Driving Electric Mobility in India

This editorial is based on " Going electric: On India and the electric vehicle space" which was published in The Hindu on 27/03/2025. The article brings into picture the import duty exemption on key EV battery components, boosting domestic manufacturing

For Prelims: Electric mobility, 'Make in India', EV deployment, Electric Mobility Promotion Scheme, PM E-DRIVE scheme, FAME II, PM Gati Shakti , Government e-Marketplace.

For Mains: Recent Advancements in India's Electric Vehicle Sector, Key Issues Associated with EV Adoption in India.

India's recent move to exempt import duties on critical EV battery components signals a strategic pivot towards domestic electric vehicle manufacturing and clean technology adoption. Despite EVs constituting **only 2% of passenger car sales in 2024,** the country has shown promising momentum in electric two-wheelers. To truly revolutionize its transportation sector, **India must not only leverage favorable trade policies but also invest substantially in research, development, and integration into the global battery value chain,** transforming from a technology importer to a competitive manufacturer

What are the Recent Advancements in India's Electric Vehicle Sector?

- **Surge in EV Adoption and Consumer Interest**: India is witnessing an exponential surge in **EV adoption, driven by supportive policies, rising environmental awareness**, and improved product availability.
    - The **growing preference for electric mobility** is evident across both urban and rural consumers, signaling a behavioural shift. This reflects not just an environmental drive but also rising confidence in EV technology and affordability.
    - **EV sales in India grew by 49.25% in 2023,** reaching 1.52 million units. In May 2024 alone, sales rose **20.88% year-on-year to 1.39 million units.**
- **Private and Commercial Segment Electrification Targets:** Government's sector-wise EV penetration targets reflect a structured roadmap for both private and commercial vehicles, showing strategic intent across segments.
    - These ambitious targets align with **India's net-zero and energy transition commitments,** while incentivizing industry innovation. The push also ensures sectoral balance in demand creation.
    - **By 2030, India targets 30% EV sales in private cars**, 70% in commercial vehicles, 40% in buses, and 80% in two- and three-wheelers, aiming for 80 million EVs.
- **Battery Manufacturing and Component Localization:** India has made clear strides toward

localising **EV battery production, reducing import dependence and strengthening strategic supply chains.**
    - The budget's customs duty exemption on battery-related capital goods encourages domestic manufacturing. This aligns with **'Make in India' and improves economic competitiveness in the EV space.**
    - The Indian EV battery market is projected to grow from US$ 16.77 billion in 2023 to US$ 27.70 billion by 2028.
- **Rising Investments by Domestic and Global Players:** The EV sector has become a magnet for **both Indian conglomerates and foreign firms**, boosting innovation and job creation.
    - These investments signal market maturity and potential for long-term growth. Capital inflow also supports ecosystem development—**R&D, manufacturing, and charging networks.**
    - **Tata Motors-JLR (US$ 1.07 billion), VinFast (US$ 2 billion), and Stellantis (US$ 238.7 million)** are among key 2024 investments. Ather Energy raised Rs. 600 crore, becoming a unicorn.
- **State-Level Push for EV Ecosystem Development:** States are innovating with their own EV policies and targets, creating a competitive and decentralised approach to EV adoption.
    - These efforts complement national goals and cater to regional mobility needs. State support also accelerates infrastructure, registration, and EV ecosystem incentives.
    - **Maharashtra targets 10% EV share in new registrations by Dec 2025; Karnataka aims for 100% electrification of cargo 3W/4W by 2030**.
- **Charging Infrastructure Expansion and Innovation**: Robust EV infrastructure is critical, and India is rapidly scaling up its charging networks, including ultra-fast and battery-swapping models. Partnerships between **OEMs, PSUs, and energy firms** are pivotal in ensuring EV convenience and last-mile viability.
    - As of **Feb 2024, India has 12,146 public charging stations**. Hyundai expanded fast charging across six metro cities and highways.
- **Financing Ecosystem and Affordability Push:** A healthy EV finance ecosystem is evolving with NBFCs and dedicated platforms, improving affordability and accelerating adoption.
    - Financing mechanisms are crucial for scaling small EVs and commercial fleet conversions, especially for MSMEs and last-mile users.
    - **EV financing in India is projected to reach US$ 50 billion (Rs. 3.7 lakh crore) by 2030. Macquarie Group launched 'Vertelo' platform in June 2024** to support EV financing and fleet management.
- **Green Defence and Institutional EV Use:** The adoption of EVs by defence and institutional bodies signals credibility and early-stage trust in clean mobility. It also helps in awareness, pilot-scale innovations, and green energy integration within official fleets.
    - **Indian Army announced phased EV deployment at peace stations in Feb 2024.** IOC launched its first EV battery swapping station in Kolkata in Dec 2023 in collaboration with **Sun Mobility.**

