

ELECTRIC MOBILITY AND JUST TRANSITION IN INDIA



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ABBREVIATIONS



BEV:	Battery electric vehicle
CO₂:	Carbon dioxide
EESL:	Energy Efficiency Services Limited
e-AMRIT:	Accelerated e-Mobility Revolution for India's Transportation
E2W:	Electric Two-Wheeler
E3W:	Electric Three-Wheeler
E3W P:	Electric Three-Wheeler Passenger
E4W:	Electric Four-Wheeler
E-Bus:	Electric Bus
E-mobility:	Electric mobility
EV:	Electric vehicle
FAME:	Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles
FY:	Financial year
GDP:	Gross Domestic Product
GHGs:	Greenhouse gases
GST:	Goods and services
HDV:	Heavy-duty vehicle
HEV:	Hybrid Electric Vehicle
HFTs:	Heavy freight trucks
ICE:	Internal Combustion Engine
IEA:	International Energy Agency
NBEM:	National Board for Electric Mobility
NCEM:	National Council for Electric Mobility
NEMMP:	National Electric Mobility Mission Plan
OEM:	Original equipment manufacturers
PHEV:	Plug-in hybrid electric vehicle
PLI:	Production-Linked Incentive
PM_{2.5}:	Fine particulate matter size 2.5
R&D:	Research and development
TPEM:	Technology Platform for Electric Mobility
UK:	United Kingdom
US:	United States

EXECUTIVE SUMMARY

The Indian electric mobility industry is expanding slowly but significantly. Switching from conventional internal combustion engine vehicles to electric vehicles is gaining momentum with the aim of setting the path for a world with fewer fossil fuels. India has adopted several initiatives to accelerate this paradigm shift to accomplish its net-zero emission goal by 2070. It is imperative to understand that the transformation is not merely technological but also a social revolution that implies a just transition approach.

Making the transition to EVs in India has an array of obstacles, including a lack of understanding, affordability issues, and potential job losses in the automotive sector. Considering such barriers, it is readily apparent that the socioeconomic consequences of the mobility transition have to be addressed accordingly. Integrating social justice, equity, and inclusivity

into the transition process will assist in creating a sustainable and equitable future that ensures everyone enjoys the upsides of electric mobility and leaves no one behind.

This report explores the transition in the road transport sector, including passenger and freight transportation. It probes into the point of intersection between electric mobility and the fair transition pathway, stressing the significance of social inclusion and justice in the transition process towards electric mobility. This report covers India's EV ecosystem and the challenges encountered in the transition to electric vehicles. It underscores the need for a transition pathway, worker skill development, stakeholder consultation, green jobs, and policy mandates to improve EV accessibility and cost. This work reveals an array of policy recommendations:

- 
- 1 Stimulate skill development to combat the challenge of job attrition.
 - 2 Promote the public's awareness of the pros and cons of electric mobility.
 - 3 Adopting appropriate strategies for expanding charging infrastructure is vital for fostering EV adoption in India.
 - 4 Making the policy formulation process more diverse.
 - 5 Recognise the rights, needs, values, perceptions, and customs of those impacted by transition dynamics.
 - 6 Involving all pertinent stakeholders in the policy-making process.
 - 7 Setting up a Just Transition fund specifically for electric mobility.
 - 8 Aid in creating green jobs to cope with the unemployment challenge triggered by the EV transition.

BACKGROUND

The automotive sector is accountable for around 24% of greenhouse gas emissions from the combustion of fossil fuels, making it one of the significant contributors to global emissions (Chaturvedi et al., 2022). In this share, the road transport sector (including both passenger and freight) has a share of about 74.5% of transport sector related GHG emissions (IEA, 2020).

Indian Prime Minister Shri Narendra Modi pledged to achieve net zero emissions by the year 2070 in 2021 at the climate change summit COP26 in Glasgow. Additionally, the entity has committed to minimizing the total expected amount of carbon emissions by one billion metric tons within the timeframe spanning from 2021 to 2030 (Deb & Kohli, 2022).

India is the third-largest vehicle market in the world and the third-largest emitter of greenhouse gases in the world (Carbon Brief, 2019). India, a nation with a population of almost 1.4 billion, faces the challenging task of growing mobility demands, which in turn results in a surge in energy demand for road transportation and corresponding CO₂ emissions (IEA, 2023). About 37 million people are directly or indirectly employed in the automotive

sector (PIB, 2023). Moreover, the transport sector is heavily dependent on fossil fuels, especially oil. Road transportation accounts for 85% of India's oil and gas demands. (Indian PSU, 2022). It has a substantial impact on urban air pollution (IEA, 2023). The road transport sector accounts for the majority of transport sector-related emissions (MoEFCC, 2021).

Electric mobility has emerged as a fundamental technological approach for mitigating carbon emissions in the transportation sector. The transition from ICE to electric vehicles will entail more than just technological innovations. As an ecosystem, the automotive industry is an extensive network of interconnected components that include technology, infrastructure, regulations, economics, and societal factors.

The intent of this concise report is to delve into and throw some light on the multitude of socioeconomic challenges encountered in the transition toward more sustainable transportation solutions. Moreover, it advocates a Just Transition Pathway that promotes equity and justice during the period of transition.



MOBILITY TRANSITION TO DECARBONIZING TRANSPORT SECTOR

Transportation is an indispensable component of modern urban life. The booming roadway segment contributes substantially to the country's socioeconomic growth. It is one of the world's fastest-growing industries. India has the world's fourth-largest automobile market (The Economic Times, 2018). This market is largely regulated by transport vehicles that are reliant on fossil fuels. Road transport is India's largest oil-consuming sector.

An upsurge in transportation requirements has led to a surge in automotive demand for energy, along with associated CO₂ emissions. Moreover, these emissions constitute a significant obstacle to decarbonizing India's energy sector. Therefore, the transportation sector in India needs to initiate the transition to electric mobility.

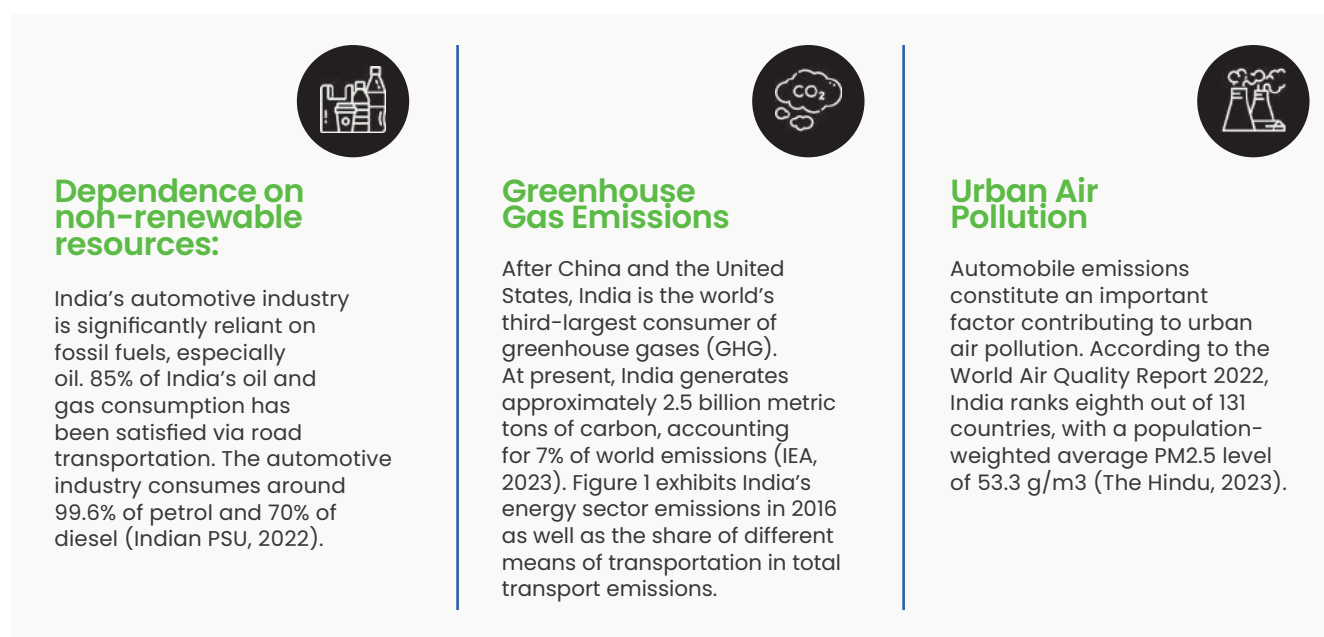
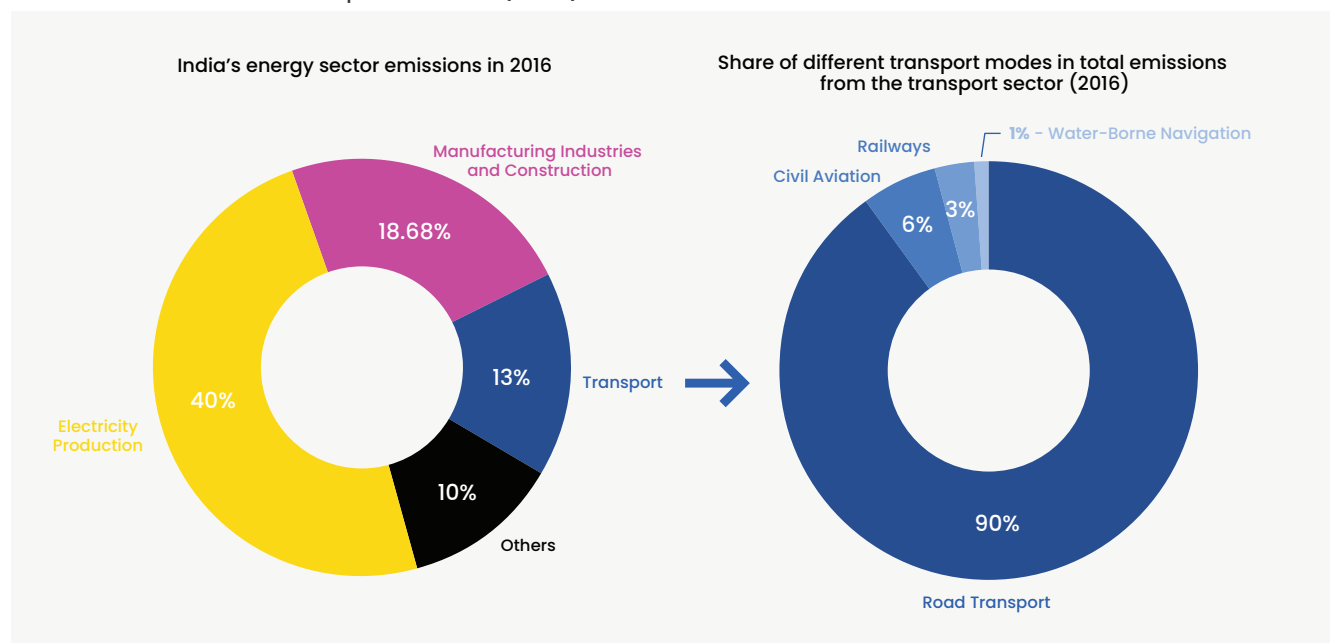


