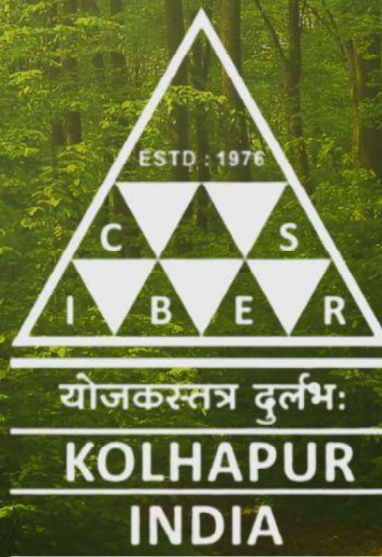




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## An Analytical Study on India Electric Mobility Index (IEMI) Developed By Niti Aayog

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### Abstract

This review article discusses the current state of EV market around the globe with special focus on India, highlighting challenges and opportunities for EV in the Indian context. EV or electric mobility is a growing component in the transportation sector of India. It is expected to spearhead India's progress towards net-zero by 2070. Considering the huge transition required to adopt EV from current fossil fuel-based transportation system, it is important that India builds robust electric mobility infrastructure throughout the country. India Electric Mobility Index (IEMI) is a multi-faceted evaluation tool developed by NITI Aayog. It serves as the first step towards understanding, evaluating and improving the electric mobility infrastructure from technology, administration and human viewpoints on a national scale. This article analyses various components of IEMI including its parameters, data collection process, score calculation methodology and scoring techniques. It also provides a list of interventions helpful for the states and UTs of India to improve their IEMI performance.

**Keywords** - EV, Electric Mobility, India Electric Mobility Index

### Introduction

The India Electric Mobility Index (IEMI) is a novel and innovative approach developed and championed by NITI Aayog, which is aimed at understanding the state of EV supportive infrastructure and EV research, and evaluating effectiveness thereof through 16 indicators that cover three key areas viz.—Transport Electrification Progress, Charging Infrastructure Readiness, and EV Research & Innovation Status. The index provides a complete snapshot of the electric mobility in a state or UT in the form of a composite score out of 100, known as IEMI score (Niti Aayog, 2025)<sup>1</sup>.

In line with Article 1 of the Indian Constitution (Legislative Department, 2025)<sup>2</sup> and Competitive Federalism espoused by NITI Aayog (Niti Aayog, 2025)<sup>3</sup>, the IEMI strives to promote healthy competition amongst states and union territories to drive the nation towards enhanced sustainability and electric powered transportation system. The IEMI score can be construed as a percentage of e-mobility objectives achieved by the respective state or UT.

According to an MDPI research paper published in May 2023 (Ferrer et al., 2023)<sup>4</sup>, transportation sector is responsible for 15% of anthropogenic GHG, 23% of global energy-related, and 8.7 Gt CO<sub>2</sub>-eq emissions. As a consequence of this, the same sector offers significant opportunities for the mitigation of anthropogenic carbon footprint. India, being the world's third largest CO<sub>2</sub> emitter wherein transportation constitutes the biggest piece of the pie (Jain et al., 2023)<sup>5</sup>, it can set an example by mitigating transportation related GHG emissions through the development of a robust electric mobility infrastructure and EV market. From 2001 to 2020, CO<sub>2</sub> emissions from the Indian transportation sector increased from 155.9 Mt to 368.2 Mt. wherein road transport produced 88% of all CO<sub>2</sub> emissions (Jain et al., 2023)<sup>5</sup>. IEMI should serve as a milestone in the development and administration of electric mobility infrastructure in the country.

### Objectives of the study

1. This paper aims to –
2. provide an overview of electric mobility across the globe with special focus on India
3. study IEMI by analysing its multi-parameter framework
4. suggest broad strategies to improve the performance of a state or UT on IEMI.

