



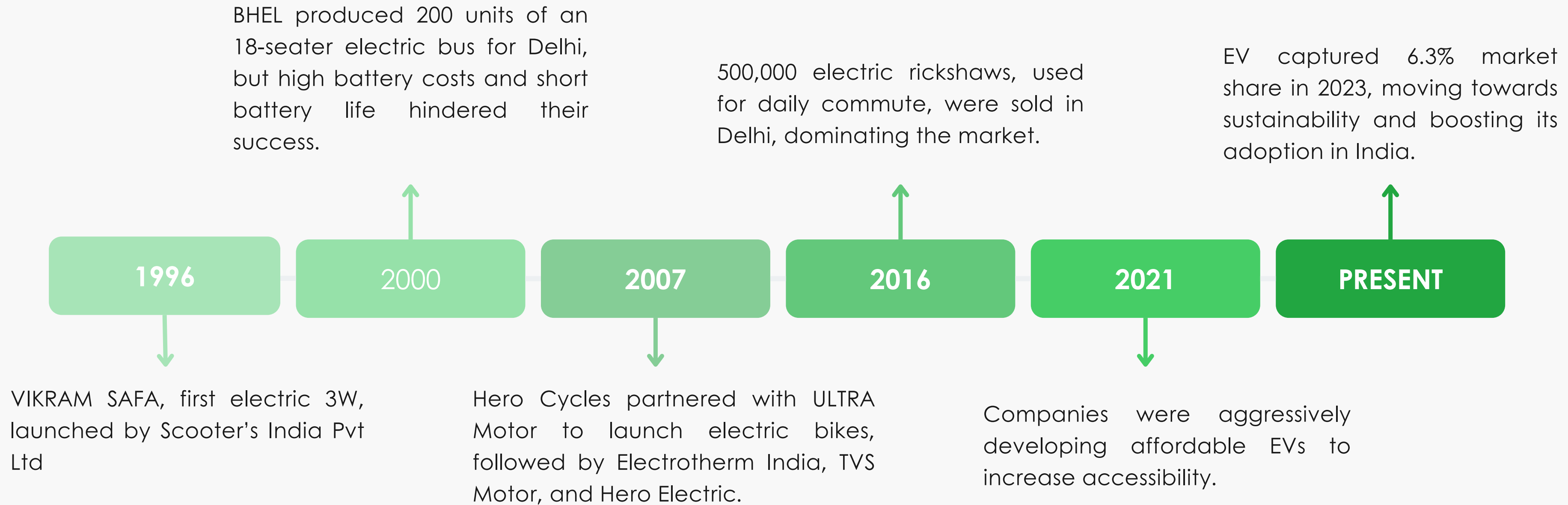
basic roots
consulting

MAKING BUSINESSES
BETTER

BRC BYTES

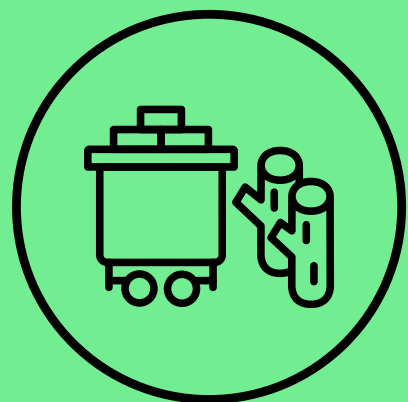
Navigating The Road Ahead: An In-Depth Analysis of The Indian Electric Vehicle Supply Chain