Figure 1: India's energy sector emissions in 2016 and share of different transport modes in total emissions from the Transport Sector (2016)



Source: MoEFCC, 2021

EV ECOSYSTEM IN INDIA



India has the 3rd largest automobile market in the world.

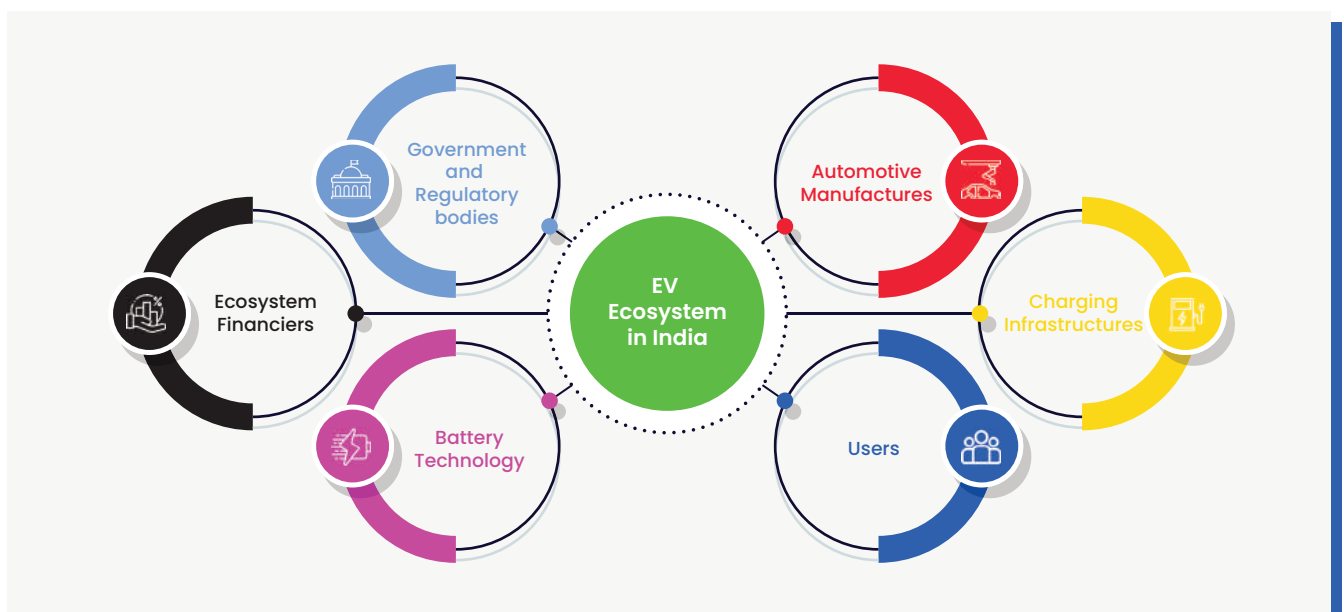
– The Financial Express (2022)

India's EV ecosystem seems to be in its earliest phases. It is a diversified and fast-evolving framework of interrelated components that support electric vehicle adoption, manufacturing, and use. This ecosystem comprises an array of stakeholders, technology, and infrastructure components, all of which contribute to a crucial part of the growth and sustainability of the e-mobility sector. The Indian EV ecosystem is comprised of six pertinent players: the government and regulatory bodies, manufacturers, financiers, component suppliers such as battery technology and charging infrastructure, and eventually consumers or users. All these important stakeholders are required to collaborate to come up with feasible solutions to the concerns of the EV transition. NITI Ayog, the Ministry of Road Transport and Highways, the Ministry of Heavy Industries and Public Enterprises, and others are proactive government bodies.

Automotive manufacturers established companies, and startups together possess substantial components in the EV ecosystem. These business entities develop, manufacture, and

commercialize electric vehicles and components. Automobile manufacturers comprise market participants such as Mahindra & Mahindra, Ashok Leyland, Bajaj Automotive, and others. Softbank Group, Hinduja Group, Asian Development Bank, and TATA Sons are exemplary ecosystem financiers (TFE Consulting, 2018). A comprehensive network of charging stations needs to be established to facilitate the widespread usage of EVs. Home chargers, office chargers, public charging stations, and fast charging networks are all components of the charging ecosystem. The EV ecosystem has been aided by advanced battery technologies. Although lithium-ion batteries are the most widespread kind used for EVs, ongoing research and development strives to improve battery capacity, durability, and charging speed. Battery technology advancements have an immediate effect on the range and performance of EVs. Additionally, suppliers of electric motors, batteries, and charging equipment are vital to the EV supply chain. Ultimately, consumers, which comprise individual customers, businesses, and public agencies, are inevitably the driving force underlying the EV ecosystem (Sonam et al, 2019).

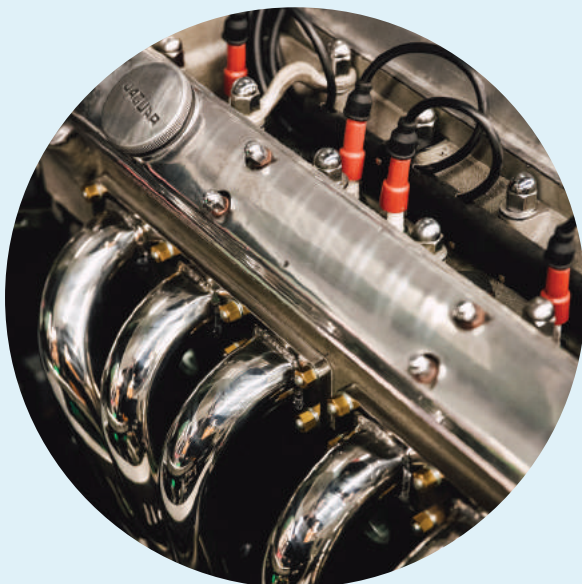
Figure 2: EV Ecosystem in India



Source: TFE Consulting, 2018

BOX 1

Difference between Internal Combustion Engine (ICE) Vehicle and Electric Vehicle (EV)



Internal Combustion Engine (ICE)

vs



Electric Vehicle (EV)

