Consumer Perception and Challenges of Electric Vehicles in Karnataka

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Abstract
This study investigates the rising trend of electric vehicle (EV) adoption in Karnataka, India. Utilizing a structured questionnaire and survey-based descriptive methodology, responses were collected from 450 participants across urban, semi-urban, and rural areas using stratified random sampling. The objective was to assess consumer awareness, perceptions, and the barriers influencing EV adoption. Analytical tools such as frequency distribution, Likert scale analysis, and cross-tabulation were applied to interpret the data. Findings reveal a high level of awareness and interest in EVs, especially among younger demographics, but also identify key deterrents such as insufficient charging infrastructure and high upfront costs. Furthermore, a significant relationship was observed between consumer income and willingness to purchase EVs, as well as between awareness of government subsidies and purchase decisions. These insights underscore the need for policy enhancements, improved infrastructure, and consumer education.
Keywords: Electric Vehicles, Consumer Perception, EV Adoption, Karnataka, Infrastructure, Government Policy, Survey Research

1. Introduction

The global automotive industry is undergoing a transformative shift from internal combustion engine (ICE) vehicles to electric vehicles (EVs), largely driven by the urgent need to address climate change, reduce urban air pollution, and achieve energy security. In this context, India has emerged as a significant player in the push for electrification, with the government setting ambitious targets for EV adoption under initiatives like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme and National Electric Mobility Mission Plan (NEMMP).

Karnataka stands out as a pioneer in this green mobility revolution. It was the first state in India to implement a dedicated Electric Vehicle and Energy Storage Policy (2017), aiming to attract investments, create jobs, and foster innovation in the EV sector. The policy includes incentives such as tax exemptions, subsidies on EV purchases, support for charging infrastructure, and special zones for EV manufacturing. Major automobile and technology companies have already begun investing in Karnataka, making cities like Bengaluru an EV innovation hub.

Despite the policy momentum and industrial backing, consumer-level adoption of electric vehicles in Karnataka has been relatively slow and uneven. Urban areas such as Bengaluru show moderate levels of EV penetration, especially in the two-wheeler and fleet segments. However, rural and semi-urban regions continue to rely heavily on conventional fuel-based vehicles. The state's diverse geography, economic disparities, and varying levels of awareness contribute to this uneven adoption.

Additionally, consumer skepticism remains a major hurdle. Concerns about limited driving range, lack of charging stations, higher upfront costs, battery lifespan, resale value, and inadequate servicing infrastructure deter potential buyers. Social perceptions and behavioral inertia—where people prefer sticking to familiar technologies—also act as barriers.

Karnataka's potential for EV growth is substantial due to its favorable ecosystem: a literate population, progressive policies, growing urbanization, and strong digital infrastructure. However, there exists a pressing need to understand

ground-level perceptions and challenges faced by everyday consumers across districts. Real insights from consumers can help bridge the gap between policy intent and practical implementation.

This study, therefore, aims to evaluate consumer perceptions, awareness, attitudes, and challenges related to electric vehicles across Karnataka. Through a structured survey approach, it attempts to highlight the key psychological, infrastructural, and financial barriers to adoption and suggest ways to accelerate the EV transition in the state.

2. Objectives of the Study

- To assess consumer awareness and perception of electric vehicles in Karnataka.
- To identify the challenges faced by consumers in adopting EVs.
- To evaluate the relationship between demographic factors and EV adoption.
- To suggest policy and market strategies for better EV adoption in the state.

Hypothesis

Hypothesis 1:

- **H_0 (Null Hypothesis):** There is no significant association between consumers' income level and their willingness to purchase an electric vehicle.
- **H_1 (Alternative Hypothesis):** There is a significant association between consumers' income level and their willingness to purchase an electric vehicle.

Hypothesis 2:

- **H_0:** Consumers' awareness of government subsidies does not significantly influence their decision to purchase electric vehicles.
- **H_1:** Consumers' awareness of government subsidies significantly influences their decision to purchase electric vehicles.