The Evolution of Electric Vehicles in India



EV Supply Chain

UPSTREAM



Raw Material Extraction



Processing and Purification

MIDSTREAM



Battery Manufacturing



Assembling BMS



Powertrain Production

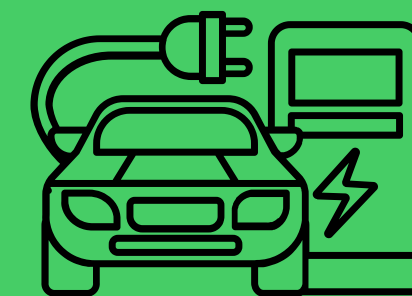


Vehicle Assembly

DOWNSTREAM



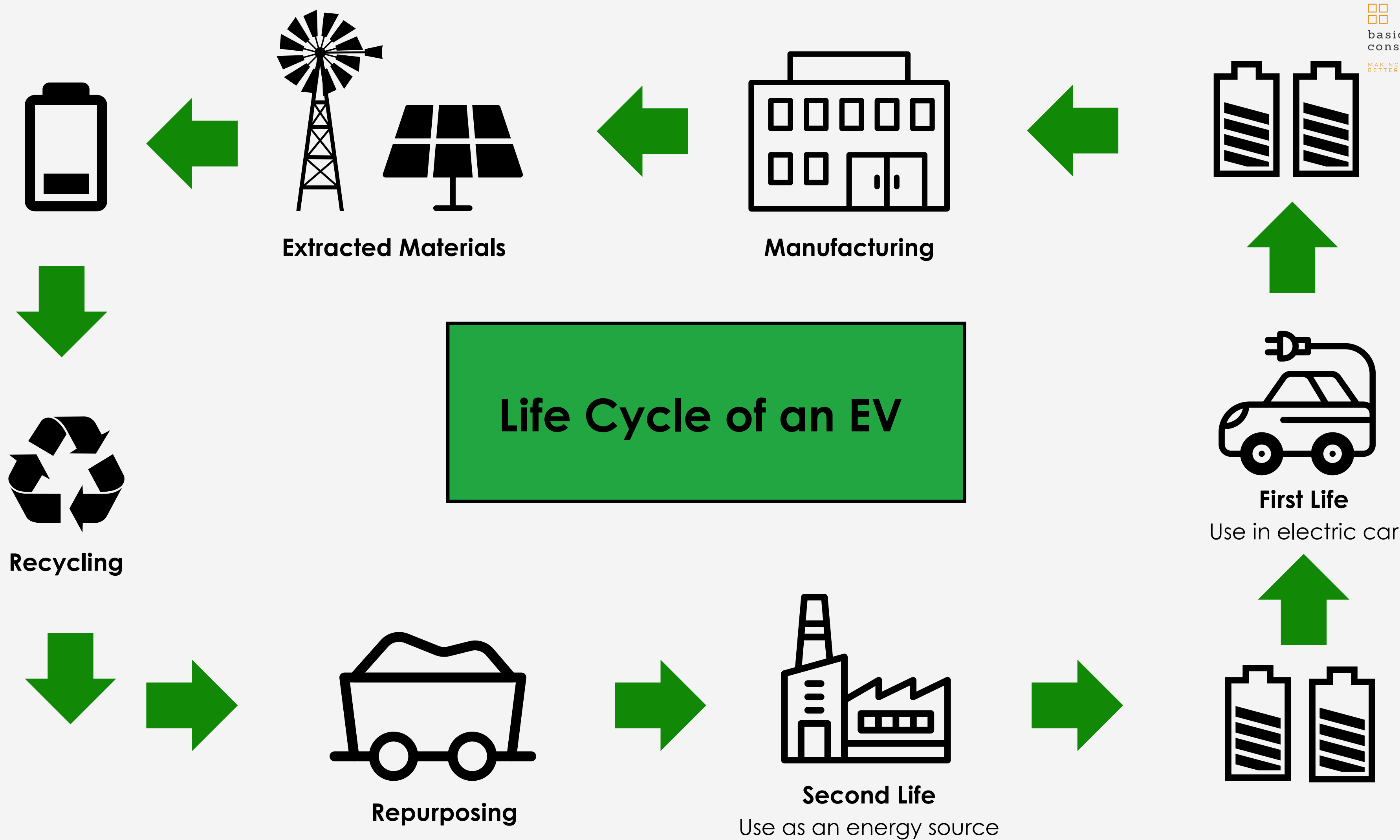
Distribution and Sales



Charging Infrastructure



After-Sales Services



Life Cycle of an EV

Extracted Materials

Manufacturing

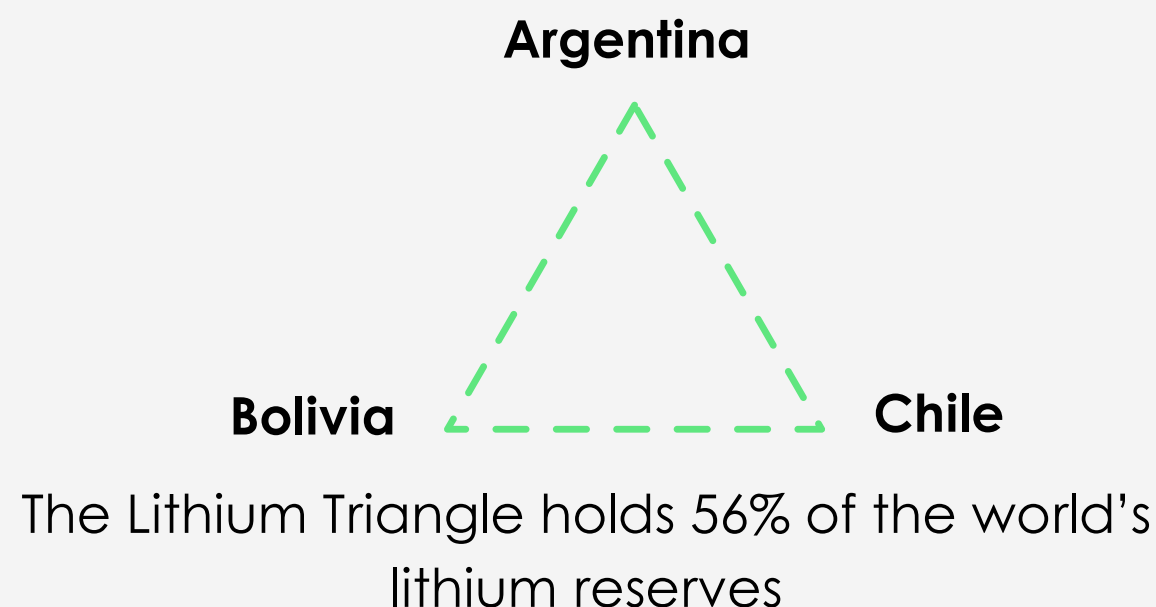
First Life
Use in electric car

Second Life
Use as an energy source

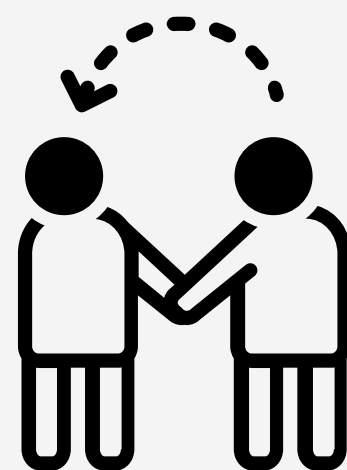
Repurposing

Recycling

The Localisation Problem



Despite small reserves, China controls lithium operations abroad, including in the Lithium Triangle, and dominates the electric car industry, producing three-quarters of global lithium-ion batteries.



India is largely dependent on China for its Lithium needs but pushing for localization.

Solution

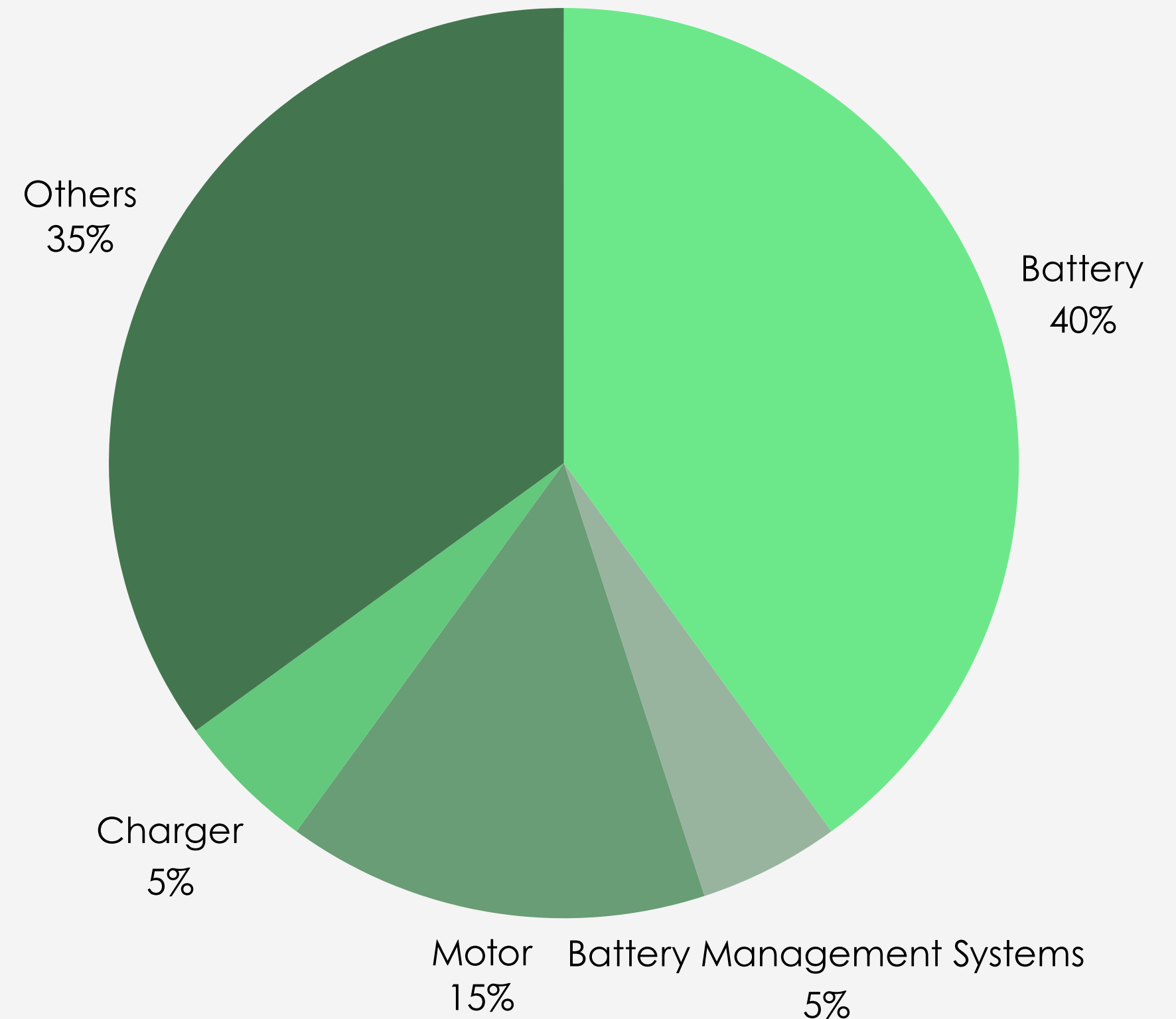
- 1 Newly discovered Lithium reserves**

Lithium reserves found in Degana, Rajasthan along with approx. 5.9 million tonnes of Lithium found in Jammu & Kashmir should help reduce India's dependency on imports.
- 2 Power of recycling Lithium batteries**

