns for recent years (esp. 2023-2025)

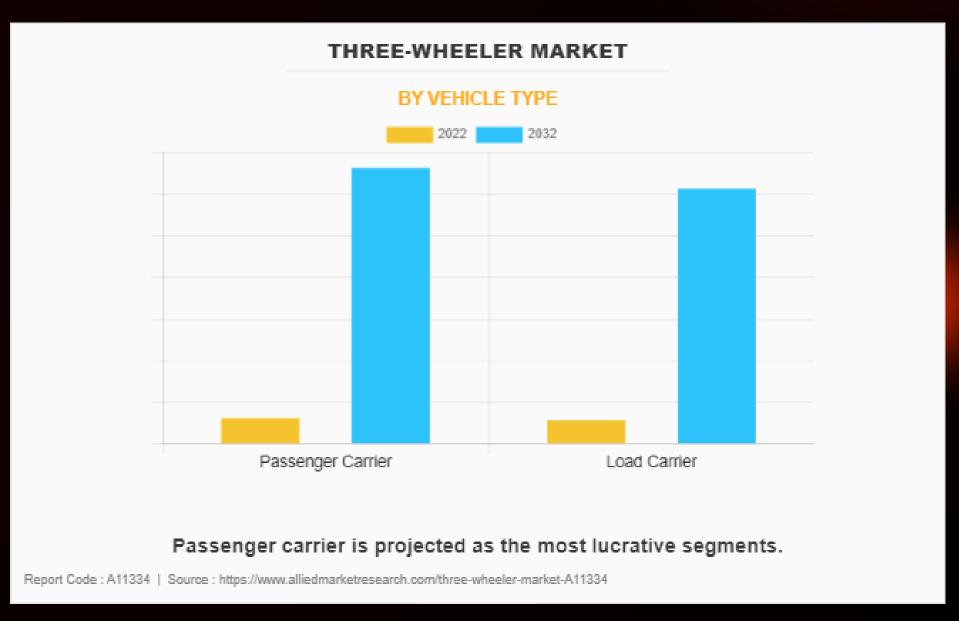




Category-Wise Sales Analysis



Electric 2-Wheelers (i.n., Ola, TVS, Ather) sales



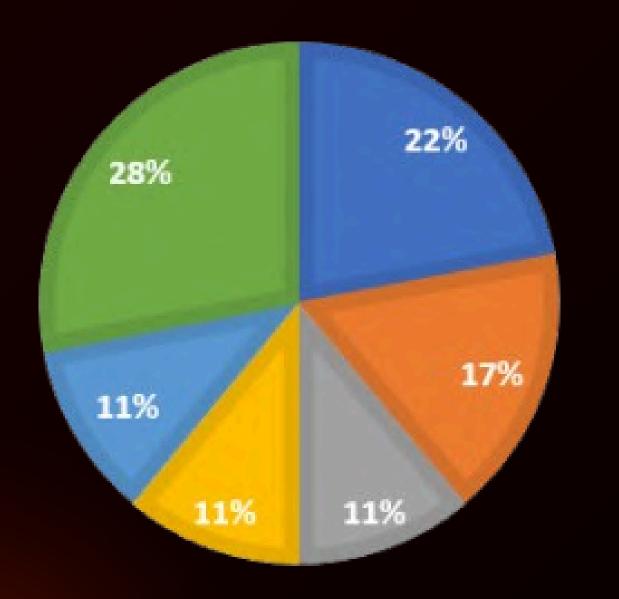
Electric 3-Wheelers (passenger & goods) sales



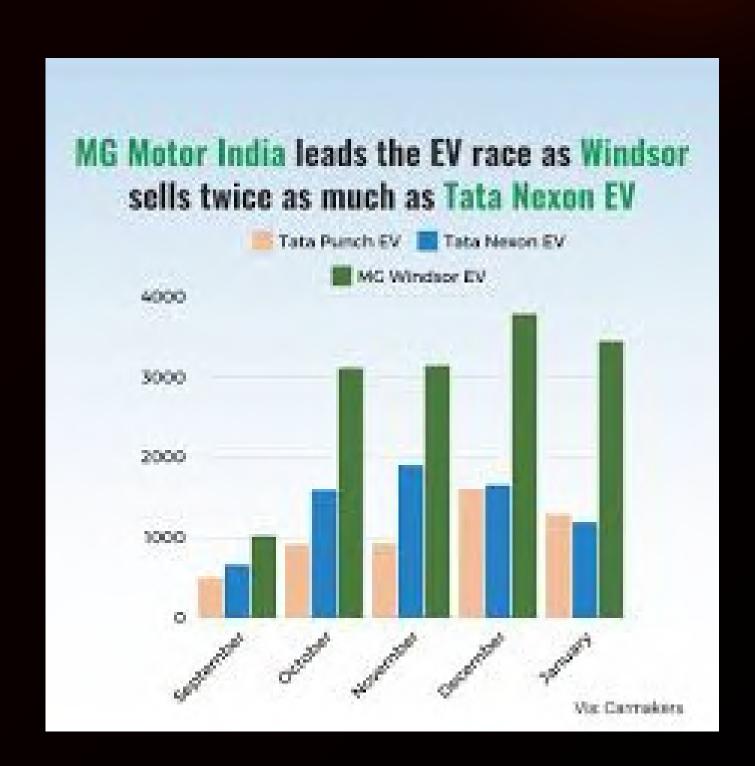
MAJOR PLAYERS





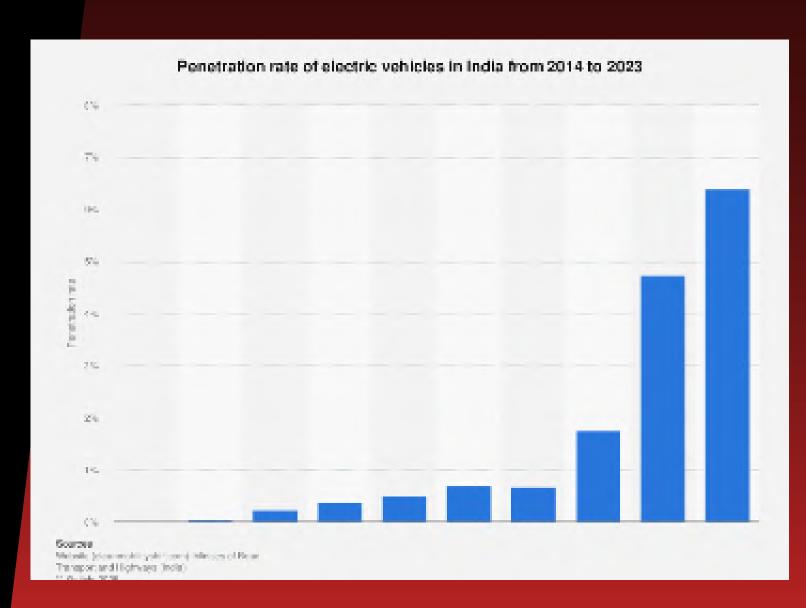


E-Rickshaws sales analysis

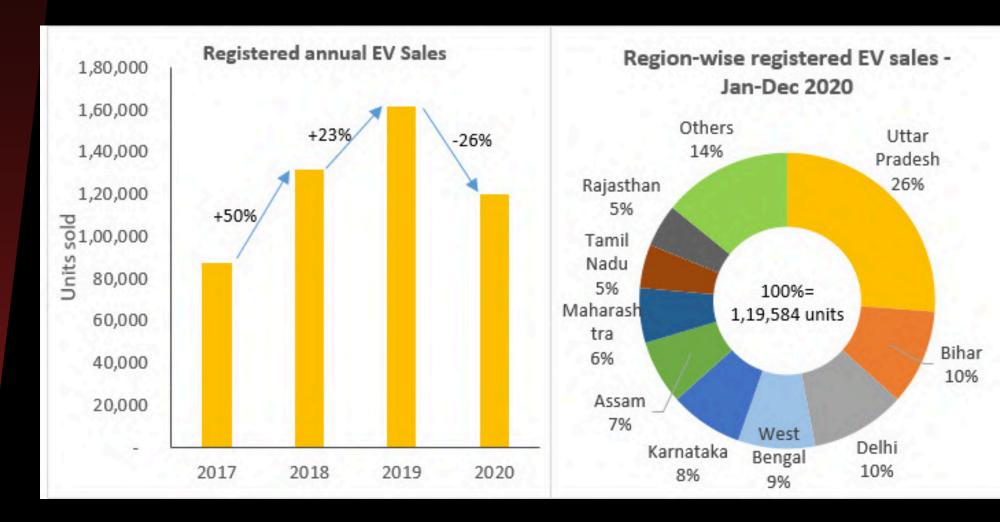


Electric 4-Wheelers (e.g., Tata Nexon EV, MG ZS)

