



Scaling Electric Vehicles in India

This editorial is based on “ [The private sector holds the key to India’s e-bus push](#)” which was published in The Hindu on 28/10/2024. The article discusses that the PM E-DRIVE scheme advances electric buses in public transport, but private operators' exclusion may limit scalability. Financing options and shared charging infrastructure are key for broader EV adoption.

For Prelims: [PM Electric Drive Revolution in Innovative Vehicle Enhancement \(PM E-DRIVE\)](#), [Electric Vehicles \(EVs\)](#), [Faster Adoption and Manufacturing of \(Hybrid and\) Electric Vehicles in India \(FAME India\)](#), [Battery-as-a-Service \(BaaS\)](#), [Renewable Energy Sources](#), [Noise Pollution](#), [Electric Mobility Promotion Scheme 2024](#), [FAME India Scheme](#), [Make in India](#), [Lithium-ion Cells](#), [Charging Stations](#).

For Mains: Significance of E-vehicle in Supporting Public Transportation and Reducing Pollution in India.

In a significant step toward achieving India’s **climate goals**, the **Union Cabinet** has approved the [PM Electric Drive Revolution in Innovative Vehicle Enhancement \(PM E-DRIVE\)](#) scheme, allocating **Rs 4,391 crore** for subsidies to procure **14,028 electric buses** across nine cities. This marks a significant shift toward **electric mobility** in public transport.

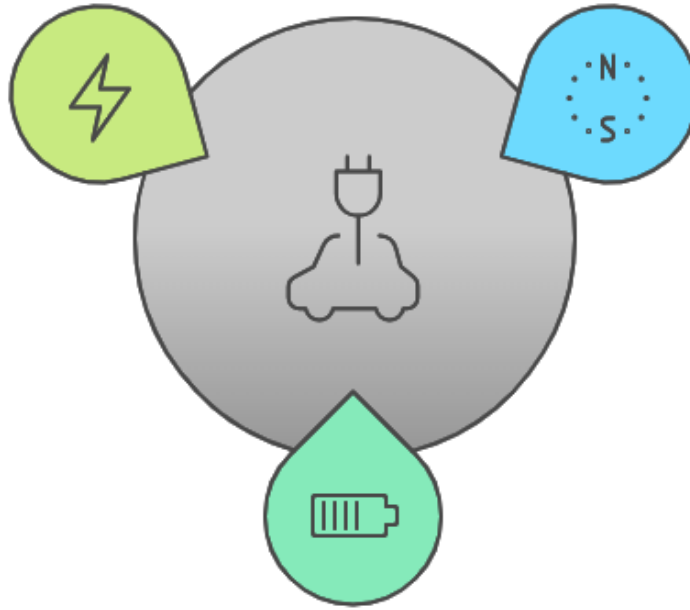
Currently, the deployment of electric vehicles has been largely driven by public sector initiatives, particularly the [Faster Adoption and Manufacturing of \(Hybrid and\) Electric Vehicles in India \(FAME India\)](#) scheme. Despite substantial funding, only a small fraction of the **24 lakh** registered buses in India are electric, with private operators making up **93%** of the total but lacking significant incentives.

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Electric Vehicle

Electricity

The energy source powering the vehicle's systems



Electric Motors

Devices that convert electrical energy into mechanical power

Rechargeable Batteries

Storage units that provide energy for vehicle operation



Types of Electric Vehicles

Fuel Cell Electric Vehicle

Generates electricity through hydrogen, emitting zero pollutants.



Battery Electric Vehicle

Relies solely on rechargeable batteries for power.