Battery recycling can meet up to 60% of market demand, especially for lithium-ion batteries, which significantly reduces energy consumption.

Cost Breakdown of EV Components

- The high-voltage battery, comprising 40% of an EV's cost, provides energy to the motor and is located on the floor or in the boot.
- The electric motor, 15% of an EV's cost, converts electrical to mechanical energy. EVs use automatic transmission (direct drive), reducing transmission fluid needs and power loss.
- BMS comprises 5% of the total cost, it safeguards the battery by monitoring cell health and preventing damage or fire.
- Other components include interiors, chassis, exterior, and powertrain. Unlike ICE vehicles, EV powertrains are simpler, comprising battery packs, charging ports, and drivetrain units.



Challenges to Widespread EV Adoption in India

Charging Infrastructure

A major hurdle is the slow development of charging infrastructure, deterred by uncertain utilization rates, high costs, and increased load on DISCOMs. The low number of EVs also hampers operators' returns.



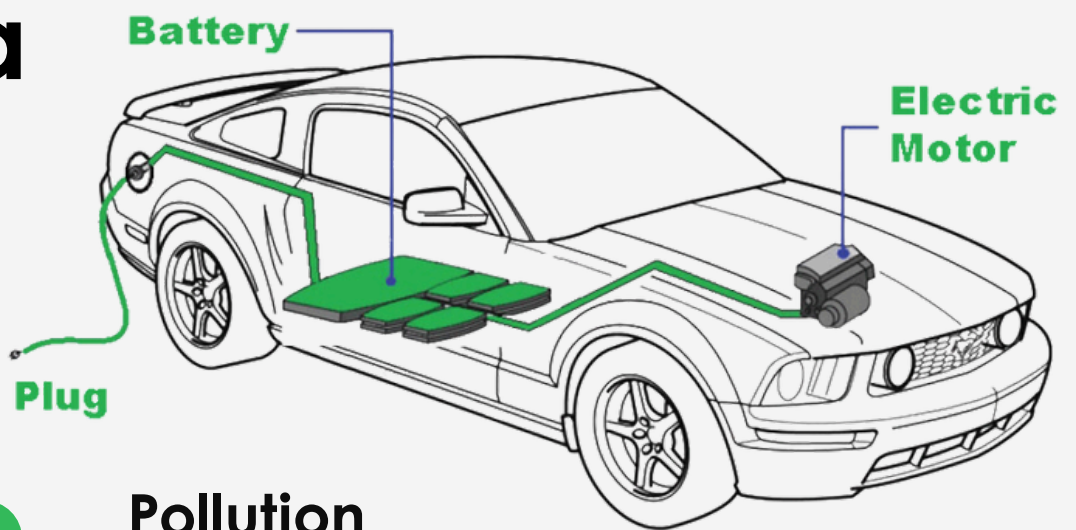
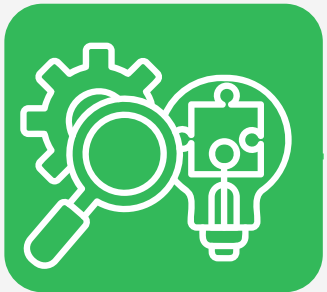
Batteries Used in EVS

India lacks metals like lithium, magnesium, cobalt, and nickel which are needed in lithium-ion batteries and therefore has to rely on costly imports.



Research and Development

Manufacturers rely on foreign technology for costly lithium-ion battery cells. Significant research is needed to develop affordable, efficient EV components for wider adoption.



Pollution

Fossil fuel-based charging and the environmental impact of lithium-ion battery production and disposal, including limited recycling and potential soil and air contamination, pose significant concerns.



Consumer Attitude

Cost effectiveness is crucial for Indian consumers. Despite government incentives, inadequate charging infrastructure and high battery replacement costs deter buyers. Limited marketing and awareness also reduce EVs' appeal comparatively.



Key Growth Drivers of The EV Industry

EV Technology Advancements

Improvements in battery life, range, charging infrastructure, and added features have boosted confidence in EVs as a primary mode of transportation.

Environmental Concerns

Rising air pollution in Indian cities fuels the shift to EVs as their lower emissions contribute to cleaner, healthier urban environments.

Major Growth Drivers

Rising Fuel Costs

Soaring fuel prices have increased demand for EVs in India as they are more affordable and have lower operating costs.

Reduced Operating Costs

EVs cut costs by eliminating fuel expenses and lower maintenance, making them ideal for city commuters seeking convenience and affordability.

Government Incentives

Government incentives like discounts, tax breaks, and rebates, along with programs like FAME, have made EVs more affordable in India.

Global Sustainable Mobility Trends

India sees a surge in electric scooters and bikes as eco-conscious consumers prioritize a cleaner future.

Government Initiatives

1

FAME II

Launched in April 2019 to promote electric and hybrid vehicles through subsidies, development of charging infrastructure, and support for local manufacturing and R&D.

2

PLI Scheme

Production-Linked Incentive (PLI) scheme for the Auto and Auto Component, and the PLI scheme for manufacturing advanced chemistry cell (ACC) batteries have proved instrumental in fostering local production and boosting EV adoption

3

Taxes & Duties

The Centre will allow automakers to import up to 8,000 EVs priced at \$35,000 or higher annually at a reduced import duty of 15%, down from 70%, if they invest at least \$500 million in India over the next three years

4

Phased Manufacturing

To promote domestic EV manufacturing, the government has proposed a phased roadmap imposing a 15% customs duty on EV parts like chargers, motors, energy monitors, brake systems, compressors, and power control units, effective from April 2021.

5

No License

The Ministry of Power clarified that no license is needed to operate EV charging stations in India, as they are considered a service, not the sale of electricity.

6

Public- Private Partnership

Since 2020, India has partnered with private firms to establish numerous EV charging stations nationwide. Private companies contributed financing and expertise, while the government offered regulatory and policy support.

The Indian government aims for 30% EV sales in private cars, 70% in commercial vehicles, 40% in buses, and 80% in two- and three-wheelers by 2030. On March 15, 2024, it approved a \$500 million EV policy with incentives to attract global investments and position India as a leading EV manufacturing hub.

