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The Impact of EV Vehicles in Bangalore Region: A Case Study

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Abstract: India has most transportation activity happening with motorized vehicles which use petroleum diesel and natural gas. This is the major source of pollution, giving rise to the carbon footprint. The use of non-renewable sources results in the fast depletion of natural resources leaving nothing for future generations. To address this issue the government has notified the Ministry of Heavy Industry and Public Enterprise and curated the nation's electric mobility mission plan for the year 2020 to address the Major issues and environmental challenges. The best alternative we have in this critical situation is a very efficient, reliable, and affordable electric vehicle. The recent trend in the breakthrough of electric vehicles, i.e., EVs with its top-notch technology and affordable battery backup has shown promising adoption by the citizens of India. This has encouraged the government of India to take various measures such as FAME- "faster adoption and manufacturing of hybrid and electric vehicles". The objective of the study conducted in the Bangalore region is to find out the impact of electric vehicles in the city.

Keywords: Public Enterprise, Heavy Industry, electric vehicles, environmental sustainability, EV manufacturing.

Introduction

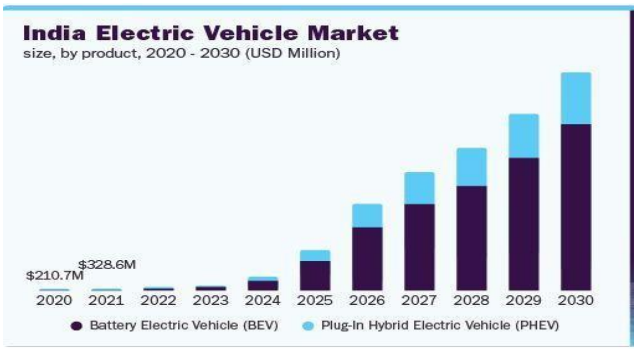
The growing popularity and acceptance of electric vehicles (EVs) puts the automobile industry on the cusp of a revolutionary period. Globally, the electric automotive scene has changed dramatically, with electric vehicles (EVs) becoming a viable substitute for conventional internal combustion engine automobiles. Consumer attitudes toward electric vehicles have become a crucial component of the ongoing mobility revolution as worries about environmental sustainability and the demand for energy-efficient transportation grow. In this context, customer disposition refers to the intricate interactions between attitudes, perceptions, preferences, and behavioral tendencies that people show about electric vehicles. It encompasses a wide range of variables affecting the decision-making process, such as awareness and knowledge about EVs, infrastructure for charging, government regulations, environmental conscience, and the perceived advantages and difficulties of adopting electric vehicles. Knowing how consumers feel about electric vehicles is not just a market research exercise, it is also a crucial factor in determining the future of environmentally friendly transportation. Recognizing the complexity of consumer attitudes and the dynamic relationships that influence the changing acceptability landscape of electric vehicles, is crucial as we begin this investigation. This introduction lays the groundwork

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for an in-depth exploration of consumers' thoughts, revealing the complex web of assumptions, expectations, and factors that shape their opinions about electric cars. We hope to offer light on the opportunities and problems that manufacturers, governments, and stakeholders face in their quest for a cleaner and more sustainable automotive future by exploring the subtleties of customer disposition in the city of Bangalore.

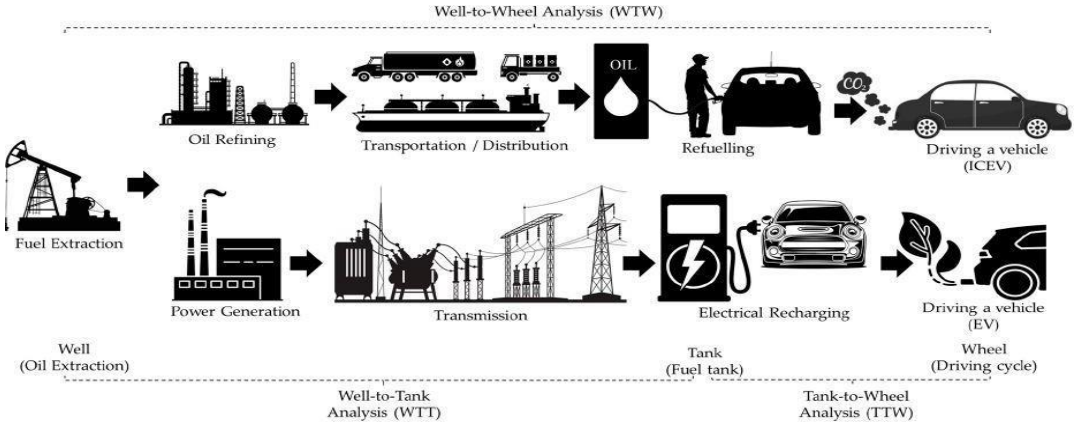
The EV Economy: Automotive Transportation's Future

With the help of developing charging infrastructure and battery technology, electric cars (EVs) have become increasingly popular worldwide as cleaner travel alternatives. Manufacturers and officials in India, the world's third-largest vehicle market, are working together to promote environmentally friendly solutions. The automobile industry, which provides a large amount of employment and contributes 7.1% of India's GDP, is undergoing a major transformation. The domestic EV market in India is expected to grow at a 49% CAGR between 2022 and 2030, with a target of 10 million sales annually by that time. It is anticipated that this expansion will create almost 50 million jobs. The government's goal of having 30% of the fleet electrified by 2030 is bolstered by legislation, incentives, and a significant increase in funding for EV manufacturing, the use of hydrogen fuel, and developing technologies in the FY24 Union Budget.



