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Adoption of Electric Vehicles in Eastern India Policies and Prospects

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ABOUT

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In December 2021, the Ministry of Science and Technology, Department of Science and Technology (Policy Research Programme) made an open call for the submission of Expressions of Interest in STI Policy Research towards the Establishment of the Center for Policy Research (CPR) by the academic and research Institutes in India. After multiple rounds of consultations and review, the DST-CPR at NISER received the final sanction order from the Government of India, Ministry of Science & Technology, Department of Science & Technology, bearing the letter/PRC/CPR/NISER Bhubaneswar-2023 (G) (PCPM) dated 29/03/2023.

The primary focus of the DST-CPR at NISER is to study the Energy Transition and the secondary focus is to study the Tribal Education, and Innovations for Tribal Education in Eastern India covering Odisha, Bihar, Chhattisgarh, Jharkhand and West Bengal.

SUGGESTED CITATION

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Adoption of Electric Vehicles in Eastern India Policies and Prospects

This policy brief presents the impacts of India's EV policy on the road transport sector in eastern India. It examines the implications of the Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India (FAME) scheme in two distinct phases: FAME India Phase I (2015–2019) and FAME India Phase II (2020–2023) on EV adoption. The study mainly discusses the energy transition in the eastern states' road transport sector, namely Bihar, Chhattisgarh, Jharkhand, Odisha, and West Bengal.

Introduction

In India, road transport accounts for 12 percent of the country's energy-related carbon dioxide emissions. According to the International Energy Agency (IEA), India's efforts to address the transport needs of its growing and rapidly advancing population may result in a twofold increase in energy consumption and carbon dioxide emissions from this sector by 2050 (IEA, 2023). The Ministry of Road Transport and Highways (MORTH) reported that road transport constitutes 3.06 percent of the overall transportation sector (4.9%) (MORTH, 2023). The expansion of road infrastructure contributed to the growing need for road transport, leading to a rise in the quantity of motor vehicles throughout time. India experienced a rapid increase in registered motor vehicles with a compound annual growth rate (CAGR) of 9.83% between 2010 and 2020 (MORTH, 2023). Consequently, the rising vehicle population growth increased national carbon emissions (Singh et al., 2017).

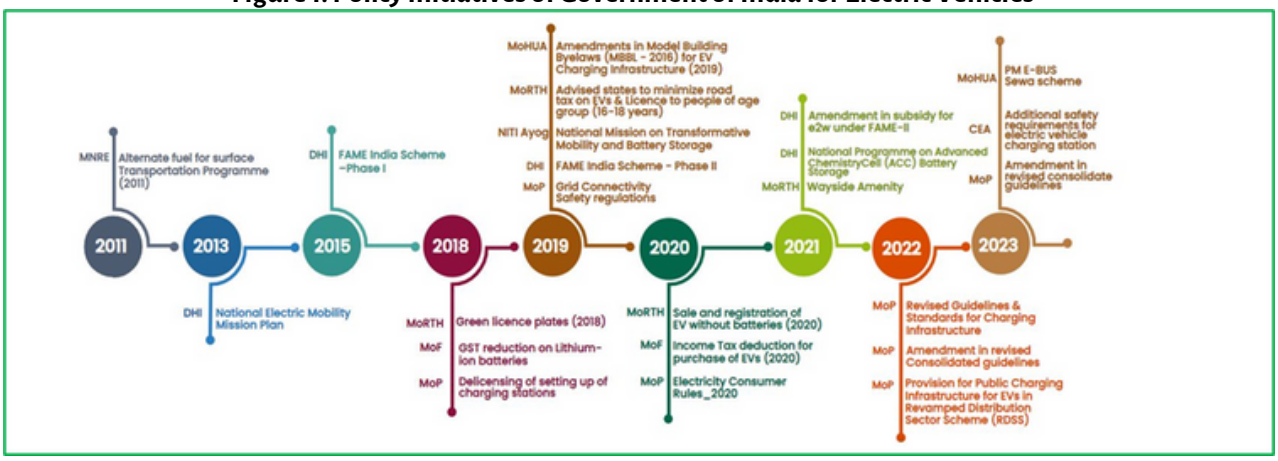
The transport sector's reliance on finite fossil fuels contributes to the release of greenhouse gas emissions, making it the second largest emitter of greenhouse gases in India (GHGPI, 2022). Adopting electric vehicles (EVs) is the best alternative to decarbonise the transportation sector, offering multiple advantages such as higher efficiency, lower air pollution, and lower oil dependence for the country (Goel et al., 2021).