Opportunities and Innovation

Evergrowing Opportunities: B2B Sector

	2W	3W, LCVs
 Online Food Delivery	✓	
 Online Grocery Delivery	✓	✓
 Ecommerce logistics & Courier	✓	✓
 Distribution	✓	✓
 Last Mile Transportation	✓	✓
 Municipal Solid Waste Management		✓

The Birth of Various Innovative Business Models

Vehicle subscription/leasing model

This model sells vehicles on a monthly rental basis with no upfront cost, aiming to reduce expenses for customers. OEMs provide maintenance, insurance, and cover battery issues, addressing reliability concerns.

Battery subscription/leasing model

In this model, vehicles are sold without batteries, which are available through a monthly subscription or lease. This reduces upfront costs and addresses battery reliability concerns.

Charging-as-a-Service

OEMs have created charging networks to reduce range anxiety, offering subscription or pay-per-use options. The government supports this with subsidized EV charging rates.

Sale of vehicle without battery

The government allows the sale of electric 2&3Ws without pre-fitted batteries to reduce upfront costs and enhance affordability.

Battery swapping model

Customer has an option to swap the drained battery with a charged battery for a fixed fee. This model primarily addresses concerns on battery charging time and reliability.

Emerging Trends in the EV Market

Fuel Cell Vehicles

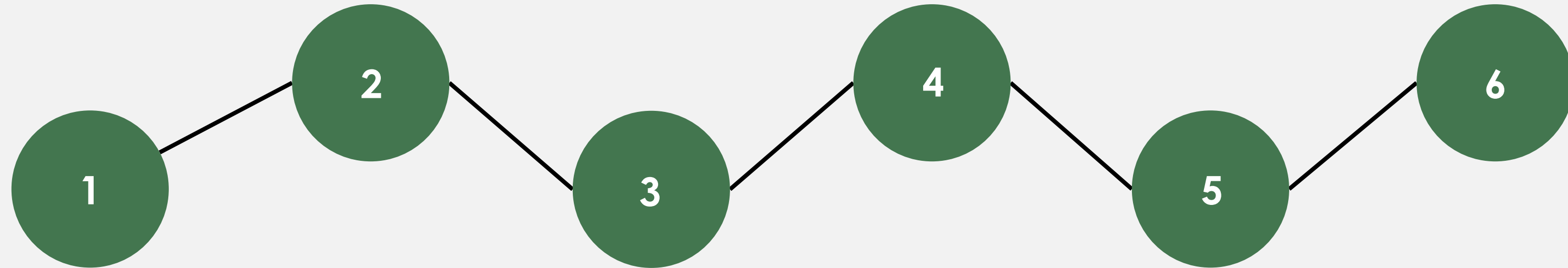
Significant research is underway aiming to commercialize hydrogen fuel cells as they emit only water and warm air.

Smart Grids

Smart grids enhance EV charging and load balancing with bi-directional charging and V2G technology returning unused energy to the grid.

Regenerative Braking

Regenerative braking captures kinetic energy during braking and reuses it, optimizing energy usage and addressing range anxiety.



Advanced Driver Assistance Systems

ADAS uses sensors to monitor surroundings, offering real-time safety tips like emergency braking and drowsiness detection for driver safety.

AI Powered Vehicle Health Checks

AI systems enhance EV safety and performance by analyzing sensor data for anomalies, enabling proactive maintenance and preventing costly repairs.

Sustainable material disposal

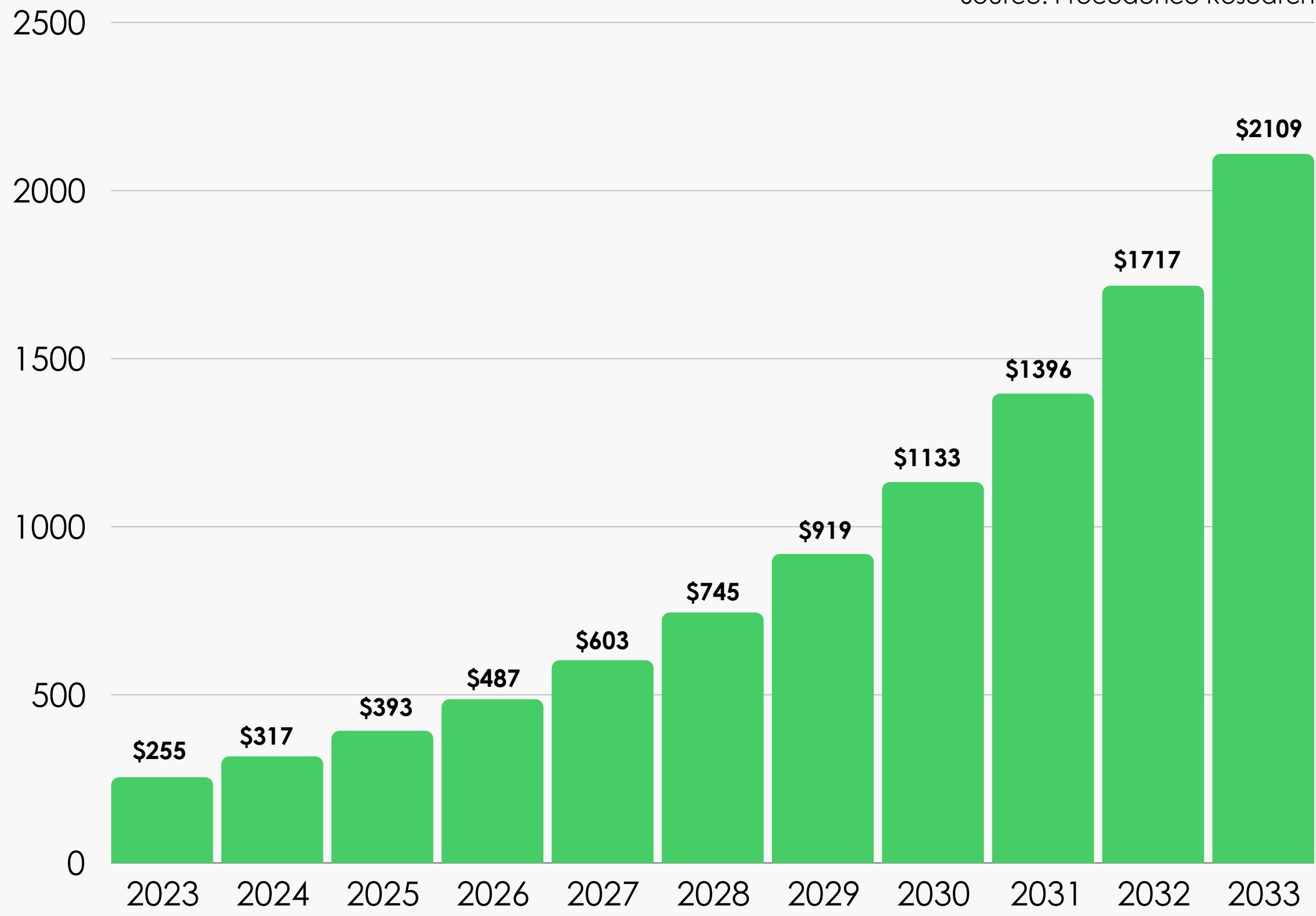
Grants and targets push automakers to use recycled batteries as they have a four times lower carbon footprint and 100 million EV batteries are to be retired in the next decade.