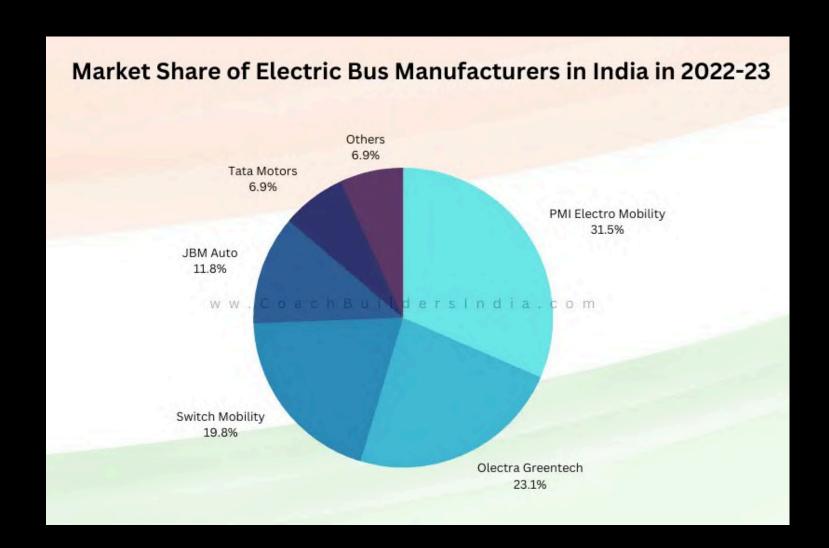




EV penetration per 1,000 vehicles in india



State-wise EV registration numbers



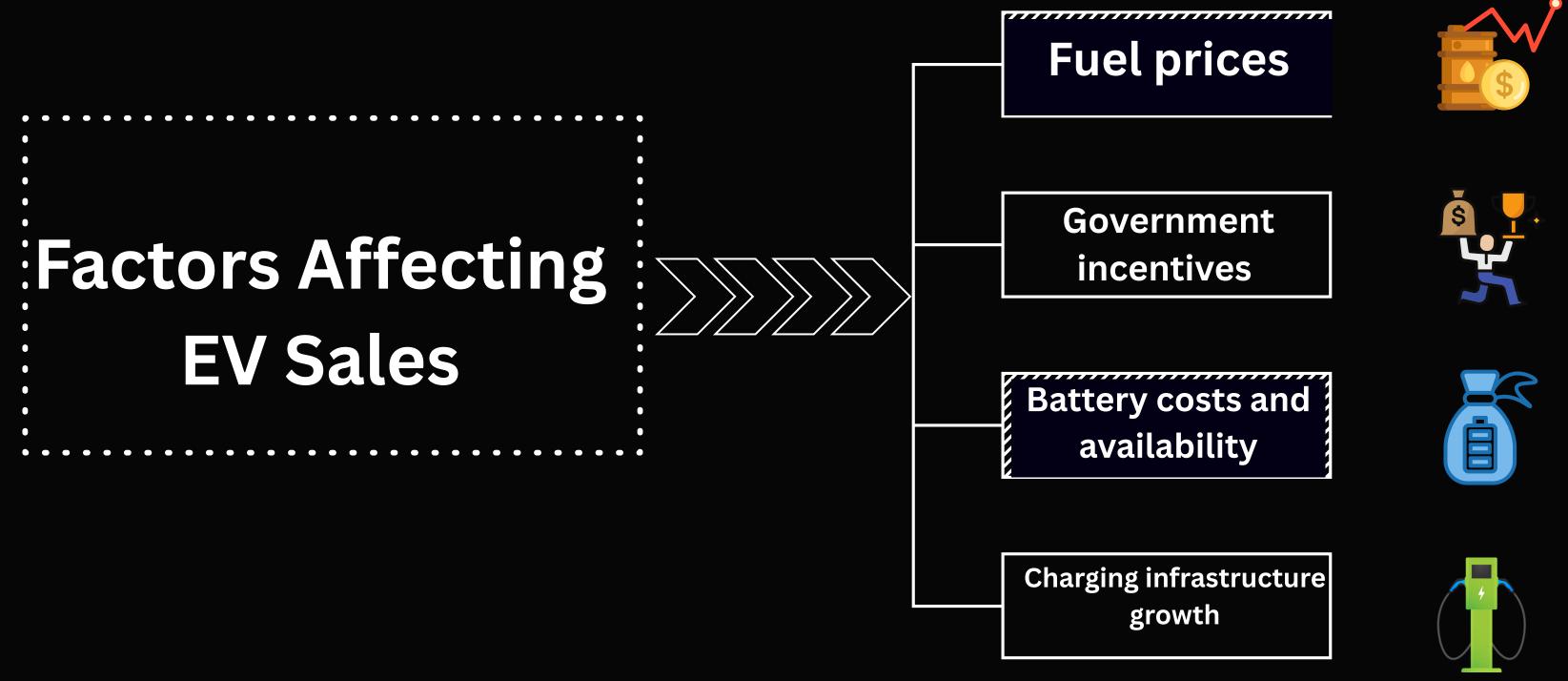
The Indian electric bus market witnessed a dynamic shift in FY 2022–23, with PMI Electro Mobility emerging as the market leader with a 23.61% share, followed closely by Olectra (20.71%) and Switch Mobility (17.22%). This trend highlights the increasing role of domestic manufacturers in electrifying public transport.

While traditional giants like Tata Motors and JBM Auto maintain strong positions, newer players and global entrants like BYD India are also making notable inroads. The presence of 'Others' at 7.03% reflects growing competition and innovation among emerging startups and regional firms.



- Nearly 5 million EVs registered globally, showing rapid adoption.
- The market is highly fragmented, with smaller players making up nearly half the share.
- Asian manufacturers like BYD, SAIC, and Geely are gaining strong global presence.
- The landscape remains competitive and dynamic, with no single dominant OEM.
- Reflects a global shift toward electrification backed by innovation and policy support.









CURRENT STATUS AND GROWTH TRENDS

India's electric vehicle charging infrastructure has witnessed an **astonishing surge** in recent years. What began with a modest 1,800 public charging stations (PCS) in February 2022 has ballooned to an impressive 16,347 by March 2024, and further . 29,277 by May 2025 – a more than **16-fold increase** in just over three years [1]. This rapid expansion mirrors the significant uptick in EV adoption, with millions of vehicles hitting the roads during this period, effectively doubling the total number of EVs sold before February 2022 .

REGIONAL DISTRIBUTION AND DISPARITIES

- Delhi currently leads the pack with 8.8 charging stations per lakh people.
- Karnataka follows closely at 8.4, and Goa at 8.6
- In contrast, states like Maharashtra have a much lower density, with only 2.9 charging stations per lakh people, while Gujarat and Rajasthan sit at 1.4 each .
- The national average stands at approximately 1.8
 PCS per lakh people.

CHARGING POINTS: INFRASTRUCTURE GROWTH AND DISTRIBUTION





USER SATISFACTION

On the positive side, a recent survey from Park+ Research Labs paints an encouraging picture: a striking **74% of Indian EV owners** who bought their vehicles after January 1, 2024, expressed a "lifelong commitment" to electric cars [9]. Consumer confidence appears remarkably high, with a solid 92% of owners expressing satisfaction with their EV purchase [10]. Economic considerations are clearly a primary driver for this transition, with 29% of respondents citing cheaper ownership as their main motivation



- A staggering 88%, for instance, admitted to suffering from "charging anxiety".
- 73% of respondents felt their EV cars were like a "black box," difficult to understand, especially as local mechanics often couldn't resolve minor issues.
- About 33% mentioned receiving a resale value for their EV that was far less than its perceived worth

Most concerning, **51% of the surveyed EV owners expressed a**preference for returning to internal combustion engine (ICE)
vehicles for their next purchase



KEY CHALLENGES AFFECTING USER EXPERIENCE

1.Charging Infrastructure:

A significant 24% of EV owners point to inadequate charging infrastructure as their primary concern.