Research on road transport in India has predominantly concentrated on the advantageous effects of electric vehicles (EVs) in reducing greenhouse gas emissions and minimising energy usage (Singh, 2006; Baidya et al., 2009; Hakkim et al., 2021; Dharmala et al., 2022). However, there is a paucity of understanding of the policies at the subnational level and their implications for EV adoption.

Policies and Schemes on EVs in India

India has actively promoted the green transition in the transportation sector since 2011. One significant example is the National Electric Mobility Mission Plan (NEMMP), initiated in 2013 to promote EVs throughout India. Several plans and programs have been launched in this sector since 2018 (Figure 1). India's diligent endeavours in environmental and climate initiatives, particularly its active participation in the Clean Energy Ministerial (CEM) meetings among the sixteen major economies and the subsequent introduction of the EV30@30 campaign during the 8th CEM in June 2017 (IEA, 2021), have contributed to this attainment. Accordingly, the Ministry of Road Transport and Highways (MORTH) has introduced the EV30@30 campaign in India, aiming to achieve a 30% share of EVs in the overall vehicle count by 2030. Specifically, the campaign targets 40% of buses, 70% of commercial cars, and 80% of 2-wheelers and 3-wheelers to be electric.

Figure 1: Policy Initiatives of Government of India for Electric Vehicles

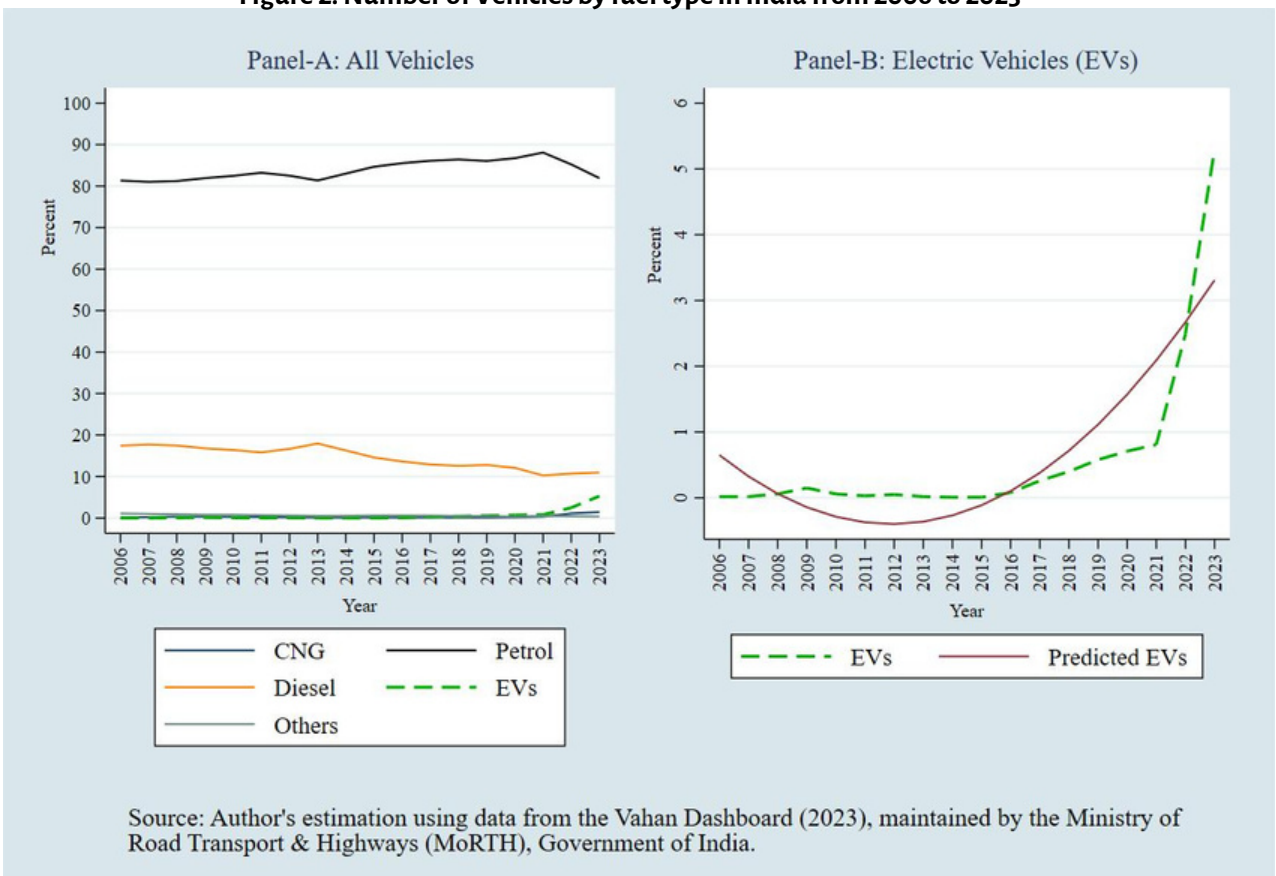


Source: Bureau of Energy Efficiency, Government of India, Ministry of Power; https://evyatra.beeindia.gov.in/central-govt-initiative-details/dhi-fame-scheme-phase-1-2015/

The government of India initiated the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) scheme under NEMMP in 2015. The scheme FAME India has two phases. The FAME India Phase-I is from April 1, 2015, to March 31, 2019. The scheme focused on four aspects: (i) Demand Creation, (ii) Technology Platform, (iii) Pilot Project, and (iv) Charging Infrastructure.

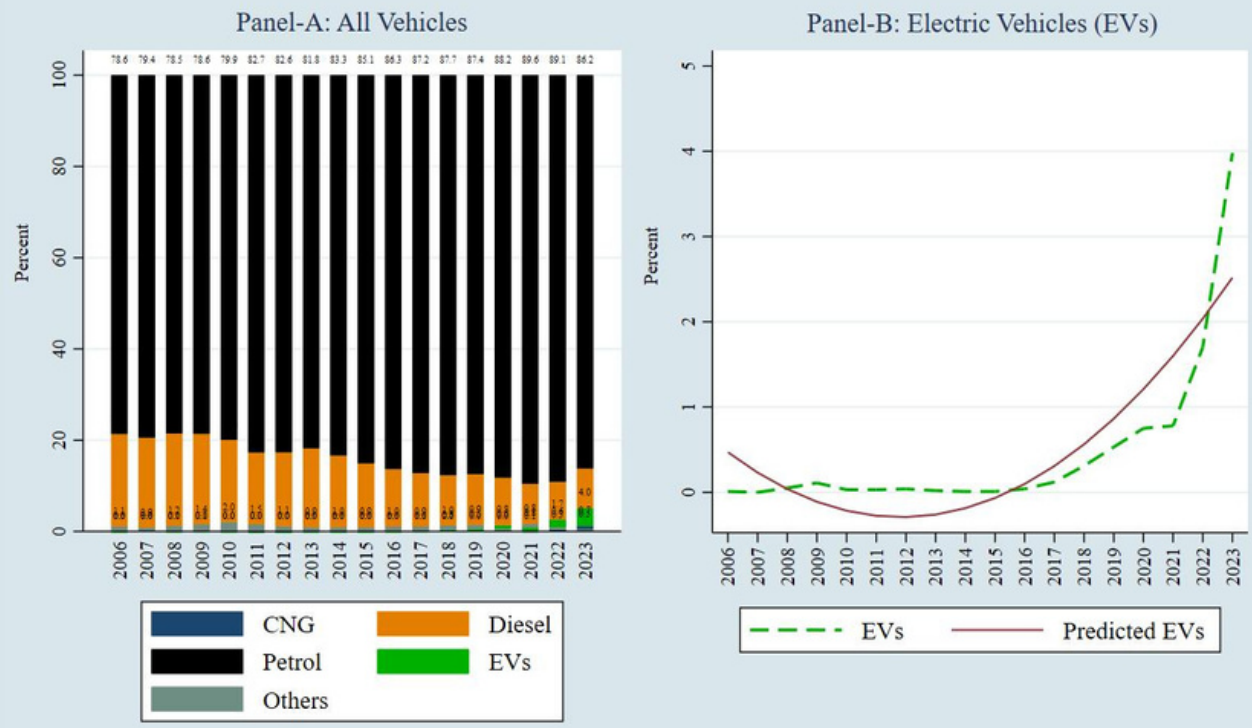
The FAME India Phase-II covers five years from April 1, 2019, with a budgetary allocation of Rs. 10,000 crores (GOI, 2023). It was initially applicable until March 2022 and then extended to March 31, 2024. The main focus of this phase is to offer support for implementing electric power in public and vehicles. The aim is to incentivise the adoption of 7,090 electric buses, 500,000 electric three-wheelers, 55,000 electric four-wheeler passenger cars, and 1 million electric two-wheelers by providing incentives based on demand. Furthermore, the programme facilitates the creation of charging infrastructure.

