



EV INDUSTRY

Powering the Future: A Comprehensive Industry Report



This research explores the dynamic landscape of the Electric Vehicle (EV) industry, examining its rapid growth, key market players, technological advancements, and policy drivers. It highlights the global push towards sustainability, the competitive strategies of major companies, and the evolving consumer demand patterns. Through strategic insights and data analysis, the study sheds light on opportunities and challenges shaping the future of mobility, with a focus on the Indian market and its alignment with global EV trends.

The electric vehicle (EV) industry is undergoing a radical transformation, driven by innovation in battery technology, increasing environmental consciousness, and strong government incentives worldwide. With major players like Tesla, BYD, and Hyundai scaling production and investing heavily in R&D, the global EV market is projected to reach \$1.08 trillion by 2029. This surge is not just about cars—it's about creating a sustainable mobility ecosystem backed by robust infrastructure, cutting-edge energy solutions, and evolving consumer behavior.

In the Indian context, initiatives like FAME II and the National Mission on Transformative Mobility have played a pivotal role in accelerating EV adoption. While challenges such as inadequate charging infrastructure, recycling inefficiencies, and high battery costs persist, emerging technologies and models like Battery-as-a-Service (BaaS) offer viable solutions. The report provides a comprehensive look at how India can capitalize on these trends to become a global hub for electric mobility.

Synergy, established in 2009, is driven by a singular mission: to bridge the gap between academia and corporate life. As a member-centric society, we aim to nurture future leaders and foster professional growth by providing unique opportunities for learning and development across various fields, including Consulting, Finance, and Marketing. Through our programs, we offer a head start to our members by engaging them in real projects with professional organizations and startups, exposing them to diverse experiences, and expanding their skill sets

In addition to hands-on projects, we organize member-only sessions with executives from different industries and conduct workshops to enhance their skills. Annually, our management conclave serves as a platform to impart business learning and test the corporate acumen of participants from across the country, fostering healthy competition among India's brightest minds.

Notable Collaborations



Live Projects



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EVOLUTION OF ELECTRIC VEHICLES

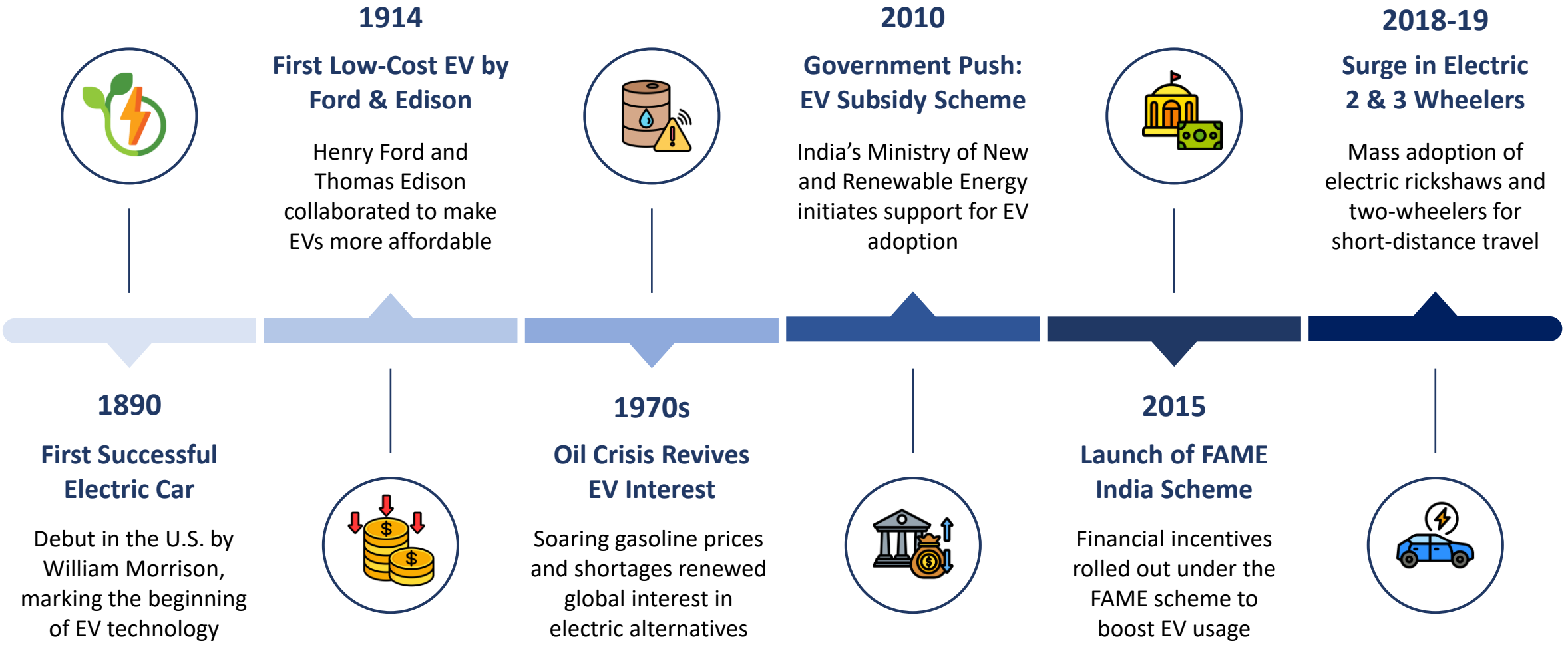
History

Industry Overview

Market Overview

HISTORY

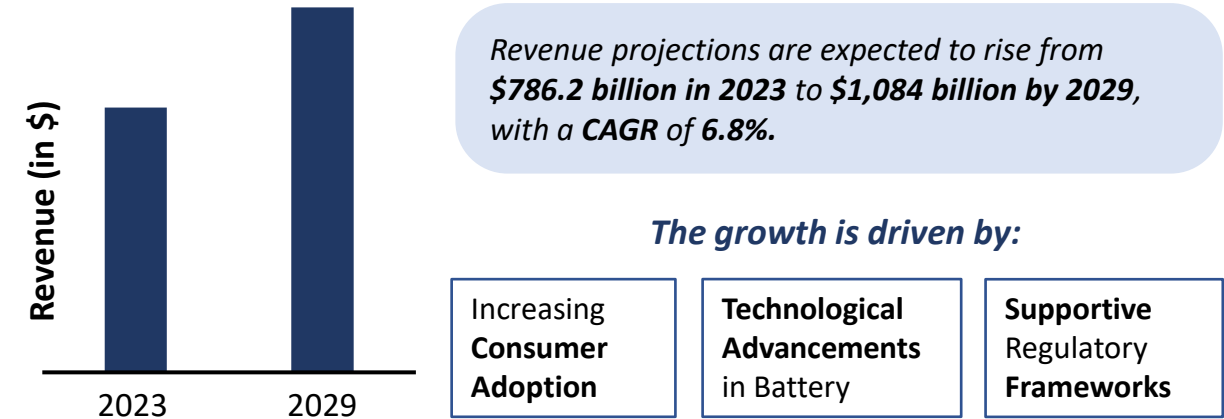
Tracing the evolution of the electric vehicle (EV) industry, from early inventions to India's national schemes. Key milestones include the first EVs, policy initiatives, and the surge in adoption of electric mobility solutions



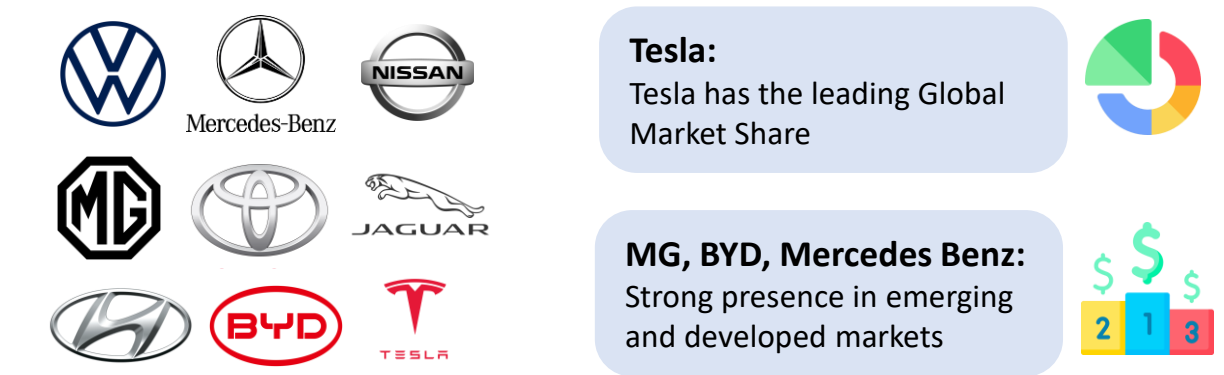
GLOBAL EV MARKET OVERVIEW

A detailed breakdown of the evolving electric vehicle (EV) consumer in India, highlighting key demographic traits like age, gender, income, and education, along with psychographic factors such as values, lifestyle preferences, and attitudes driving sustainable mobility choices.