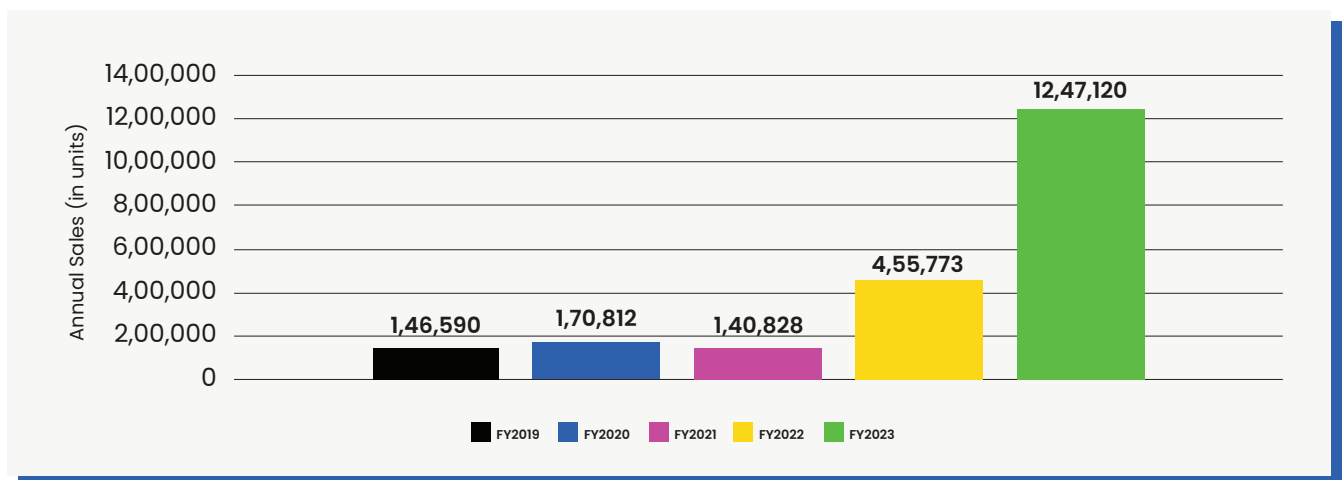
The automotive sector is going through a significant transition from conventional Internal Combustion Engine (ICE) vehicles to Electric vehicles (EVs). Both categories have their own set of advantages and drawbacks. ICE, as the name implies, leverages internal combustion to derive energy from fossil fuels. It generates power by consuming fossil fuels such as gasoline or diesel. Electric vehicles, on the other hand, use the electricity stored in battery packs to power the electric motor and propel the vehicle. A storage battery, drive motor, motor controller, power electronics converters, charge controllers, and a battery management system (BMS) are the core components of an EV. The powertrain Engine, Transmission, and Driveshaft are the three vital components of an ICE. Due to their limited energy storage capacity, EVs have lower driving ranges than engine-powered vehicles. ICE vehicles emit an array of pollutants,

including CO₂, whereas EVs release no tailpipe emissions, rendering them a more sustainable alternative. Due to their constrained energy storage capacity, EVs have a comparably lower range than ICE. To charge EVs, charging infrastructure is needed. EV charging times vary between 2 to 8 hours, while ICE vehicles need only a few minutes to restock fuel tanks. An EV's obtaining price is usually higher than that of an ICE vehicle. ICE, on the contrary, has higher operating costs than EVs. An ICE's engine efficiency is approximately 30%; on the other hand, an EV's engine effectiveness is 80%. EV batteries are relatively heavy and require a lot of space; in contrast, ICE gasoline is lightweight (Vidyanandan, 2018).

FACTS AND FIGURES ELECTRIC MOBILITY IN INDIA

The Indian EV market continues to remain in its early phases. Average sales of electric vehicles in India attained 2,337,761 units by FY2023. Figure 4 indicates that annually, EV sales approached 1.2 million vehicles in FY2023. Registered 2W, E-Bus, E-Car, E3W Cargo, and E3W Passenger are all comprised. The main reason behind this boost is a surge in sales of certified 2W and E3W passengers. In FY2023, the top three E2W players were Ola Electric, Hero Electric, and Okinawa Autotech, which comprised more than 45% of registered vehicle category sales. In FY2023, the top three E3W players were Mahindra & Mahindra, YC Electric Vehicle, and Saera Electric, with 8.95%, 7.34%, and 5.46% of the total market, respectively (JMK Research & Analytics, 2023).

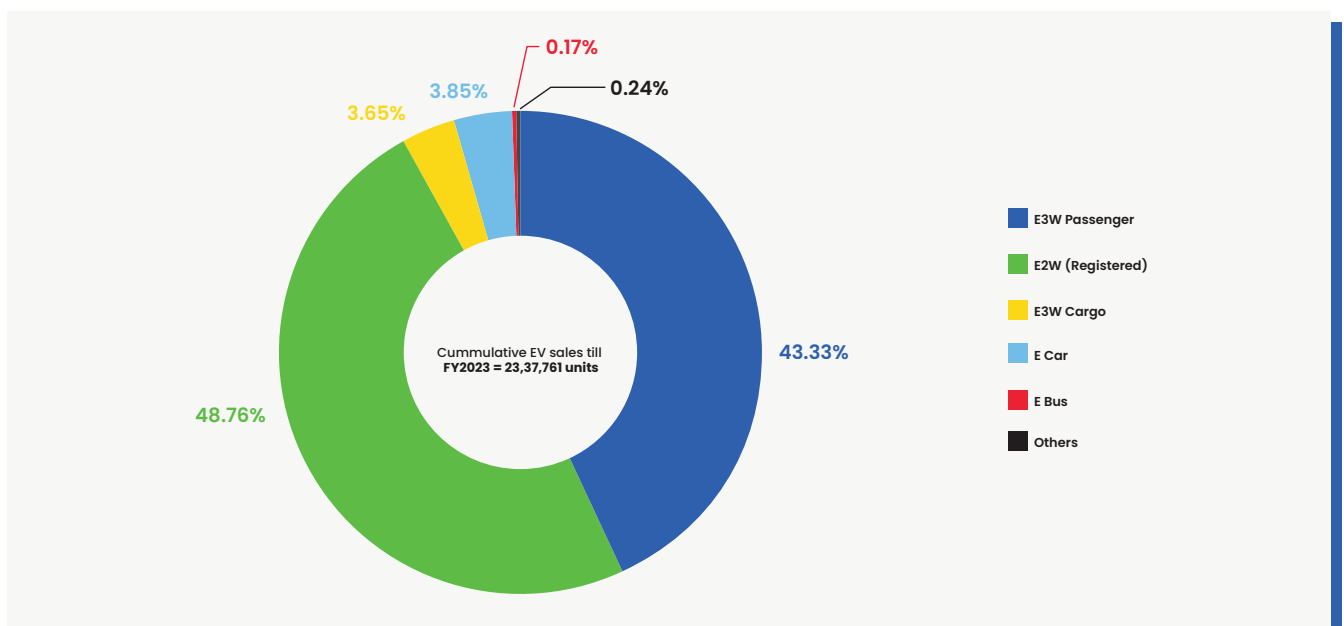
Figure 3: EV Annual Sales Trend in India (FY 2019 – FY 2023)



Source: JMK Research & Analytics, 2023

Figure 5 depicts the overall market share for each vehicle segment. E2W and E3W passengers will have the majority of the market share in India until FY2023. In India, E2W and E3W P accounted for 48.67% and 43.33% of all electric cars, respectively. Adapted vehicles, forklifts, freight carriers, omnibuses, agricultural tractors, and trailers (agriculture vehicles) are some of the others.

Figure 4: Vehicle Category-wise Market Share of EV till FY2023



Source: JMK Research & Analytics, 2023

Figure 6 shows the state-wise registered EV sales for FY2023. The top EV-selling states are Uttar Pradesh, Maharashtra, Delhi, Karnataka, and Rajasthan, constituting over 50% of the market share (JMK Research & Analytics, 2023). Uttar Pradesh is leading in EV sales with 20.64%.