Source: Precedence Research

Global Market Size

The global electric vehicle market size reached USD 255.54 billion in 2023 and is projected to hit around USD 2,108.80 billion by 2033 with a notable CAGR of 23% from 2024 to 2033.

Nearly one in five cars sold in 2023 was electric. Electric car sales neared 14 million in 2023, 95% of which were in China, Europe and the United States

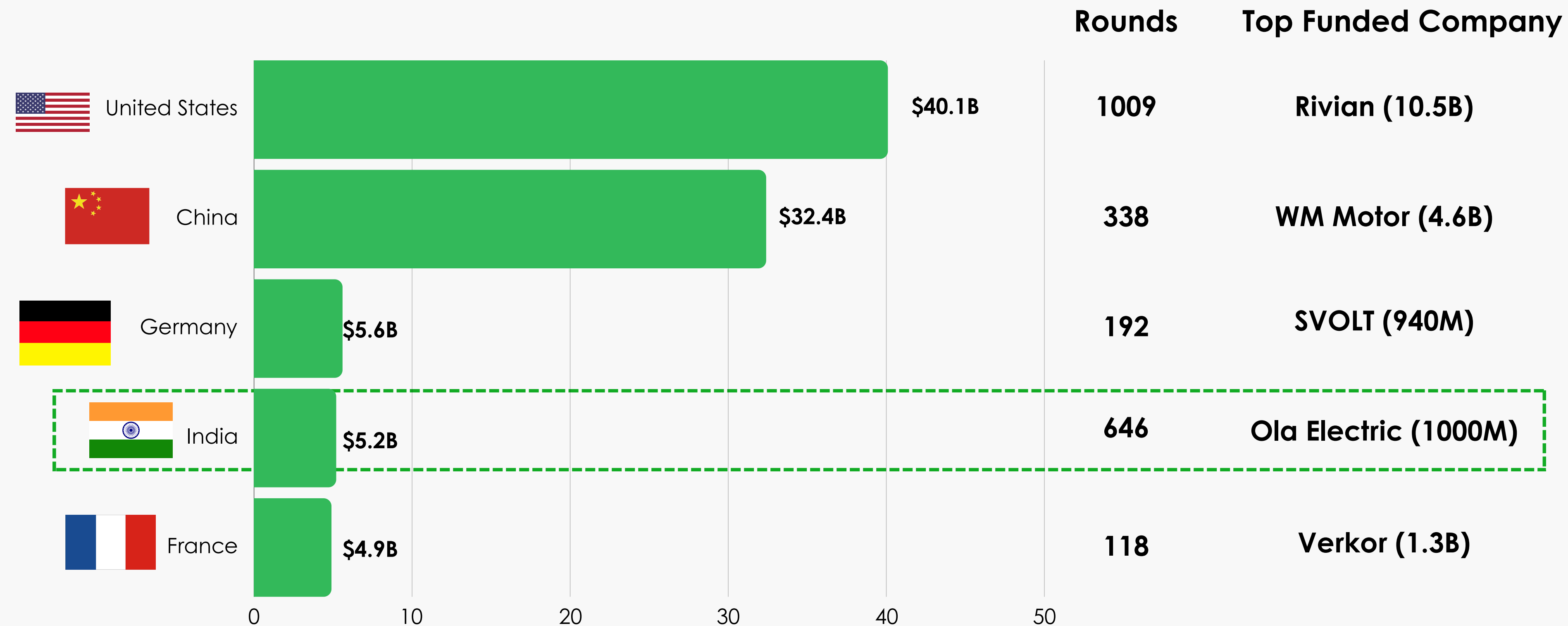


Electric Vehicle Market Size 2023-2033 (USD Billion)