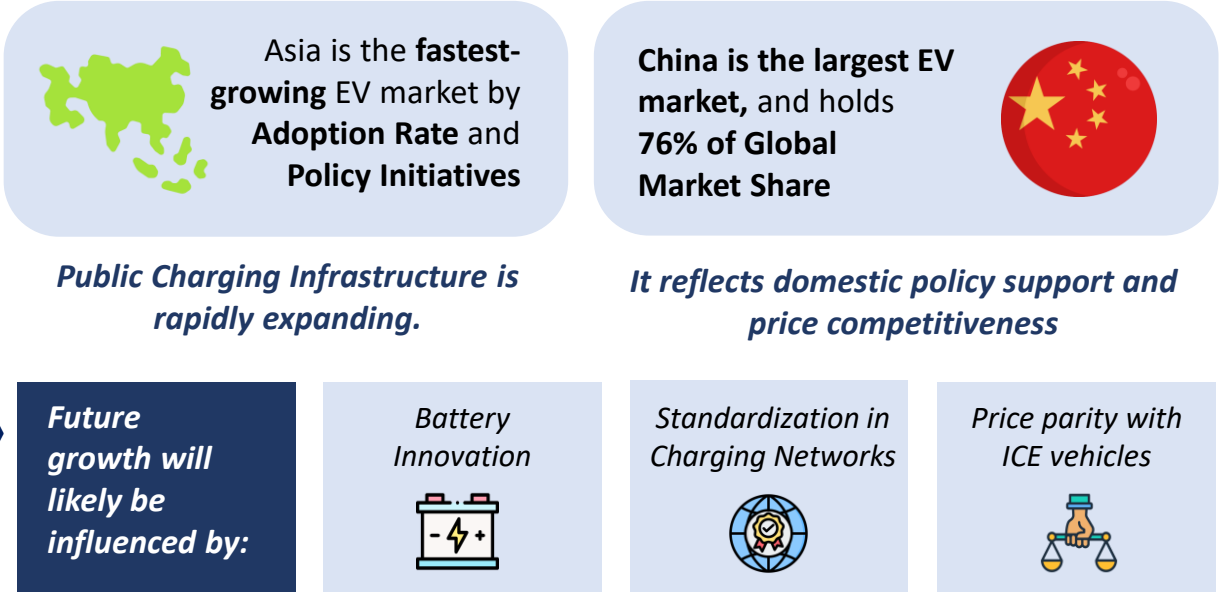
WORLDWIDE MARKET OVERVIEW



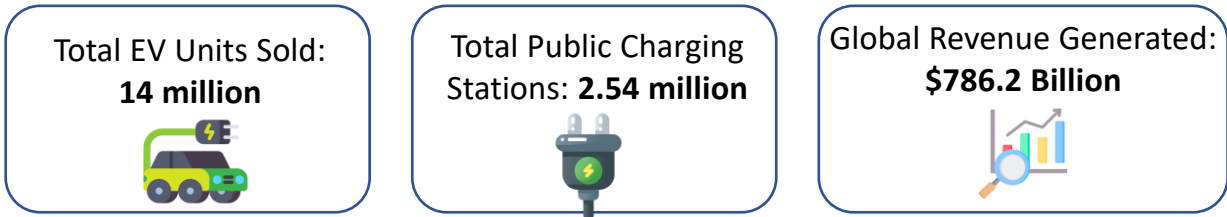
LEADING MARKET PLAYERS



Geographical Market Insights



KEY MARKET INDICATORS (2024)





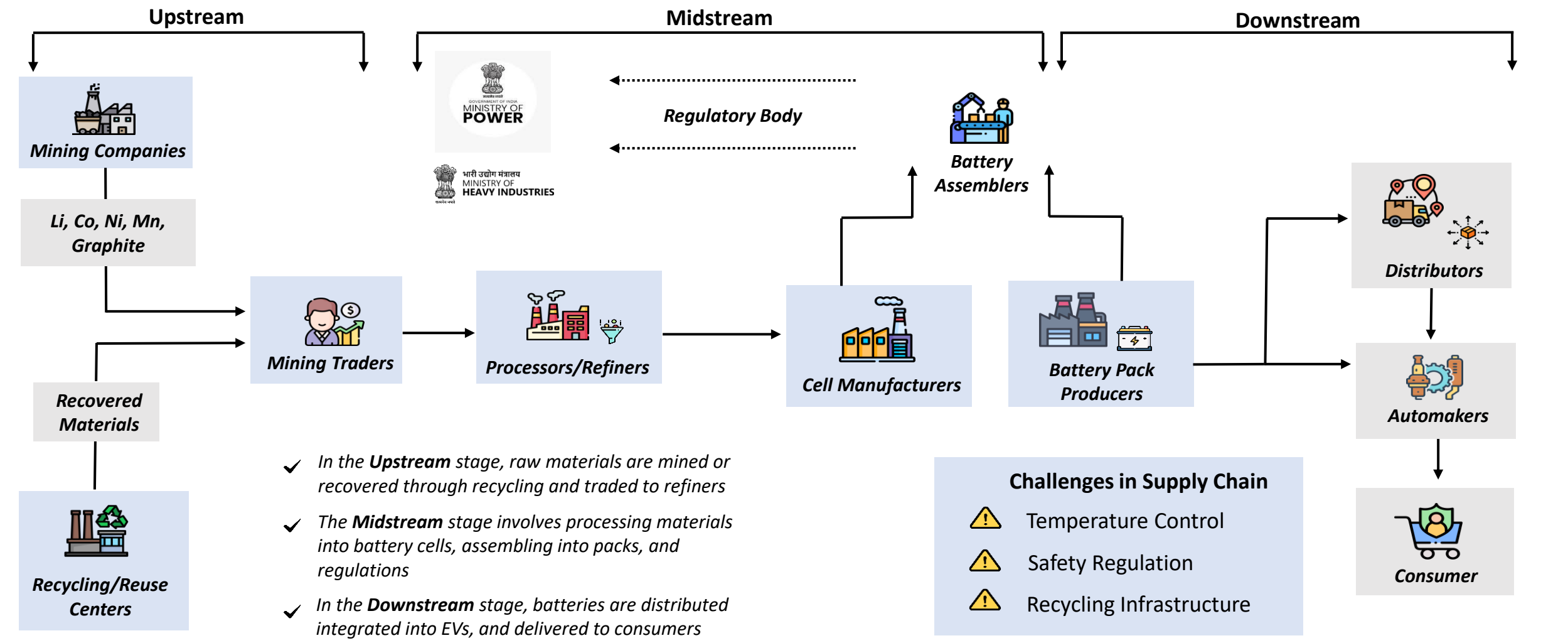
DELIVERING VALUE

Supply Chain

Customer Segmentation

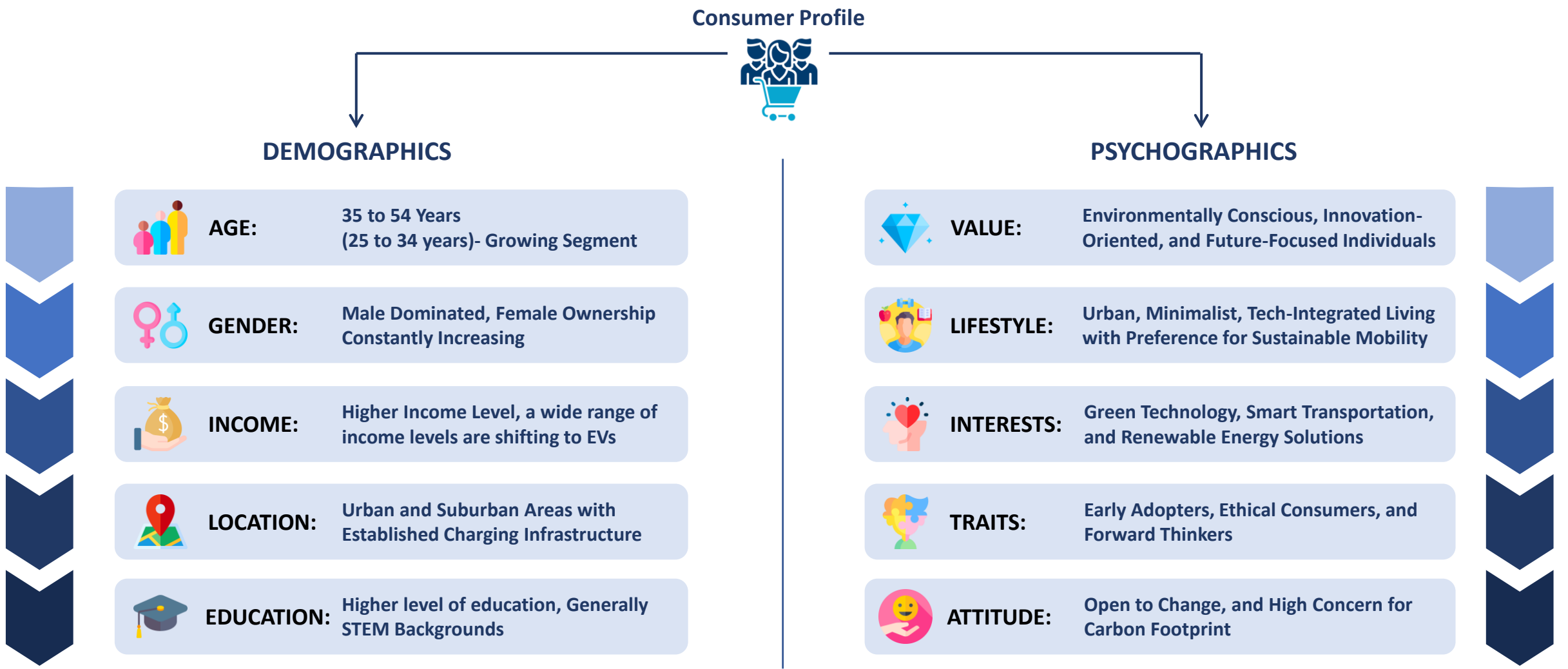
SUPPLY CHAIN: FROM RAW MATERIALS TO CONSUMERS