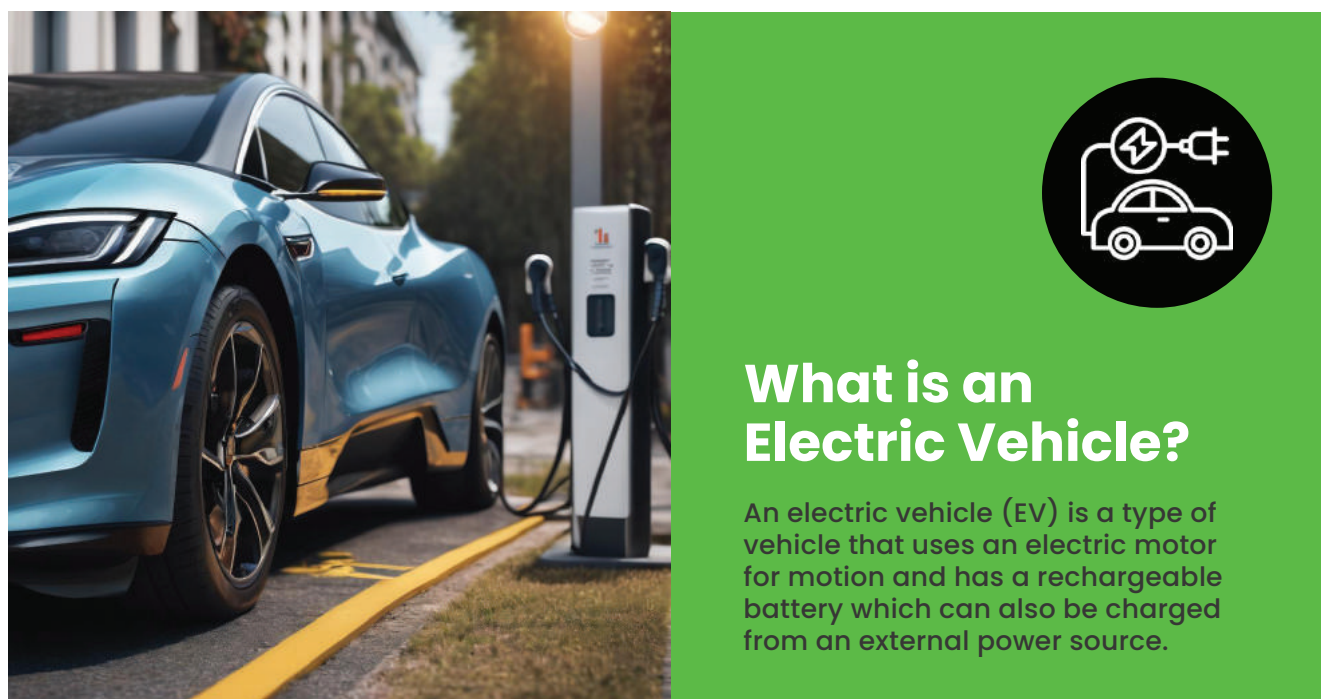
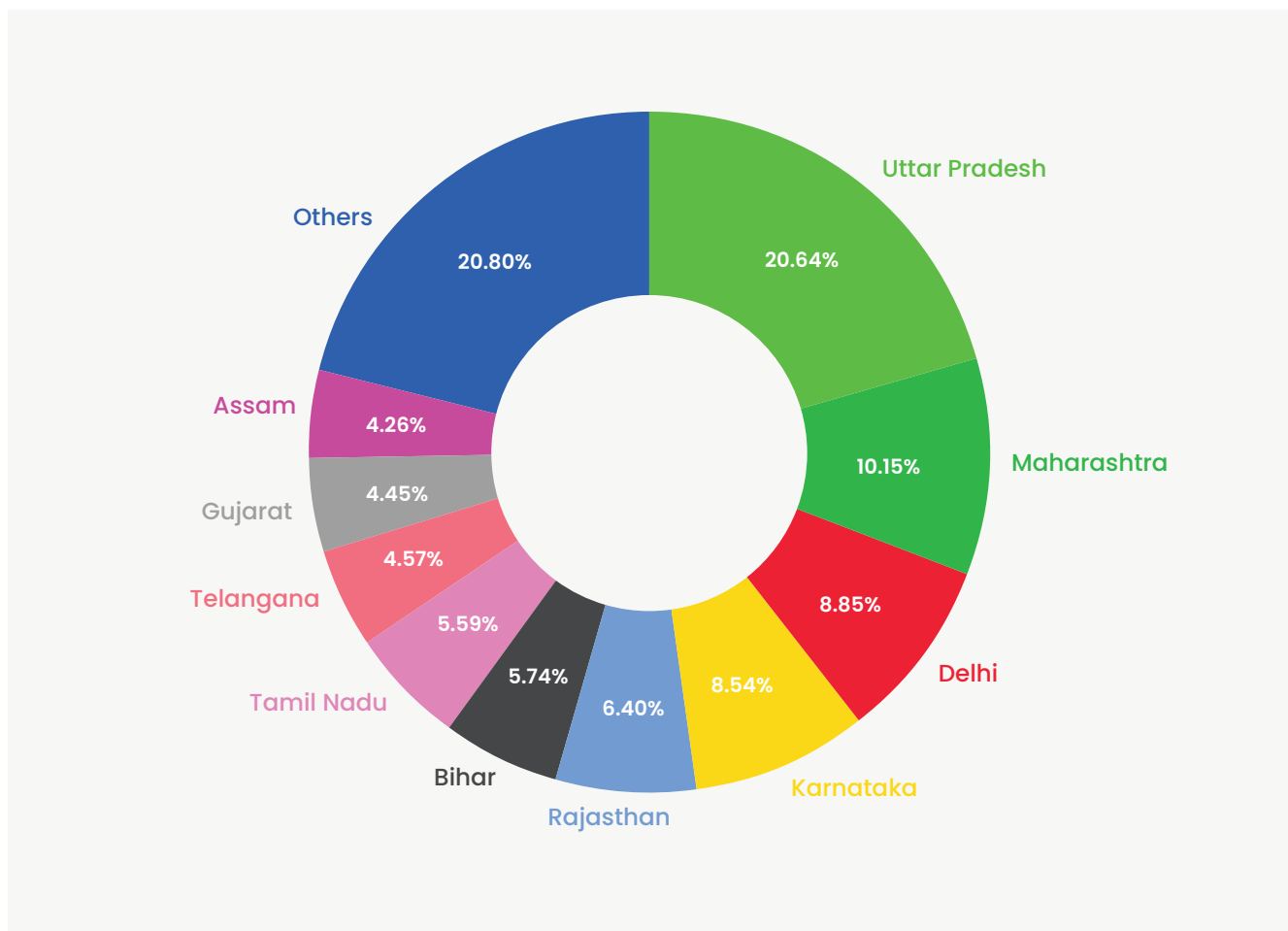


Figure 5: State-wise Registered EV sales till FY2023



Source: JMK Research & Analytics, 2023

BOX 2**What are the benefits of EVs?**

Electric vehicles are establishing themselves as a promising alternative to conventional automobiles, with an expectation to reduce CO2 emissions attributed to the traditional transportation sector. These solutions offer a range of benefits, comprising environmental, economic, and societal aspects, which render them a more viable and sustainable option.

Figure 6: Benefits of EVs

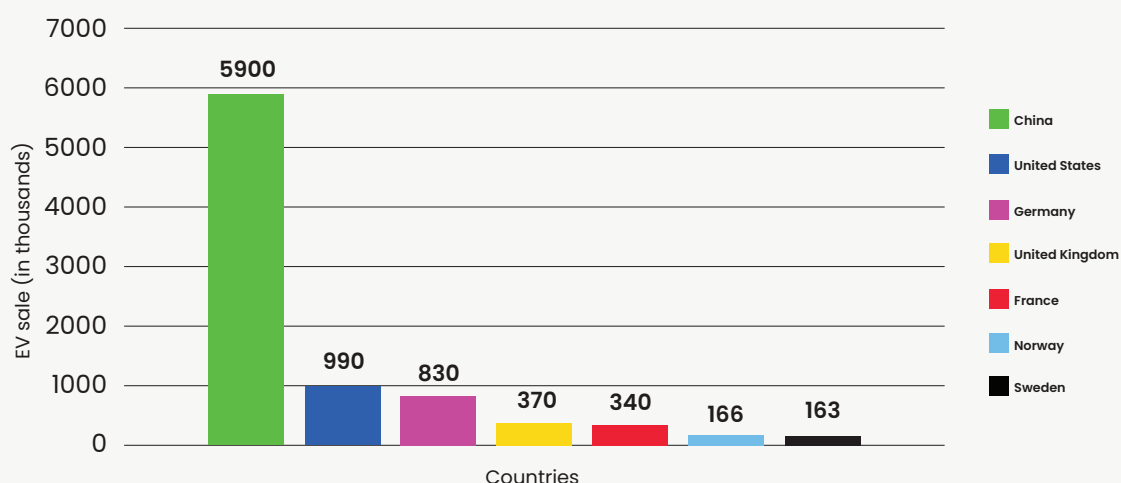


BOX 3

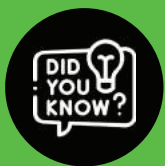
Global Trends of Electric Mobility

According to the Global EV Outlook 2023, Norway, the Netherlands, Sweden, China, the United States, France, and the United Kingdom have the highest market share of electric automobiles. China has the largest electric vehicle market share globally. Electric car sales exceeded \$10 million in 2022, representing a 55% increase over 2021. Global sales were largely driven by China, Europe, and the United States. China accounted for 60% of global electric vehicle sales. According to reports, China has already met its 2025 sales goal for electric vehicles. Europe has the second-largest EV market, with a 15% growth in sales by 2022. Germany was the leading European country in terms of EV sales in 2022. The United States, the world's third-largest market, stimulated EV sales by 55% in 2022. In 2022, all three of these markets are going to account for 95% of global sales (Global EV Outlook, IEA, 2023). Figure 5 portrays the global EV sales trend in 2022.

Figure 7: Global EV Sales trend in 2022



Source: Global EV Outlook, 2023



Norway is the EV capital of the world as it boasts the highest EV market penetration per capita.



Today in the world, one in every 7 cars sold is an electric vehicle.