Figure 2: Number of Vehicles by fuel type in India from 2006 to 2023



Source: Author's estimation using data from the Vahan Dashboard (2023), maintained by the Ministry of Road Transport & Highways (MoRTH), Government of India.

Figure 3: Vehicles by fuel type in the Eastern region of India



Source: Author's estimation using data from the Vahan Dashboard (2023), maintained by the Ministry of Road Transport & Highways (MoRTH), Government of India.

The initial allocation of Rs. 895 crores for FAME-I was raised to Rs. 10,000 crores in FAME-II to boost the adoption of EVs across India.

Trends in the Adoption of EVs

All India Scenario

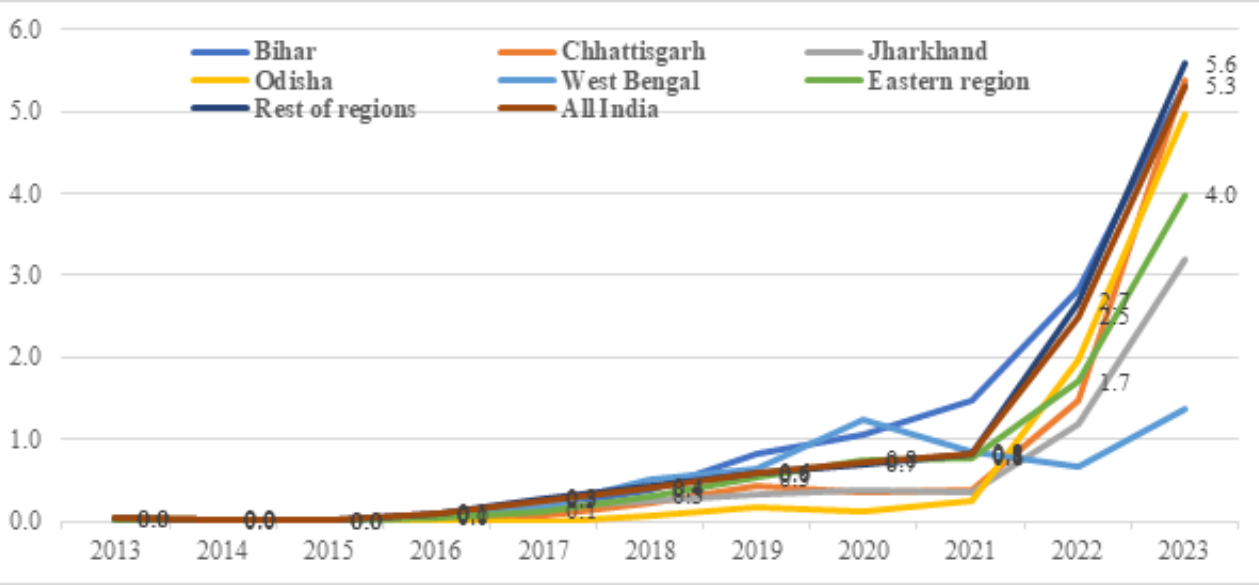
Panel A in Figure 2 demonstrates the distribution of India's overall vehicles according to their fuel type from 2006 to 2023. Petrol-driven vehicles accounted for the majority share (81.92% in 2023) in India, followed by the diesel-vehicles (10.97% in 2023). The proportion of EVs has increased significantly since 2021. This period coincides with the scope of FAME India Phase II (post-2019). It implies that the financial incentives have probably motivated consumers to purchase EVs. Panel B of Figure 1 exclusively shows the trends in the number of EVs during 2006-2023. We observe a consistent rise in the number of EVs starting from 2015 and continuing until 2021. After 2021, there is a substantial rise in the number of EVs, reaching about 5.3 percent in 2023.