An end-to-end view of the EV supply chain from raw material extraction and recycling to battery production, vehicle assembly, and final consumer delivery highlighting key challenges like safety, temperature control, and recycling infrastructure.



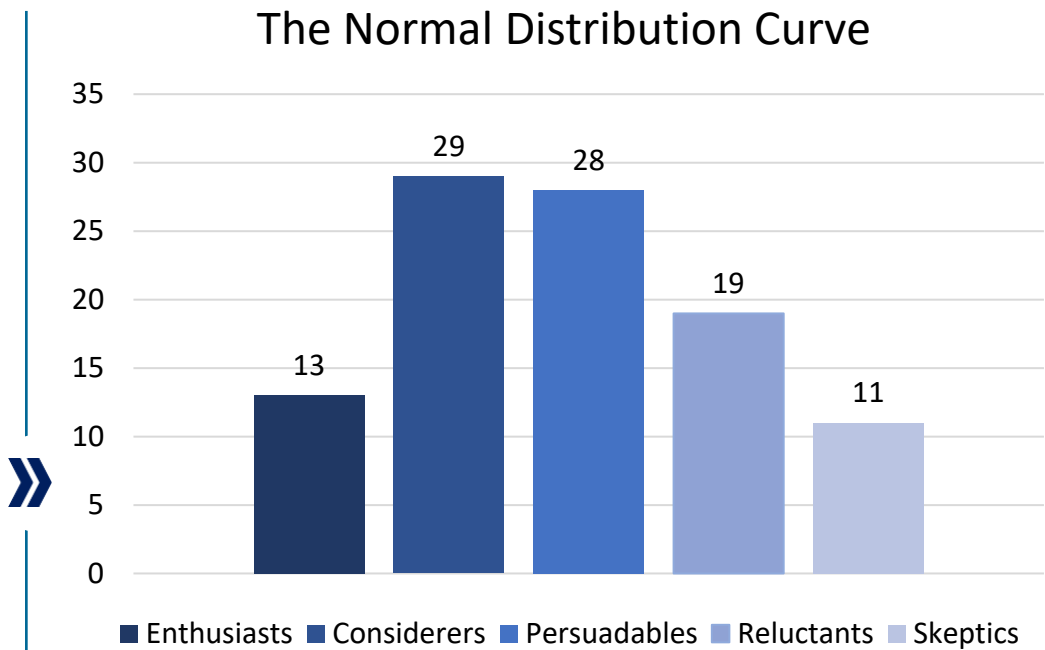
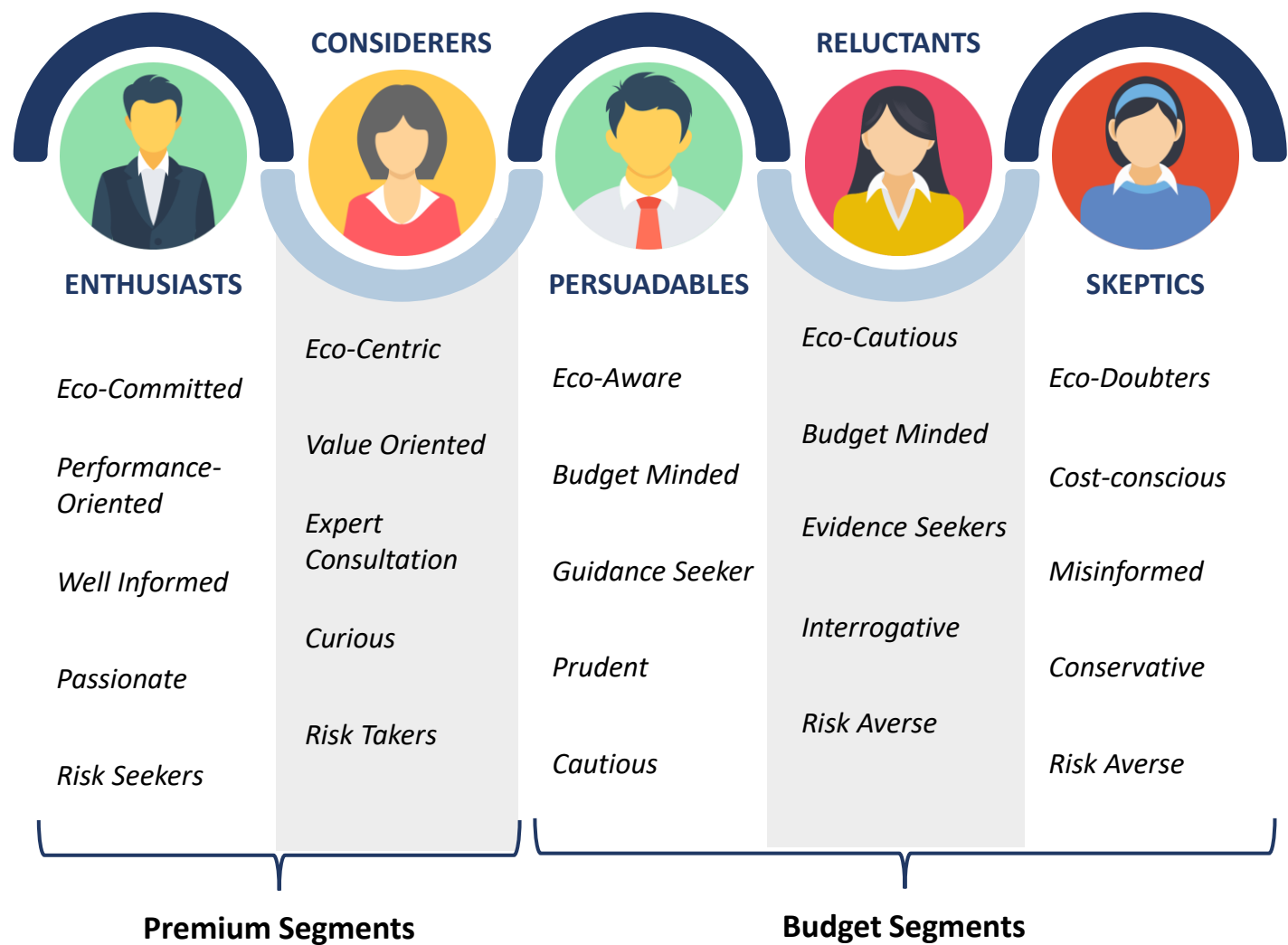
UNVEILING CONSUMER PROFILE

A snapshot of evolving EV consumers highlighting their demographics like age, income, and education, along with psychographics such as eco-conscious values, tech-savvy lifestyles, and openness to sustainable mobility solutions.



SEGMENTATION BASED ON MINDSET TOWARDS EV

Mapping the evolution of consumer attitudes in the electric vehicle (EV) landscape from early eco-committed adopters to cautious skeptics highlighting psychological drivers risk profiles and the growing potential for mass adoption through strategic targeting and education



How the segments have evolved:

- The share of EV Enthusiasts has consistently increased from 6% in 2021 to 11% in 2022 to 13% in 2023.
- However, the proportion of Skeptics and Reluctants registered a 2% increase in 2023, highlighting that many remain unconvinced of the benefits of EVs.

A blue electric car is shown from a side profile, parked at a charging station. The car is connected to a charging cable. The background is a blurred night scene of a parking lot or charging area with some lights and structures.