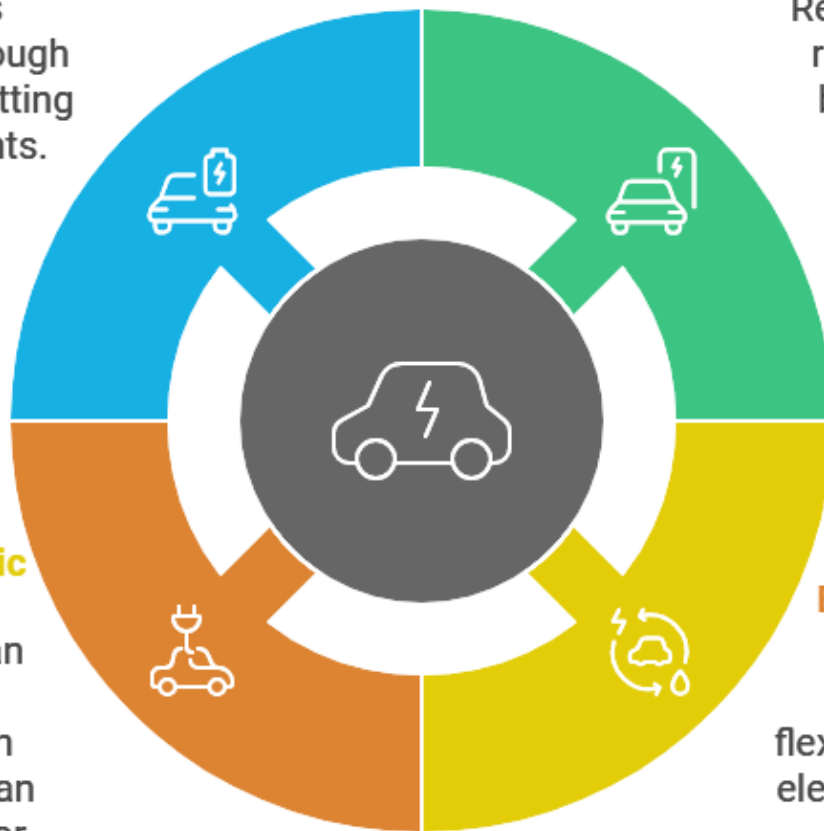
Hybrid Electric Vehicle

Combines an internal combustion engine with an electric motor.



Plug-in Hybrid Electric Vehicle

Offers the flexibility of using electricity or fuel.



What are the Benefits of Electric Vehicles (EVs)?

- **Environmental Impact:** EVs produce **zero tailpipe emissions**, making them cleaner and beneficial for urban air quality.
 - They significantly reduce **greenhouse gas emissions**, especially when powered by **renewable energy sources**, helping India work towards its carbon neutrality targets.
- **Lower Running Costs:** EVs are cheaper to operate in the **long run**, with electricity costs typically lower than fuel costs.
 - Government incentives, such as reduced electricity tariffs for **EV charging**, make them even more cost-effective.
- **Reduced Maintenance Requirements:** EVs have fewer moving parts compared to internal combustion engines, leading to lower wear and tear and, subsequently, reduced maintenance costs.
- **Financial Incentives and Tax Benefits:** The government offers various incentives like reduced **registration fees, tax benefits, and subsidies**, making EVs more affordable and encouraging widespread adoption.
- **Enhanced Efficiency:** EVs convert up to **60% of electrical energy** into propulsion, whereas traditional combustion engines (petrol or diesel cars) convert only 17%-21%, making EVs more energy-efficient.
- **Reduced Noise Pollution:** EVs operate quietly, helping to **reduce noise pollution** in crowded urban areas, enhancing driving comfort, and benefiting public health.

What are the Challenges in EV Adoption as Public Transport?

- **High Upfront Costs:** Electric buses and other public transport vehicles are **1.5 to 2 times** more expensive than diesel alternatives.
 - This financial burden is particularly challenging for small private operators who lack sufficient funds.
 - While **electric intercity buses** can be more profitable over their service life, high interest rates and loan costs make them less financially viable during loan periods.
- **Limited Charging Infrastructure:** [Charging stations](#) are limited to urban areas and largely concentrated in state-run transport hubs.
 - For instance, there were only **12,146 public EV charging stations** operational across the country as of February 2024.
 - **Private bus operators** often find it challenging to set up or access affordable charging facilities, especially in **semi-urban or rural areas**.
- **Financial Risks and Limited Access to Credit:** Banks view EV investments as high-risk due to limited resale value and uncertain battery life, leading to higher interest rates and shorter loan terms.
 - This financial risk deters private players from entering the EV market.
- **Battery Life and Maintenance:** Battery replacement costs are significant, and many operators worry about degradation over time.
 - Additionally, EV technology requires **specialized maintenance**, increasing dependency on technical know-how and specialized services.
- **Grid Stability and Power Supply:** The energy demands for charging EVs are high, especially in densely populated areas.
 - In regions where power cuts are frequent, **grid stability** becomes a concern, hampering the reliability of EV infrastructure.
- **Lack of Skilled Workforce:** EVs require specific skills for maintenance and repairs, and the lack of trained personnel affects the operational efficiency and longevity of EVs in public transport.
- **Private Sector Exclusion:** The public sector has driven electric bus deployment, supported by subsidies under the **FAME India scheme**, which funded 425 buses under **FAME I (2015-2019)** and 7,120 under **FAME II (2019-2024)**.
 - However, public transport buses account for **only 7%** of registered buses in India, while private buses, making up 93%, are not included in major national schemes.
 - Limited financing, high perceived risks, and low resale values complicate the uptake of electric buses in the private sector.