What are the Key Issues Associated with EV Adoption in India?

- **Inadequate Charging Infrastructure and Interoperability Issues:** The slow rollout of public charging stations remains a major roadblock**, especially in tier-2 and tier-3 cities.**
    - Additionally, **lack of standardisation across chargers and connectors** causes fragmentation and user inconvenience. Interoperability and access parity are essential for building confidence among consumers.
    - As of **February 2024, India has only 12,146 public EV charging stations**. CII estimates that **to achieve a ratio of 1:40 charging infra to EVs**, India will need to install more than **400,000 chargers** annually with a total of **1.32 million chargers till 2030.**
- **High Upfront Cost and Limited Financing Access:** Despite falling battery prices, the initial cost of EVs remains higher than their ICE counterparts.
    - **Inadequate consumer financing options** further restrict access, especially for informal sector buyers. This cost challenge persists despite long-term savings in fuel and maintenance.
    - And due to high upfront cost as well as limited charging infrastructure, ICRA expects electric vehicle penetration to remain low **(3-5%) till 2025**

- **Supply Chain Dependence and Battery Raw Material Vulnerability:** India remains heavily reliant on global supply chains for critical raw materials like **lithium, cobalt, and nickel.**
    - This raises vulnerabilities due to **geopolitical tensions, import costs, and lack of domestic reserves.** Strategic autonomy in battery production is yet to be fully realised.
        - For instance, **India imported 70% of its lithium-ion cells in 2023**.
- **Disparities in State-Level EV Ecosystem Development:** While some states like **Delhi, Maharashtra, and Karnataka** lead in EV policy and infrastructure, others lag behind in planning and execution.
    - The **absence of a uniform nationwide EV strategy** causes uneven adoption and slows down the creation of a national market.
    - **Goa leads in EV penetration at 14.2%,** while many large states like Uttar Pradesh have sub-5% adoption.
        - **Maharashtra targets 10% EV share in new registrations by Dec 2025;** many others have no clear targets.
- **Incomplete Domestic Manufacturing and Innovation Ecosystem:** India's EV manufacturing ecosystem still relies on s**ignificant imports of components, with limited domestic R&D in advanced technologies**.
    - This **hampers value addition, affects job creation potential, and exposes the sector to global supply shocks**. Indigenous innovation is growing but not yet mature.
    - **Budget 2025-26** proposes to fully exempt Basic Customs Duty on cobalt powder and waste, the scrap of lithium-ion battery, Lead, Zinc and 12 more critical minerals, **signalling need for domestic capacity.**
- **Low Consumer Awareness and Range Anxiety**: A large section of potential EV buyers lacks understanding of **EV benefits, total cost of ownership, and maintenance models.**
    - Concerns over **vehicle range, battery life, and lack of nearby service centres** persist, especially outside metros. This perception gap deters first-time adopters.
    - According to a recent survey, **83% of Indian consumers are open to NEVs by 2030**, but **only a small fraction understands charging tech and subsidy schemes** fully. **Rural adoption remains nascent.**
- **Policy Volatility and Uncertain Subsidy Continuity:** Frequent changes and lack of clarity around central and state subsidies, GST rates, and registration benefits make investors and buyers hesitant.
    - The phase-wise uncertainty around **FAME II** and transition to newer schemes like the **Electric Mobility Promotion Scheme** creates confusion.
    - **FAME II (US$ 1.43 billion) ends in March 2024;** the **PM E-DRIVE scheme** has replaced it. Industry demands a **long-term incentive framework to ensure business continuity.**

What Measures can India Adopt for Enhancing EV Adoption?