WHAT DRIVES EV ADOPTION

EV Purchase Drivers

Political Landscape

Legal Environment

FINANCIAL CONSIDERATIONS

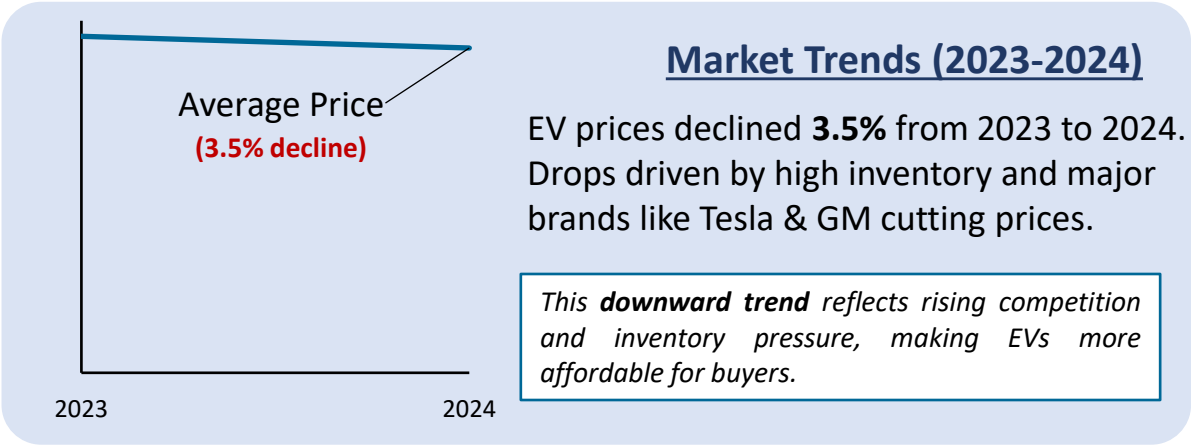
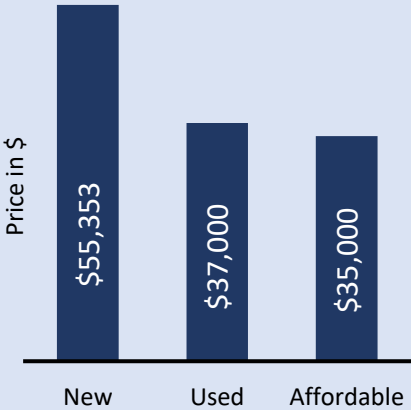
Understanding the cost dynamics of EV ownership, from average purchase prices and market trends to the role of federal tax credits in making electric vehicles more affordable for consumers in 2024

AVERAGE PURCHASE PRICES

Average Purchase Prices (2024)

New EVs **\$55,353**
Affordable Range **\$30,000 – \$40,000**
Used EVs **\$37,000**

These price points are **key financial considerations** that influence consumers' decisions when purchasing an electric vehicle.



TAX CREDITS & INCENTIVES



Not All EVs Qualify!

Not all EVs qualify for the credit, and those that do may not get the maximum amount. The 2024 EV tax credit depends on:

- Purchase Price (MSRP)
- Final Assembly Location
- Battery Type
- Source of Critical Minerals
- Pre-Tax Income

While federal tax credits can **enhance EV affordability**, eligibility depends on many factors. Buyers should research carefully to **ensure qualification and maximize savings**

OWNERSHIP COST ANALYSIS

Examining the complete financial picture of ownership, from substantial fuel and maintenance savings that can reduce monthly expenses by \$90-200, to potential cost challenges including higher insurance premiums, expensive battery replacements, and various hidden expenses that impact long-term economics

UPSIDES

Fuel Savings



Average **EV charging cost**: \$60/month (Feb 2024)

Gasoline cost (typical household): \$150–\$200/month



Lower Maintenance Costs



Fewer moving Parts = fewer repairs

No need for **oil changes**, transmission fluid, or spark plugs



DOWNSIDES

Higher Insurance Costs

- ✓ EVs generally **cost more to insure** than gas-powered cars
- ✓ **Higher replacement value** increases premium



Expensive Major Repairs

- ✓ EV parts **harder to source**
- ✓ **Battery replacements** range from **\$5,000–\$20,000**



Hidden Costs

- ✓ **Home charging setup**
- ✓ **Software & firmware updates** (some manufacturers charge for these)



While electric vehicles offer significant savings in fuel and routine maintenance, prospective owners must also consider higher insurance premiums, potential repair costs, and various hidden expenses that can influence the total cost of ownership.

PRACTICAL CONSIDERATIONS

Evaluating the real-world usability factors of electric vehicle ownership, from battery range capabilities and charging infrastructure accessibility to climate impacts on performance, helping consumers understand how EVs fit into their daily driving needs and environmental conditions

BATTERY RANGE

How Far Can EVs Go in 2024?

High-End Models

Up to 500 miles per charge



Moderate Price Models

Average range of 300 miles



What This Means for Buyers:



More money = longer range



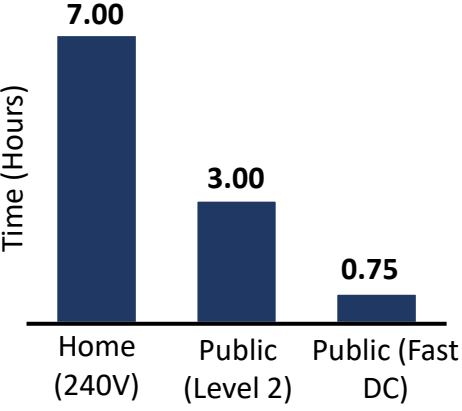
Best suited for **urban & suburban**



Not ideal for frequent **long-distance**

CHARGING INFRASTRUCTURE

Average time to charge EV to 80%



HOME CHARGING

Installation Costs: \$1,150-\$2,750 (Motor Trend, 2024)

Standard 240V Charger: Takes 4-10 hours to reach 80%

Faster Chargers Available

PUBLIC CHARGING

Electricity tariffs increase monthly operating costs

Coverage is **uneven**, especially in rural areas

Station availability: Use DOE tools to check

Installation costs, electricity rates, and charging access remain key for prospective EV buyers.

WEATHER & CLIMATE



Freezing temperatures affect EV performance

Lower Reliability



Cold weather makes long trips harder

Battery Efficiency Drops



Better suited for **extreme winters** (for now)

Gas Vehicles More Practical

POLITICAL LANDSCAPE

To assist the acceptance of electric vehicles (EVs) the central government has announced a number of promotional measures including tax incentives for electric vehicle owners, public EV charging infrastructure development, and so on

Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) – I and II

India's **Flagship Scheme** for promoting Electric Mobility

Launched by DHI in **2015**, currently in its **Second Phase**

FAME II was Implemented for a **3 Years** (from 19 April 2019)

Budget Allocation of **10,000 Crores**

INCENTIVES OFFERED

Total Approximate Incentives	Approximate Size of Battery
Two Wheeler: Rs 15000/- per kWh upto 40% of the cost of vehicles	2 kWh
Three Wheeler: Rs 10000/- per kWh	5 kWh
Four Wheeler : Rs 10000/- per kWh	15 kWh
E Buses: Rs 20000/- per kWh	250 kWh
E Trucks: Rs 20000/- per kWh	400–600 kWh

The Department of Heavy Industries has also **sanctioned 2636 charging stations** in 62 cities across **24 States/UTs under FAME** India scheme phase II.

National Mission on Transformative Mobility and Storage

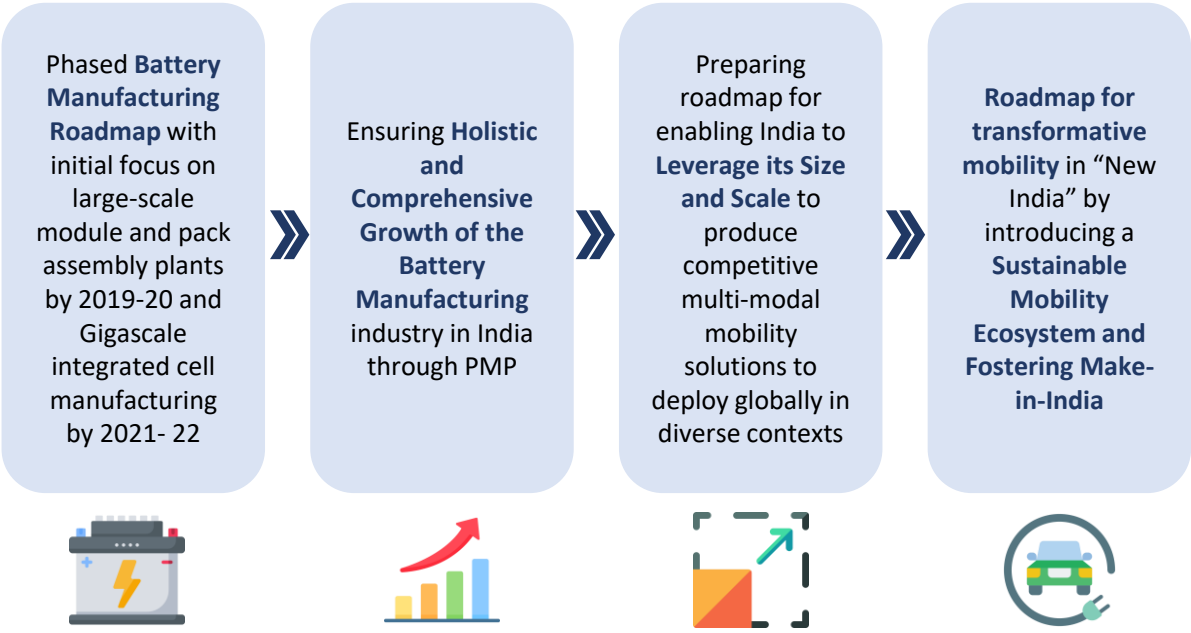
Strategies for **Transformative Mobility** and **Phased Manufacturing**