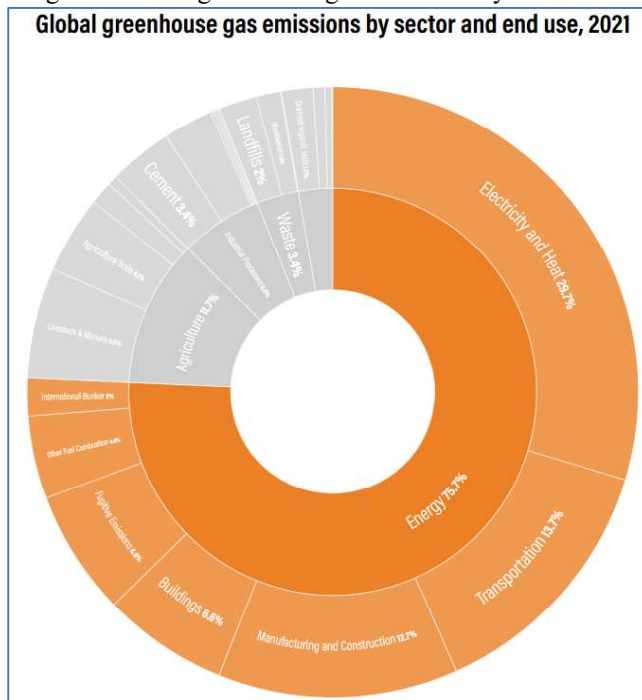
### b) The structure of this paper is as follows:

The paper starts by giving an overview of sector-wise GHG emissions. Then it explores the EV as a strategy to mitigate GHG emissions with special focus on India. In the last part, it attempts to provide a comprehensive description of IEMI.

**The sector-wise GHG emissions around the globe and in India**

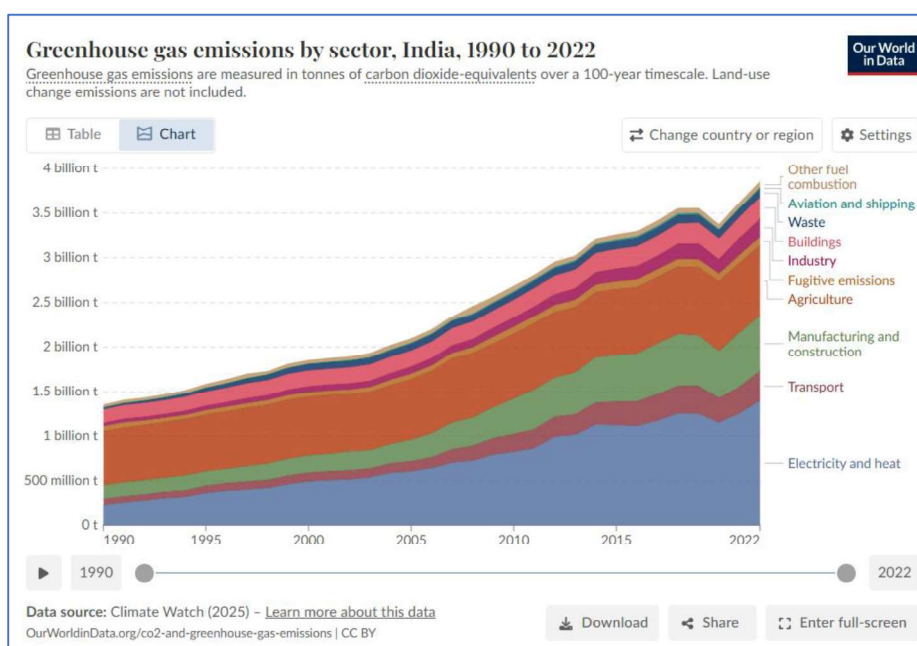
According to World Resources Institute 2021 report<sup>6</sup>, transportation contributes to 13.7% of total GHG emissions. The contribution of the transportation sector is not same everywhere. In the US, for example transportation is a much larger contributor than the global average. According to a chart published by ourworldindata.org<sup>7</sup> based on the data provided by Climate Watch, the contribution of transportation sector in India grew from 4.88% in 1990 to 8.62% in 2022, reaching a whopping 332 million tonnes CO2 equivalent.