– World Economic Forum (2023)

POLICY INITIATIVES FOR ELECTRIC MOBILITY IN INDIA



Given the importance of electrifying the road transportation sector to improve energy security and reduce emissions, the Indian government has placed a high emphasis on fostering electric car adoption through policy initiatives. The policies provide an assortment of incentives to promote EV adoption in the country. By 2030, the government intends to raise the percentage of EV sales to 30% of private automobiles, 70% of commercial vehicles, and 80% of two- and three-wheelers (The Hindu, 2021). India launched the National Mission for Electric Mobility in 2011. The National Electric Mobility Mission Plan (NEMMP) 2020 was launched in 2013 to encourage the manufacturing and utilization of electric vehicles. The NEMMP undertook a range of endeavors that aim to encourage the acceptance of electric vehicles in four pertinent segments: subsidies to boost demand, the establishment of EV production, the installation of charging stations, and research and development. Under NEMMP, India set an ambitious goal of having electric vehicle sales constitute the target; however, this was not accomplished, as slightly more than half a million electric vehicles were sold in India between 2013 and 2020 (IEA, 2023; Arora &

Gargava, 2023; Sarode & Sarode, 2020; Srikanth, 2018). 14%–16% of total vehicle sales by 2020, i.e., 6–7 million electric vehicle sales by the same year.

The 2019 National Mission on Transformative Mobility and Battery Storage stipulated additional impetus for India's journey towards the electrification of transportation. This mission consisted of multiple initiatives aimed at enhancing the local manufacture of EVs, EV components, and batteries. Moreover, India is an endorser of the EV30@30 campaign in lieu of the Clean Energy Ministerial's Electric Vehicle Initiatives in 2022. This campaign intends to elevate EV sales to 30% by 2030 (IEA, 2023).

India has launched two flagship national programs focused on strengthening road transport electrification. The first is the Faster Adoption and Manufacturing of Electric Vehicles (FAME) program, which offers subsidies for EV purchases along with support for the setting up of charging infrastructure. The Production-Linked Incentive (PLI) scheme is the second program. It is intended to boost manufacturing across a variety of sectors. The Indian

government also provides an array of financial and non-financial incentives to promote the adoption of electric vehicles. Financial incentives include lower GST on EV purchases as well as EV chargers and charging stations. In addition, some state-level laws enhance these incentives, aiding national initiatives (Dash, 2023). In the year 2022, NITI Aayog launched a portal named e-AMRIT (Accelerated e-Mobility Revolution for India's Transportation) as a central information platform that assists in creating awareness regarding electric mobility (Arora & Gargava, 2023). Figure 7 highlights India's policy initiatives towards electric mobility.

A total of 26 states have developed electric vehicle regulations with the goal of increasing

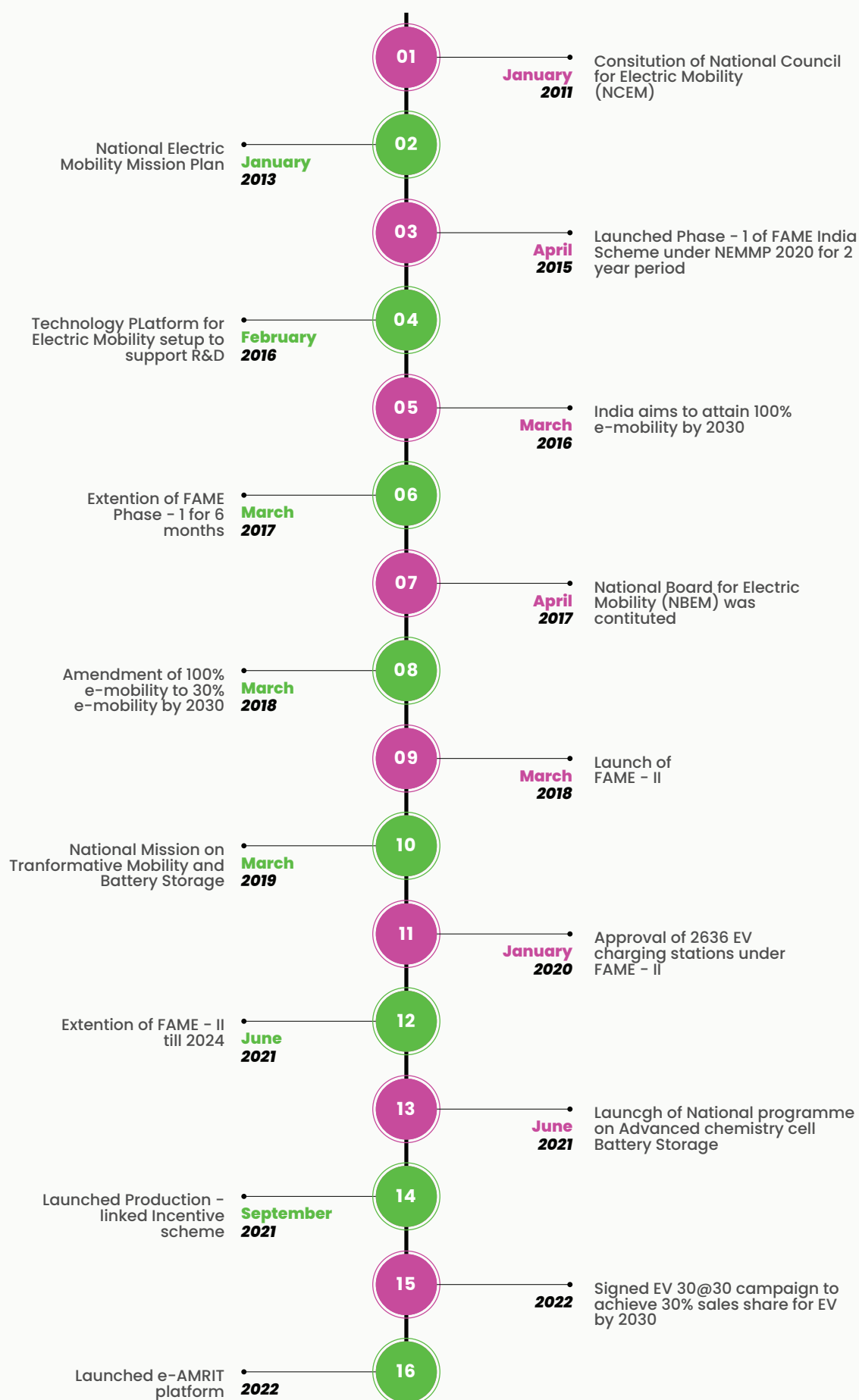
EV demand and boosting EV and component manufacturing. 16 of the 26 state EV plans were launched between 2020 and 2022; 8 have been in place for two years or longer; and the Goa state EV policy has been phased out. The most comprehensive policies are available in Maharashtra, Haryana, Delhi, and Uttar Pradesh. The states with the most significant demand-side incentives for consumers include Delhi, Odisha, Bihar, Chandigarh, and Andaman & Nicobar, which include exemption from road tax, registration fee exemption, and a subsidy on the upfront cost of two, three, four-wheelers, and buses. Six states have established targets for EV job generation, including Andhra Pradesh, Telangana, Tamil Nadu, Bihar, Karnataka, and Himachal Pradesh (Climate Trends, 2023).

Table 1: State-wise EV penetration Targets and Status as of November 2022

State	EV Penetration Target	Status as on November 2022
Andhra Pradesh	10,00,000 EVs by 2024	27,662 units of EVs 2.7% of target
Bihar	1,00,000 EVs by 2024 2W - 24,000; 3W - 70,000; 4W - 4,000; E-bus - 1,000	1,08,217 units of EVs 2W - 13,039; 3W - 94720; 4W - 238; E-bus - 27
Karnataka	1,500 e-buses by 2022	357 e-buses
Kerala	By 2022, 2W - 2,00,000; 3W - 50,000; goods carrier - 1,000 By 2025, e-Bus - 6,000	50,348 units of EVs 2W - 36,573; 3W - 4010; 4W - 5699; Buses - 56
Madhya Pradesh	25% of all new registered vehicles by 2026	9,638 units of EVs 2.2% of total vehicle sales since policy launch
Tamil Nadu	No EV penetration target e-Bus: Electrify 5% of buses every year by 2030	99,022 units of EVs 2.02% of total registered vehicles are EVs Zero e-buses
Delhi	25% of all new vehicle registrations are EVs by 2024 Buses 1,000 by 2020	83,300 units of EVs 7.2% of all new registered vehicles since 2020 Buses - 423
Uttar Pradesh	10,00,000 EVs by 2024; 1000 electric buses; 70% EV public transportation on identified green routes in identified 10 EV cities by 2030	2,78,218 EVs 27.82% of target 632 Buses

Source: Climate Trends, 2023

GOVERNMENT INITIATIVES TO PROMOTE ELECTRIC MOBILITY IN INDIA

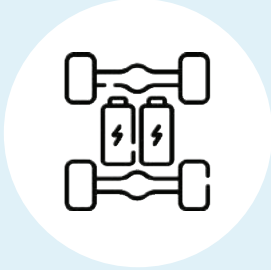


BOX 4

What type of Electric Vehicle are available in India?

