



## Electric Mobility: Is India Charged Up for the Future?

This editorial is based on [“Will e-mobility go the biofuel way?”](#) which was published in The Hindu Businessline on 08/04/2024. The article explains how India's Electric Vehicles (EVs) segments' growth may suffer due to problems like battery availability/disposal and proposes viable solutions.

**For Prelims:** E-Mobility, [Lithium](#), [Faster Adoption and Manufacturing of Electric Vehicles \(FAME\) scheme](#), [Vehicle Scrappage Policy](#), [Production Linked Incentive \(PLI\) scheme](#)

**For Mains:** Challenges in sustainable Electric mobility in India, Solutions for successful E-mobility transition.

India is currently experiencing a wave of excitement surrounding [electric vehicles \(EVs\)](#), towards a potential future of cleaner transportation. This shift towards EVs promises significant environmental benefits by reducing emissions in our cities.

However, to fully unlock the potential of e-mobility, it's crucial to address some key areas. It includes India's energy mix, charging infrastructure development, domestic battery manufacturing, and responsible battery disposal practices - all crucial aspects for building a robust and sustainable e-mobility ecosystem in India.

### What is E-Mobility?

Electric mobility (e-mobility) is a method that employs **electrical propulsion** partially or fully, to **power a wide range of vehicles**. Examples include cars, buses, and personal devices such as bicycles and scooters. There are two main types of electric mobility: **pure electric** and **hybrid**.

#### ▪ About Electric Vehicles:

- [Electric Vehicles \(EVs\)](#) are run by electric motors which are powered by energy stored in batteries. EVs have an electric motor instead of an [Internal Combustion Engine \(ICE\)](#).
- As an EV runs on electricity, the vehicle emits no exhaust from a tailpipe i.e. it has **zero tailpipe emission** and does not contain components, such as a fuel pump, fuel line, or fuel tank.
- EVs contribute directly to [Sustainable Development Goal \(SDG\) 7](#), which aims to ensure **access to affordable, reliable and sustainable energy for all**.
- EVs promote the use of renewable energy sources by **reducing reliance on fossil fuels** and contributes towards **India's 'Panchamrit' Targets at COP26** climate summit.

#### ▪ Current Status of E-Mobility in India:

- According to [the Bureau of Energy Efficiency \(BEE\)](#), the Electric Vehicle industry in India is far behind, with **less than 1% of the total vehicle sales**.
- Currently, Indian roads are dominated by conventional vehicles and have approximately

**0.4 million electric two-wheelers** and a few thousand electric cars only.

- **Target for EVs:** As per [NITI Aayog](#) report, the Indian government is aiming for EV adoption to reach **40 percent for buses, 30 percent for private cars, 70 percent for commercial vehicles, and 80 percent for two-wheelers by 2030.**

## TYPES OF ELECTRIC VEHICLES

<u>EV</u> (Electric Vehicle)	<u>HEV</u> (Hybrid Electric Vehicle)	<u>PHEV</u> (Plug-in Hybrid Vehicle)	<u>MHEV</u> (Mild Hybrid Vehicle)
<ul style="list-style-type: none"><li>• No IC engine</li><li>• Only electric drive</li><li>• Battery pack size is large (20-80 kWh)</li><li>• Example: <i>Nissan Leaf, Tesla Model S</i></li></ul>	<ul style="list-style-type: none"><li>• Has IC engine and electric motor</li><li>• The batteries get charged by the engine</li><li>• Battery pack size is medium (6-12 kWh)</li><li>• Example: <i>Honda Civic Hybrid</i></li></ul>	<ul style="list-style-type: none"><li>• Has IC engine and electric motor</li><li>• The batteries can be charged from an external source (plug)</li><li>• Example: <i>BMW i-8</i></li></ul>	<ul style="list-style-type: none"><li>• IC engine and electric motor</li><li>• Turns off the engine and switches to motor when coasting, braking and restarting quickly</li><li>• Cannot be solely driven on electric motor</li><li>• Example: <i>Chevrolet Silverado Hybrid</i></li></ul>