Image 1 – Global greenhouse gas emissions by sector and end use



Source – World Resources Institute (Data source - Climate Watch)<sup>6</sup>

Image 2 – Global greenhouse gas emissions by sector, India, 1990 to 2022



Source – Our World in Data (Data source - Climate Watch)<sup>7</sup>

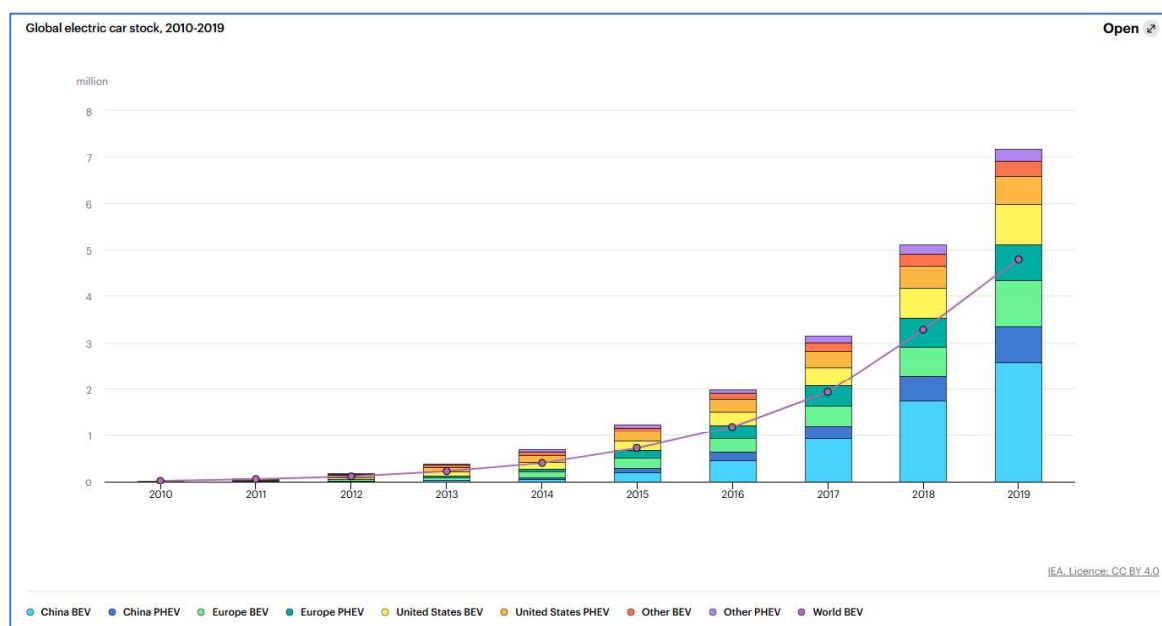
### Growth of EV as a strategy for mitigating transportation specific GHG emissions

There are different views on life-cycle GHG emissions of electric vehicles, as one must consider the carbon footprint of electricity used for the production and subsequent regular charging of electric vehicles. However, as per Hirz et al.<sup>8</sup>, when considering low-carbon electric power generation, the life cycle related greenhouse gas emission impact of electric cars is significantly lower than those of cars driven by combustion engines, even if their footprint of vehicle production might be higher than those of conventional cars. A significant advantage of EVs compared to conventional gasoline vehicles is their energy efficiency. EVs use approximately 87%–91% of the energy from the battery and regenerative braking to propel the vehicle. Gasoline vehicles only convert about 16–25% of the energy from gasoline into movement [averaging highway and city driving] (US EPA, 2025)<sup>13</sup>. In India, 41.6% of electricity generation is from non-fossil fuel sources (GOI, Ministry of Power)<sup>9</sup>, and the same is expected to increase in upcoming decades due to government policies. Hence, a robust EV sector supported by low-carbon electric power generation will prove to be an effective strategy for India towards achieving net-zero by 2070.

### State of electric vehicles around the globe and in India

Following a decade of tremendous expansion, by the end of 2020, the global EV stock (cars, vans, trucks, buses and 2 and 3 wheelers) was around 50 million (IEA, 2025)<sup>15</sup>. Sales of electric cars topped 2.1 million globally in 2019, taking the global stock to 7.2 million. Electric cars registered a 40% year-on-year increase. Indications of a continuing shift from direct subsidies to policy approaches that rely more on regulatory and other structural measures – including zero-emission vehicles mandates and fuel economy standards – have set clear, long-term signals to the auto industry and consumers that support the transition in an economically sustainable manner for governments (Global EV Outlook, 2020)<sup>10</sup>. Owing to these favourable factors, the global EV stock reached around 140 million in 2024 (IEA, 2025)<sup>15</sup>.