The swift surge observed in the post-2021 era signifies that the EV markets are progressing substantially.

The case of Eastern States

Panel A in Figure 3 presents the distribution of total vehicles in the eastern region according to fuel type from 2006 to 2023. The petrol-driven vehicles of this region (86.18%) were higher than the national average (82.01%). The share of EVs in total vehicles has also steadily surged from 2021. EVs in the country increased from 0.01 percent in 2015 to 0.58 percent in 2019. In 2016, the Eastern region had an adoption rate of only 0.04 percent for EVs, which was lower than the national average of 0.09 percent. In the subsequent years, the eastern region lagged behind the other regions before rising in 2020. Nevertheless, there are state-wise variations. Despite the rising trend in the adoption of EVs in the Eastern region, its proportion in the total vehicles is still minimal (4.0%) compared to the rest of the regions (5.6%) (Figure 4).

Figure 4: Trends in the adoption of EVs in different regions/states



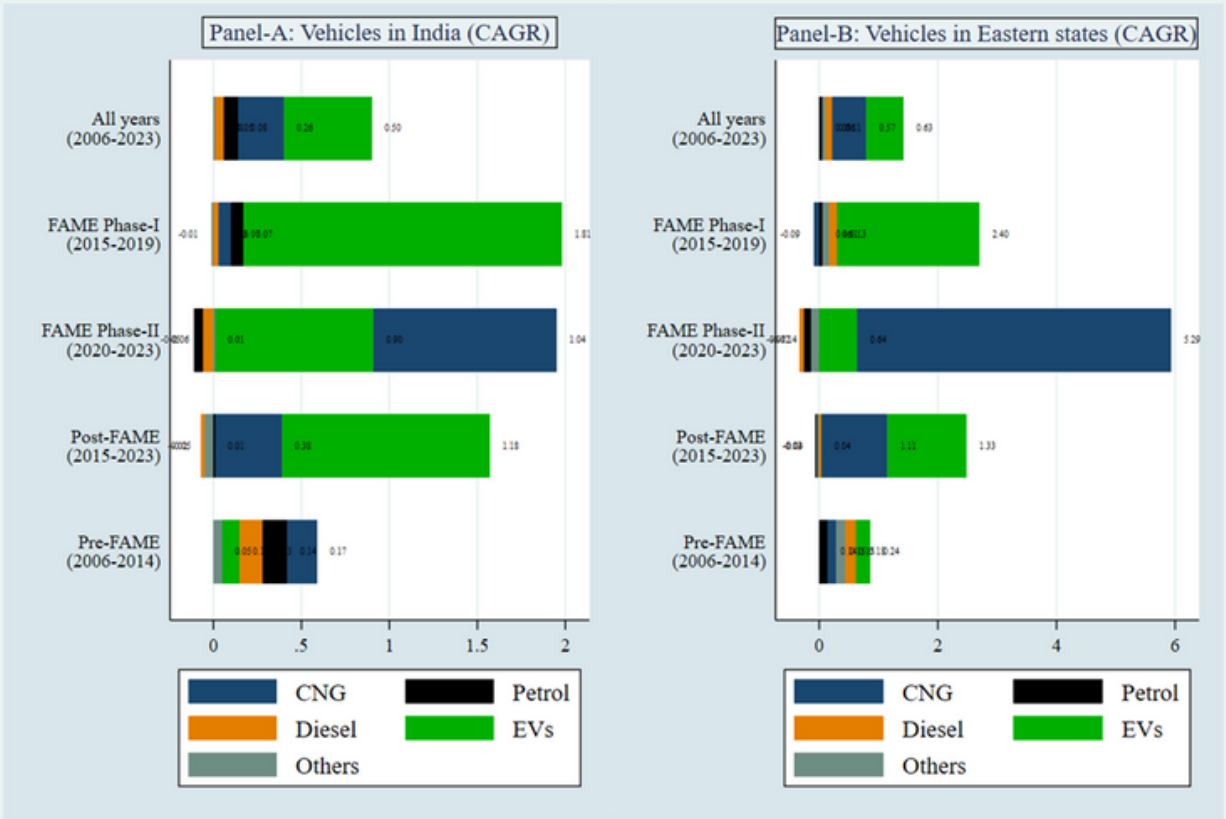
In the eastern region, Chhattisgarh (5.39%) and Bihar (5.33%) have relatively higher adoption levels of EVs than the national average of 5.31 percent in 2023. The remaining states in the Eastern region have a lower proportion of EVs than the national average and the average for the Eastern region. West Bengal had the lowest EV adoption rates in the region (1.36%) in 2023. Poor administration and lack of local government support might be reasons for the low adoption rate of EVs.