Phased Manufacturing Program to **Localize Production** across Value Chain

Finalization by the Mission with a clear **Make In India Strategy**

Coordinate with **Key Stakeholders** in Ministries/ Departments/ states

ROADMAP



LEGAL LANDSCAPE

The Indian government is boosting EV adoption through key legal reforms lowering GST, enforcing battery recycling rules, investing in ACC battery production, and tightening safety norms with robust thermal and fire protection standards.

BATTERY REGULATIONS

Battery Waste Management Rules

EV battery makers must collect and recycle **70% of used batteries** by 2030 under **Extended Producer Responsibility (EPR)**, promoting circularity and reducing long-term environmental harm

PLI Scheme for ACC Batteries

₹18,100 crore has been allocated to boost domestic ACC battery manufacturing, strengthening India's EV production ecosystem

Objective

These policies ensure **sustainable battery usage** and support the development of a **self-reliant** and **eco-friendly** EV industry

GST REDUCTIONS

GST on Electric Vehicles

GST on electric vehicles has been reduced to **5% from 28% on ICE vehicles**, significantly improving affordability and encouraging wider consumer adoption

GST on Charging Stations

GST on **EV chargers** and **stations** has been cut to **5%**, lowering installation costs and accelerating investment in charging infrastructure

Objective

These reductions aim to make EVs and related infrastructure more **accessible**, **supporting** the shift toward clean and **sustainable** mobility

SAFETY STANDARDS

AIS 038 and AIS 156

These standards mandate **thermal management systems** in EV batteries to prevent overheating, reduce fire risks, and ensure stable operation in Indian conditions

Updated EV Safety Rules (2023)

The latest rules require **fire-resistant** materials and compulsory **short-circuit testing** to improve battery safety and avoid electrical failures

Objective

The focus is on enhancing **user safety**, building **public trust** in EVs, and ensuring **reliable performance** in everyday use

The background of the slide features a dark, moody image of an electric car parked next to a charging station. The car is on the left, and the charging station is on the right. The scene is dimly lit, with some light reflecting off the car's surface and the charging station's screen. The overall color palette is dark blue and black.

BATTERY DEVELOPMENT

Capital Investment


Economics & Funding

Lithium Ion Batteries


EV BATTERY DEVELOPMENT: CAPITAL INVESTMENT

Analyzing the massive financial requirements for EV battery industry growth, from multi-billion dollar gigafactory investments and R&D spending on next-generation technologies to ongoing operational expenses including raw materials, labor, and supply chain logistics that drive the transition to electric mobility


OPERATING EXPENSES (OPEX)




Raw Materials (~60%)
Lithium, cobalt, nickel are major cost drivers in battery production



Labor & Utilities (10–15%)
Covers workforce wages & energy consumption during production



Maintenance & Logistics (5–10%)
Includes equipment maintenance & transportation of materials



Waste Management (\$5–10M/Yr.)
Waste disposal, environmental safety, and compliance costs

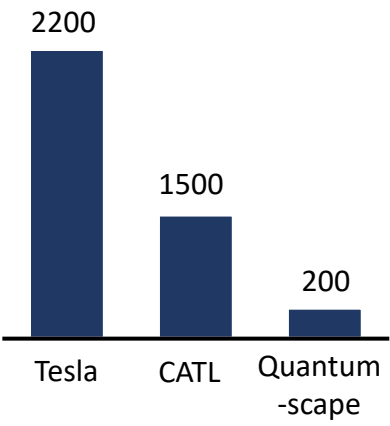
RESEARCH AND DEVELOPMENT

R&D Investment Landscape (2023)

Tesla: \$2.2 billion (total R&D)

CATL: \$1.5 billion

QuantumScape: \$150-200 million



MAJOR CAPITAL EXPENDITURE (CAPEX)

Gigafactory Setup	Battery Cell Production Lines	Equipment & Machinery	Land, Infrastructure, Permits	Supply Chain/ Logistics Setup
<p>Cost Range: \$2-5 billion per plant</p> <p>Purpose: Establishing large-scale manufacturing facilities to produce EV batteries</p>	<p>Cost Range: \$50-100 million per GWh capacity</p> <p>Focus: Establishing production lines for scalable battery cell manufacturing</p>	<p>Cost Proportion: 30-40% of total plant cost</p> <p>Role: Essential for automated production, quality control, and efficiency</p>	<p>Variable Costs: Depending on region</p> <p>Considerations: Cost of land acquisition, infrastructure development, and securing necessary permits</p>	<p>Cost Range: \$200-500 million for global integration</p> <p>Focus: Establishing efficient global logistics for sourcing materials and distributing products</p>

EV BATTERY ECONOMICS & FUNDING

Analyzing the financial dynamics driving EV battery industry growth, from cost reduction targets and profitability metrics to diverse funding sources and risk mitigation strategies that shape investment decisions and market development

MARKET FINANCIAL OUTLOOK

1. Cost & Capacity Outlook

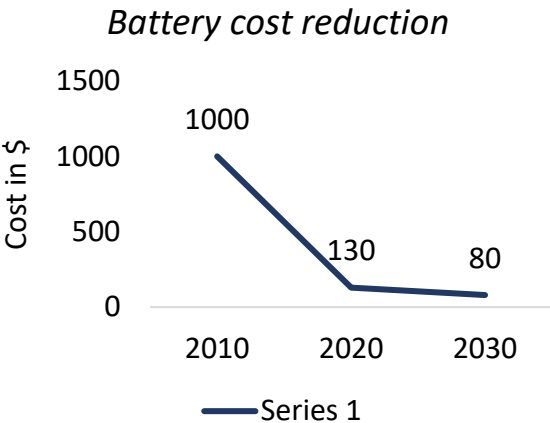
Battery costs expected to drop to \$80/kWh by 2030

2. Market Growth

Battery market projected to exceed \$400B; \$250B+ investment anticipated

3. Supporting Sectors

Recycling and materials markets to reach \$20B and \$80B+



PROFITABILITY METRICS



1. Margin Overview

Gross margins: 15–25%, EBITDA margins: 10–15% average



2. Key Profit Drivers

Scale, integration, OEM contracts, and sourcing reduce costs

BATTERY COST ECONOMICS



Current cost (2023 average): ~\$130/kWh



Industry breakeven target: ~\$100/kWh



Solid-state batteries: ~\$400-600/kWh (higher CapEx & R&D)

FINANCIAL RISKS AND MITIGATION STRATEGY

Financial Risk

1. Raw Material Price Volatility

Fluctuating lithium, cobalt, and nickel prices increase production uncertainty



Mitigation Strategy

Establish long-term contracts, invest in recycling, and diversify material sourcing globally

2. Delayed Capital Recovery

Delayed ROI stretches payback period, impacting investor confidence



Secure OEM agreements, leverage government incentives, and use scalable modular factory designs

FUNDING SOURCES & INVESTMENT TRENDS

Equity financing: IPOs (e.g., LG Energy Solution raised \$10.8B in 2022)

Venture capital: Focus on next-gen battery tech (over \$8B invested)