Image 3 – Global electric car stock, 2010-2019



Source – Global EV Outlook, 2020<sup>10</sup>

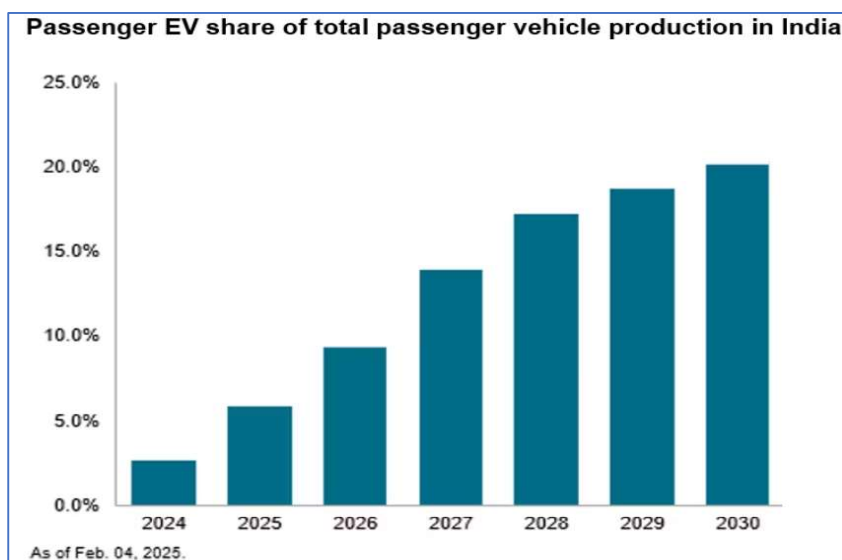
In India, currently the EV market is small. But India aims for 100% electric vehicle sale by 2030. The CAGR of electric vehicles since 2020 is 28.12%. Once accounting for just 0.5% of total vehicle sales in 2018, EVs rose to 7.7% of new vehicle sales in 2024, with over 6.5 million EVs operating on Indian roads as on June 2025 (IEMI Report 2024)<sup>18</sup>. According to a survey in Ludhiana, 36% of the existing car and two-wheeler owners were enthusiastic about shifting to electric vehicle. Telangana state Government is also encouraging the use of EVs by eliminating road tax for EV owners, planning to build charging facilities at metro stations in Hyderabad and proposing to replace diesel-run public transport vehicles with electric vehicles in Hyderabad. In November 2018, the Delhi Govt. released a draft policy that is aiming to convert 25% of their vehicles to EVs by offering various incentives and by setting up charging infrastructures in both residential and non-residential areas. This policy aimed to develop a charging point at every 3 km by offering a subsidy of 100% (up to INR 30,000) and waive off

the road tax, parking charges, and registration fee for EV by 2023. In Mumbai-Pune highway, a private firm named Magenta Power is also working for setting up EV charging infrastructure (Goel et al.)<sup>11</sup>.

Below is a list of the major nation-wide initiatives by GoI to promote EV market (Business Outreach, Sep, 2025)<sup>14</sup>:

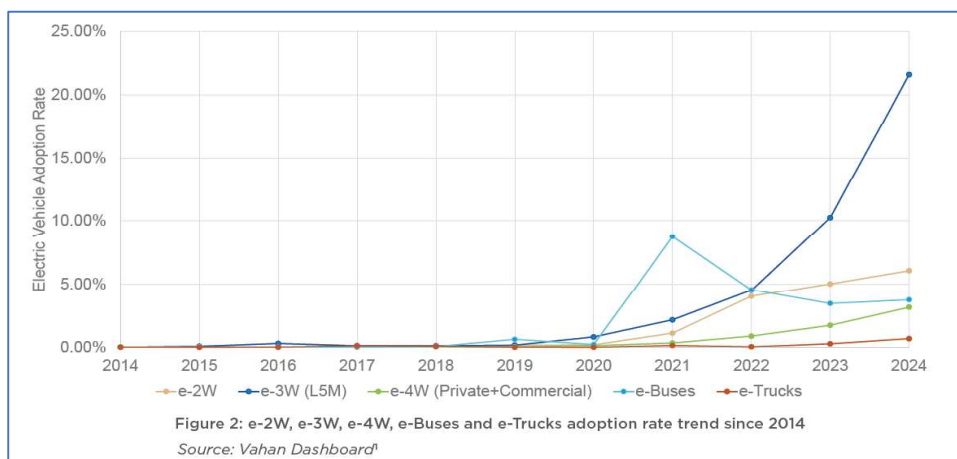
- 1) FAME [Faster Adoption and Manufacturing of Hybrid and Electric Vehicles] Scheme – a multi-phased subsidy scheme focusing on EVs, battery capacity, charging infrastructure, domestic manufacturing and integration with renewable energy.
- 2) GST Reduction, Tax Incentives, and Regulatory Support - GST on EVs has been reduced to 5%, buyers are eligible for a claim on an income tax deduction, EVs are exempt from permit requirements [for commercial use] and the government has issued green license plates for EVs.
- 3) Production-linked Incentive [PLI] Scheme - The government has introduced PLI for the Advanced Chemistry Cell Batteries with an outlay of ₹18,100 crore.
- 4) Charging Infrastructure Push - The Indian government has set a target of installing over 22,000 public charging stations by 2026.