A Highlight of The Vehicle Life-Cycle Approach

The study compares the carbon emissions of conventional internal combustion engine vehicles (ICEVs) versus electric vehicles (EVs) using a well-to-wheel (WTW) life-cycle approach. WTW includes all aspects of energy flow, including the extraction of fossil fuels and vehicle operation. Every power source's whole value chain is covered by the analysis. Figure 1 illustrates stages from fuel extraction to vehicle operation for both ICEVs and EVs, using gasoline as a reference for ICEVs. In ICEVs, the well-to-wheel approach comprises "well to tank," involving energy source extraction, fuel transport, and tank filling, and the second part of the approach contains “tank to wheel," involving energy utilization for vehicle motion.



Essentials Impacting Customers Use of Electric Vehicles (EVs)
Consumers' functional and emotional demands are being met by a multitude of variables that are driving the adoption of electric cars (EVs) as the automotive industry faces a dramatic change toward sustainable transportation. The following important variables have a significant impact on consumer preferences and choices regarding the adoption of EVs.

Leading predictor of customer adoption of electric vehicles (EVs):

- Drive comfort
- Speed performance
- Digital dashboard display
- Battery life and warranty benefits
- Exterior and interior design
- Eco-friendly
- Cost-effective
- Battery charging stations
- Financial support from the government
- Mobile applications Staff hospitality when making reservations for maintenance services
- Message alerts for timely maintenance and service reminders
- The attitudes of technicians both before and after maintenance services
- Aftercare and timely maintenance services
- The availability of genuine replacement parts

Analysis Of Zone-Wise Sales in Bangalore
With the advent of electric vehicles (EVs), the dynamic automotive environment of Bangalore is witnessing a wind of change. This essay explores the complex web of consumer opinions about electric vehicles in Bangalore, illuminating the variables that influence attitudes and perceptions.

Bangalore continues to lead in sales of EVs. With a strong focus on manufacturing, this region has been able to garner investments and contribute to substantial development across the EV value chain. The region has maintained a strong focus on enhancing its R&D capabilities and has been a catalyst in creating synergies within the ecosystem by involving multiple stakeholders as the segment grows.

Analysis of zone-wise sales in Bangalore

Bangalore North			
EV segments	2022-23	2021-22	Y-o-y growth
2-W	29,004	13,428	116%
3-W	637	376	69%
PV	999	622	61%
Total	30640	14426	112%

	Bangalore East		
EV segments	2022-23	2021-22	Y-o-y growth
2-W	102,912	41,290	149%
3-W	4,780	2,947	62%
PV	5948	1838	224%
Total	113,640	46,075	147%

Bangalore West			
EV segments	2022-23	2021-22	Y-o-y growth
2-W	44,399	11,404	289%
3-W	2,714	1,205	125%
PV	5,051	2,230	127%
Total	62,164	14,839	252%

Bangalore South			
EV segments	2022-23	2021-22	Y-o-y growth
2-W	66,773	35,679	84%
3-W	2,739	1,860	47%
PV	4,574	1,186	286%
Total	73,086	38,725	89%

The significant influence that Bangalore has on the EV ecosystem in India is demonstrated by the fact that these four zones accounted for about 22% of all EV sales in FY 2022–2023.

With a 2% penetration rate, Bangalore leads India in sales of electric photovoltaic systems, followed by Karnataka (1.1%) and Tamil Nadu (1%). The percentage of electric cars (EVs) in passenger vehicles (PVs) across the country is 0.8% on average. Delhi has the greatest penetration rate of electric two-wheelers (E2Ws) at 9.6%, followed by Karnataka (8.6%) and Kerala (7.3%). In India, the average rate of E2W penetration is 4.5%.

Bangalore is becoming a hotspot for green mobility solutions in terms of technology, offering services like energy infrastructure, battery management systems, charging solutions, and sustainable mobility. Commercial applications in the logistics and fast-moving consumer goods (FMCG) industries are being driven by this expansion.

Findings

1. As India speeds its migration to electric vehicles, emerging consumer needs features, channel preferences, charging infrastructure, and flexible ownership arrangements. With 70% of Tier 1 Indian vehicle buyers saying they would be prepared to explore an electric vehicle (EV) for their next vehicle purchase well above the global average of 52%—the nation is well-positioned for an electric vehicle (EV) future.

