www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
(Int Peer Reviewed Journal)
Vol. 04, Issue 11, November 2024, pp : 134-136

e-ISSN : 2583-1062
Impact Factor : 7.001

ELECTRIC VEHICLES AND SUSTAINABLE CONSUMPTION IN INDIA: OVERCOMING BARRIERS TO ADOPTION

Ms. Pooja Sunil Wadhwa[1]

[1]H.R. College of Commerce & Economics, India.

ABSTRACT

Electric vehicles (EVs) are increasingly recognized as a sustainable transportation solution, crucial for reducing greenhouse gas emissions, decreasing fossil fuel dependence, and addressing urban air pollution issues. As part of global efforts to promote sustainable consumption, EV adoption is positioned at the core of India's transport policy, where the country aims for a 30% share of EVs in its mobility market by 2030. Despite governmental initiatives and the growth of the EV market, India faces numerous adoption challenges. This paper examines the critical factors influencing EV adoption in India through a comprehensive review of existing literature, highlighting the impact of economic, infrastructural, and behavioral factors, as well as the policy landscape. Key recommendations are provided for addressing these barriers, including improved financial incentives, charging infrastructure expansion, and heightened consumer awareness, which are essential for fostering a conducive environment for EV growth and meeting India's sustainable development objectives.

1. INTRODUCTION

As the world grapples with escalating environmental challenges, the demand for sustainable transportation solutions has surged. Electric vehicles (EVs) are recognized as a pivotal element in achieving Sustainable Development Goal 12 (SDG 12), which aims to ensure sustainable consumption and production patterns. EVs have gained traction globally as a cleaner alternative to internal combustion engine (ICE) vehicles due to their potential to significantly reduce greenhouse gas (GHG) emissions and lower dependence on fossil fuels. For a developing economy like India, adopting EVs aligns well with both environmental targets and economic objectives by reducing import reliance and fostering local manufacturing. However, India faces unique challenges in scaling up EV adoption, including high initial costs, inadequate infrastructure, and low levels of public awareness. These challenges need to be carefully addressed to realize India's ambitious goal of achieving a 30% share of electric vehicles in its mobility market by 2030. This paper explores the complex factors that impact EV adoption in India and presents policy recommendations to accelerate the transition toward sustainable mobility solutions.

2. LITERATURE REVIEW

The literature on EV adoption highlights a wide array of factors affecting consumer acceptance and market penetration. Studies conducted in developed countries have shown that financial incentives, technological advancements, and improved infrastructure are vital for EV adoption (Rezvani et al., 2015). However, the challenges faced in emerging economies like India often differ. For example, Kumar et al. (2020) and Shankar & Kumari (2019) highlight that the high cost of EVs is a significant barrier in India, especially considering the country's price-sensitive market. Additionally, behavioral factors such as perceived reliability, safety, and environmental benefits play an essential role in influencing consumer decisions. Scholars have used various models to examine these factors, including the Theory of Planned Behavior (TPB), which explains consumer behavior based on attitudes, subjective norms, and perceived behavioral control. Studies like those by Tarei et al. (2021) and Shalendra & Sharma (2021) have applied TPB to understand EV adoption behavior, showing that awareness and social influence can significantly impact adoption rates. The Technology Acceptance Model (TAM), another widely used model, suggests that ease of use and perceived usefulness are crucial in technology adoption, which can also be applied to understand attitudes towards EV technology in India. Collectively, these studies emphasize that India's unique socio-economic context requires tailored approaches to overcome adoption barriers.

3. METHODOLOGY

This research employs a secondary analysis approach, systematically reviewing existing studies, policy documents, and market analyses related to EV adoption in India. Key sources include government reports, such as those from the Ministry of Heavy Industries on the Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, as well as academic articles on consumer behavior and market adoption. A synthesis of these sources helps identify major gaps in the current EV ecosystem and highlights areas requiring policy intervention. Furthermore, this study incorporates comparative insights from international EV markets to contextualize India's challenges and policy approaches within the global landscape. By using a case-study approach focused on India, the research aims to present recommendations

that are practical and adaptable to the country's unique demographic and infrastructural needs. Limitations include the reliance on secondary data, which may not fully capture recent consumer sentiment or evolving market dynamics.

Factors Affecting EV Adoption in India

1. Economic Factors: A significant barrier to EV adoption in India is the high upfront cost of purchasing EVs. Although operational costs are typically lower compared to internal combustion engine (ICE) vehicles, the initial purchase price remains prohibitive for many consumers. Additionally, the lack of consistent financial incentives across states and limited financing options for EVs further impacts adoption rates. To address this, targeted subsidies and lower interest financing could potentially reduce the financial burden on consumers and encourage wider adoption (Kumar et al., 2020).