The impact of FAME on Road Transport

The CAGR of vehicles by fuel types in different phases of the FAME scheme in India and Eastern states are provided in Panels A and B of Figure 5, respectively. Adoption of EVs has grown at 0.50 percent per annum over the 2006–2023 period. A notable uptake of EVs is observed in FAME Phase I (2015–2019), with a growth rate of 1.81 percent. Concurrently, the growth rate of petrol-driven vehicles declined from 0.14 percent in pre-FAME (2006–2014) to 0.01 percent in post-FAME (2015–2023). Similarly, the growth rate of diesel-driven vehicles declined from 0.13 percent in the pre-FAME period to a negative growth rate of -0.02 percent in the post-FAME period (Figure 5). The growth rate of EVs was 0.90 percent.

In contrast, the growth rate of Compressed Natural Gas (CNG) (1.04%) took place faster than that of EVs in the FAME Phase II. It is expected to rise further by the end of March 2024 (Figure 5). The growth rate in the adoption of EVs increased from 0.24 in pre-FAME to 1.33 percent in the post-FAME periods. Simultaneously, the growth rate of petrol-driven vehicles has declined from 0.14 percent in the pre-FAME to a negative growth rate of -0.02 percent in the post-FAME periods. Similarly, the rate of diesel-driven vehicles has declined from 0.18 percent to 0.04 percent during the same periods. Despite its decline, the growth rate is still positive for diesel-driven vehicles compared to petrol-driven vehicles during the post-FAME. However, the pattern differs when we assess the growth rate by disaggregating the FAME into phases I and II. The FAME phase I had a positive growth rate for petrol (0.06%) and diesel-driven vehicles (0.13%), whereas the FAME phase II showed a negative growth rate for both. The growth rate of CNG is much faster compared to that of EVs in the Eastern states. It had a negative growth rate (-0.09%) during the FAME Phase I, but it became positive (5.29%) in Phase II. This growth rate of CNG is even much higher than that of India's (1.04%) growth rate during the FAME phase II, as shown in Panel-A in Figure 5.

Figure 5: Vehicles in the FAME Phase I and II in India and the Eastern states (CAGR)



Source: Author's estimation using data from the Vahan Dashboard (2023), maintained by the Ministry of Road Transport & Highways (MoRTH),Government of India.

Table 1: Policies, Schemes, and Infrastructure for EVs in the Eastern States

States	EV Policy Status	Fixed charge	EV Tariff (₹/kWh)	No. of registered Electric Vehicles ®	No. of Public Charging Stations	No. of Districts having Public EV chargers	No. of CPO	No. of retail outlets having public EV chargers
Bihar	Notified 2023	0	LT: 8.87, HT: 8.00	197339 (50.6%)	124	33	8	91
Chhattisgarh	Notified 2022	0	5	45719 (11.7%)	149	26	10	90
Jharkhand	Notified 2022	Rural: 50/KW, Urban - 100/KW	Rural: 5.75, Urban - 6.00	31544 (8.1%)	135	25	8	76
Odisha	Notified 2021	0	5.5	52022 (13.3%)	198	28	9	143
West Bengal	Notified 2021	0	6	63208 (16.2%)	318	23	13	191
Eastern states (total)				389832 (100)	924	135	48	591

Source: Bureau of Energy Efficiency (2023), Ministry of Power, Government of India. https://evyatra.beeindia.gov.in/state-ev-policies/;
Note: ® The provided values are as of May 1, 2023.; CPO- Charge Point Operator; Percentage values are in parenthesis.