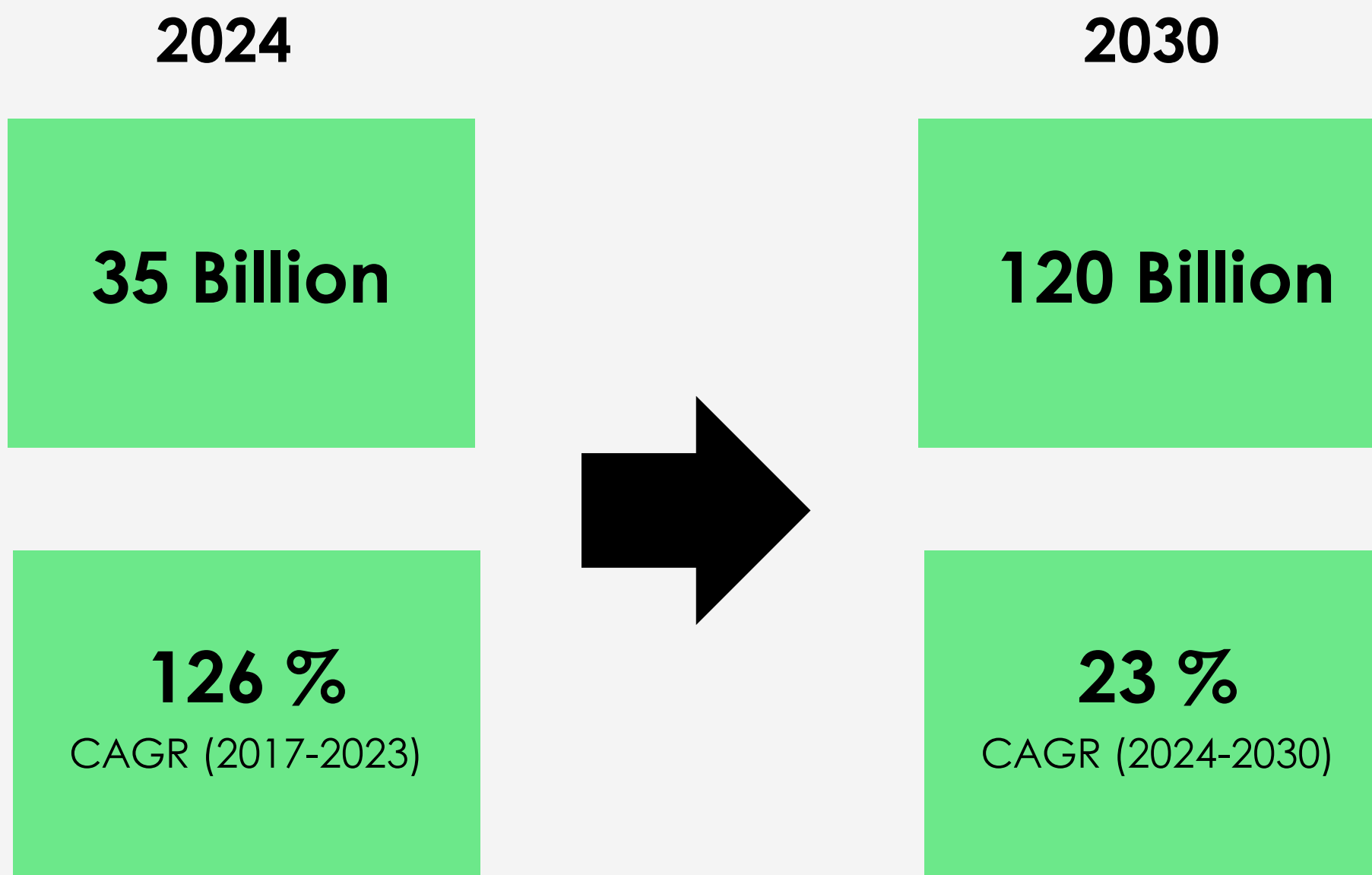
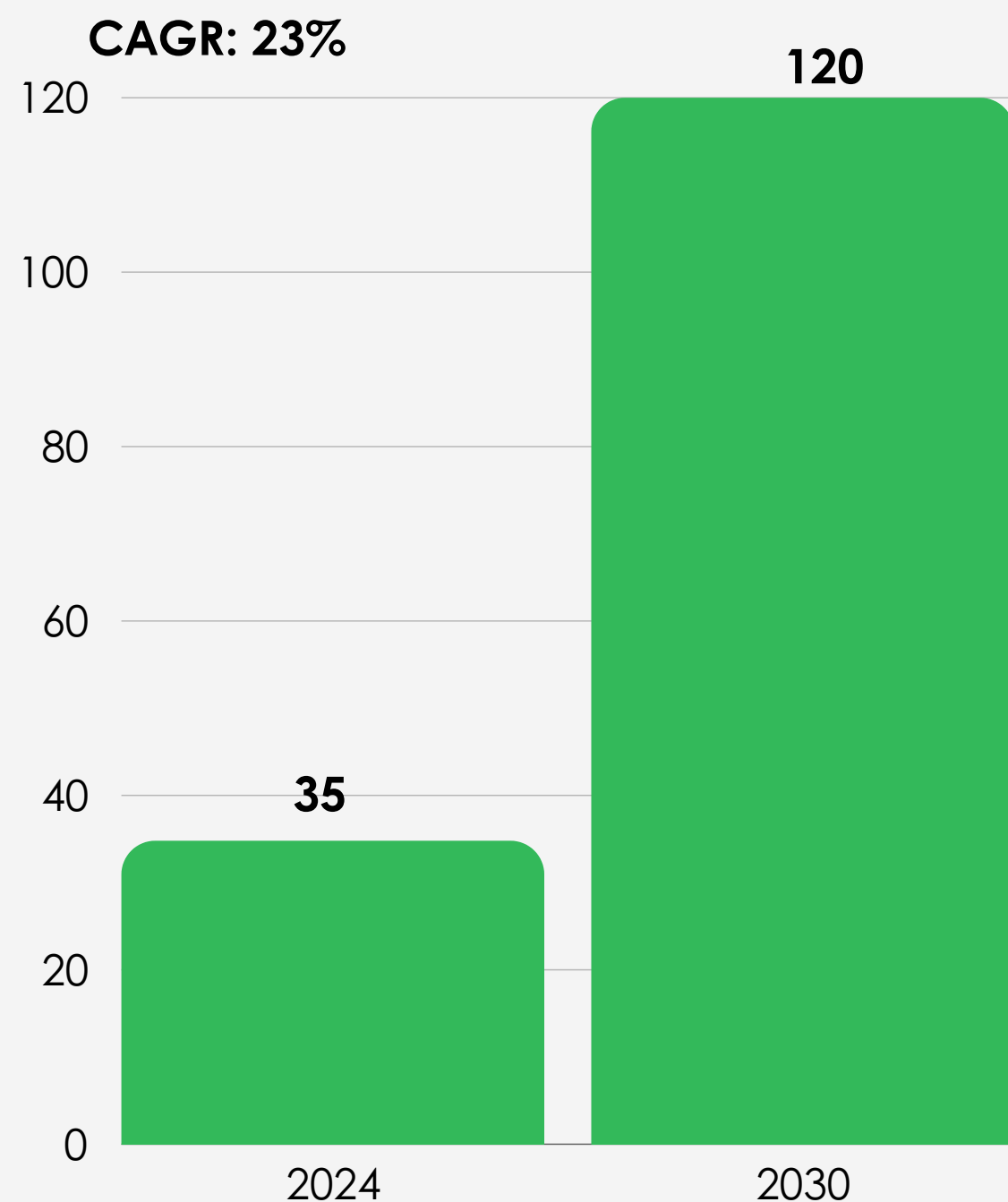
Electric cars accounted for around 18% of all cars sold in 2023, up from 14% in 2022 and only 2% 5 years earlier, in 2018. These trends indicate that growth remains robust as electric car markets mature.

India's Positioning in The Global Market

India comes under the top 5 most funded countries.



Indian Market Size and Growth




Largest Segment by Fuel Category

98%

Value Share, BEV, 2023

Battery Electric Vehicles dominate India's EV market. BEVs have rechargeable batteries and no gasoline engine.

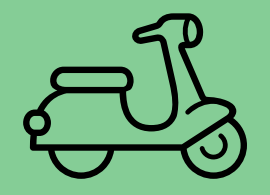


Largest Segment by Vehicle Type

89%

Value Share, Two-Wheelers, 2023

Two-Wheelers dominate the market due to their affordability, convenience in congestion and low operating costs.



Major Players

Two-Wheelers



Ola Electric Mobility

Okinawa Autotech

Hero Electric

Ampere Vehicle

Ather Energy

Three-Wheelers



Mahindra Electric

Piaggio Vehicles

Euler Motors

Atul Auto

Lohia Auto

Four-Wheelers



Tata Motors

MG Motor India

Mahindra Electric

Hyundai India

BYD India

The Ministry of Skill Development and Entrepreneurship predicts the EV industry could generate 1 crore direct jobs and 5 crore indirect jobs by 2030.

Investments: \$6B (2021) → \$20B (2030)
PE/VC Investments: \$181M → \$1,718M
(849% growth annually)