Image 4 – Passenger EV share of total passenger vehicle production in India



Source – S&P Global Mobility<sup>12</sup>

Image 5 – Electric vehicle adoption rate in India



Source – India Electric Mobility Index 2024<sup>18</sup>

### India Electric Mobility Index (IEMI) – an evaluation tool for electric mobility infrastructure in India

India's EV sector suffers from various obstacles viz. unavailability of skilled repair and maintenance personnel, high capital cost, lack of consumer awareness about government initiatives for EVs, import dependence for raw materials of batteries, limited driving range of most EVs, environmental impact of battery production and disposal and lack of robust charging infrastructure (Goel et al.)<sup>16</sup>. Many of these factors can be mitigated only through support from the government and various public institutions. IEMI has been designed to critically evaluate and analyse the state of electric mobility infrastructure in a state or UT.

#### Objectives of IEMI (India Electric Mobility Index 2024)<sup>18</sup>

- 1) To recognise states that are performing well in this sector
- 2) To identify key success factors that have an outsized impact on e-mobility development
- 3) To encourage states to take a more proactive approach to e-mobility
- 4) To support evidence-based policymaking for sustainable EV growth

#### Parameters of IEMI (India Electric Mobility Index 2024)<sup>18</sup>

Weight	Key Area	Parameter	Type	Description
50%	Transport Electrification Progress	EV Registration and Adoption rate (25%) <i>Of private and commercial vehicles</i>	Outcome	Share of electric vehicles registered in the state as per Vahan data
		Transport Electrification Initiatives (11.5%) <i>For governance, transition, operational support and fuel price parity</i>	Enabler	State-led efforts to plan, regulate and accelerate EV adoption
		Purchase Incentives (13.5%)	Enabler	State subsidies, tax exemptions and fee exemptions offered by state
30%	Charging Infrastructure Readiness	EV to EV charger ratio (15%)	Outcome	Total no. of public chargers and charging stations in the state
		Charging Infrastructure Initiatives (10.5%) <i>Including capital subsidies for charger infrastructure, and formulation of bylaws for charging</i>	Enabler	Government fiscal and non-fiscal incentives to promote charging infrastructure
		Total renewable energy capacity and its share (3%)	Enabler	Share of renewables in the total installed electricity generation capacity
		Power availability (1.5%)	Enabler	Gap between power demand and supply
20%	EV Research and Innovation Status	Startups (10%)	Outcome	No. of e-mobility startups in a state
		EV Research and Innovation (6%) Initiatives	Enabler	State efforts to promote electric mobility research
		EV Patents (4%)	Enabler	Total no. of active patents related to e-mobility in a state