Figure 9: Types of EV in India

1. Battery Electric Vehicle (BEV)



- BEV runs solely on a battery-powered electric drivetrain.
- The electricity is stored in a large battery pack which is used to drive the vehicle.
- This battery pack can be charged by connecting it to the electricity grid.

2. Hybrid Electric Vehicle (HEV)



- HEVs contain both electric motor and engine.
- The fuel gives energy to the engine whereas the battery supplies electricity to the motor.
- The electrical energy is generated by the car's own braking system to recharge the battery called as 'regenerative braking'.

3. Plug-in Hybrid Electric Vehicle (PHEV)



- PHEVs also have both engine and a motor.
- This type of EVs allows to choose among the fuels i.e., conventional fuel (petrol) or alternative fuel (Bio-Diesel).
- It can also run with the help of a rechargeable battery pack which can be also charged externally.

4. Fuel Cell Electric Vehicle (FCEV)



- FCEV also called Zero-Emission Vehicles uses fuel cell technology to provide electricity to drive the vehicle.
- Fuel's chemical energy is converted into electrical energy.
- Example: Hydrogen FCEV

Source: e-AMRIT (2023)

BARRIERS TO EV ADOPTION IN INDIA

1.



High Purchasing Cost:

High purchasing costs of vehicles and batteries as compared to conventional vehicles discourage potential consumers.

2.



Range Anxiety:

The limited availability of on-route charging infrastructure is the main concern of the public. Range anxiety is the fear of dying out of battery charge before reaching a destination. It is one of the key barriers for the slow adoption of EVs in India.

3.



Lack of Charging Infrastructure:

The adoption of electric vehicles and the setting up of charging infrastructure present a huge challenge in India. Without sufficient charging stations, ensuring the adoption of electric vehicles in India is quite difficult.

4.



High Charging Time:

The charging time of EVs is another challenge. It takes a longer time to charge an EV.

5.



Vehicle/Battery Weights:

Due to the heavy weight of batteries and vehicles, consumers do not prefer buying EVs in India.

6.



Consumer Behavior:

All the barriers, such as range, charging issues, and the high capital cost of EVs, substantially influence consumer behavior. Such behavior significantly hinders the adoption of EVs in India.



Sociology not technology will decide the electric car race.

– John Thornhill

The barriers mentioned above associated with the transition to electric mobility can have far-reaching implications for social equity, energy justice, and economic well-being.

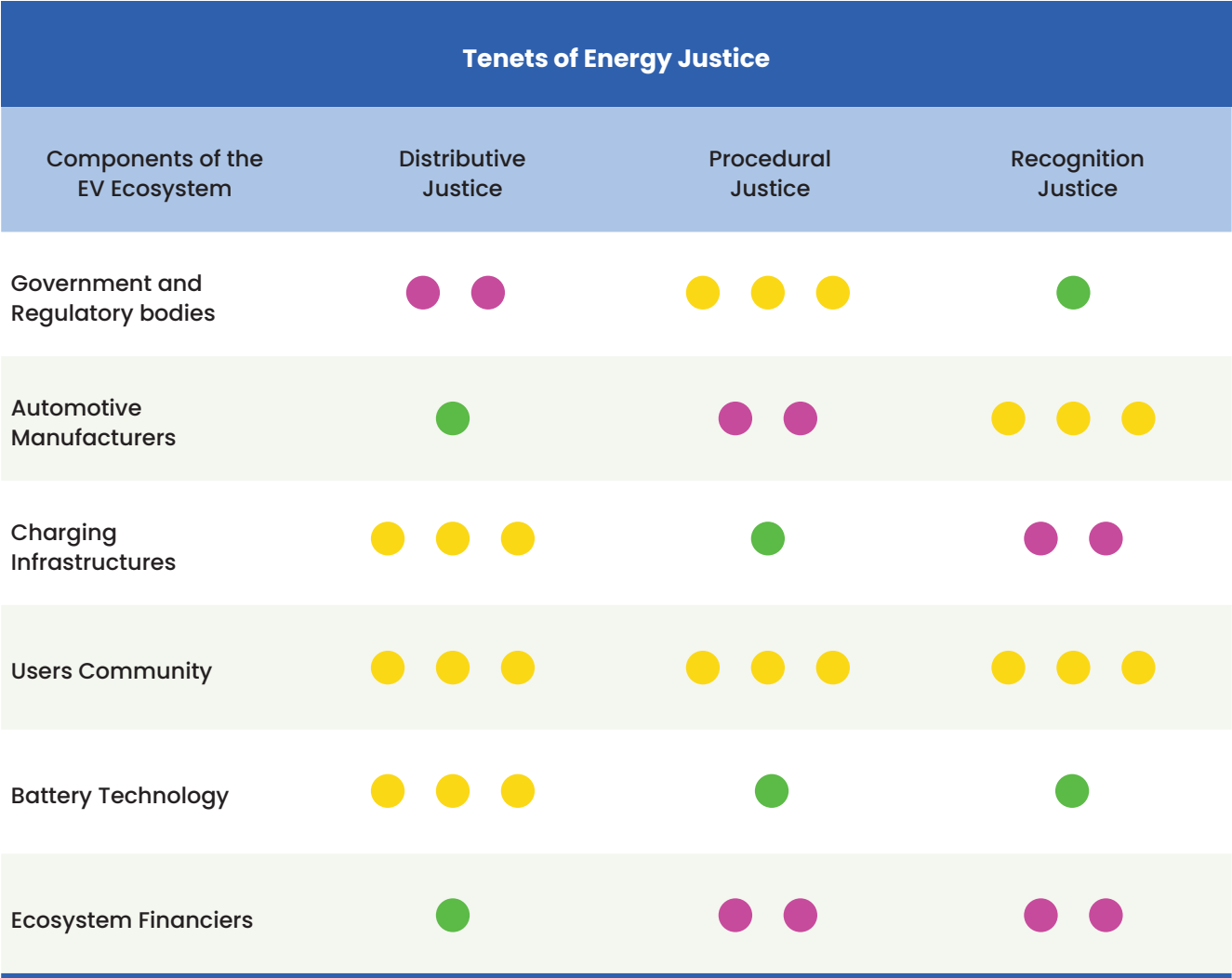
- The socio-economic divide is prominent in EV adoption rates. Higher-income individuals are more likely to purchase EVs, while lower-income households may find them financially unaffordable, exacerbating transportation-related inequalities. Failure to address affordability concerns can result in energy poverty, where some households struggle to meet their energy needs. Clean energy solutions, such as electric vehicles, can reduce energy costs in the long run, but the initial investment can be a barrier for low-income households.
- Since the focus is primarily on urban areas for promoting EVs, access to charging infrastructure stands as a challenge for the rural population. While progress has been made in expanding charging networks, some regions still lack sufficient charging stations, especially in rural areas. Inadequate charging infrastructure can cause range anxiety and deter potential EV buyers. Such barriers to electric vehicle adoption, including cost and charging infrastructure limitations, can hinder access to cleaner transportation options.
- Traditional automotive manufacturing, including the production of engines, transmissions, and exhaust systems, is a labor-intensive industry. As automakers move toward EVs, which have fewer moving parts and simpler drivetrains, the demand for components associated with ICE vehicles may decline. This shift would lead to substantial job losses in manufacturing plants that produce these components. Similarly, manufacturers and suppliers that specialize in ICE-related components may experience reduced demand for their products, affecting jobs at various tiers of the supply chain.
- As EVs become more prevalent, the need for traditional automotive technicians with expertise in ICE vehicles may decrease. Consequently, there may be job displacement unless these technicians are retrained to work on EVs and electric systems.

MOBILITY TRANSITION AND ENERGY JUSTICE

A technological solution, such as electrification of the transportation sector, is essential to lowering carbon emissions. However, not much consideration is given to justice in this context. The essence of justice in the transitional phase cannot be overstated. It will assist in overcoming societal aversion toward change and accelerate the process of transition. Justice in the case of energy transitions is usually taken to comprise four dimensions: recognition, distributive, and procedural (Schwanen, 2021). Figure 13 shows the three kinds of justice requisite for achieving a just mobility transition.

