A COMPARATIVE STUDY OF CONVENTIONAL AND ELECTRIC VEHICLE INDUSTRIES IN INDIA: POLICY, ENVIRONMENTAL AND ECONOMIC PERSPECTIVES

Ku. Trushali Vijayrao Khode
Research Scholler,
Nabira Mahavidyalay,
Katol, 441302,
Email : khodetrusha1@gmail.com,
Mob.No. :7350354109

Prof. Dr. Punit Niranjan Raut
Assistant professor,
Department of Commerce,
Nabira Mahavidyalay, Katol,
Email : rautpunit@yahoo.com,

Crossref DOI - https://doi.org/10.63665/rh.v7i2.83

Abstract :

The Indian automobile industry is undergoing a structural transition driven by environmental concerns, energy security challenges, and policy-led interventions promoting electric mobility. This study presents a comparative analysis of conventional internal combustion engine (ICE) vehicles and electric vehicles (EVs) in the Indian context, with a focus on environmental impact, economic implications, and policy frameworks. Using secondary data from government reports, regulatory bodies, and international agencies, the study examines emissions, cost structures, lifecycle impacts, and the role of initiatives such as FAME, BS-VI norms, vehicle scrappage policy, and production-linked incentives. The findings indicate that while conventional vehicles currently dominate the market, electric vehicles offer significant long-term advantages in terms of lower emissions, reduced operating costs, and alignment with India's sustainability goals. The study concludes that electric vehicles are not merely an alternative but a necessary pathway toward sustainable mobility in India.

Keywords : Electric Vehicles, Conventional Vehicles, Indian Automobile Industry, Environmental Impact, Public Policy

---

Introduction :

The automobile industry is a key pillar of India's economic development, contributing significantly to industrial output, employment generation, and mobility requirements of a rapidly urbanizing population. Historically, the sector has been dominated by internal combustion engine (ICE) vehicles powered by petrol and diesel. However, increasing vehicular emissions, dependence on imported fossil fuels, and deteriorating urban air quality have raised serious concerns regarding the long-term sustainability of conventional vehicles.

Major Indian cities consistently record air pollution levels exceeding permissible standards, with vehicular emissions identified as a major source of particulate matter ($PM_{2.5}$), nitrogen oxides (NO_x), and carbon dioxide (CO_2) (CPCB, 2018). Although regulatory measures such as Bharat Stage VI emission norms have improved fuel and emission quality,

conventional vehicles continue to exert environmental and public health pressures.

In this context, electric vehicles have emerged as a viable and sustainable alternative. EVs offer zero tailpipe emissions, lower operating costs, and compatibility with renewable energy integration. Recognizing these advantages, the Government of India has implemented a combination of regulatory restrictions on conventional vehicles and incentive-based support for electric mobility. Despite growing policy attention, there remains a need for a holistic comparative evaluation of conventional and electric vehicles within the Indian economic and regulatory framework. This study addresses this gap by systematically analyzing economic, environmental, and policy dimensions of the transition.

Review of Literature :

Existing literature highlights the environmental superiority of electric vehicles over conventional ICE vehicles, particularly in terms of reduced greenhouse gas emissions across the vehicle life cycle (IEA, 2021). Life-cycle assessment studies suggest that even in electricity grids partially dependent on fossil fuels, EVs generate lower overall emissions than petrol and diesel vehicles over their operational lifespan (NITI Aayog, 2020).

Economic analyses focusing on total cost of ownership indicate that while EVs entail higher upfront costs, lower fuel and maintenance expenses make them economically competitive in the long run (IEA, 2021). Policy-oriented studies emphasize the role of emission standards, fuel taxation, and fiscal incentives in shaping consumer adoption patterns. Bharat Stage emission norms and vehicle scrappage policies have been identified as indirect instruments promoting electric mobility by increasing compliance costs for conventional vehicles (Ministry of Road Transport and Highways, 2020).

However, the literature also identifies persistent challenges, including inadequate charging infrastructure, battery disposal concerns, and range anxiety. The present study builds on existing research by integrating economic, environmental, and policy perspectives into a unified comparative framework tailored to the Indian automobile sector.

Objectives of the Study :

The objectives of the study are:

1. To compare conventional and electric vehicles in terms of economic cost and operational efficiency.
2. To analyze the environmental impact of conventional and electric vehicles.
3. To examine the role of government policies in accelerating the transition toward electric vehicles.
4. To assess the long-term sustainability of electric vehicles in the Indian automobile sector.