## Why are EVs Crucial?

- **Environmental Benefits:** EVs have the potential to significantly reduce [greenhouse gas emissions](#) and combat [climate change](#).
  - Unlike [fossil fuel](#) engine vehicles, EVs produce zero tailpipe emissions.
  - EVs help reduce carbon dioxide (CO<sub>2</sub>) and other pollutants that contribute to air pollution, smog, and global warming.
  - Electric vehicles help reduce harmful pollutants such as [nitrogen oxides \(NO<sub>x</sub>\)](#), [particulate matter \(PM\)](#), and [volatile organic compounds \(VOCs\)](#).
    - This has a direct positive impact on public health, as cleaner air reduces the risk of respiratory and cardiovascular diseases.
- **Energy Diversity and Security:** EVs contribute to energy diversity by **reducing dependence on oil imports**.
  - As the electricity grid can be powered by a mix of energy sources, including renewables like solar and wind. EVs offer the opportunity to shift transportation towards cleaner and more sustainable energy options.
- **Technological Advancements and Job Creation:** The development and adoption of EVs have spurred technological advancements in battery technology, electric drivetrains, and charging infrastructure.
  - These advancements not only benefit the automotive sector but also have broader applications, such as energy storage for [renewable energy](#) sources and grid stability.
  - Electric mobility **creates jobs and innovation** in battery manufacturing, [renewable](#)

[energy](#), and charging infrastructure.

- **Long-Term Cost Savings:** Electric vehicles have **lower operating costs**, as electricity is generally cheaper than gasoline or diesel.
  - Moreover, EVs have fewer moving parts and require less maintenance, resulting in reduced servicing and repair expenses over time.
- **Decongesting Cities:** Electric vehicles can help decongesting cities by promoting **shared mobility** and compact design.
  - **Shared mobility** refers to the use of vehicles as a service rather than as a personal asset. This can reduce the number of vehicles on the road and the need for parking space.
  - **Compact design** refers to the use of smaller and lighter vehicles that can fit more easily in urban spaces. This can also reduce congestion and emissions.
  - **Innovative and futuristic smart EVs** for shorter intra-city distances, day- trips, and the like would not need a bigger battery. That means less time to recharge and lower cost.

## What are the Emerging Challenges Associated with E-Mobility in India?

- **Limited Environmental Benefit:**
  - India's **current dependence on fossil fuel-based electricity generation** significantly **diminishes** the potential **environmental benefits** associated with **electric vehicles**.
    - As per India Energy Outlook 2021, if India continues with its current energy mix (dominated by fossil fuels-75 percent), switching to EVs might not lead to a significant decrease in carbon emissions .
- **Range Anxiety and Infrastructure Bottlenecks:**
  - **Range anxiety** refers to the fear or concern of running out of battery charge while driving. The **limited driving range** is a significant challenge for EV adoption.
    - A report by the **Ministry of Power, India, mandates a charging station every 25 km on highways**. However, as of 2023, India has only around 1,800 charging stations, with most concentrated in major cities like Delhi, Mumbai, and Bengaluru.
  - Additionally, **charging times are significantly longer** than refueling conventional vehicles.
  - Setting up charging stations is **expensive**, requiring substantial investment in land and technology. The widespread adoption of EVs could also put a strain on electricity grids during peak demand hours.
- **Higher Tyre Emissions:**
  - **EVs tend to be heavier** than conventional vehicles, potentially leading to increased particulate matter **emissions from tires**, negating some of the [tailpipe emission](#) reduction benefits.
- **Battery Dependence and Supply Chain Issues:**
  - India lags in domestic battery manufacturing, **heavily relying on imports( 77 percent of total imports from China** as per [Global Electric Vehicle Outlook, 2022](#),
  - This raises concerns about future battery price hikes, especially considering the limited geographic sources of some raw materials.
    - Notably, **Biofuel development in India** hasn't thrived well as it did in Brazil, primarily **due to a shortage of feedstock of biofuels**.
  - Additionally, a **robust system for responsible battery disposal** is yet to be established, posing a potential environmental threat.
  - **Carbon Border Adjustment Mechanism (CBAM):** The European Union's implementation of the CBAM is set to affect several of our industries. CBAM could disproportionately affect developing countries that rely on exports to wealthier nations.