Midstream Suppliers

Battery Manufacturers



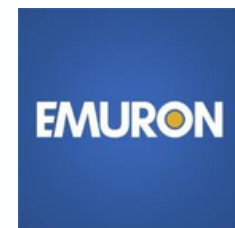
Motor Manufacturers



Fleet Operators



Battery Management Systems



Charging Infrastructure Providers

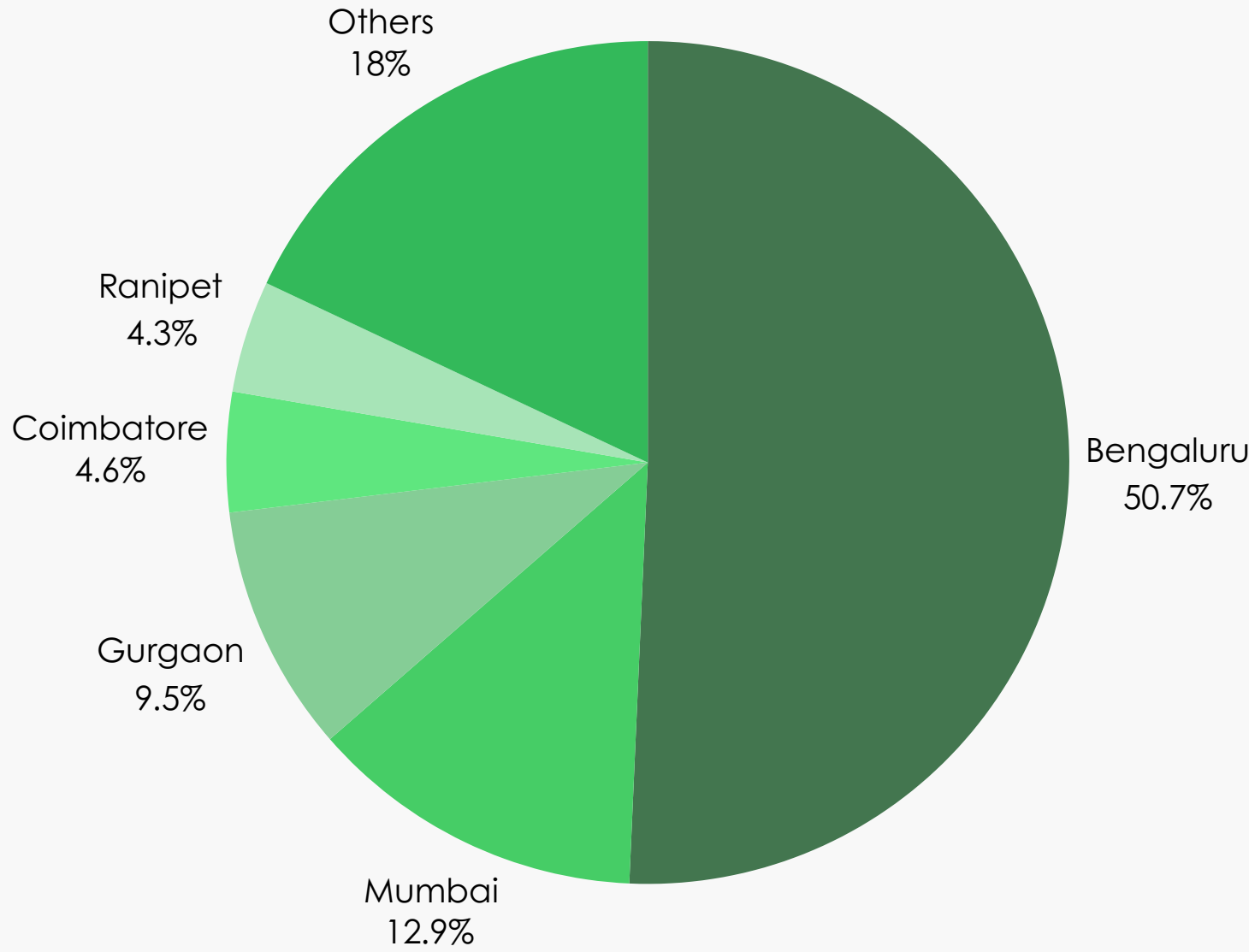


Investment Climate



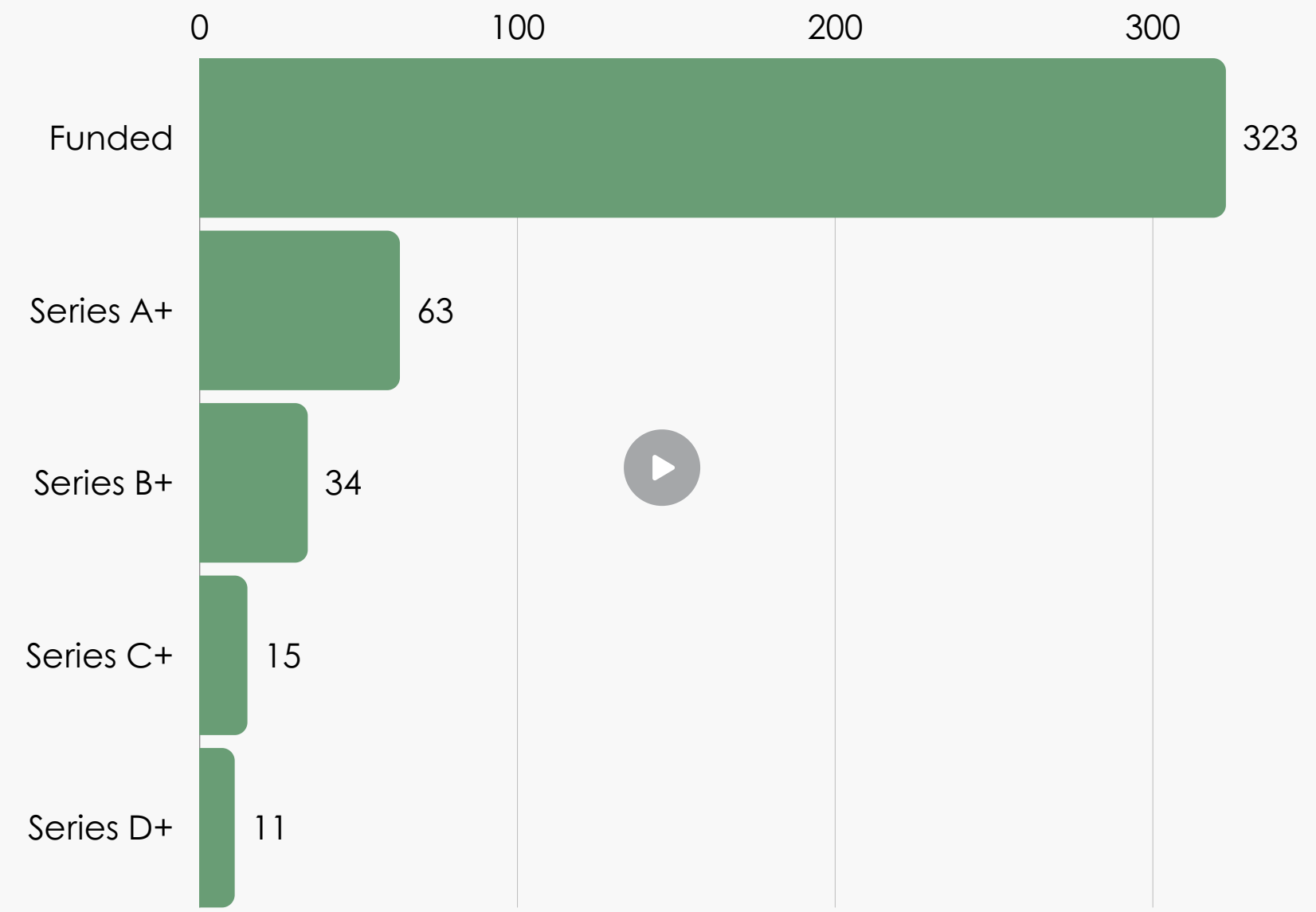
\$5.2B
Total Funding

Funding by cities



1,297
Total Companies

Funding Funnel

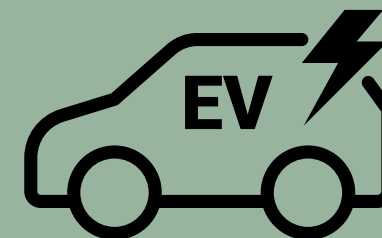


Where are VCs Looking to Invest?