2. Infrastructural Factors: India's charging infrastructure is currently insufficient to support mass EV adoption, especially in semi-urban and rural areas. Reliable and widespread charging infrastructure is essential for alleviating range anxiety—a common concern among potential EV users. The government's FAME II scheme aims to support the installation of thousands of public charging stations, but these efforts need to be scaled and supplemented with private sector investment to create a comprehensive EV charging network (GIZ, 2021).

3. Behavioral Factors: Public perception significantly influences EV adoption. Many consumers remain skeptical about the reliability, battery life, and maintenance costs associated with EVs. Additionally, environmental concerns, while increasing, may not yet be strong enough to drive widespread adoption. Educational campaigns that increase awareness of the environmental benefits and long-term cost savings associated with EVs could positively shift consumer attitudes (Shalendra & Sharma, 2021).

4. Policy Factors: Although the National Electric Mobility Mission Plan (NEMMP) and the FAME initiatives represent significant efforts to promote EVs, inconsistent policies and incentives across states hinder the creation of a unified EV ecosystem. For instance, some states offer robust subsidies and incentives, while others provide little to no support, creating a fragmented market landscape. Streamlining policies at the national level could enhance policy effectiveness and encourage manufacturers and consumers to invest in EV technology.

5. Technological Factors- The advancement and availability of battery technology are crucial in determining the performance, range, and overall cost of EVs. In India, limited access to high-quality, affordable battery technology has impacted EV adoption. Battery life, charging speed, and replacement costs are still significant concerns among consumers, which contribute to hesitancy in purchasing EVs. Innovations like battery-swapping technology and lithium-ion advancements can address these issues, but they require robust research and development investments. Collaborations between industry and academia could help accelerate technological improvements, making EVs more appealing and practical for a broader consumer base.

6. Environmental and Climatic Factors- India's diverse climate poses unique challenges for EV adoption, particularly concerning battery efficiency and performance. Batteries tend to lose efficiency in extreme temperatures, which is a concern in India's varied climate zones, from the heat of the plains to the cold of the northern regions. Studies have shown that battery performance can degrade significantly in high temperatures, affecting vehicle range and operational costs. To address this, manufacturers could consider developing climate-resistant batteries or provide specific guidance for battery usage and maintenance across different climate zones in India.

7. Social and Cultural Factors- In India, the purchase of a vehicle often involves social and cultural considerations beyond just functionality. Many consumers prioritize vehicle ownership as a symbol of status, reliability, and longevity, and there may be a preference for traditional internal combustion engine (ICE) vehicles. Additionally, some consumers may be reluctant to adopt a new and relatively unfamiliar technology like EVs. Addressing these social and cultural barriers requires targeted marketing campaigns that emphasize the long-term value, environmental benefits, and future-forward nature of EVs. Influencer endorsements and the use of EVs by high-profile figures in society could also help normalize EV adoption and reshape cultural perceptions.

8. Energy Infrastructure and Grid Reliability

The capacity of India's energy grid to support increased EV adoption is a major consideration. EV charging imposes additional demand on the power grid, which may already be under strain, especially in areas with high electricity demand and inconsistent supply. Integrating renewable energy sources like solar and wind into EV charging stations could alleviate some of the strain on the grid, while also reducing the carbon footprint of EVs. Strategic planning is needed to ensure grid stability, manage peak demand, and create a sustainable energy infrastructure that can support the anticipated growth in EV usage.

www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)
(Int Peer Reviewed Journal)
Vol. 04, Issue 11, November 2024, pp : 134-136

e-ISSN : 2583-1062
Impact Factor : 7.001

4. CONCLUSION

The transition to electric vehicles is integral to achieving sustainable development and energy security objectives in India. This study has explored the primary factors influencing EV adoption in India, including economic, infrastructural, behavioral, and policy-related challenges. Addressing these barriers requires a multi-faceted approach that involves collaboration between government, industry, and consumers. Key policy recommendations include providing consistent financial incentives, investing in comprehensive charging infrastructure, and conducting public awareness campaigns to shift consumer perception. A well-rounded and supportive EV ecosystem will not only boost adoption rates but also contribute to reducing India's environmental impact and advancing its commitment to sustainable mobility. Meeting these challenges is essential if India is to fulfill its vision of becoming a global leader in sustainable transport.

5. REFERENCES

[1] Bansal, P., Kockelman, K.M. (2017). Review over vehicle choice. Journal of the Transportation Research Forum.
[2] Kumar, P., Chakrabarty, S. (2020). Total Cost of Ownership Analysis of EVs in India. Transportation Research Record.
[3] Shalender, K., Sharma, N. (2021). EV adoption intention in India. Environment, Development and Sustainability.
[4] Rezvani, Z., Jansson, J., Bengtsson, M. (2015). Motivations for sustainable consumption: EV adoption. Business Strategy and the Environment.
[5] Tarei, P.K., Chand, P., Gupta, H. (2021). Barriers to EV adoption: Evidence from India. Journal of Cleaner Production.