Joint Ventures: OEMs and battery makers share cost and risk

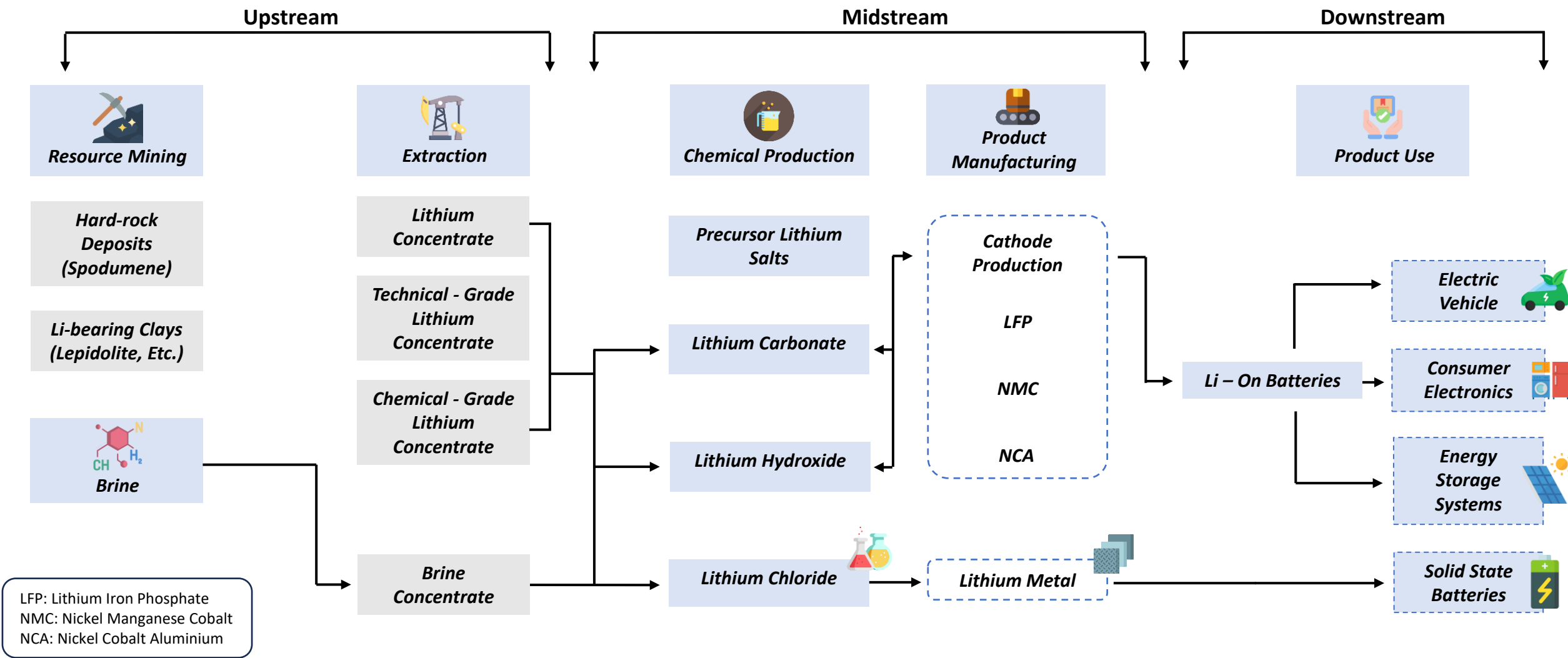
Debt instruments: Green bonds, sustainability-linked loans

Strategic Partnerships: Automakers invest directly in battery companies

Private equity: Consolidation plays in component manufacturing

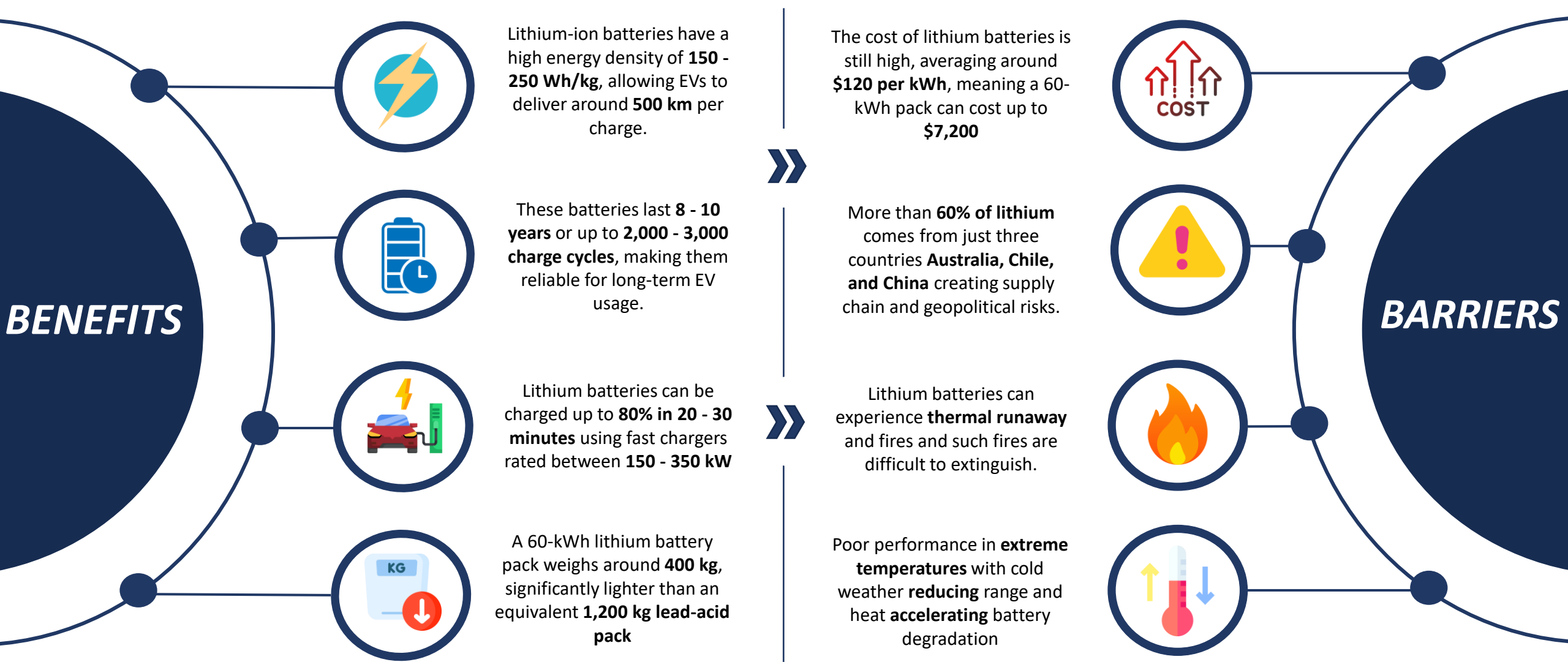
LITHIUM SOURCING IN INDIA FOR BATTERIES

Mapping the complete lithium supply chain from upstream resource extraction and processing to downstream battery manufacturing, covering the transformation from raw materials through chemical refining to final applications in electric vehicles and energy storage systems.



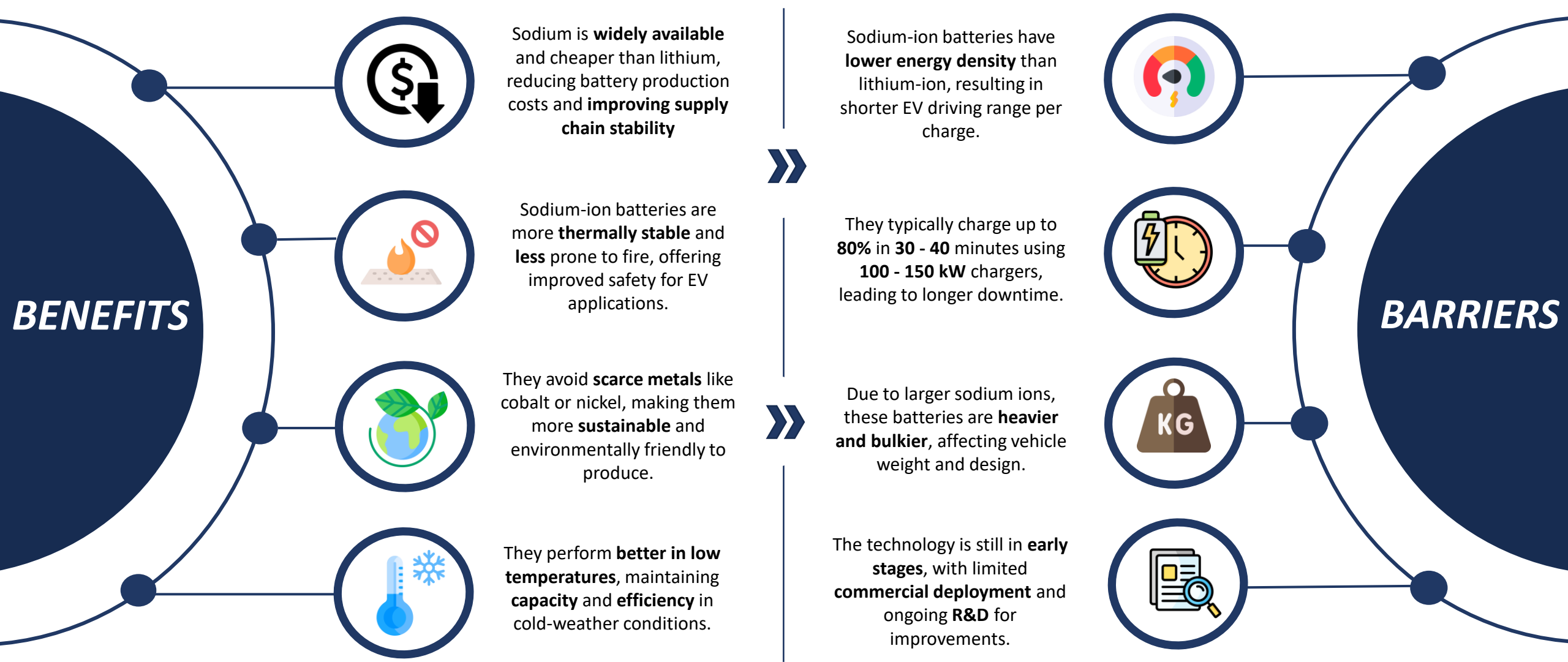
LITHIUM-ION BATTERIES IN EVS

Examining the current state of lithium-ion battery technology in electric vehicles, weighing key advantages like high energy density and fast charging capabilities against critical challenges including cost barriers, supply chain risks, and safety concerns