## What are Some Government Initiatives to Promote EV Adoption?

- [New Electric Vehicle Policy 2024](#)
- [Faster Adoption and Manufacturing of Electric Vehicles \(FAME\) Scheme II](#),
- [National Electric Mobility Mission Plan \(NEMMP\)](#),
- [National Mission on Transformative Mobility and Battery Storage](#),
- [Production Linked Incentive \(PLI\) scheme](#)
- [Go Electric campaign](#)

- India is among a handful of countries that support the global [EV30@30 campaign](#), which aims for at least 30% of new vehicle sales to be electric by 2030.

## What are the Possible Ways to Boost E-Mobility in India?

- **Boosting Renewable Energy:** Transitioning towards renewable energy sources like [solar and wind power](#) is crucial to maximize the environmental benefits of EVs.
  - Government Initiatives like [National Green Hydrogen Mission](#), [Global Biofuel Alliance \(GBA\)](#), [PM-KUSUM](#) aims to enhance India's Capacity in renewable energy production. It will ensure cleaner electricity generation for charging of EVs.
- **Expanding Charging Infrastructure:** Developing a network of charging stations, particularly along highways and rural areas, is essential to alleviate range anxiety. Exploring innovative solutions like [battery swapping stations](#) can significantly reduce charging time. However, standardization of battery design and collaboration among stakeholders is necessary for this approach.
  - Government Initiatives like [National Mission on Transformative Mobility and Battery Storage](#), the [Production Linked Incentive \(PLI\) scheme](#) aims towards solving the infrastructural challenges related to charging of EVs.
- **Encouraging Domestic Battery Manufacturing:** Investing in domestic battery production capabilities is vital to reduce import dependence, control battery costs, and create new job opportunities. Collaboration between the government and industry can drive the development of a robust domestic battery supply chain.
  - Government Initiatives like [Faster Adoption and Manufacturing of Electric Vehicles \(FAME\) Scheme II](#) are likely to aid domestic battery manufacturing for EVs.
- **Addressing Battery Disposal Challenges:** A well-defined system for disposing of used EV batteries is crucial for environmental sustainability. Raising public awareness about responsible battery disposal practices and investing in efficient recycling facilities are essential steps.
  - Government Initiatives like the [New Electric Vehicle Policy 2024](#) and [Vehicle Scrappage Policy](#) are likely to address the battery disposal challenges.

## Conclusion

The aim to build a successful e-mobility ecosystem requires a collective effort from the government, industry, and stakeholders. The government should play a vital role by providing financial incentives for EV adoption and domestic battery manufacturing. The industry needs to invest in infrastructure development, research, and innovation to create a robust and efficient e-mobility ecosystem fulfilling [SDG 7](#) for access to affordable clean energy to all.

### Drishti Mains Question:

Evaluate the emerging challenges associated with E-mobility transition in India. Discuss the government initiatives and opportunities associated for its widespread adoption.

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

### Prelims

**Q. In the cities of our country, which among the following atmospheric gases are normally considered in calculating the value of Air Quality Index? (2016)**

1. Carbon dioxide
2. Carbon monoxide
3. Nitrogen dioxide
4. Sulfur dioxide

## 5. Methane

**Select the correct answer using the code given below:**

- (a) 1, 2 and 3 only
- (b) 2, 3 and 4 only
- (c) 1, 4 and 5 only
- (d) 1, 2, 3, 4 and 5

**Ans: B**

**Q. With reference to the Agreement at the UNFCCC Meeting in Paris in 2015, which of the following statements is/are correct? (2016)**

1. The Agreement was signed by all the member countries of the UN and it will go into effect in 2017.
2. The Agreement aims to limit the greenhouse gas emissions so that the rise in average global temperature by the end of this century does not exceed 2°C or even 1.5°C above pre-industrial levels.
3. Developed countries acknowledged their historical responsibility in global warming and committed to donate \$ 1000 billion a year from 2020 to help developing countries to cope with climate change.

**Select the correct answer using the code given below:**

- (a) 1 and 3 only
- (b) 2 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

**Ans: B**

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## **Mains**

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