What are the Government Initiatives to Promote Electric Vehicles?

- **National Level Initiatives:**
 - **Electric Mobility Promotion Scheme 2024 (EMPS):** The [Electric Mobility Promotion Scheme 2024](#) has an outlay of **Rs 778 Crore** and will be in effect from 1st April 2024, to 30st September 2024.
 - This scheme provides incentives to buyers of electric **two-wheelers (e-2W) and three-wheelers (e-3W)**.
 - **Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Scheme:** The [FAME India Scheme](#) was launched in 2015 to promote the adoption of electric and hybrid vehicles in India.
 - **Phase-I (2015-2019)** had an outlay of **Rs 895 Crore**. It supported approximately 2.8 lakh electric and hybrid vehicles, deployed 425 electric and hybrid buses, and sanctioned 520 charging stations.
 - **Phase-II (2019-2024)** has a total budgetary support of **Rs 11,500 Crore** and focuses on the electrification of **public and shared transportation**.
 - The targets include supporting 7,262 electric buses, 155,536 electric three-wheelers, 30,461 electric passenger cars, and 1,550,225 electric two-wheelers.
 - **Production Linked Incentive Scheme for Automobile and Auto Component Industry (PLI-AAT):** It has a budgetary outlay of **Rs 25,938 Crore**.
 - This scheme incentivizes various categories of electric vehicles, including **e-2W, e-3W, e-4W, e-buses, and e-trucks**.
 - **Production Linked Incentive Scheme for Advanced Chemistry Cells (PLI-ACC):** It has an outlay of **Rs 18,100 Crore**. This scheme aims to promote the manufacturing of

advanced battery technologies in India.

- **Scheme to Promote Manufacturing of Electric Passenger Cars:** This scheme is designed to attract investments from global **electric vehicle** manufacturers and promote India as a manufacturing destination for electric vehicles.
- **Support for Charging Infrastructure: The Ministry of Heavy Industries** has also sanctioned **Rs 800 Crore** as capital subsidy for establishing 7,432 electric vehicle public charging stations.
 - To date, **Rs 560 Crore** has been released, and an additional **Rs 73.50 Crore** has been sanctioned for the setup or upgrade of 980 public fast charging stations.
- **Phased Manufacturing Program (PMP):** Promotes local manufacturing of EV components through a graded duty structure, boosting indigenous production and reducing import dependency.
- **National Electric Mobility Mission Plan (NEMMP):** Aims to achieve national fuel security by promoting **hybrid and electric vehicles** in the country and envisaging fuel savings of 950 million liters by 2030.
- **National Mission on Transformative Mobility and Battery Storage:** Aims to promote "**Make in India**" in the EV sector by encouraging the localization of battery production and reducing the costs of EVs over time.
- **Battery Swapping Policy:** The government launched a battery swapping policy to reduce charging times and improve electric vehicle (EV) efficiency by allowing users to exchange depleted batteries for charged ones.
 - Released in February 2023, the policy focuses on standardizing battery sizes for **two- and three-wheelers** and includes safety protocols, identification codes, recycling processes, and potential subsidies.
- **Other Government Initiatives:**
 - In the **Union Budget for 2023-2024**, the government extended customs duty exemptions for importing machinery and equipment necessary for manufacturing **lithium-ion cells** for electric vehicle batteries.
 - Both commercial and private battery-operated vehicles are eligible for green license plates and are exempt from permit requirements.
 - **The Goods and Services Tax (GST)** on **electric vehicles** has been reduced from **12% to 5%**, and the **GST** on **EV charging stations** has been lowered from **18% to 5%**.
 - Additionally, a waiver on **road tax** for EVs has been implemented to reduce their initial costs.
- **State-Level Initiatives:** Many Indian states, including **Maharashtra, Delhi, and Karnataka, Uttar Pradesh** offer **subsidies, tax waivers, and incentives** for EV buyers, aiming to boost regional EV sales and establish charging infrastructure.
 - **For example:** In Delhi, **battery electric vehicles (BEVs)** are expected to account for 25% of all vehicle registrations by 2024. Additionally, delivery service providers are required to convert 100% of their fleet to electric vehicles by 2025.