2.Range Anxiety:

The fear of running out of battery power before reaching a charging point affects 23% of owners.

3.Maintenance Challenges:

The time required to recharge vehicles frustrates 21% of EV owners.



4.Maintenance Challenges:

This presents another hurdle. Many EV owners face the frustration of local mechanics being ill-equipped to handle electric vehicle repairs. This, coupled with the difficulty in getting second opinions on repair costs, only compounds their anxieties.



CARBON EMISSION REDUCTION:

ENVIRONMENTAL IMPACT AND CHALLENGES







- Over **70% of India's electricity comes from coal**, directly influencing the carbon footprint of EV charging
- The transport sector accounts for approximately 14% of India's total greenhouse gas emissions and is the fastest-growing sector in terms of annual GHG emissions.
- In 2022-23, approximately 3.9 million passenger cars were sold in India, making it the third-largest passenger vehicle market after China and the United States.

Factors Affecting Emissions Reduction

- 1. Grid Carbon Intensity: Differences in the grid mix and efficiency can cause emissions to vary by up to 368 grams of CO₂e per kilometre. This is a substantial difference, equivalent to the carbon footprint of driving two to three petrol cars for every kilometre.
- 2. **Test-Cycle Energy Consumption:** Laboratory testing often doesn't fully reflect real-world conditions.
- 3. **Real-World Energy Consumption:** Actual driving patterns and conditions significantly impact emissions.









PRIORITIZATION 🗘

Why Prioritization Matters??

- Maximizes impact with limited resources
- Reduces emissions faster
- Builds user trust in EVs through early successes
- Encourages private investment by signaling policy focus
- Avoids scattered deployment that underperforms









INNOVATIONAL, R&D VIEW

- Manufacturing of advanced battery or evs segments and hybrid vehicles to compete with today's heavy duty vehicles.
- Can create millions of direct and indirect jobs for people.
- Development of charging stations using solar energy reducing dependency on petroleum, natural gas etc.
- Generating opportunities for new start ups, entrepreneurship reducing dependency on imported vehicle segments Incorporating self service and ai driven software for better management.





INFRASTRUCTAL VIEW

- Development of charging station or battery swapping station in case we can innovate petrol pumps into hybrid charging stations reducing full construction or structural cost especially in densely populated metropolitan cities.
- Fast charging access: Priority for vehicles with lower SoC (state of charge) or time-critical use.
- Smart charging: Aligning with grid availability and pricing mostly relying on renewable energy but with a backup of non renewable energy.
- technologies such as CCS2 (combined charging system), can ensure that vehicles remain operational with minimal downtime.
- An additional mobile battery swapping or charging station with dynamic pricing for emergency use.
- An external cooling station for long runs or for heavy vehicles





EY FEATURES OF CCS2



FEATURE

DESCRIPTION

Connector Type

Based on the Type 2 AC plug, with two extra DC pins for fast charging

Charging Modes

AC (up to \~43 kW) and DC fast charging (up to 350 kW in some cases)

Plug Design

Single integrated port on the EV for both AC and DC charging

Use Case

Public charging stations and long-distance travel

Vehicle Compatibility

Used by most European and Indian EVs (like Hyundai, Kia, Tata Nexon EV, BMW, Mercedes, Volkswagen, etc.)



FINANCIAL VIEW

- switching to evs certainly diminishes needs and wants of importing oils and gases reduces costs
- manufacturing of evs rather than importing deprives many custom duties and other taxes
- exporting advanced manufactured vehicle segments
- EVs satisfies electrical, social and governance criteria booms green financing from both private and government investors







Metrics Prioritization Go-To-Market



ENVIRONMENTAL VIEWS

- Reducing air pollution especially in urban areas due to zero tailpipe emissions lowering carbon footprints
- Reducing Noise pollution
- Limits usage of non renewable source of energy leading to sustainable development
- Petrol (gasoline) and diesel are fossil fuels that can degrade over time, especially when stored improperly.
- They can be recycled but with limitations and degraded quality and high cost of recovery leading to corrosion, performance issues, clogging in engines wrt EVs.
- These cannot be easily dumped anywhere leds to hazardous impact.





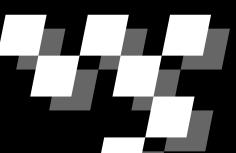
CONSUMER (USER) VIEW

- As people fears to use new technology but with optimum(or low due to manufacturing rather than importing) pricing and positive environmental effects EVs can be easily trustable by people
- With government's schemes and low taxes on EVs it can draw consumers attention.

GOVERNMENT VIEW

- Launching schemes like FAME II
- Relexation & funding new startups or entrepreneur's or fleet operators adopting EVs or paving path for sustainable development
- Simplify tax regulations, reduce capital gains tax for foreign and domestic investors.





GO-TO-MARKET STRATEGY 🗘



TIMMERMAN INDUSTRIES

Consumer Awareness Campaigns:

Collaborations with influencers and auto reviewers on YouTube/social media.

Government-sponsored EV expos and demo drives in Tier 2 and Tier 3 cities.

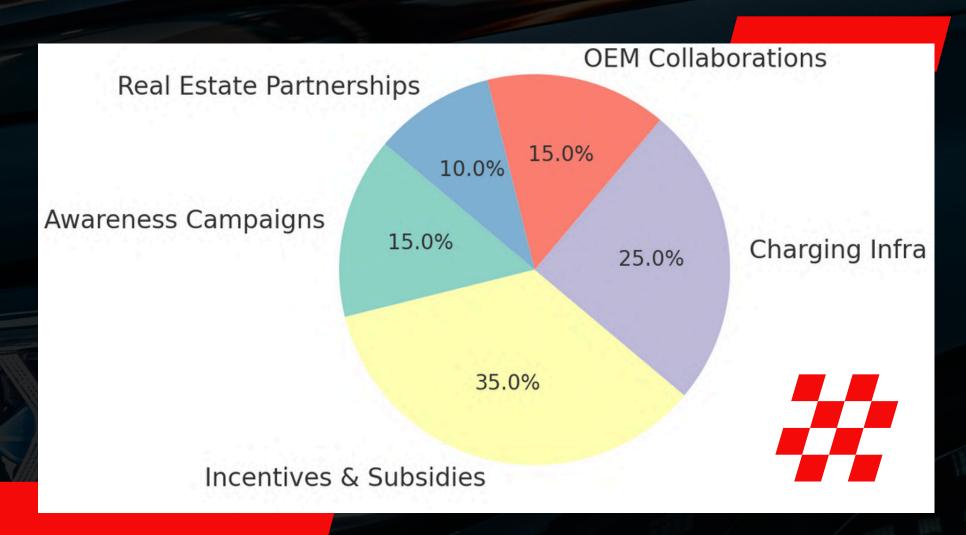
→ Incentive Programs:

Upfront subsidies under FAME II.

State-specific perks: No road tax (Delhi), free registration, priority parking.

Special loan schemes with lower interest rates from PSU banks.

ILLUSTRATIVE GTM STRATEGY INVESTMENT SPLIT





SUPPLY-SIDE STRATEGIES



Partnerships with Real Estate & Malls:

Mandating EV charger installation in new residential and commercial buildings. Collaborations with builders (e.g., DLF, Prestige) for EV-ready societies.

OEM and Infra Collaboration:

Automakers partnering with charging providers (e.g., Ather Grid, Tata Power)

Fleet-focused bundles (vehicle + charging + service).