**Break-up of parameters and their weights (India Electric Mobility Index 2024)<sup>18</sup>**

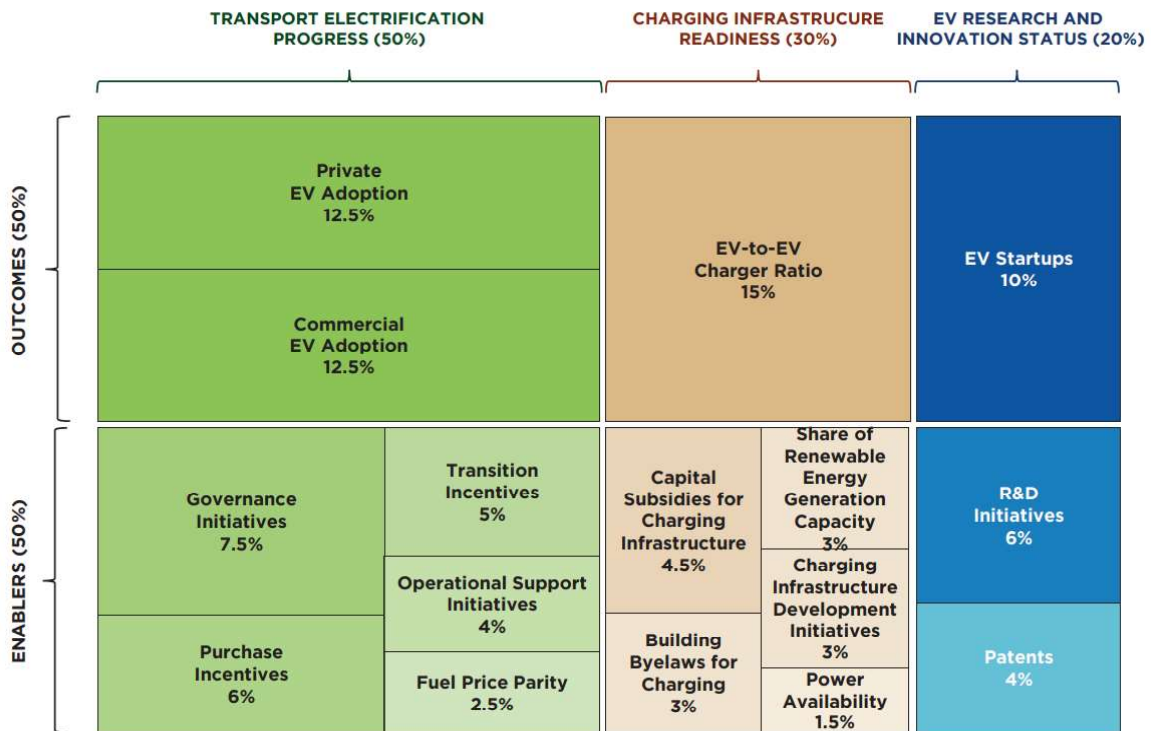
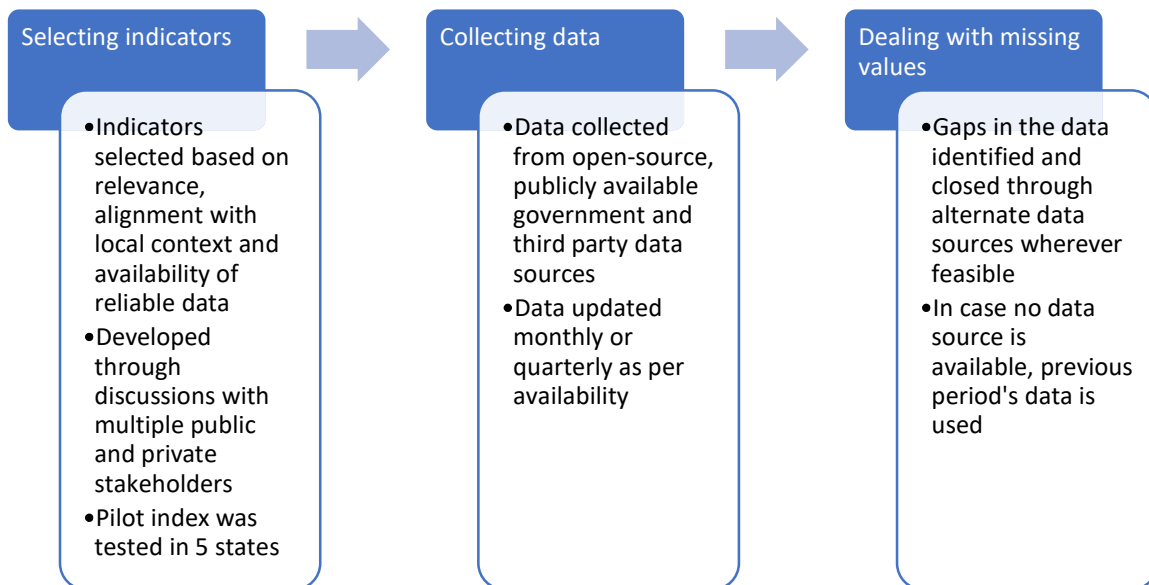


Figure 8: IEMI Theme and Indicator Weightages

Source – Niti Aayog<sup>18</sup>

**a) Data collection process of IEMI (India Electric Mobility Index 2024)<sup>18</sup>**



**b) Calculation of score (India Electric Mobility Index 2024)<sup>18</sup>**

**Table 1: Theme Weightages and Theme Score Notations**

Theme	Theme Weightage	Theme Score
Transport Electrification Progress	50% (T <sub>1</sub> )	S <sub>1</sub>
Charging Infrastructure Readiness	30% (T <sub>2</sub> )	S <sub>2</sub>
EV Research and Innovation Status	20% (T <sub>3</sub> )	S <sub>3</sub>