What Should be the Way Forward?

- **Inclusion of Electric Buses in Priority Sector Lending (PSL):** By classifying electric buses as a priority sector, banks can provide low-interest loans to small private operators, easing their access to capital and enabling a more equitable EV transition.
- **Development of Shared Charging Infrastructure:** States should focus on setting up public charging hubs in high-traffic areas, accessible to both private and public operators.
 - Developing shared public charging infrastructure, especially in urban areas and key intercity corridors, is essential for encouraging private investment in electric buses.
 - Shared facilities reduce infrastructure costs and make EV adoption viable for smaller operators.
- **Battery-as-a-Service (BaaS) Models:** Encouraging BaaS models, where operators lease rather than buy batteries, would reduce the upfront costs and eliminate concerns over battery degradation.
 - Battery swapping stations should also be promoted to reduce downtime for commercial fleets.
- **Extension of Lease Terms for Electric Vehicles:** Extending lease terms for EV loans to 10-12

years (from the current 3-4 years) could help private operators by spreading out repayment obligations, making EVs financially viable over the long term.

- **Specialized Skill Development Programs:** Technical training centers dedicated to EV maintenance and repair could be set up to ensure a skilled workforce.
 - This initiative would help address the operational challenges and reduce reliance on imported expertise.
- **Enhanced Fiscal Support and Subsidies:** Extending FAME-like incentives to the private sector would encourage more players to adopt electric buses.
 - States could also provide additional subsidies for setting up private charging stations in underserved areas.
 - State governments could offer financial subsidies and ensure minimum energy consumption guarantees to attract private investment in charging infrastructure.
- **Promotion of Public-Private Partnerships (PPPs):** Collaborative **PPP** models for **infrastructure development** could help mobilize private investments in charging infrastructure, especially in urban and intercity routes.
 - Governments could offer land and tax incentives, while private players bring in capital and operational expertise.
- **Strengthening Research and Innovation in Battery Technology:** Investment in battery technology research, particularly for **lithium-ion and alternative energy sources**, could reduce battery costs and dependency on imports, enabling a more sustainable EV ecosystem.
- **Industry Initiative:** In response to growing customer awareness, the industry has been utilizing technological advancements and government support to enhance the availability of sustainable options.
 - Innovative solutions, including fast-charging stations and community charging facilities, have been developed to improve convenience for **electric vehicle (EV)** owners.

Conclusion

India's **transition to electric vehicles (EVs)** is key to achieving **climate goals** and enhancing **urban air quality**. The recent **PM E-DRIVE scheme** supports **electric buses**, yet **excluding private operators** underscores the need for **inclusive policies**. Addressing **high upfront costs, limited charging infrastructure**, and a **skilled workforce shortage** is vital. **Public-private partnerships, innovative financing**, and **technology advancements** will drive EV adoption across sectors, establishing a **sustainable electric mobility ecosystem** for a cleaner future.

Drishti Mains Question:

Assess the effectiveness of the various government initiatives in promoting electric vehicles and addressing adoption barriers in public and private sectors.

UPSC Civil Services Examination, Previous Year Questions (PYQs)

Prelims:

Q. With reference to 'fuel cells' in which hydrogen-rich fuel and oxygen are used to generate electricity, consider the following statements: (2015)

1. If pure hydrogen is used as a fuel, the fuel cell emits heat and water as by-products.
2. Fuel cells can be used for powering buildings and not for small devices like laptop computers.
3. Fuel cells produce electricity in the form of Alternating Current (AC).

Which of the statements given above is/are correct?

(a) 1 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

Ans: (a)

Mains:

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

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