Local Manufacturing Push:

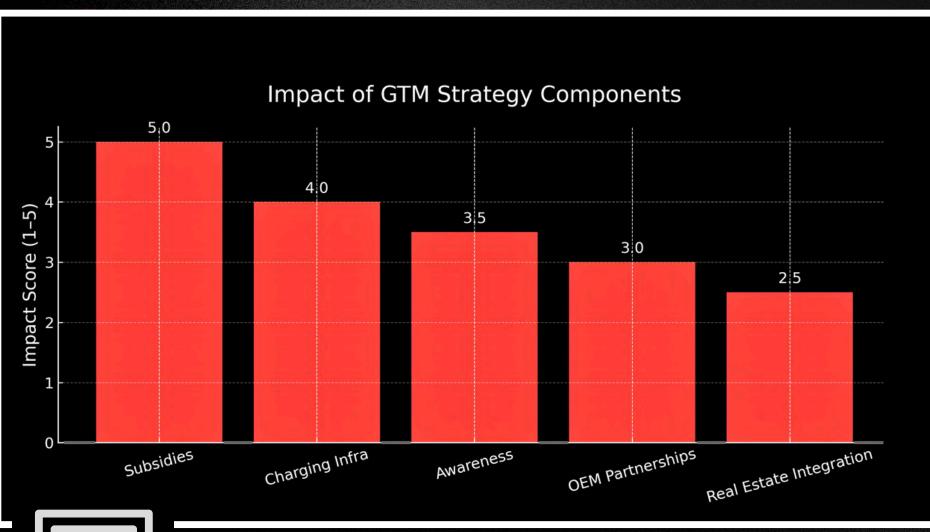
Encouraging domestic battery cell production (PLI scheme).

Assembly and R&D localization to reduce import dependency.

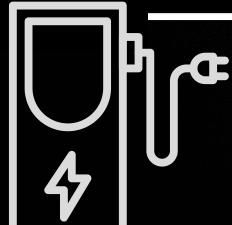


GTM STRATEGY BAR GRAPHH





Strategy Area	Key Actions
Consumer Awareness	National campaigns, influencer marketing, demo
Incentives	FAME II subsidies, state rebates, low-interest EV loans
1.OEM & Infra Partnerships	OEM-charger tie-ups, bundled fleet
Local Manufacturing	PLI scheme for battery production, domestic
Real Estate Integration	EV-ready societies, mall charging, mandatory building

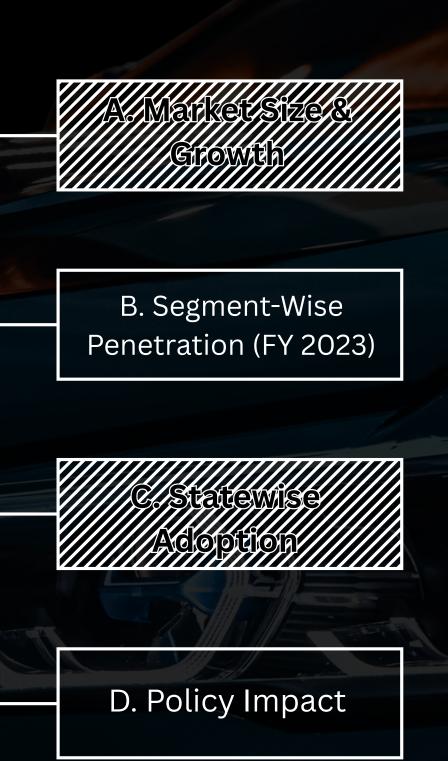




DATA & MARKET INSIGHTS 🗘









A. MARKET SIZE & GROWTH

- India's EV market size in FY 2024: ₹38,000 Cr (~\$4.5 Bn)
- Projected CAGR (2024–2030): 36–40%

- EV Market Value CAGR: ~23.8%
- EV Volume CAGR: ~24-26%
- Charging infra CAGR: ~31%

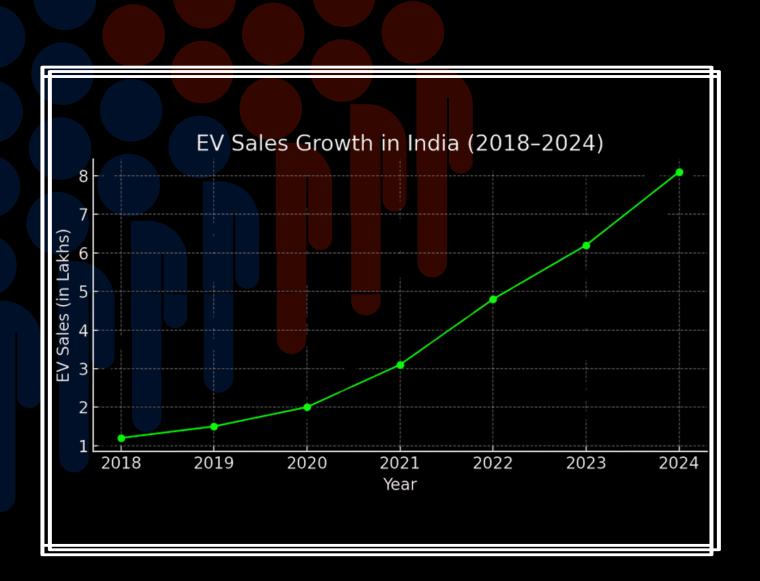


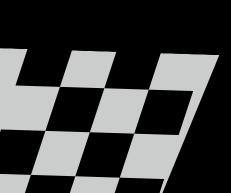
1.59 million units (up from 1.01 million in FY 2022–23)





- 2-wheelers: ~65%
- 3-wheelers: ~25%
- 4-wheelers: ~9%
- Electric buses: <1%

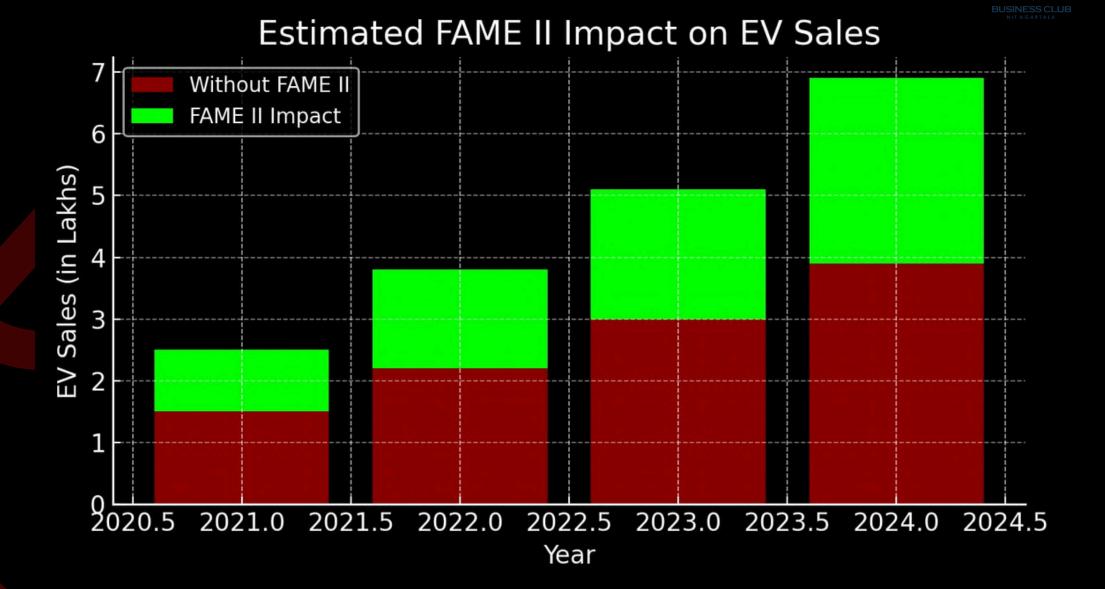




D. POLICY IMPACT

- **EV** sales doubled from FY2022 to FY2023 after FAME II extension.
- States with EV-specific roadmaps see faster infra growth (e.g., Delhi EV Policy 2020).

FAME-II (Faster Adoption and Manufacturing of Electric Vehicles) was a government scheme in India aimed at promoting electric mobility by providing demand-side incentives for electric vehicles. It was launched in 2019 with a total outlay of ₹11,500 crore. The scheme supported electric two-wheelers, three-wheelers, four-wheelers, buses, and public charging stations. The FAME-II scheme has ended on March 31, 2024.