Figure 10: Energy Justice Tenets for Electric Mobility Transition





Source: Author's Analysis

● Less Intensity
 ● ● Moderate Intensity
 ● ● ● High Intensity

BOX 5

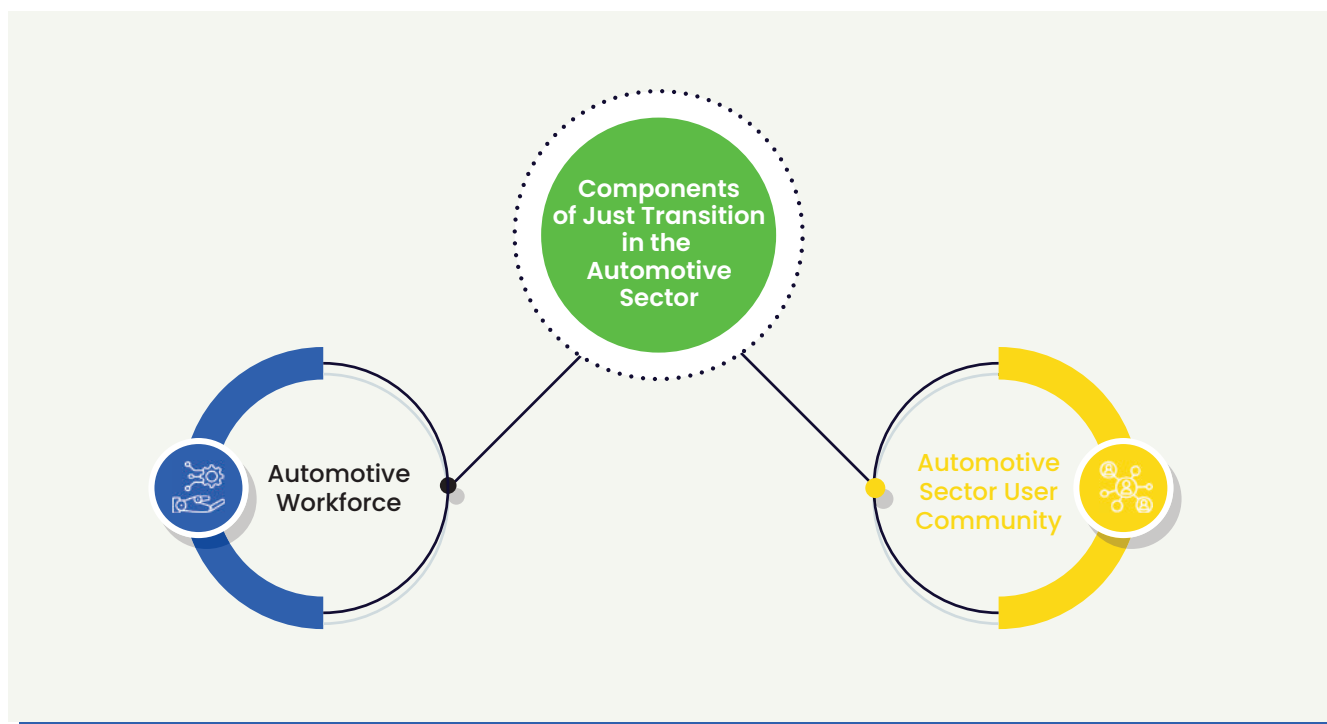
What is Just Transition?

A Just Transition means greening the economy in a way that is as fair and inclusive as possible to everyone concerned, creating decent work opportunities, and leaving no one behind.

- International Labour Organization



Photo Credit: www.scroll.in

Figure 11: Components of Just Transition in the Automotive Sector

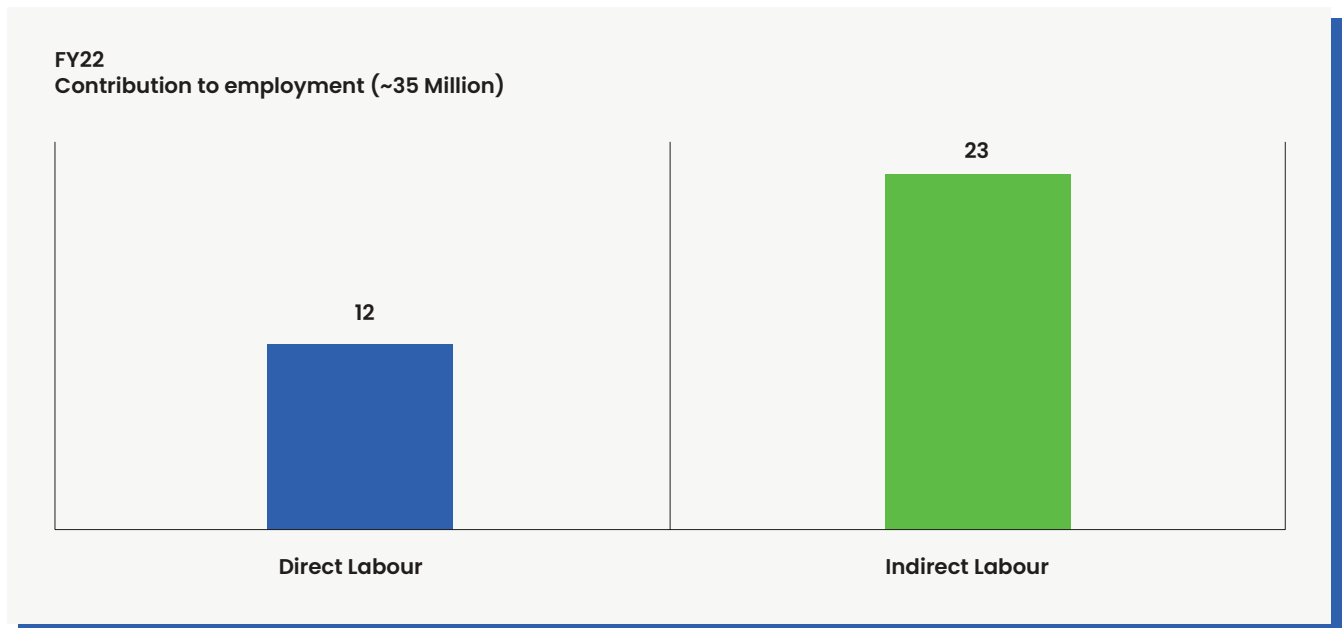
EV car Tesla Model Y is the best-selling electric car in the world with 771,300 sales.

– Statista (2023)

AUTOMOTIVE SECTOR AND EMPLOYMENT

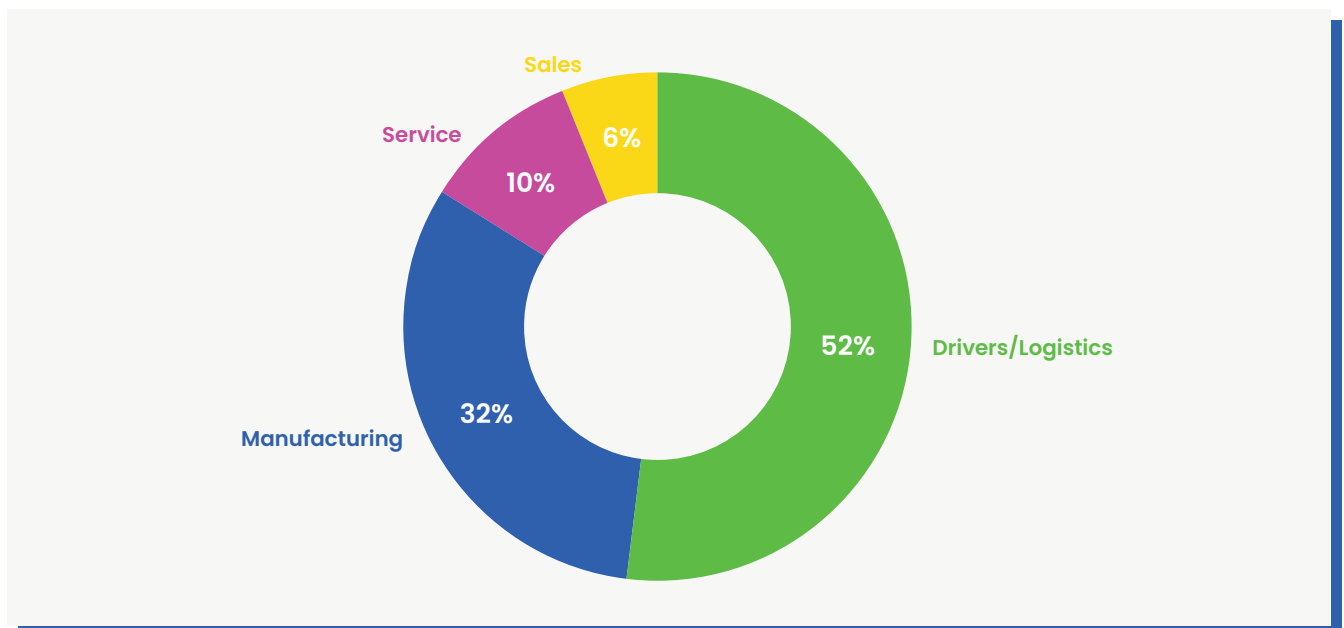
The automotive sector in India contributes 7.1% of the country's overall GDP and 49% of manufacturing GDP. The industry leverages approximately 37 million people, both directly and indirectly (PIB, 2023). Based on an NSDC analysis, indirect labor contributes substantially more to employment in the sector. Direct labor comprises the personnel employed by auto original equipment manufacturers (OEMs) and auto component manufacturers. Indirect labor comprises support services that enable direct labor, including service activities, drivers, cleaners, automobile financing providers, and insurance positions (NSDC, 2013). Referring to the NSDC data, Figure 11 portrays the significance of direct and indirect labor for employment in fiscal year 22. Figure 12 shows the worker distribution in the auto industry.