2. The market for internal combustion engine (ICE) vehicles has grown recently, but the swift shift to electrification marks a significant turning point. Global climate policies are driving the commitment to accelerate the adoption of electric cars (EVs). Examples of government programs that support this goal include the Faster Adoption and Manufacturing of Electric Vehicles (FAME) plan and city-level access regulations for ICE vehicles.

3. With automakers aiming for cost parity with internal combustion engine vehicles and increasing EV accessibility, the industry is expected to reach 10-15% penetration by 2030. Results from our 1,200-person, December 2022 India Mobility customer Survey shed light on customer attitudes and apprehensions regarding electric vehicles, with particular attention paid to sustainability, the availability of charging stations, and the changing nature of the online shopping experience.

4. The majority of consumers favor electric cars (EVs) due to the growing importance of sustainability. Consumers generally agree that the transition to electric vehicles will quicken. The vast majority of people are thinking about electric automobiles (EVs) for their future vehicles. Out of those, plug-in hybrid electric vehicles are favored by 21%, while full-battery electric vehicles are chosen by 49%.

5. These decisions are consistent with the results of our research on electric two-wheelers, which showed that 86% of consumers would consider buying an EV compared to 69% who would consider buying an ICE vehicle. This demand for EVs is being fueled by several factors.

6. Potential purchasers list the impact on the environment (67%), lower total cost of ownership (26%), and reduced engine noise (26%), as the key benefits of driving an EV.

Suggestions

1. The degree of consumer awareness regarding electric vehicles is one of the key factors influencing their attitudes. There's a tangible excitement and interest in electric vehicles (EVs) in Bangalore areas where information is more readily available. The companies should make use of the situation and sell more of their products to all segments of the population.

2. The accessibility and practicality of the infrastructure for charging have a direct impact on customer disposition. Many people have voiced the general issue that there are not enough charging stations, to reduce skepticism and increase trust among potential EV users, this infrastructure must be purposefully expanded, and more charging stations and portals must be installed in the city to increase the sales.

3. Government policies and incentive schemes stand out as major movers when it comes to influencing customer attitude. The attraction of tax breaks and subsidies influences consumer disposition favorably. However, to ensure a more seamless transition to electric vehicles, the complexity of these policies highlights the need for transparency and simplification. Corporates along with the government need to work on these grounds**.**

4. There are concerns inherent in customer sentiment. Potential EV consumers' hesitancy is exacerbated by projected maintenance costs, anxiety over range, and a lack of model variety. Industry stakeholders, legislators, and manufacturers must work together to address these issues. To alleviate these worries, technological advancements, open communication, and EV model diversity are essential tactics. These concerns must be considered as soon as possible.

5. Indian customers acknowledge the cost-effectiveness and convenience of home charging, but they prefer public charging (58%) and charging at home (42%). Although 55% of people can charge at home, 30% have room to improve. So, both options must be readily available for the customer's convenience.

6. Remarkably, two-thirds of buyers are still exploring electric vehicles despite having restricted access to home charging, 38% of them cite a lack of nearby charging infrastructure. It is essential to invest in both home and public charging.

7. Public charging decisions are influenced by site safety (28%), expenses (41%), and speed (49%). Consumers will pay an additional 10% to 20% for the convenience of quick charging. Additional charges need to be waived to regular users with lesser subscription fees.

8. For prospective EV consumers, the test drive experience is crucial. 24% of doubters regard it as a turning point in their purchasing process, and they advise OEMs to conduct lengthy test drives to ensure customer satisfaction. Key factors driving growing EV adoption include rising gasoline prices, improved maintenance infrastructure, improved vehicle safety, and a better understanding of EV total cost of ownership.

Conclusion

1. Bangalore North, with the third-highest number of electric vehicles in south India, the region makes a major contribution to the industry. The state policy is to attract INR 50,000 crores in investments and create 1.5 lakh jobs.

2. Over the past five years, the state has emerged as one of the top hubs for EV production, having inked many memorandums of understanding (MOUs) with prospective investments of over INR 24,000 crores and 48,000 jobs.

3. Bangalore south region is making a concerted effort to coordinate the growth of e-mobility with the state's industrial sector, particularly regarding EV components, constructing and establishing a suitable infrastructure for charging, encouraging domestic production.

4. Bangalore East Electric mobility has been recognized by the state government as a significant growth engine for the upcoming years, Infrastructure for hydrogen generating and private charging stations by offering financial incentives (and refueling infrastructure)

5. Bangalore West to position as a center for energy storage systems and electric vehicles, the state wants to attract investment in the EV industry by supporting production (including, but not limited to, offering customized incentives to large-scale and important projects). EV research hubs and other Centers of Excellence are being established to support research and development.

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