SODIUM-ION BATTERIES IN EVS

Evaluating sodium-ion technology as an affordable alternative to lithium-ion batteries, analyzing cost and sustainability advantages against performance limitations including lower energy density, slower charging speeds, and early-stage commercial development.



A dark blue electric car is parked next to a charging station at night. The car is illuminated by a soft blue light, and the charging station is also lit up. The background is dark, and the car's headlights are on, casting a warm glow.

TAXES AND SUBSIDIES

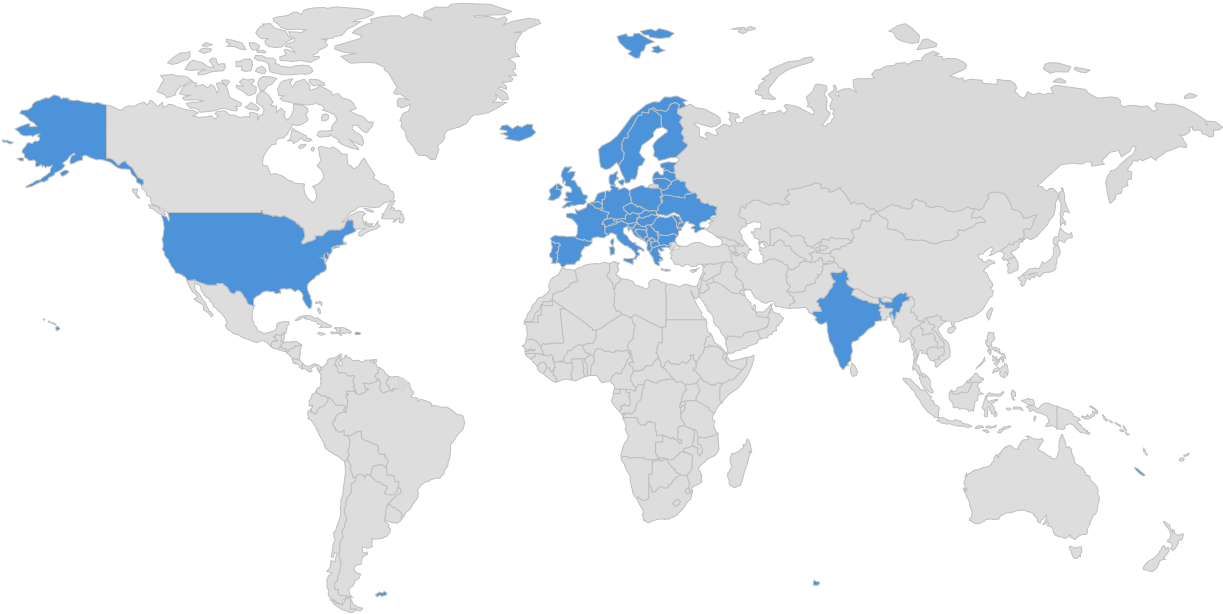
Taxes

Subsidies

THE EV TAX GAME: WHO'S ACTUALLY WINNING?

Analyzing EV tax incentives to uncover benefit distribution across stakeholders, highlighting disproportionate gains by high-income buyers versus limited access for low-income and rural adopters.

EV INCENTIVE LANDSCAPE



INDIA

- GST slashed to 5% on EVs from 18%
- FAME II subsidy up to ₹20,000/kWh
- ₹1.5L EV loan tax deduction (Sec 80EEB)

U.S.A

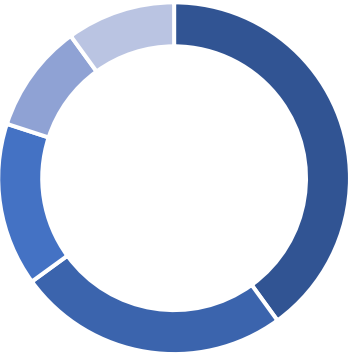
- Federal EV credit: \$7,500 (new), \$4,000 (used)
- Eligibility based on battery, assembly, and income
- Extra state rebates in places like California, Colorado

EUROPE

- EV incentives vary by country
- Germany & France offer purchase subsidies
- Norway exempts EVs from import and road taxes

WHO ACTUALLY BENEFITS MOST?

Stakeholders' Breakdown



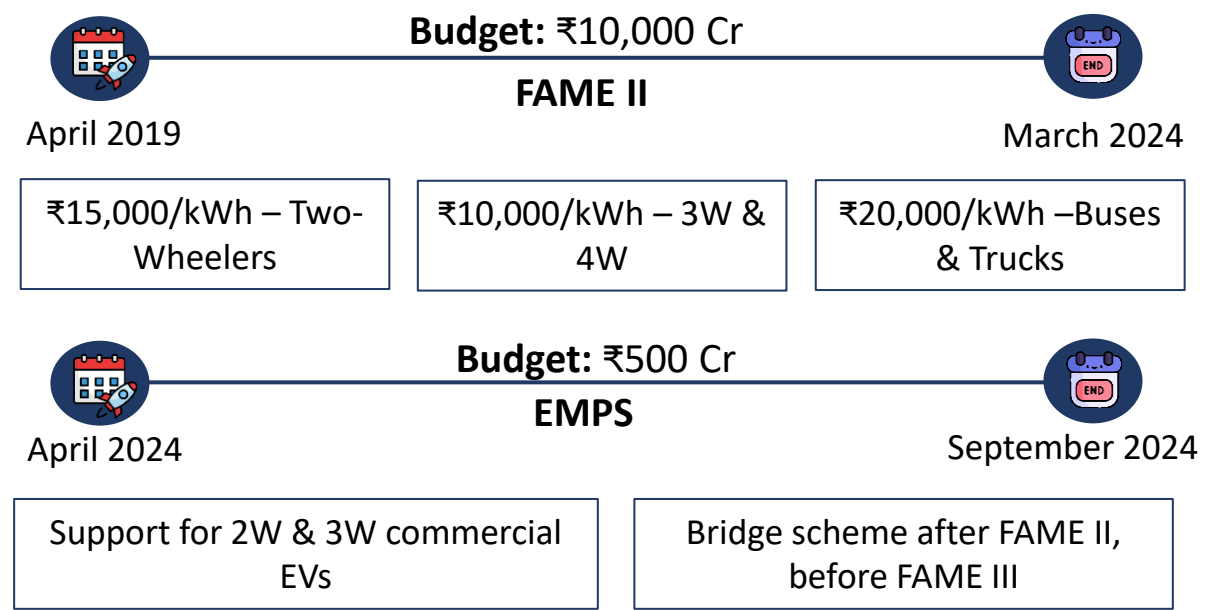
- High-Income Urban Buyers
- OEMs & Battery Giants
- Fleet Operators
- Used EV Buyers
- Rural/Middle-Income Buyers

	Stakeholder	Explanation
	Urban Rich Buyers	Max credits, easy EV access
	OEMs & Battery Giants	Higher sales, govt R&D & CapEx support
	Fleet Operators	Bulk savings, tax benefits
	Used EV Buyers	Limited access, battery concerns
	Rural / Low-Income Buyers	Low awareness, poor infra, few 2W/3W subsidies

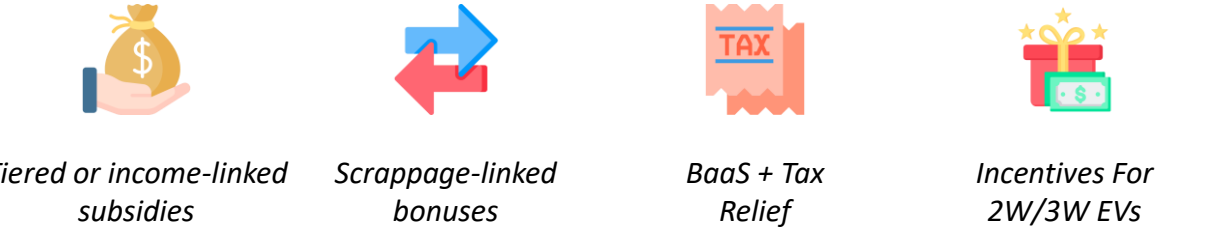
RETHINKING EV SUBSIDIES: FROM INCENTIVES TO IMPACT

Exploring how EV subsidies are evolving, examining the risks of over-reliance, and identifying smarter policy designs that enhance effectiveness, promote fairness, and support long-term sustainable growth in the EV market.