- **Develop a Unified National EV Charging Infrastructure Mission:** India must establish a **single-window EV Charging Infrastructure Mission** to standardise charger types, enable interoperability, and ensure equitable deployment across urban and rural areas.
    - This mission should involve coordination between state **DISCOMs, ULBs, and private players.** A push for smart-grid-enabled charging with renewable energy integration is critical.
    - A **common public data portal for real-time availability** and uptime of stations can enhance consumer trust.
- **Rationalise and Stabilise EV Subsidy Architecture:** India needs a long-term, stable subsidy framework under a **revamped FAME III that synchronises with state-level EV policies.**
    - This should adopt a demand-linked dynamic incentive model and phase-wise tapering based on market maturity.
    - **Linking this with the Electric Mobility Promotion Scheme** ensures smoother transitions. Stability in policy timelines boosts investor and consumer confidence.
- **Prioritise Domestic Battery Manufacturing under PLI 2.0:** An enhanced PLI scheme focused specifically on advanced battery chemistries, solid-state storage, and battery recycling ecosystems can future-proof India's EV value chain.
    - It should prioritise **circular economy models and incentivise deep-tech R&D.** Strengthening this under the **'Atmanirbhar Bharat'** framework ensures long-term

resilience in strategic materials and cell-to-pack innovation.

- **Integrate EV Mobility with Smart Cities and PM Gati Shakti:** EV planning should be embedded into Smart Cities Mission and logistics planning under **PM Gati Shakti** for seamless **urban mobility and green freight corridors.**
    - **EV-ready zones**, battery swapping hubs, and green parking infrastructure can be co-developed.
    - This integrated planning approach reduces duplication and enables effective fund convergence.
- **Launch Targeted EV Financing Schemes for MSMEs and Informal Sector**: Special credit guarantee and interest subvention schemes must be created for small fleet operators, gig workers, and MSMEs to adopt EVs for commercial use.
    - A **dedicated NBFC-led green financing platform like 'Vertelo'** should be expanded with central support.
    - Priority lending tag for EVs under RBI guidelines would further boost institutional funding.
- **Mandate EV Inclusion in Government and PSU Procurement:** All government departments, PSUs, and defence establishments should adopt a minimum **30% EV fleet replacement mandate within a set time frame.**
    - This will catalyse volumes, set examples, and create demand visibility. Linking this with the **Government e-Marketplace (GeM)** ensures procedural ease and price discovery.
- **Strengthen Skill Development under Skill India + EV Industry Partnerships:** A tailored EV workforce strategy must be implemented under the Skill India Mission in collaboration with EV startups and auto giants.
    - Courses on battery maintenance, charger servicing, **BMS (battery management systems),** and **EV software diagnostics** should be launched across ITIs. This enhances employability and supports industry readiness.
- **Promote Local Innovation through Startup India + FAME Synergy**: A cross-scheme synergy should be created where startups solving EV-related issues, **thermal management, AI-based energy routing, or rural EV charging—**are fast-tracked for incentives under both **FAME and Startup India**.
    - This encourages frugal innovation and localisation of advanced components and software layers.
- **Establish a National EV Awareness and Behavioural Shift Campaign:** A large-scale national campaign like "**Har Ghar EV, Har Rasta Green**" can be launched using mass media, schools, and community-based events.
    - This should **demystify range anxiety, charging myths, cost comparisons, and highlight successful users.** Citizen-centric outreach bridges the perception gap in tier-2/3 markets.

Conclusion:

India's electric vehicle sector is at a **pivotal juncture, driven by policy support, rising investments, and growing consumer acceptance**. While significant strides have been made in manufacturing, infrastructure, and financing, challenges like charging gaps, supply chain dependencies, and cost barriers remain. By **integrating EV adoption with broader sustainability** goals, India can transition from an emerging market to a global leader in clean mobility.

Drishti Mains Question:

Analyze the recent advancements and challenges in India's electric vehicle (EV) sector. How can policy interventions, domestic manufacturing, and infrastructure development accelerate EV adoption while ensuring long-term sustainability?

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)
