



India's Electric Vehicle Journey

This editorial is based on “[Should not EVs and Hybrids be treated equally for government subsidies?](#)” which was published in The Hindu on 21/06/2024. The article brings into picture the importance of focusing on technologies like strong hybrids and electric vehicles that offer greater emissions reductions. It highlights the need for evolving policies that balance lifecycle emissions, total cost of ownership complying with India's broader climate and energy security goals

For Prelims: [Electric vehicles](#), Plug-in Hybrid Electric Vehicles, Battery Electric Vehicles, [National Electric Mobility Mission Plan \(NEMMP\) 2020](#), [FAME scheme](#), [New Electric Vehicle Policy](#), [Lithium-ion batteries](#).

For Mains: Major Challenges Related to Electric Vehicle Adoption in India, Measures can be Adopted to Accelerate EV Adoption in India.

The debate over [electric vehicles \(EVs\)](#) in India is complex, involving considerations of **emissions, cost, and policy**. While EVs are often touted as zero-emission vehicles, experts point out that in India, where 75% of electricity comes from coal, the **lifecycle emissions of EVs may actually be higher than those of internal combustion engine (ICE) vehicles** or hybrids in some cases.

Some argue that [hybrid vehicles](#), with their smaller battery packs and improved fuel efficiency, may currently offer a better balance of emissions reduction and cost-effectiveness in the Indian context. The debate also touches on the role of **government subsidies and policies** in shaping the automotive market.

Looking ahead, the future of EVs in India appears promising, with **increasing adoption in two-wheeler and three-wheeler segments**, ongoing improvements in battery technology, and the government's push for cleaner transportation.

What are Electric Vehicles?

- **About:** Electric vehicles are a type of vehicle that use one or more electric motors for propulsion, instead of a **traditional internal combustion engine (ICE)** that burns gasoline or diesel.
 - Though the concept of electric vehicles has been around for a long time, it has drawn a considerable amount of interest in the past decade amid a **rising carbon footprint and other environmental impacts of fuel-based vehicles**.
- **Types of Electric Vehicles:**
 - Battery Electric Vehicles (BEVs): Solely rely on battery power for propulsion and produce zero tailpipe emissions.
 - [Plug-in Hybrid Electric Vehicles \(PHEVs\)](#): Combine an electric motor with a gasoline engine. They can be charged externally and run on battery power for a limited range, then switch to the gasoline engine for longer journeys.

- **Hybrid Electric Vehicles (HEVs):** Use both an electric motor and a gasoline engine, but the battery cannot be charged directly by plugging in.
 - The battery is charged by the gasoline engine or **through regenerative braking**.
- **Benefits of EVs:**
 - **Reduced Emissions:** Produce zero tailpipe emissions, contributing to cleaner air and improved public health.
 - **Lower Operating Costs:** Electricity can be cheaper than gasoline, leading to lower fuel costs per kilometer.
 - **Quieter Operation:** Electric motors generate significantly less noise compared to gasoline engines.
 - **Improved Efficiency:** Electric motors convert a higher percentage of energy into usable power compared to gasoline engines.
- **EV Policies in India:**
 - **2010:** India incentivizes EVs through a Rs 95-crore scheme by the Ministry of New and Renewable Energy (MNRE), offering up to **20% incentives on ex-factory prices**. Withdrawn in **March 2012**.
 - **2013:** Launch of '[National Electric Mobility Mission Plan \(NEMMP\) 2020](#)' to boost EV adoption, address energy security, and reduce vehicular pollution. Largely remained unimplemented.
 - **2015:** Union Budget announces [FAME scheme](#) with a Rs 75 crore outlay to incentivize clean-fuel technology cars, **targeting 7 million EVs by 2020**.
 - **2017:** Indian Transport Ministry aims **for 100% electric cars by 2030**. Plan scaled down to **30% after industry concerns**.
 - **2019:** Union Cabinet approves **Rs 10,000-crore** [FAME-II scheme](#) to accelerate EV adoption with upfront purchase incentives and charging infrastructure.
 - **2023:** The 36th GST Council Meeting decided to **reduce the GST rate on electric vehicles from 12% to 5%** and chargers or charge stations from **18% to 5%** to boost the electric vehicle market.
 - **2024:** Centre has recently proposed a [New Electric Vehicle Policy](#) that is **currently** under consultation.