Battery Technology

With the high cost and critical importance of batteries, innovations in battery technology, including efficiency improvements and recycling processes, are attracting substantial investments.



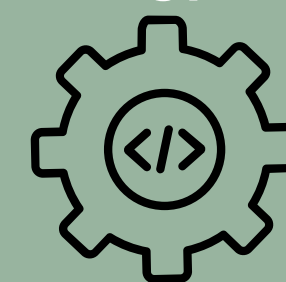
EV Manufacturers (OEMs)

A significant portion of investments (90% in the first 10 months of CY2022) is directed towards pureplay EV manufacturers like Ola Electric and Ather Energy. This sector attracts large investments due to its potential for mass-market penetration and growth

Growing interest in specialized financing solutions that support the EV ecosystem. This includes leasing options, subscription models, and other financial products that lower the barrier to entry for consumers and businesses looking to switch to electric vehicles








Specialized Financing



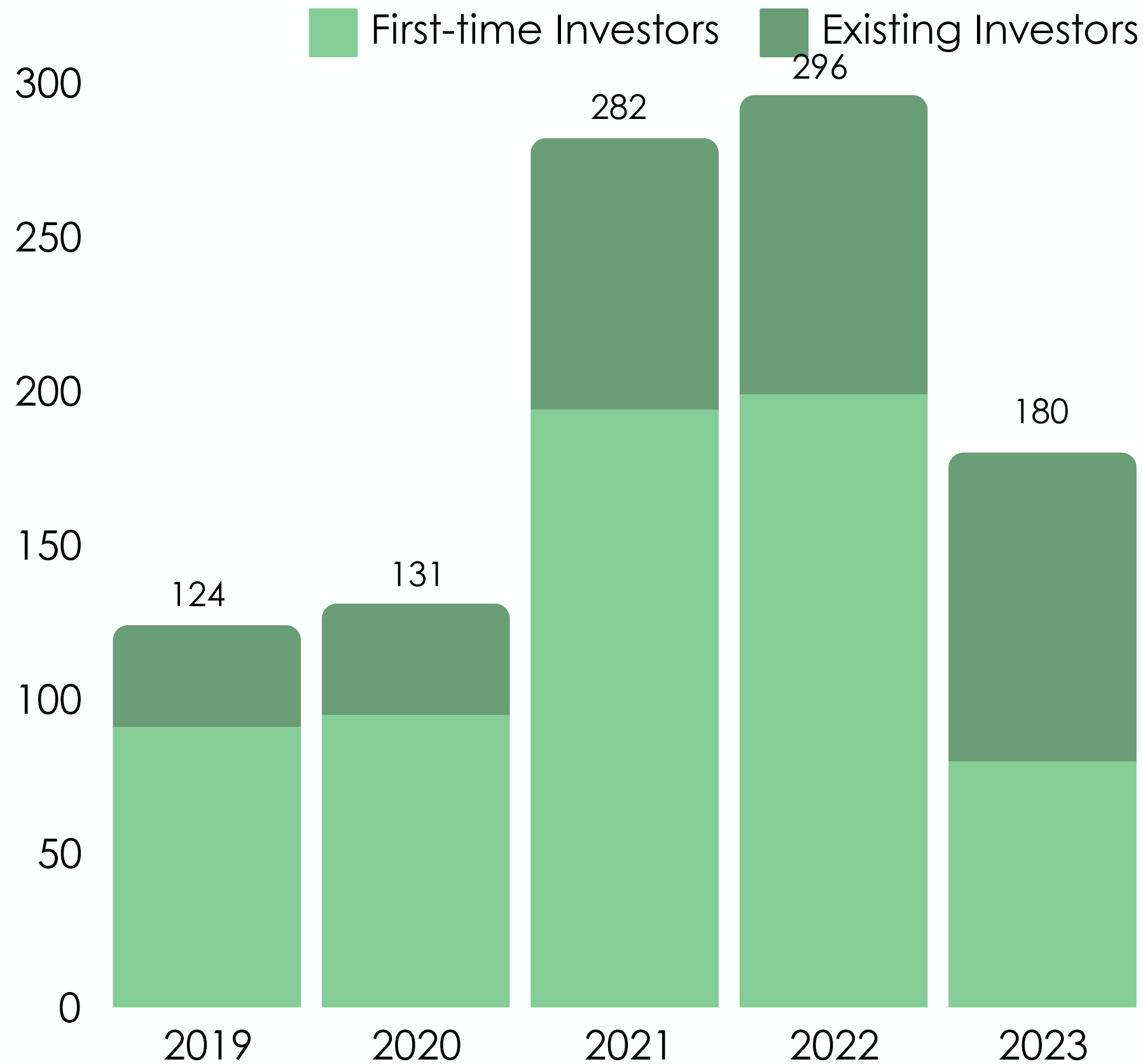
Software and Connectivity Solutions

VCs are investing in telematics for real-time vehicle data, fleet management software to optimize logistics and cut costs, and smart charging solutions for efficient energy use and grid integration. IoT technology enhances communication between EVs, charging stations, and infrastructure, improving navigation, energy management, and safety.

Top Funding Rounds

Organisation	Funds Raised	Round	Investors
 Tata Passenger	\$496M	Series D	The Rise Fund
 Ampere Vehicles	\$220M	Series B	Abdul Latif Jameel
 TI Clean Mobility	\$145M	Series D	SBI, Multiple Asset Management
 Mahindra Electric	\$145M	PE	Temasek
 Ola Electric	\$140M	Series E	Temasek, DIG Investment, etc.

Y-o-Y Active Investors



Most Active Investors






VC - Seed

VC - Early Stage

PE

Accelerators & Incubators

Most Actively Investing in The Indian EV Industry

Organisation	Overall Investments	Investments in EV	Notable Investments
 Blume	257	6	Yulu (\$125M), Euler Motors (\$106M), Battery Smart (\$74.0M)
 Tiger Global Management	771	3	Ola Electric (\$1000M), Ather Energy (\$445M), Battery Smart (\$74.0M)
 Anicut Capital	110	4	Log9 Materials (\$89.7M), Zypp Electric (\$37.5M), Echargeup (\$9.6M)
 Venture Catalysts	321	9	BluSmart (\$118M), Charge Zone (\$71.2M), Zypp Electric (\$37.5M)
 We Founder Circle	153	7	BluSmart (\$118M), Zypp Electric (\$37.5M), Oben Electric (\$11.9M)

Predictions for EV Penetration in India

The creation of an ecosystem is essential to success.



Recipe for Success



2W & 3Ws will be the pioneers of the EV penetration. Whereas, buses will be dependent on state undertakings and 4Ws will fall behind and follow slower adoption.

Supportive government policies

Innovation and Technology

Reduced dependancy on imports

Consumer preferences

Substantial PE/VC investments

High petrol, diesel & CNG prices

Improving cost competitiveness