For any state or UT,

$$IEMI\ score = T_1S_1 + T_2S_2 + T_3S_3$$

**Table 2: Indicator Weightage Notations**

Indicator	Indicator Weightage	Indicator score
Indicator 1	(I <sub>1</sub> )	K <sub>1</sub>
Indicator 2	(I <sub>2</sub> )	K <sub>2</sub>
Indicator n	(I <sub>n</sub> )	K <sub>n</sub>

For any state or UT,

$$Theme\ Score = \frac{\sum_{i=1}^n I_i K_i}{W_T}, I_i \in T,$$

where

W<sub>T</sub> is the theme weightage of theme T and  
 I<sub>i</sub> ∈ T represents indicator i belonging to theme T.

**c) Scoring methods (India Electric Mobility Index 2024)<sup>18</sup>**

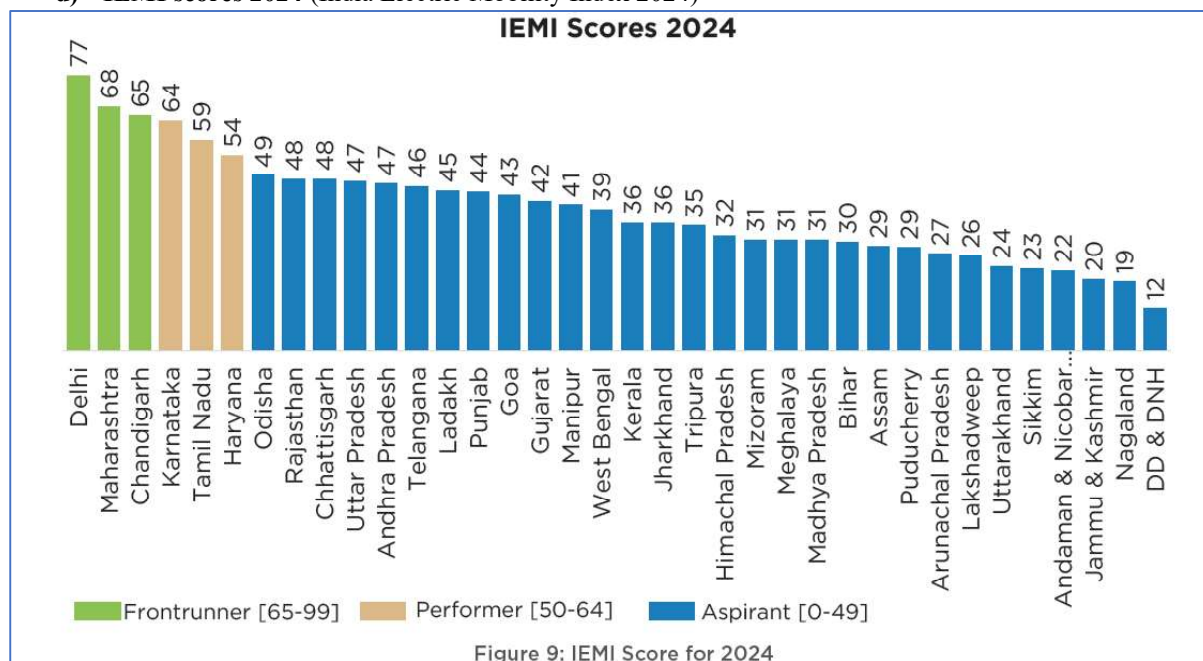
The indicators are evaluated based on two scoring methods: absolute and relative scoring. In the absolute scoring method, a state is scored based on the number of given initiatives it is implementing. In the relative scoring method, a state is scored in comparison with the performance of other states and UTs. Relative Scoring Indicators are:

- 1) private EV adoption
- 2) commercial EV adoption
- 3) purchase incentives
- 4) fuel price parity
- 5) EV-to-EV charger ratio
- 6) share of renewable energy generation capacity
- 7) power availability
- 8) EV Startups and EV Patents.

Absolute or Binary scoring Indicators are:

- 1) governance initiatives
- 2) transition initiatives
- 3) operational support initiatives
- 4) charging infrastructure development initiatives
- 5) building bylaws and mandates and R&D initiatives. Each indicator’s scoring method is tailored to rationalise the evaluation process.