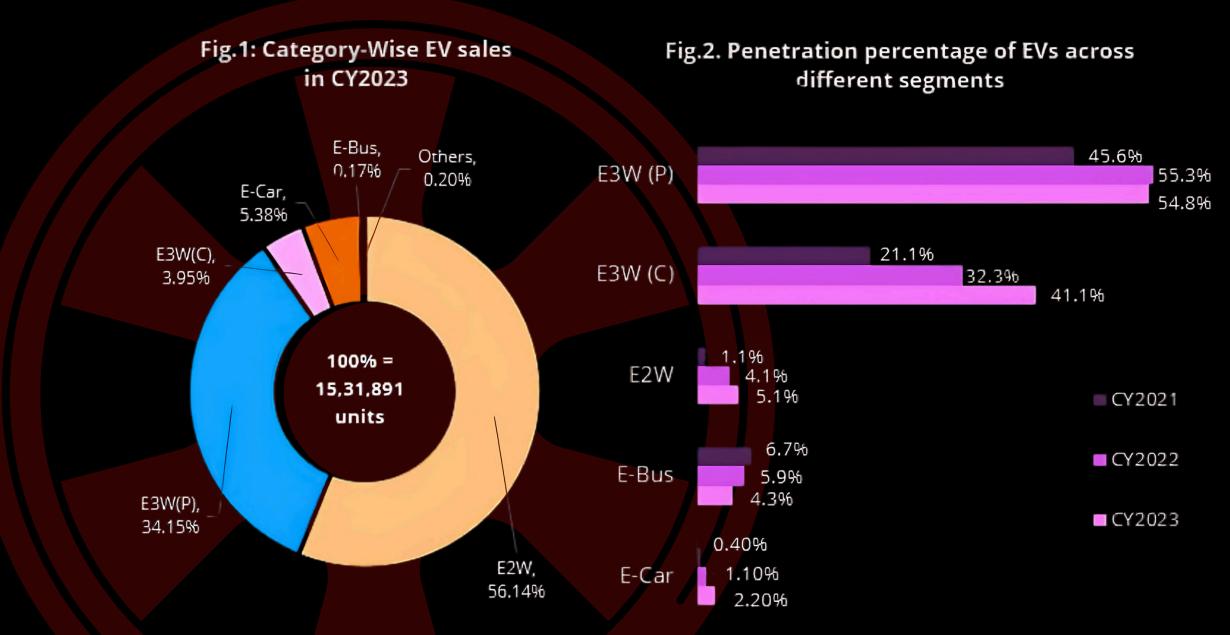


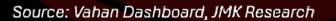


B. SEGMENT-WISE PENETRATION (FY 2023)



- **2-wheelers: ~5.5**% of total sales (led by Ola, Ather)
- 3-wheelers: ~50% (especially in e-rickshaw dominated states)
- → 4-wheelers: ~2% but growing (Tata Nexon EV, MG ZS EV)



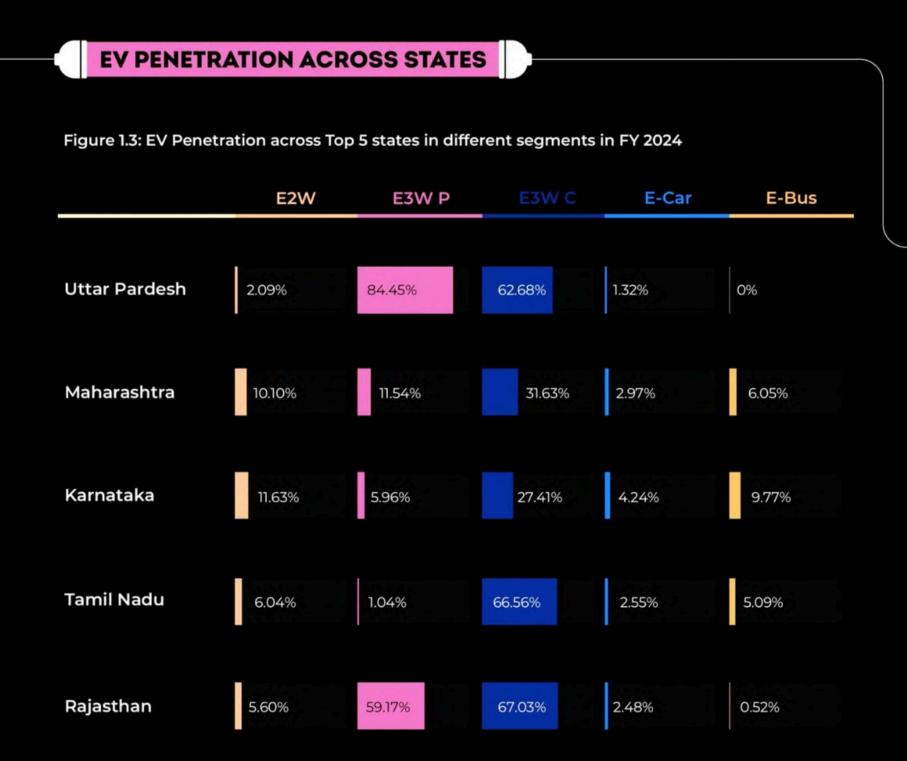


Note: EV Penetration $\% = \frac{EV \text{ units registered in the category}}{Fotal (ICE+EV) units registered in the category}$



C. STATEWISE ADOPTION



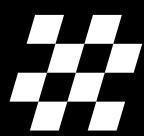


In FY2024, Karnataka leads in the E2W penetration rate with 11.63%, the E-Car category with 4.24% electrification, and the E-Bus category with 9.77% among the top 5 states.

Uttar Pradesh has the highest 3W Passenger electrification rate among the top 5 states, with approximately 84% of the category electrified.

Rajasthan, Tamil Nadu, and Uttar Pradesh have each surpassed 60% electrification in the 3W Cargo category in FY2024.

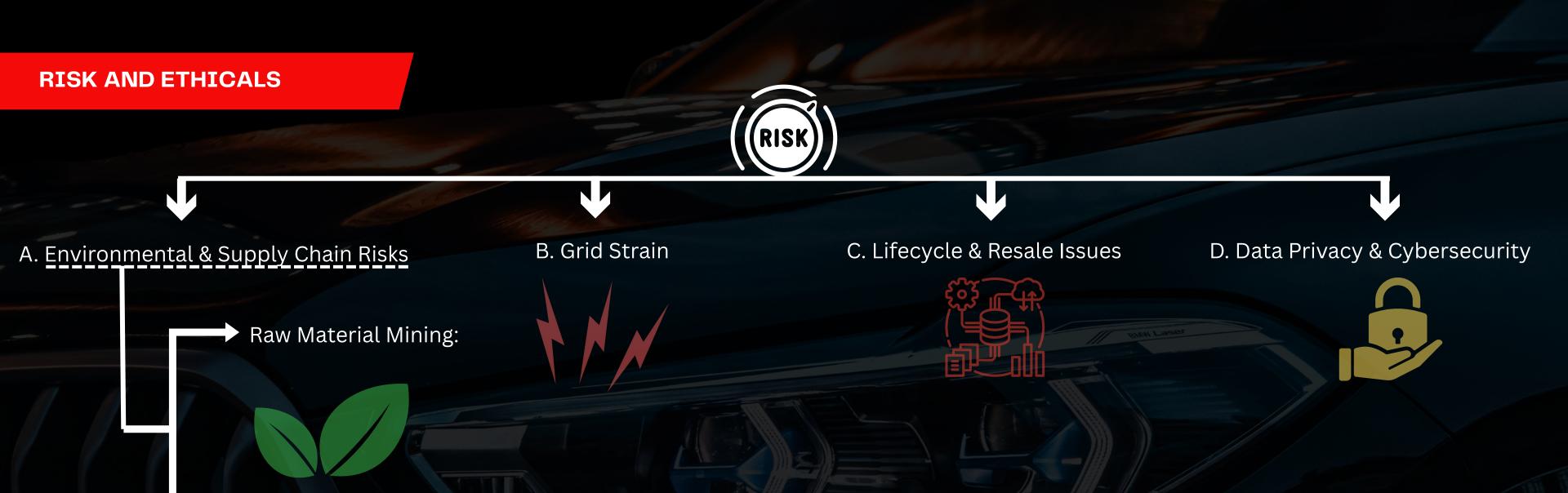
Source: Vahan Dashboard, JMK Research



Battery Disposal:

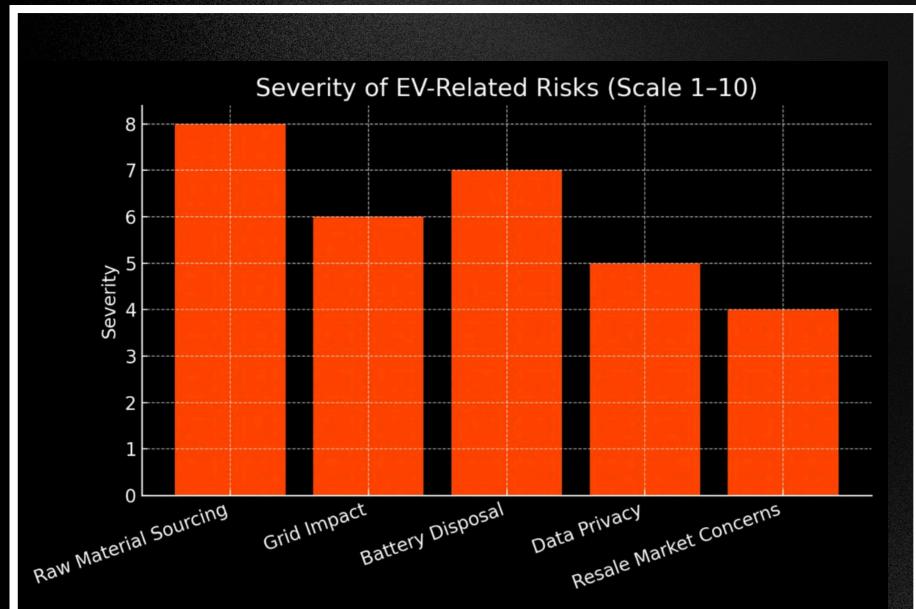
RISKS & ETHICAL CONCERNS 🗘



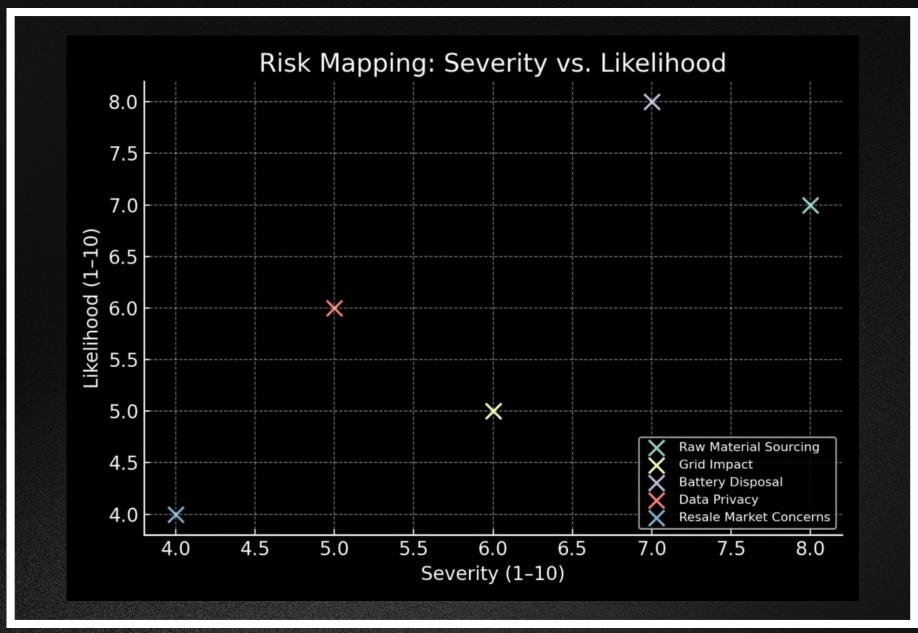














A. ENVIRONMENTAL & SUPPLY CHAIN RISKS



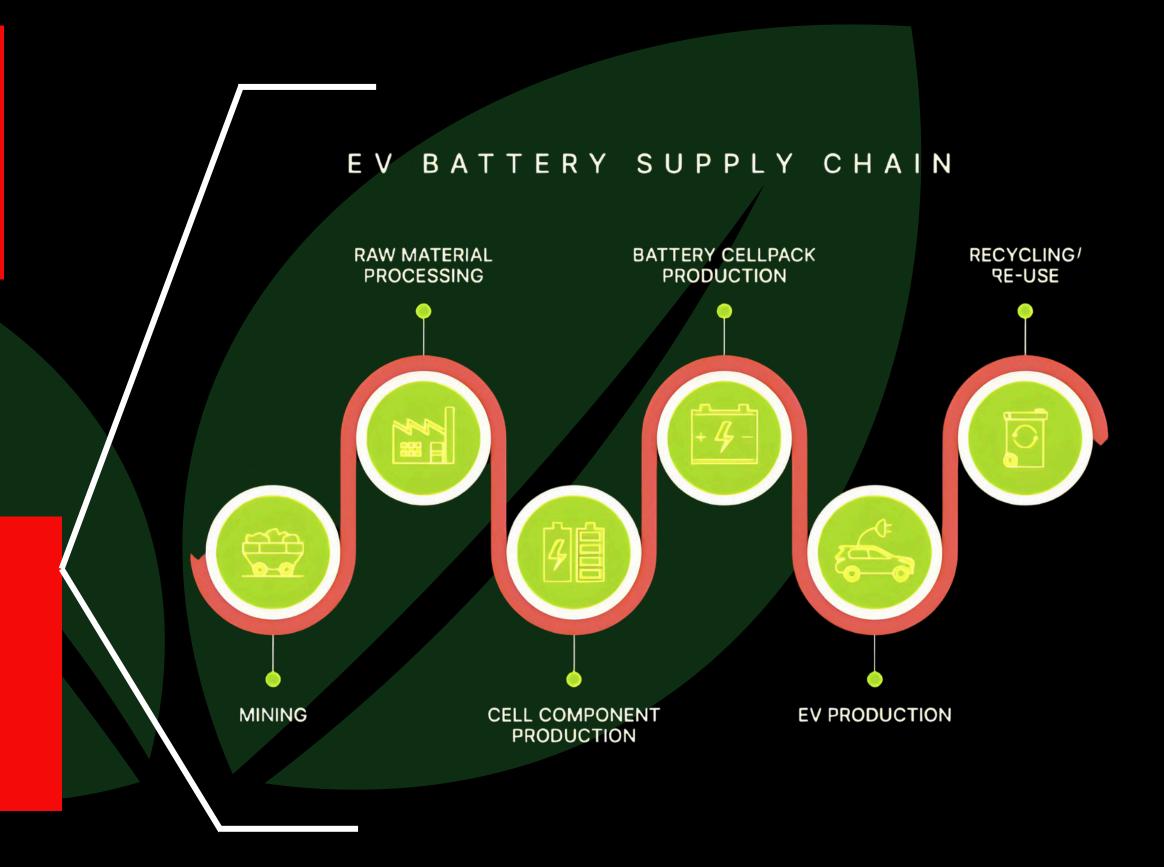
Raw Material Mining:

Lithium, cobalt sourced from DRC, Bolivia—linked to child labor and environmental harm.

→ Battery Disposal:

Lack of formal recycling systems increases landfill burden.

Risk of toxic leakage from dead battery packs.





B. GRID STRAIN



Localized stress during peak hours in cities with high EV density.

Risk of blackouts if charging isn't time-managed (e.g., 7–10 PM window).

C. LIFECYCLE & RESALE ISSUES

EV resale market underdeveloped; depreciation rates uncertain.

Limited battery health diagnostics for used vehicles.







D. DATA PRIVACY & CYBERSECURITY

Smart EVs collect real-time data potential risks around data misuse or cyberattacks.