What are the Environmental Benefits of EV Adoption?

- **Reducing Air Pollution:** In India, vehicular traffic is responsible for 27% of total air pollution and causes 1.2 million deaths annually. The adoption of electric vehicles (EVs) in India will thus significantly mitigate the negative environmental impacts associated with Internal Combustion Engine (ICE) vehicles.
- **Reducing Noise Pollution:** Noise pollution is a significant issue in India, exacerbated by rapid urbanization and increased vehicle use. According to a 2022 UNEP report, five Indian cities are among the world's noisiest. While the report cites various sources, EVs can help lower noise levels since they lack the mechanical valves, gears, and fans found in ICE vehicles.
- **Improving Operational Efficiency:** In terms of fuel efficiency, petrol or diesel cars convert only 17 to 21% of stored energy, whereas EVs can convert 60% of electrical energy from the grid. This transition to electric vehicles in India will enhance the efficiency of fuel usage and optimization, reducing operational costs for end-users and increasing the demand for EVs.

What are the Major Challenges Related to Electric Vehicle Adoption in India?

- **High Cost of EVs:** Compared to an **internal combustion engine (ICE)** car, a similar electric car can be significantly more expensive.
 - For instance, a **Tata Nexon starts at around Rs 8.10 lakh**, while the Nexon EV starts at **Rs 14.74 lakh**.
 - This high upfront cost is a major deterrent for many potential EV buyers, particularly in a price-sensitive market like India. Government subsidies can help bridge the gap, but their effectiveness can be limited.
- **Limited Charging Infrastructure:** India's charging infrastructure for EVs is still in its early stages of development.
 - While the number of charging stations is increasing, **they are concentrated mainly in major cities**.

- This lack of widespread charging facilities creates "**range anxiety**" for potential **EV owners**, who fear running out of power before finding a charging station.
- **Lack of Robust Local Battery Manufacturing Ecosystem:** India heavily relies on imported [Lithium-ion batteries](#), a crucial and expensive EV component
 - India imports them from **China, Japan, and South Korea**. In 2022, it imported 617 million units of lithium-ion batteries for **USD 1.8 billion**.
- **Grid Dependence and Emissions:** India's electricity grid **heavily relies on coal-fired power plants**.
 - While EVs produce **zero tailpipe emissions**, charging them with electricity generated from fossil fuels contributes to overall emissions.
 - The environmental benefit of EVs depends on the **cleanliness of the electricity** grid. Until India significantly increases its renewable energy capacity, **the true environmental benefit of EVs might be limited**.
- **Skill Gap in EV Maintenance:** EVs require a different skill set for maintenance and repair compared to traditional ICE vehicles.
 - The **current Indian automotive workforce** is not adequately equipped to handle the complexities of EV technology.
- **Apprehensions on Adaptation for Indian conditions:** India's extreme temperatures, in summers often exceeding 40°C in many regions, can significantly **impact the performance of electric vehicles**.
 - Studies have shown that **EV range can decrease by up to 17%** in temperatures above 35°C.
- **Recycling and Sustainability Concerns:** Lithium-ion batteries used in EVs require proper disposal or recycling due to the presence of rare earth elements and other potentially hazardous materials.
 - India currently **lacks a robust system for EV battery recycling**. Improper battery disposal can pose environmental risks.
- **Range Anxiety:** It refers to the fear or uncertainty of running out of battery charge while driving. Many consumers worry about the limited range of EVs and the potential inconvenience of finding charging stations for long journeys.
 - Although the range of EVs has been improving, it remains a concern for consumers, especially in a country with vast distances like India and continuously improved Highway Infrastructure.

What Measures can be Adopted to Accelerate EV Adoption in India?