Research Methodology :

The study adopts a descriptive and analytical research design. It relies exclusively on secondary data collected from government publications, policy reports, academic journals,

and industry studies published during the period 2017–2023. Major data sources include reports from NITI Aayog, Ministry of Road Transport and Highways, Central Pollution Control Board, and the International Energy Agency.

Comparative analysis is employed to evaluate conventional and electric vehicles across economic, environmental, and policy dimensions. A life-cycle perspective and cost-based assessment are used wherever applicable to derive meaningful insights.

Comparative Analysis of Conventional and Electric Vehicles :

1. Economic Comparison :

Conventional vehicles generally have lower initial purchase costs compared to electric vehicles. However, their long-term operating expenses remain high due to volatile fuel prices, regular maintenance requirements, and complex engine systems. In contrast, electric vehicles offer significantly lower running costs, as electricity is cheaper per kilometer than petrol or diesel. Maintenance costs are also lower due to fewer moving components and the absence of internal combustion mechanisms.

2. Environmental Impact :

Conventional vehicles emit CO_2, NO_x, and particulate matter, contributing substantially to air pollution and climate change. Although BS-VI norms have reduced emissions per vehicle, the cumulative environmental impact remains significant. Electric vehicles produce zero tailpipe emissions and reduce noise pollution. Life-cycle studies indicate that total emissions from EVs are considerably lower than those from ICE vehicles over their operational lifespan (IEA, 2021).

3. Policy and Regulatory Influence :

The Indian government has implemented stringent emission standards, vehicle scrappage policies targeting older polluting vehicles, and higher fuel taxation to discourage fossil fuel consumption. Simultaneously, incentive-based measures such as the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, reduced GST on EVs, and investment in charging infrastructure have created a supportive ecosystem for electric mobility. These combined regulatory and fiscal interventions have significantly influenced market dynamics in favor of electric vehicles.

Findings and Discussion :

The study finds that electric vehicles offer clear long-term economic advantages despite higher initial costs. Environmental benefits are substantial, particularly in reducing urban air pollution and greenhouse gas emissions. Government policies emerge as a decisive factor in shaping both consumer behavior and industry strategies. While conventional vehicles continue to dominate in the short term, their long-term viability is increasingly constrained by

regulatory and environmental pressures.

Conclusion :

The comparative assessment of conventional and electric vehicle industries reveals that India is at a critical junction of technological and environmental transition. Policy interventions aimed at discouraging fossil-fuel-based mobility and promoting clean energy vehicles have started reshaping consumer preferences and industrial strategies. Electric vehicles demonstrate clear advantages in terms of emissions reduction, energy efficiency, and long-term economic viability. Strengthening charging infrastructure, battery recycling mechanisms, and renewable energy integration will be crucial for sustaining this transition. The study reaffirms that electric mobility is central to India's vision of achieving sustainable, low-carbon transportation.

References :

- Central Pollution Control Board. (2018). *National air quality monitoring programme report*. Government of India.
- Government of India. (2013). *National electric mobility mission plan 2020*. Ministry of Heavy Industries.
- International Energy Agency. (2021). *Global EV outlook 2021*. IEA.
- International Energy Agency. (2022). *Global EV outlook 2022*. IEA.
- India Brand Equity Foundation. (2023). *Electric vehicles: Driving sustainable mobility in India*. IBEF.
- Kumar, P., & Chakrabarty, S. (2020). Total cost of ownership analysis of the impact of vehicle usage on the economic viability of electric vehicles in India. *Transportation Research Record, 2674*(10), 563–572. https://doi.org/10.1177/0361198120947089
- Ministry of Heavy Industries. (2022). *Faster adoption and manufacturing of electric vehicles in India (FAME-II): Scheme status report*. Government of India.
- Ministry of Road Transport and Highways. (2020). *Bharat Stage VI emission norms*. Government of India.
- Ministry of Road Transport and Highways. (2021). *Vehicle scrappage policy*. Government of India.
- NITI Aayog. (2020). *India's electric mobility transformation*. Government of India.
- NITI Aayog & Rocky Mountain Institute. (2019). *Electric mobility transformation in India: Accelerating adoption*. Government of India.
- Organisation for Economic Co-operation and Development. (2020). *Reducing the environmental impacts of road transport*. OECD Publishing.
- Sharma, S., Manchanda, S., & Bhatia, S. (2021). Adoption of electric vehicles in India: An empirical analysis of consumer perception. *Energy Policy, 153*, 112266. https://doi.org/10.1016/j.enpol.2021.112266