POLICY REVIEW / LEGAL FRAMEWORK 🗘



CENTRAL GOVERNMENT POLICIES

FAME II

FAME India Phase II (FAME-II) is a government scheme in India designed to promote electric vehicle (EV) adoption through demand incentives. It was launched in 2019 with a budget of ₹11,500 crore and aims to support various categories of EVs, including electric two, three, and four-wheelers, electric buses, and public charging stations. The scheme in- centivizes electric vehicle purchases, mak- ing them more affordable for consumers

Incentives for e-2Ws, e-3Ws, e-buses.

Focus on localization (minimum 50% domestic content).



Central & state government incentive schemes - Corporate tax benefits



- Abolition of dividend distribution tax –
- Dividend taxable for the shareholder
- No cassading effect –
 Dividends received not ind ward pays dividend in
 prescribed time



- Access to lower dividend tax rates under the treaty (as low as 5%/ 10%)
- Ease of tax credit in parent company jurisdiction
- Reduction of group tax cost



 Dividend received from foreign subsidiaries is taxable at a concessional rate of 15%*



- Special tax rate of 5%* in case of foreign lenders, for interest on monies borrowed before 1July 2023 (subject to conditions)
- Strong treaty network with approx. 94 nations



 Long term capital gains taxable at a reduced rate of 10%*. in case of non-resident shareholders and treaty benefit, if any)



 No obligation to file an income 11X return by non-resident companies in case of rovaity, technical service fee, dividend or interest income, if it has been subjected to WHT as per domestic

India – a destination of choice for setting up manufacturing operations

KEY STATE EV POLICIES

State	Highlights
Delhi	25% EV target by 2024, scrappage incentives
Maharashtra	₹1,00,000 subsidy for e-4Ws
Tamil Nadu	100% road tax exemption, EV cluster development
Gujarat	Subsidy + battery swapping infra support

REGULATORY PROVISIONS

→ Import Duties:

High duties on battery packs (up to 40%) to favor local assembly.

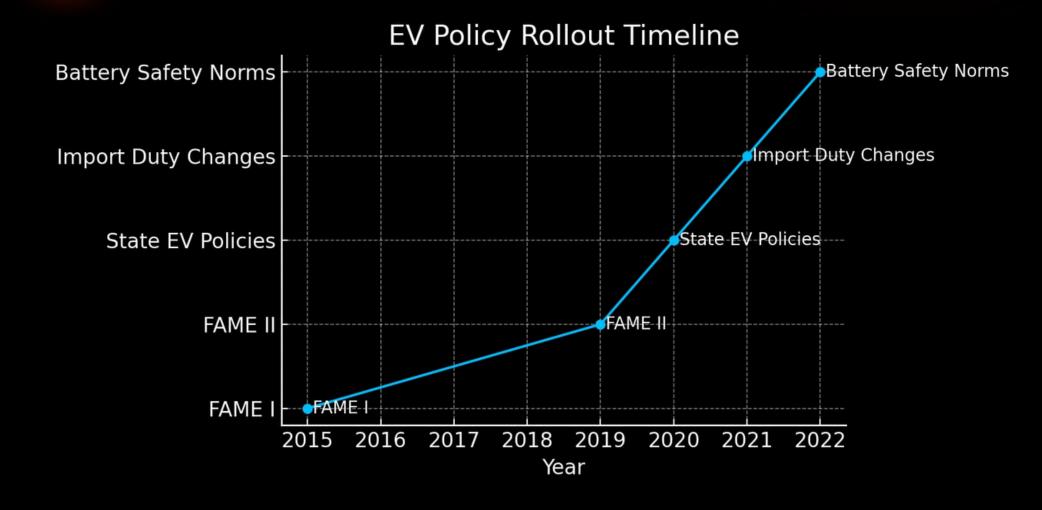
Charging Standards:

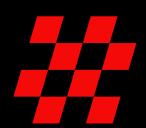
BIS standards for chargers, interoperability under discussion.

→ Import Duties:

ARAI and ICAT testing for range, safety, and battery reliability.







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hybrid / electric veticles martier de-

Velopment and manufacturing sylrem

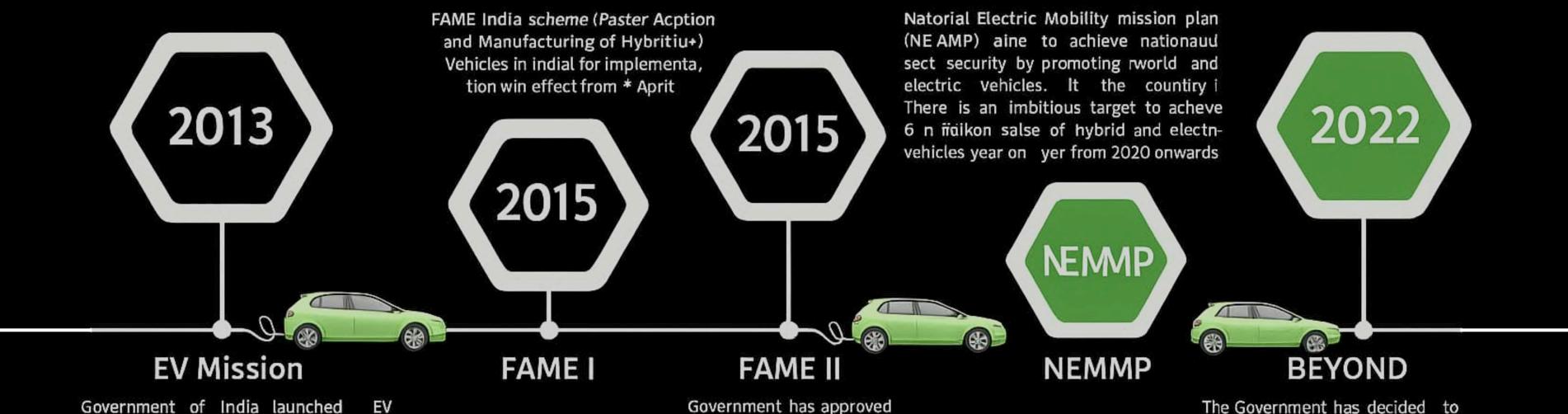
Government aims to kick start

forther extend Fame India Seche

Phase I fiu S et March

NATIONAL ELECTRIC MOBILITYMISSION PLAN (NEMMP)





Phase II of FAME Scheme

with an outlay of RS.3 years

commencing from II" Ap!







MARKET EXPANSION:

Public transportation, logistics, and shared mobility

Electric buses, equipped with advanced lithium-ion or sodium-ion batteries (under the FAME II scheme). These buses, typically equipped with batteries ranging from 250 to 300 kWh, offer a range of 150 300 km on a single charge. development of fast-charging infrastructure, using technologies such as CCS2 (combined charging system) for minimal downtime

Electric light commercial vehicles (e-LCVs) powered by battery packs ranging from 50-80 kWh can be instrumental in reducing the carbon footprint of the logistics industry. Mahindra Electric and Tata Motors are leading the development of electric vans and small trucks for urban deliveries, which typically travel less than 100 km per day. This makes them ideal for electric drivetrains, particularly when combined

with regenerative braking.

In shared mobility, electric two- and three wheelers equipped with swappable battery technology (such as Hero Electric) are gaining attraction. Battery swapping systems, built on modular 2-3 kWh packs, allow for quick exchanges, minimising charging downtime. This is especially advantageous for ride-hailing platforms systems.





LOCALISATION of supply chain

- Battery manufacturing and advanced technology development India's reliance on imported lithium-ion batteries is one of the most significant barriers to lowering EV costs. To overcome this, the government's PLI scheme aims to incentivise the local manufacturing of ACC batteries.
- This involves developing lithium-ion, solid-state and next generation technologies such as lithium sulfur and sodiumion batteries. Local gigafactories (battery production facilities capable of producing several gigawatt hours of capacity annually) are being planned, with companies such as Reliance and Ola Electric leading this trend. These facilities will help reduce the current battery import costs of US\$ 135-150 per kWh and bring it closer to the global target of US\$ 100/kWh.









creating a significant opportunity in battery recycling. Startups can innovate in

recovering valuable metals such as lithium, cobalt and nickel from used EV batteries.