Figure 13: Contribution to Employment of Direct and indirect Labor in Automotive sector



Source: NSDC, Human Resource and Skill Requirements in the Auto and Auto Components Sector (2013-2017, 2017-2022), (2013)

Figure 14: Auto Sector Workforce Distribution



Source: NSDC, Human Resource and Skill Requirements in the Auto and Auto Components Sector (2013-2017, 2017-2022), (2013)

BOX 6

The transition towards Electric Mobility: A threat to livelihood?



Photo Credit : The Indian Express

The paradigm shifts from ICE to electric mobility, triggered by environmental concerns, has significant implications for multiple segments of the automobile industry. Electric rickshaws (e-rickshaws) have become more popular in India as a cleaner and more efficient means of transportation. On August 16, 2021, Haryana Chief Minister Shri Manohar Lal Khattar launched an electric three-wheeler zone in Gurugram, India's National Capital Region (NCR). Consequently, the Municipal Corporation of Gurugram (MCG) opted to prohibit diesel and CNG autorickshaws in a predefined zone and allow only electric three-wheelers.

This change has concerned CNG auto-rickshaw drivers, who have been a pivotal component of the city's transportation network for years. In response to being prohibited from particular areas, specifically those assigned for e-rickshaws, CNG auto-rickshaw operators led to several protests. The CNG auto-rickshaw drivers claimed they were denied access to zones where e-rickshaws are allowed to operate, leading to a loss of business. The transition to e-rickshaws as an eco-friendly initiative is seen as a threat to their livelihood by CNG auto drivers.

The above case study illustrates the socio-economic challenges of the transition towards electric mobility. Maintaining a balance of environmental considerations, economic impacts, and social aspects is imperative to achieving a just transition.

"We might end up starving to death"

– Arvind Kumar, CNG Auto Rickshaw Driver

BOX 7

Will green jobs be enough to accommodate the conventional automotive workforce?



Evidently, the conventional transport sector comprises a substantial percentage of the total workforce in the country, and with the continuing transition, jobs are anticipated to decline substantially. The electric automobile industry, in contrast, is going to offer significant job opportunities in areas such as electric motors, controllers, drivetrains, and related software. EVs are more software-oriented than ICE vehicles, which would result in an influx of new information technology employment. For the purpose of promoting environmental sustainability, the EV industry will generate green jobs.

One major concern is whether green jobs will be sufficient to meet the needs of the workforce in the conventional automobile industry. EV careers are going to require new skill sets for existing and new workers. Only appropriate worker training can guarantee a just transition between the industry's formal and informal sectors. In order to address the transition in the transport sector, it is essential to map the employment consequences at all levels, including local, state, and national. It would cover all aspects of the value chain, along with the major industries that the transition will affect.

Source: The Times of India (2021)



Only 6 Indian states have defined targets for job creation in the EV sector:

Andhra Pradesh, Telangana, Tamil Nadu, Bihar, Karnataka, Himachal Pradesh.

- Climate Trends (2023)

JUST TRANSITION PATHWAY FOR ELECTRIC MOBILITY

The Indian automobile and transport sectors are rapidly transitioning from conventional ICE to cutting-edge electric vehicles. This transformation is anticipated to trigger significant modifications in manufacturing, sales, services, production processes, consumption, and technologically planned chains of value. As a result, these changes will have a substantial impact on the industry's employment sector. Therefore, the transition process implies addressing socioeconomic challenges and the well-being of workers and vulnerable groups. Along with attaining a net zero emission objective, India needs to ensure that transitioning to a low-carbon future is more socially inclusive and equitable.

1

Currently, India's low-carbon transportation transition strategies pay little consideration to the potential consequences for end users and the extent to which the transition will abide by the principles of equality, inclusion, and justice (2022, British Academy).

2

A Just Transition Pathway is required to ensure factors such as the need to ensure that transitions yield sustainable mobility solutions accessible to all individuals and address the issue of possible layoffs in the electric mobility sector through the creation of employment prospects.

3

A just transition in the transportation sector would prioritize people and communities, integrate important considerations like job retention and creation, ignore past injustices while preventing future ones, and foster an atmosphere beneficial to citizen well-being.

4

It would aid in identifying those who might face disadvantages as an outcome of the transition. This is essential in the pursuit of an "inclusive and equitable" approach to decarbonizing the automotive sector, which is especially pertinent in a developing country like India.



As of February 2024, 12,146 EV charging stations have been installed in India.

- The Economic Times (2024)

Photo Credit: John Cameron (www.unsplash.com)

SUMMARY FOR POLICYMAKERS

This section is going to provide an outline of policy recommendations for policymakers to render the transition to electric mobility more equitable and just for everyone in society. India's current regulations are primarily focused on technology and solution-oriented. So far, the relevance of justice and equity in the framework of low-carbon transportation has been left out. Therefore, it is of the utmost importance to adhere to the Just Transition Pathway while transitioning to electric mobility and incorporating it into policy. Policies should prioritize end-user justice by enabling enhanced collaboration between the transportation and energy sectors, ensuring that low-carbon mobility options are accessible across diverse socioeconomic strata. In order to facilitate the ongoing transition to more equitable outcomes, effective policy measures are required. The policy recommendations are outlined as follows:

- **Skill Development:**

Skill development is a fundamental prerequisite for an industry's development. Transitioning from traditional industries to e-mobility necessitates the creation of new skill sets for workers. There is an urgent need for skilling, reskilling, and upskilling transport industry workers. Comprehensive training programs are going to equip individuals with the necessary skills for the EV industry. Skill development might assist in mitigating the anxiety related to industrial transition. This would also boost the acceptability of new technology.

- **Accessibility and Affordability:**

Prioritizing accessibility in policies for electric mobility can create better adoption strategies and support just transition. One of the primary disadvantages of the switch to electric transportation is the high cost of acquisition.

Making policies that make EVs more accessible will promote a more sustainable and just transition.

- **Inclusive Transition:**

Involvement of all the stakeholders in the transport industry in the policy formulation process for electric mobility involving workers and vulnerable communities affected by this transition would especially help in addressing the challenges faced by people on the ground. Taking a diverse perspective from all the stakeholders, like the government, employers, and workers, would help make the transition process more inclusive and equitable.

- **Charging Infrastructure:**

Unfortunately, India's existing policies have not focused enough on charging infrastructure, and very limited stations are available.



Bringing effective policies for increasing charging infrastructure is crucial to improving EV adoption in India. Also, make sure these charging stations are accessible to all segments of the population.

- **Collaborations:**

Promoting and providing educational programs to create adaptive skills through the collaboration of the industry with other stakeholders like academic institutions or research centers. Academic institutes and research centers can provide a robust research background regarding the topic, which can help in the policymaking process.

- **Education and Awareness:**

India stands as one of the youngest nations worldwide, with an average population age of 29 years (Financial Express, 2017). Organize public awareness and outreach campaigns for the youth to spread awareness regarding electric mobility and its benefits. Awareness can be spread through other communication channels, such as social media, to convey information and promote active public participation.

- **Capacity Building on Just Transition:**

Lack of awareness is a huge challenge that needs to be addressed for electric mobility adoption in India. People on the ground are

unaware of the benefits of electric mobility. There is an urgent need for capacity building at the grassroots level to make the transition process easier.

- **Stakeholder Consultations:**

Organizing social consultations, debates, and dialogues for all the stakeholders would help in identifying the key challenges posed by the transition. Consumer behavior towards electric mobility is a challenge faced by the industry for EV adoption. It is important to understand the perception and experience of the consumer with the new technology for better adoption.

- **Fostering Green Jobs:**

Creating green job opportunities in the electric mobility sectors like manufacturing, production, maintenance services, etc. Promoting green jobs would equip the workforce to face challenges such as job loss posed by the transition process. Green jobs can significantly contribute to sustainability and the process of just transition.

- **Just Transition Fund for Electric Mobility:**

Creating a Special Fund for the transition process in the transport sector.

CONCLUSION

Electric mobility is widely acknowledged as one of the best solutions for lowering emissions and revolutionizing the global transport industry. It is critical for India to address the transition issues as it decarbonizes the transportation industry. To ensure the effectiveness of the transition, a comprehensive and inclusive strategy that promotes social fairness, employment stability, and community engagement is required. Indian policymakers need to ensure that the transition to a low-carbon future is a just transition. A just transition in the realm of electric mobility requires not only addressing the potential disruptions in traditional sectors but also building a future where economic growth aligns with society's welfare and environmental well-being.

The policy recommendations highlighted in the policy brief offer a justice-oriented pathway to navigate the complexities of this transition, with the goal of building sustainable and equitable mobility that supports both technological progress and social justice.



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