- **"Battery Lease-to-Own" Program:** Implementing a government-backed scheme where EV buyers only purchase the **vehicle chassis, leasing the battery long-term**.
 - As battery technology improves, **lessees can upgrade to newer models at reduced costs**.
 - At the end of the lease term, users can buy out the battery or **return it for recycling**.
 - This could reduce initial EV costs by up to 40%, making them more competitive with ICE vehicles.
- **Invest in Battery Technology:** Current batteries are small and have low voltage capacities, limiting their ability to enhance EV propulsion and extend travel distances.
 - To tackle this issue, private companies need to innovate by developing batteries made of **lightweight materials** with higher energy density, and capable of being charged using renewable sources.
 - The Government is also promoting the manufacturing of batteries in India with the National Mission for Transformative Mobility and Battery Storage, 2019.
 - Such schemes should be leveraged to promote technological enhancement in the battery segment.
- **Increase Charger Density:** According to the Confederation of Indian Industry (CII), India needs over 1.3 million chargers by 2030. To encourage EV adoption, we must significantly increase the number of charging stations.
 - **Charge as You Park:** Transforming parking meters in urban areas **into EV charging points**. This leverages existing infrastructure and creates a vast network of charging options without significant additional investment.
 - **Standardization:** The government, in collaboration with EV ecosystem players and auto

OEMs, should prioritize establishing standardization protocols, ensuring interoperability, and promoting the development of fast-charging technologies.

- **EV Rural Entrepreneurs" Program:** Enabling rural individuals to set up and operate small-scale EV charging stations from their village or small businesses.
 - Provide micro-loans and technical support for setting up standardized charging points.
 - Implementing a **mobile app for users to locate and book these charging points.**
 - Operators can earn income from charging fees, creating new economic opportunities.
- **Highway Battery Swap Corridors:** Establishing a network of standardized battery swap stations along major highway routes.
 - **Partnering with dhaba owners to host these stations,** providing them additional income.
 - Creating an **online reservation system for swap slots** to minimize wait times during peak travel.
- **Equal Subsidies to EVs and Hybrids:** The government should consider treating **EVs and hybrids equally for subsidies,** as both technologies offer significant environmental benefits.
 - Policies should be dynamic and adapt to the evolving landscape, focusing on **lifecycle emissions and total cost of ownership.**
 - This approach ensures efficient use of resources and supports India's transition to a greener transport system while meeting climate and energy security goals.
- **Second-Life Battery Bazaar:** Creating a vibrant "**Second-Life Battery Bazaar.**" This online or physical marketplace connects individuals and businesses with used batteries suitable for **repurposing in low-powered applications like rickshaws, solar storage, or even powering village microgrids.**
 - Investing in research and development of **innovative "urban mining" techniques.** These techniques can extract valuable **lithium, cobalt, and nickel from electronic waste,** including old batteries, phones, and laptops.
 - It will reduce electronic waste, create new economic opportunities, and promote a **circular EV ecosystem.**

What Can India Learn from Other Countries' Success?

- **Europe (EU, EFTA, UK):**
 - **Financial Incentives:** These countries successfully increased EV adoption through tax reductions and exemptions. India's similar policies hold promise, potentially accelerating EV penetration within the next few years.
 - **Key Takeaway for India:** Continued support through financial incentives can significantly boost EV adoption.
- **China:**
 - **Government Support & Domestic Competition:** China's dominance in the EV market stems from a potent combination. Generous government support fueled innovation, while intense domestic competition drove down prices, making EVs more accessible.
 - **Lessons for India:** While India offers government support, its domestic EV market lacks the same level of competition. Encouraging competition and continued government support can lead to a thriving Indian EV industry.
- **The US:**
 - **Government Investments & Private Innovation:** The US EV market is substantial, thanks to government investments, supportive policies, and leading players like Tesla and GM driving innovation. However, recent sales declines highlight the need for careful policy design.
 - **Lessons for India:**
 - **Innovation & Technical Expertise:** India needs to accelerate innovation by fostering educational centers of excellence. Learning from the US experience, government funding for EVs should be strategically phased out over time, considering economic factors.

Drishti Mains Questions:

Discuss the challenges and opportunities associated with the adoption of electric vehicles in India. How can government policies be optimized to support a sustainable transition to EVs while balancing

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Mains

Q. How is efficient and affordable urban mass transport key to the rapid economic development in India? (2019)

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