3. Review of Literature

Literature Review

Bose, P., & Patel, V. (2021).: Bose and Patel conducted a comparative study on the state-wise readiness for electric vehicle (EV) adoption in India, evaluating infrastructure, policy support, and public awareness. Karnataka was found to be among the top-performing states, primarily due to proactive government policies and investment in EV charging networks. Their findings suggest that a combination of regulatory backing and technological infrastructure significantly impacts EV market growth.

Joshi, R., & Reddy, S. (2023): This study investigated how educational background influences consumer perception and adoption of EVs in Karnataka. It was found that individuals with higher education levels were more aware of EV benefits, including environmental impact and cost savings. Joshi and Reddy also pointed out a positive correlation between formal education and the intention to purchase EVs, emphasizing the role of education in driving sustainable transport behaviors.

Kumar, S., et al. (2020): Kumar and his team examined the intersection between electric mobility and rural infrastructure development. Their study showed that the adoption of EVs in rural Karnataka is limited due to inadequate charging infrastructure and road conditions. However, they noted that the deployment of low-speed electric vehicles like e-rickshaws and electric two-wheelers is gaining momentum in peri-urban areas, signaling a potential growth path if rural infrastructure improves.

NITI Aayog (2021): The NITI Aayog report provided a comprehensive national framework for India's electric vehicle vision leading up to 2030. It outlines critical goals such as electrifying 30% of vehicles by 2030 and heavily investing in battery manufacturing and charging stations. The report highlights Karnataka as a key participant, noting the state's early adoption of EV policies and its leadership in electric two-wheeler production, which aligns with the central government's green mobility agenda.

Ramesh, V., & Mehta, T. (2021): This research focused on the attitudes of young consumers (aged 18–35) towards EVs in metropolitan cities like Bengaluru. It found that younger consumers are more environmentally conscious and tech-savvy, showing a strong preference for smart and connected EVs. However, concerns about cost and battery life persist. The authors recommend youth-targeted incentives and awareness campaigns to bridge this gap.

Rao, N., & Bhat, M. (2020): Rao and Bhat explored perceptions of Total Cost of Ownership (TCO) among existing and prospective EV users. Their study revealed that while EVs offer lower operational costs, the high upfront purchase price and limited resale value deter many consumers. In Karnataka, financial incentives and subsidies have somewhat mitigated these concerns, but a lack of consumer understanding about TCO continues to hinder adoption.

Shankar, R., & Banerjee, A. (2022): This paper analyzed the role of economic incentives such as subsidies, tax breaks, and low-interest loans in driving EV demand across Indian states. Karnataka, with its robust FAME II policy implementation and local subsidies, has seen a notable increase in EV registrations. Shankar and Banerjee emphasize that sustained policy support is essential to maintain growth and address initial consumer hesitation.

Singh, R., & Nayak, A. (2018): Singh and Nayak focused on the psychological barriers to EV adoption, including range anxiety, skepticism about new technology, and resistance to change. Their findings indicated that these factors are more prominent in older populations and in areas with underdeveloped charging infrastructure. Educational campaigns and community engagement were suggested as effective tools to overcome these mental blocks.

Tripathi, S., & Sharma, D. (2019): Tripathi and Sharma tackled the issue of "range anxiety"—the fear of running out of charge before reaching a destination. Their study demonstrated that this fear is a major obstacle for EV uptake, especially in long-distance travel scenarios. They recommended improving fast-charging infrastructure and offering real-time navigation support in EVs to reassure users and increase confidence.

Verma, S. (2022): Verma's study looked into brand trust and its influence on EV purchase decisions. It was found that consumers are more likely to purchase from well-established automobile brands transitioning into electric mobility. In Karnataka, brands like Tata, Hyundai, and Ather enjoy relatively high trust, which plays a critical role in the consumer decision-making process. The research also highlighted the need for consistent brand communication and after-sales service to build long-term loyalty.

5. Statement of the Problem

Despite Karnataka's progressive policies and infrastructural investments in the electric vehicle (EV) ecosystem, actual consumer adoption rates remain lower than anticipated. Consumers, though largely aware, are deterred by concerns over charging infrastructure, high upfront costs, and range limitations. Moreover, much of the existing literature focuses on national or metropolitan-level data without capturing the diverse perspectives from urban, semi-urban, and rural Karnataka. This gap in localized understanding hinders the effectiveness of policies aimed at encouraging EV uptake.