**d) IEMI scores 2024 (India Electric Mobility Index 2024)<sup>18</sup>**



**e) Recommendations to improve the score**

Following are the recommendations applicable to all the states and UTs in general that will help them improve their IEMI scores:

- 1) The states lacking an EV policy should frame and notify a detailed policy in this direction to develop a comprehensive approach to the EV.
- 2) The states struggling to grow their EV sector despite robust policy framework should consider developing fiscal and non-fiscal measures to promote EV, in the form of concessions, exemptions and incentives.
- 3) Some states need to consider setting up a high-level interdepartmental committee to steer the development of electric mobility in the planned direction.
- 4) To address the scarcity of skilled manpower in this sector, the states and UTs can set up EV skill development centres and offer e-mobility courses.
- 5) Every state and UT should have a dedicated website or app for EV awareness and support.
- 6) The states lying in remote areas with sufficient land availability can offer concessional land rates for charging infrastructure setup.
- 7) Providing single window system for approvals to setup charging infrastructure is a prerequisite to develop EV in India.
- 8) Collaboration between government agencies and top universities to promote EV oriented R&D is the need of the hour to develop state of the art EV.
- 9) Regions such as Delhi can consider setting up low emission zones in designated areas.
- 10) To facilitate transition from old vehicles to EVs, some states need to design attractive scrapping policies and incentives.

**Conclusion**

It is clear from this study that EV is a high-potential “green” sector that will drive India’s progress towards becoming net-zero by 2070. Given that EV embodies a huge transition from decades old fossil fuel-based transportation system, it requires significant investment in electric mobility infrastructure. The India Electric Mobility Index (IEMI) is a well-articulated tool developed by NITI Aayog to evaluate the state of electric mobility infrastructure in each state and UT. This tool not only highlights weak areas for a state/UT but also provides a direction to its efforts towards promoting electric mobility. The concerned state/UT can aspire to stand out as a leader in the EV revolution of India, and set an example for other states/UTs in a friendly competitive federalism spirit.

**References**

India Electric Mobility Index | iTech Mission Niti Aayog website

Constitution of India, Legislative Department, GOI

Competitive Federalism, Niti Aayog website

Carbon Emissions in Transportation: A Synthesis Framework by Ana Luiza Carvalho Ferrer, May 2023

Analysing driving factors of India's transportation sector CO2 emissions: Based on LMDI decomposition method by Siddharth Jain, Shalini Rankavat, September 2023

World Resources Institute - Where Do Emissions Come From by Mengpin Ge, Johannes Friedrich and Leandro Vigna, December 2024

Breakdown of carbon dioxide, methane, and nitrous oxide emissions by sector by Hannah Ritchie, Pablo Rosado, and Max Roser, January, 2024

Breakdown of carbon dioxide, methane, and nitrous oxide emissions by sector by Hannah Ritchie, Pablo Rosado, and Max Roser, January, 2024

Greenhouse Gas Emissions of Electric Cars: A Comprehensive Evaluation by Hirz et al. May 2022

Power Sector at a Glance ALL INDIA, Ministry of Power, GOI

Global EV Outlook 2020

A review on barrier and challenges of electric vehicle in India and vehicle to grid optimisation by Goel et al. June 2021

India's EV Market: Trends and Future Prospects, S&P Global, 2024

Electric Vehicle Myths, United States Environmental Protection Agency

Electric Vehicle Market in India: Opportunities and Challenges by Archita Lotani Business Outreach, September 2025

Global EV Data Explorer IEA, July 2025

A review on barrier and challenges of electric vehicle in India and vehicle to grid optimisation by Goel et al. June 2025

India Electric Mobility Index | iTech Mission Niti Aayog website

Electric Mobility Index Report, 2024 India Electric Mobility Index | iTech Mission Niti Aayog website

Introduction to Electric Mobility by Feras Naser February 2023

Electric Mobility in Brazil: Opportunities, Challenges, and Future Trends by Jairo Silva September 2025

The Cutting Edge of Electric Mobility : In-depth analysis of strategies of companies leading the electrification of land sea and air: Innovation Shikiho 2023 Summer/Autumn by Hatada, Kusuura December 2023

Sustainability: What Everyone Needs to Know by Thompson, Norris, Sorensen April 2021

Electric Vehicles: Electrifying the Road Ahead. Unveiling the Evolution, Innovations, Insights, Progress, & Sustainability, and Shaping Tomorrow by Jamal M August 2023

Analysis of Selected Sustainability Criteria of Electric Vehicles from an Energy-Economic Perspective in Europe by Bodo Gohla-Neudecker September 2014