Rising fuel costs and the high prices of electric vehicles are driving Indian customers to consider CNG as a more affordable and viable alternative fuel for transportation, as reported by the Nomura Research Institute (NRI,2020). The state-level policies of Eastern states for EVs came into being in the years following 2021 (Table 1). These policies are supplementary to the national policies on electric vehicles (EVs) and aim to facilitate the shift from traditional internal combustion engines (ICE) to EVs. Notably, states such as Odisha and West Bengal implemented their EV policies shortly before other regional states. In addition, the number of charging stations and retail outlets equipped with public EV chargers in these states is substantially higher than that of other states in the Eastern region. However, the uptake of EVs is deficient in Odisha and West Bengal. This suggests that not merely the placement of charging stations influences the higher adoption of EVs. The high cost of automobiles and the lack of consumer awareness also contribute to the low adoption level. According to the Bureau of Energy Efficiency dashboard (BEE, 2023), the eastern states have fewer awareness programs than southern states, such as Tamil Nadu, Kerala, Andhra Pradesh, and Telangana. These southern states have widespread awareness through various programmes and have used various sources, such as newspapers, television, radio, workshops, webinars, quiz competitions, and EV exhibitions.

Conclusion and Policy Recommendations

The FAME program and its subsidies are crucial in effectively promoting EVs. While the adoption of EVs is rapidly increasing on a national scale, this progress is not evenly distributed at the subnational level. The effect of decarbonization on road travel is diverse and is contingent upon distinct socio-economic and geographic circumstances. Thus, subnational policies should avoid one-size-fits-all policies to ensure an equitable transition in the road transport sector.

The transportation studies mainly indicate that the adoption of EVs is primarily prevalent in urban cities that possess comparatively superior infrastructure. The EV policies should prioritize the development of infrastructure facilities in rural areas, particularly by promoting the installation and expansion of public charging stations. To decrease expenses, promote domestic producers' production of electric vehicle technologies. These will facilitate the rural population's access to EVs and ensure their active participation in the energy transition.

The promotion of EVs alone cannot facilitate a complete shift of all vehicles towards the energy transition, as a significant portion of vehicles still rely on the conventional internal combustion engine, which is considerably more cost-effective than electric vehicles. Also, there are certain commonly identified limitations related to the adoption of EVs, such as limited servicing, high capital costs, battery effectiveness, charging duration, and a lack of charging infrastructure.

Nevertheless, in Eastern states, the upfront costs and a lack of customer awareness are the primary limitations. Promoting hybrid EVs in the Eastern states would offer a combination of traditional combustion engines and electric charging. As the more significant segments of the population had the experience of traditional engine usage, this not only helped them to transition slowly from the usage of ICE to pure EVs but also reduced charging dependency. Fuels such as CNG, CBG, and hydrogen, which are alternative and feasible, would work together and jointly contribute to achieving carbon neutrality. Subnational policies within the Eastern states can promote the use of these alternative fuel types. Furthermore, it is imperative to foster active cooperation between the local government, stakeholders, and educational institutions to enhance awareness regarding energy transition, government initiatives on road transport, and the importance of maintaining a sustainable environment.

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THERE ARE THREE PRIMARY TYPES OF ELECTRIC VEHICLES:

Battery-electric vehicles are powered by electricity stored in a battery pack.

With plug-in hybrid vehicles, an electric motor and sizable rechargeable battery are combined with a gasoline or diesel engine.

The electricity needed to power the motor in fuel cell automobiles is created by splitting hydrogen molecule electrons.

THE CARBON FOOTPRINT OF ELECTRIC VEHICLES IS SMALLER THAN THAT OF GASOLINE-POWERED CARS, REGARDLESS OF WHERE THE ELECTRICITY COMES FROM.

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