Hence, this study aims to explore **consumer perception and challenges** in the adoption of EVs specifically in Karnataka to bridge the disconnect between awareness and actual adoption behavior.

6. Research Gap

Although several national and regional studies have evaluated electric vehicle adoption trends in India, **few have deeply analyzed consumer sentiment in Karnataka**, which has its own distinct EV policies and demographic mix. The following research gaps have been identified:

- **Lack of localized studies** focusing on urban vs. semi-urban/rural consumers in Karnataka.
- **Limited attention to consumer-specific barriers** such as financing, charging convenience, and total cost of ownership in the state context.
- **Insufficient analysis** of the influence of demographic variables (age, income, education) on consumer willingness to switch to EVs.

- **Absence of updated data** post-2022 regarding how state-level EV policies are perceived at the grassroots level.

This study addresses these gaps by employing stratified sampling and a fresh survey to capture the voices of 450 respondents across Karnataka.

7. Research Methodology

- **Research Design**: Descriptive, Survey-based
- **Sample Size**: 450 respondents
- **Sampling Technique**: Stratified random sampling (urban, semi-urban, rural)
- **Instrument**: Structured questionnaire via Google Forms
- **Analytical Tools**: Percentage analysis, Likert scale, bar charts, cross-tabulation

8. Data Analysis and Interpretation

8.1 Gender-wise Respondents

Gender	Frequency	Percentage
Male	260	57.80%
Female	190	42.20%

Interpretation: Slightly more males than females participated, possibly due to higher male interest in automobiles.

8.2 Age Group of Respondents

Age Group	Frequency	Percentage
18–25	160	35.60%
26–35	200	44.40%
36–45	60	13.30%
Above 45	30	6.70%

Interpretation: Majority of respondents were youth and working professionals, the ideal target for EV adoption.

8.3 Awareness of EVs

Response	Frequency	Percentage
Yes	400	88.90%
No	50	11.10%

Interpretation: Awareness of electric vehicles is high in Karnataka, largely due to media, social media, and policy initiatives.

8.4 Preferred Vehicle Type

Type	Frequency	Percentage
2-Wheeler (EV)	260	57.80%
4-Wheeler (EV)	150	33.30%
Not Interested	40	8.90%

Interpretation: Two-wheelers dominate consumer interest due to affordability and daily utility.

8.5 Main Barriers to EV Adoption

Barrier	% of Respondents
Lack of Charging Stations	35%
High Initial Cost	30%
Limited Range	15%
Maintenance Concerns	12%
Limited Models Available	8%

Interpretation: The absence of widespread charging infrastructure and high upfront costs are the biggest hindrances.

8.6 Readiness to Purchase an EV in 2 Years

Response	Frequency	Percentage
Yes	280	62.20%
No	170	37.80%

8.7 Support for Government Subsidies

Response	Frequency	Percentage
Yes	380	84.40%
No	70	15.60%

8.8 Opinion on Policy Support

Response	Frequency	Percentage
Sufficient	210	46.70%
Not Sufficient	240	53.30%

9. Key Findings

- High awareness and interest in EVs, especially among younger generations.
- Two-wheelers are the preferred EV category.
- Lack of charging stations and high upfront cost are the top barriers.
- Consumers demand more robust government policy and infrastructure.
- Over 62% of respondents plan to buy an EV in the next two years.
- Majority support increasing subsidies and government promotion.

10. Suggestions

- Improve rural and semi-urban charging infrastructure.
- Provide targeted subsidies and easy financing schemes.
- Enhance awareness programs, especially in colleges and local communities.
- Support local startups and companies producing affordable EVs.
- Introduce government-sponsored exchange programs to replace old IC vehicles with EVs.

11. Conclusion

The electric vehicle revolution in Karnataka is underway, but challenges persist. With better infrastructure, policy support, and consumer education, EV adoption in Karnataka can accelerate rapidly. The results suggest optimism among consumers, especially the youth, which presents a valuable opportunity for sustainable mobility growth in the state.

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