Emerging technologies such as hydrometallurgical and pyrometallurgical recycling

processes can recover over 95% of critical battery materials, offering cost effective

INNOVATION AND ENTREPRENEURSHIP

and environmentally friendly solutions. Companies such as Attero and Gravita India are already working in this space, building systems that recover materials efficiently while reducing the environmental impact.



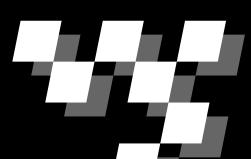




Opportunities

India's automotive manufacturing ecosystem, combined with its low labour costs and government-backed incentives, makes it a potential global EV manufacturing hub. The export of electric two- and three-wheelers, equipped with high-performance lithium-ion or leadacid battery packs, presents a great opportunity. India's automotive industry also has the potential to produce cost effective EVs for emerging markets in Africa, Southeast Asia and Latin America, where affordability is crucial Additionally, India can export key EV components, such as power electronics, battery management systems (BMS) and electric drivetrains, to global markets.







CHARGING INFRASTRUCTURE

Another major opportunity lies in the expansion of EV charging infrastructure. Fast-charging networks using technologies such as CHAdeMO and CCS2, capable of delivering up to 350 kW of power, are essential for reducing charging times.

Entrepreneurs can explore models such as home charging solutions integrated with rooftop solar or innovative battery swapping stations that serve to high demand segments such as two- and three wheelers.

Solar-powered charging stations, combining photovoltaic panels with energy storage systems (ESS), offer a sustainable charging solution.









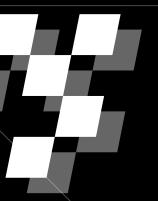


ELECTRIFICATION

Fleet operators like Amazon, Redbus ,OLA etc. can reduce their operating costs by switching to EVs. According to Weforum.org, the Total Cost of Ownership (TCO) for a two-wheeler in New Delhi is Rs 2/km when it's run on petrol. This cost comes down to Rs 0.52/km when switched to EVs. Undoubtedly, the operating costs go down by more than half for fleet operators. Maintenance costs will go down as well.

However, shifting to EVs is happening at a much slower pace when compared to Brazil or the US. Electric vehicles in India are still unfavored because of the high upfront costs, unestablished reseller value, and lack of trust in the new technology.

To address these concerns, the government is providing tax incentives to reduce upfront costs. Meanwhile, first mover companies are providing robust and reliable charging solutions that will boost confidence in this new technology.







AND SELLINGS OF THE SELLINGS O

A Battery Management System (BMS) in electric vehicles is crucial for ensuring the efficient operation and safety of lithium batteries.

- Battery Monitoring: Continuously tracks parameters like voltage, current, and temperature of each battery cell.
- Thermal Management: Manages heat generated during charging to prevent overheating.
- Battery Balancing: Ensures even charge distribution among cells to maximize efficiency.
- Safety Controls: Implements protections against overcharging, overheating, and other potential hazards.

Service centre for quarterly or half yearly check with AI integration.

Conclusion

CONCLUSION

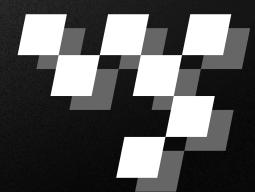




India's journey toward electric mobility is both ambitious and transformative. With its vision to achieve 30% EV penetration by 2030, the country is leveraging a multipronged approach — driven by progressive policies, innovative startups, growing consumer awareness, and pressing environmental priorities.

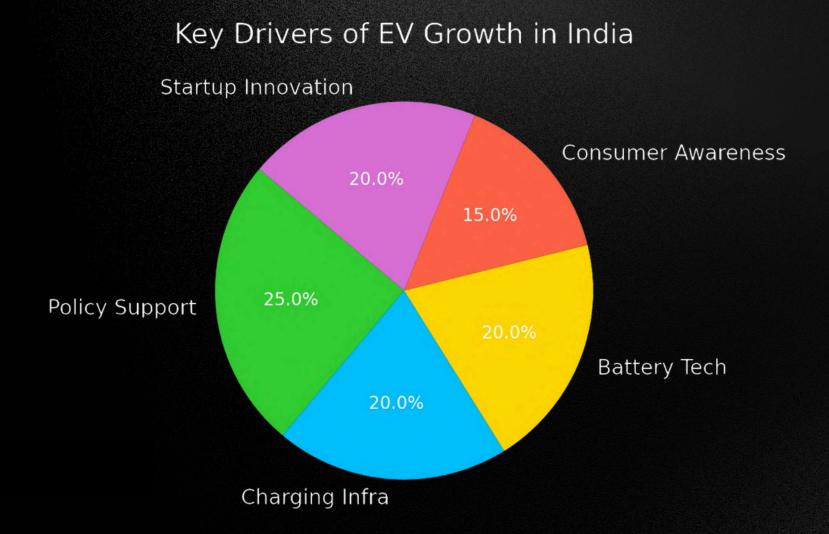
While challenges such as high upfront costs, limited charging infrastructure, and technological dependency persist, the trajectory is clear: India is moving steadily toward a sustainable, electric future.

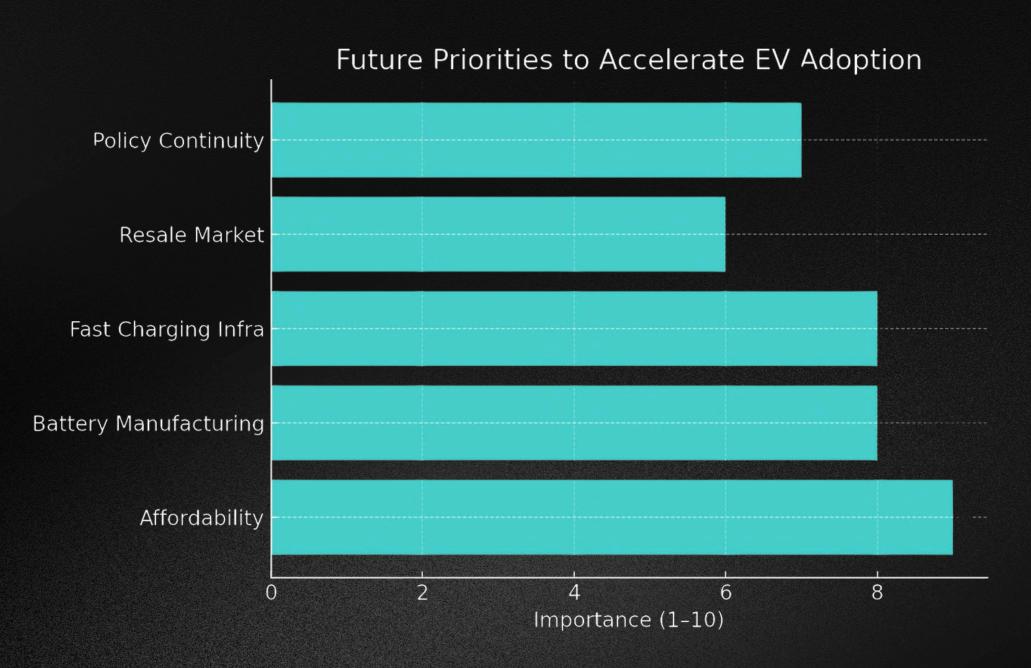
Key developments — from the FAME schemes and battery PLI incentives to public-private partnerships in charging infrastructure — have set a strong foundation. Moreover, successful case studies like Ola Electric's 2W revolution, Tata's portfolio expansion, and Amazon's electrification of last-mile delivery demonstrate scalable models that blend innovation with impact.



Conclusion









For India to sustain this momentum, prioritizing affordability, accelerating domestic battery manufacturing, and expanding fast-charging networks must remain central. Equally important is aligning all stakeholders — government, industry, and consumers — in a shared vision for clean mobility.

The road ahead is not without bumps, but it is navigable. With the right strategies, India has the potential not only to electrify its roads but to emerge as a global leader in EV innovation, manufacturing, and sustainability.



MEET THE TEAM







ANURAG GUPTA



TANAY AGARWAL



KAIF TAHIR



ABHIJEET SONAWANE



RAHUL KUMAR MAURYA