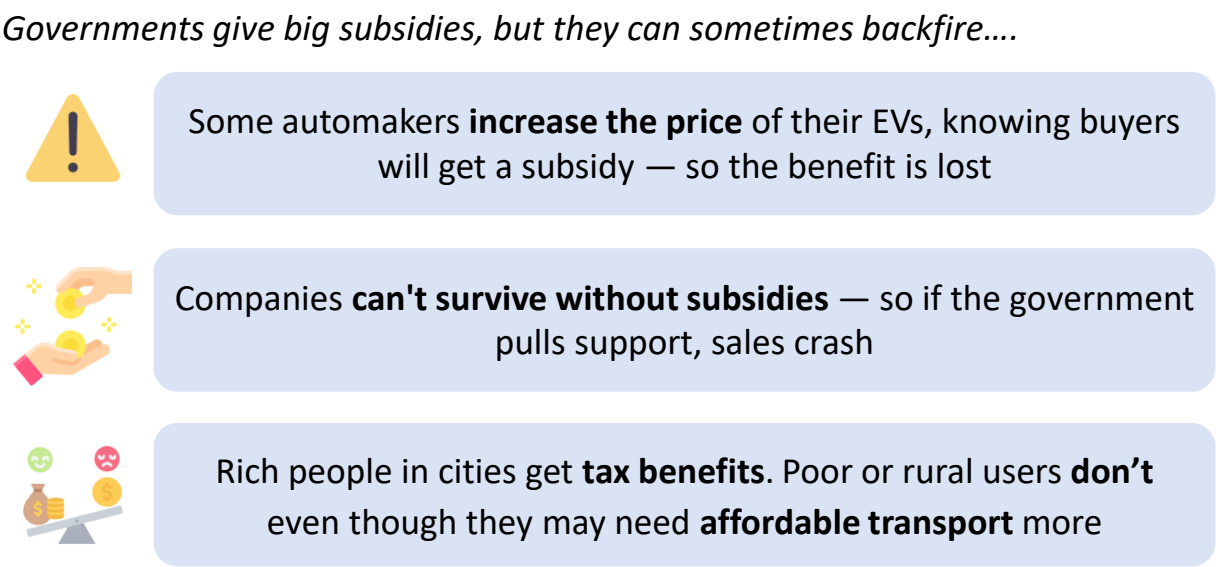
EV SUBSIDY SCHEMES IN INDIA



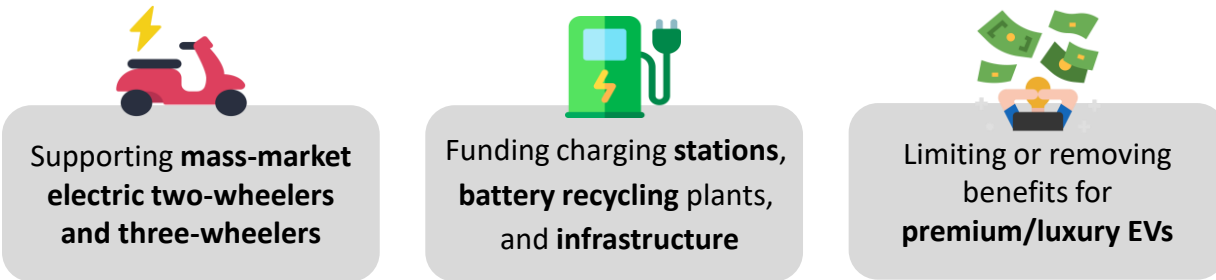
SMARTER WAYS TO OFFER EV BENEFITS



RISKS IN THE CURRENT SYSTEM



CHANGING SUBSIDY TRENDS



CASE STUDY

MG Windsor



MG WINDSOR IS REVOLUTIONIZING EV OWNERSHIP WITH BaaS

MG Windsor debuts a first-of-its-kind BaaS model in India, separating the EV's ₹9.99 lakh ex-showroom price from the battery. Owners lease the battery at ₹3.5/km with a 1,500 km/month plan (₹5,250), lowering upfront costs and enhancing flexibility. The model offers a lifetime battery warranty for first owners

KEY COMPONENTS OF BaaS



Subscription-Based Battery Packs
Users **subscribe to battery packs** based on monthly usage (e.g., ₹5,250 for 1,500 km), offering predictable expenses and scalability



Battery Leasing
Battery **rented at ₹3.5/km instead of being purchased**, Removes large capital expense, shifting to a usage-based model



Fast Charging or Swapping
Batteries can be quickly swapped or charged at BaaS network stations, reducing downtime and enhancing convenience



Limited Warranty Transferability
While first owners enjoy **unlimited warranty**, second owners get only **8 year limited battery warranty** pro-rated from initial sale date

IMPORTANCE OF BaaS



Lower Upfront Cost

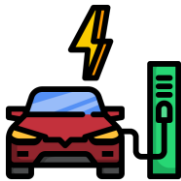


Flexibility in Ownership



Better Battery Life Cycle

FUTURE IMPLICATIONS



Promotes EV Adoption







Lower Entry Cost + *Convenient Battery Rental Model* = *Increased EV Affordability And Adoption*



Aligns with **average city travel (1,500 km/month)**, promoting practical, affordable, and sustainable electric commuting

MG WINDSOR EV VS MARUTI GRAND VITARA

Contrasting the pricing, range, fuel/charge economics, and running costs of an electric SUV and a petrol-powered SUV. This comparison reveals how EV and ICE models cater to different usage priorities and cost dynamics






BASIS		MG WINDSOR EV (EXCITE)	MARUTI GRANDA VITARA (SIGMA)
	Price	₹9.99 lakh ex-showroom, offering lower upfront cost for an EV	₹10.99 lakh ex-showroom, slightly higher due to traditional ICE setup
	Charge Cost	₹380 per full charge (38 kWh), extremely cost-effective for city usage	₹4,500 per full tank (45 litres petrol), reflecting higher recurring fuel expense
	Mileage	331 km claimed, suitable for urban and short intercity runs	872 km (19.38 kmpl × 45L), ideal for long highway drives
	BaaS Cost	₹3.50/km, applicable under battery subscription models	Nil, as there is no separate battery subscription model
	Running cost/Km	₹4.64/km, more economical over shorter distances	₹5.16/km, slightly costlier in ongoing usage
	Target Segment	Eco-conscious urban commuters seeking sustainability and low running cost	Traditional users prioritizing range, fuel familiarity, and long-distance comfort
Maintenance and other factors		EVs: No engine oil or gear oil change needed; lower service costs	ICE Vehicles: Require regular oil changes and servicing

Note: Road tax, registration, and insurance not included in calculations (EVs often get waivers)

Source: [Business Today](#)

MG WINDSOR EV vs TATA NEXON EV

Both vehicles are fully electric, yet they differ in pricing structure, battery management model, and long-term running costs. These differences significantly influence the overall value proposition for buyers

BASIS		MG WINDSOR EV (Excite)	TATA NEXON EV (Creative +)
	Price	Rs 9.99 lakh - Offers a lower upfront investment, ideal for budget-conscious buyers	Rs 12.49 lakh - Higher purchase cost, but includes key features like BaaS for long-term savings
	Charge Cost	Rs 380 per full charge (38 kWh) – Slightly higher due to larger battery capacity	Rs 300 per full charge (30 kWh) - More economical per charge due to smaller battery
	Mileage	Claimed range of 331 km per full charge – Suitable for daily commutes and occasional long drives	Claimed range of 325 km per full charge – Comparable to MG, offering similar travel efficiency
	BaaS Cost	Rs 3.50/km - Battery-as-a-service is billed separately, adding to running costs	Included in vehicle price - No additional BaaS charges, making it simpler for the owner.
	Running cost/Km	Rs 4.64/km - Higher running cost mainly due to separate battery rental	Rs 0.92/km - Much more economical in the long run, thanks to integrated BaaS

Breakeven Analysis

- ✓ A MG Windsor EV owner would need to drive **53,879 kilometers** to match the overall ownership cost of a Tata Nexon EV
- ✓ **Insight:** Although the MG Windsor offers a cheaper entry point, the **Tata Nexon EV proves more cost-effective** over extended use due to its lower per-kilometer running cost and included battery service





THANK YOU

