ABS International Journal of Management
Volume XIII Issue 1 June 2025 | ISSN 2319-684X (PRINT)

Electric Vehicles for Sustainability: A Case Study on The Dynamic Prospects of Electric Vehicles In Bangladesh

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ABSTRACT:
Electric Vehicles (EVs) have emerged as a promising solution for reducing the environmental effect of existing fossil-fuel-powered transportation systems. This study uncovers the dynamics of Electric Vehicles in Bangladesh, a developing country faced with difficulties in air pollution, urban congestion, and energy security. The study thoroughly analyses the Electric Vehicle situation in Bangladesh, considering factors such as governmental frameworks, infrastructural development, consumer attitudes and trends. The report also evaluates the environmental benefits of adopting electric vehicles, focusing on reducing greenhouse gas emissions, air pollution and reliance on fossil fuels. Based on the findings, this paper proposes strategic recommendations to policymakers and stakeholders in Bangladesh to expedite the adoption of electric vehicles. Bangladesh may transition to a sustainable and eco-friendly transportation system by tackling the difficulties and capitalising on the opportunities, contributing to combatting climate change and building a greener future.

Keywords: *Eco-fashion, consumer perceptions, sustainability, Bangladesh*

INTRODUCTION

Bangladesh & Electric Vehicles

Bangladesh's capital, Dhaka, has ranked 5th with the worst traffic congestion. With a population of over 22 million, traffic congestion remains an obstacle to Bangladesh's livability and functionality. Moreover, it has been noted that Dhaka city alone has approximately 1.81 million registered vehicles, which means the gas emissions are very high, resulting in an unsustainable environment. With the growing concern about urbanisation and the need for eco-friendly transportation solutions, the electric vehicles market is experiencing rapid growth. Bangladesh is a developing country and is prompt to adopt new technologies to establish an integrated society. Currently, the country stands at the 116th position in the Global Innovation Index as per the records 2022. In response to the challenges, various stakeholders in Bangladesh are exploring the potential to revolutionise the transportation landscape by adopting electric vehicles. This research paper aims to explore the possible dynamics of electric vehicles in Bangladesh and inspect the factors influencing their adoption, the challenges they face, and the potential economic and environmental impacts of the widespread usage of electric vehicles.

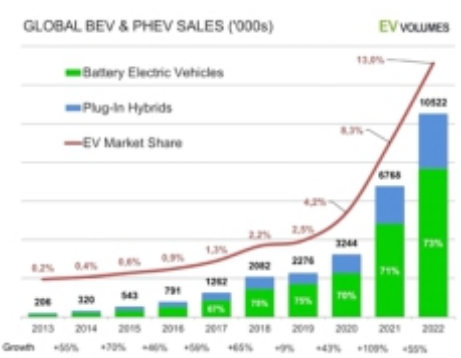

Figure 1
(Source: EV-Volumes - The Electric Vehicle World Sales Database. (n.d.). https://www.evvolumes.com/news/global-ev-sales-for-2022/)

The global transportation scene is changing dramatically, driven by the need to address environmental concerns and develop more sustainable mobility solutions. Electric Vehicles are at the forefront of this transition, having the potential to revolutionise transportation by lowering emissions and reliance on fossil fuels. This study aims to investigate the dynamics of electric vehicles in the context of Bangladesh and induce crucial insights regarding Electric vehicle adoption patterns, policy efficacy, consumer attitudes, and technological obstacles in Bangladesh for a cleaner and greener future. In a country dealing with rising air pollution, traffic congestion, and energy security concerns, the advent of Electric Vehicles allows for reinventing urban transportation. This research proposal aims to clarify how electric vehicles may establish a sustainable sector within Bangladesh's transportation landscape by analysing the infrastructure development, policy incentives, environmental impacts and consumer preferences. As the world progresses towards decarbonisation, it is believed that this research will play an important role in identifying the challenges associated with Electric Vehicles integration and creating a road

to a more sustainable and profitable future for Bangladesh.

Background

Electric Vehicles (EVs) is a sector that accounts for around 1/6th of global emissions. They have emerged as a disruptive force in the automotive industry, indicating a significant shift from conventional engine vehicles to more sustainable and eco-friendly transportation options. The widespread adoption of Electric Vehicles addresses various critical challenges, including air pollution, climate change and energy security. Relying on electric battery-powered motors, electric vehicles are a more quitter, neater and energy-efficient alternative to traditional fossil-fuel-powered vehicles. The evolution of Electric Vehicles goes back to the early 19th century when Americans became more prosperous thanks to industrialisation and switched to newly invented motor vehicles (steam, gasoline or electric) to get around. Electric cars have quickly become popular with urban residents, especially women who were very reluctant to use public transport, thus ensuring their safety (Matulka, 2014). According to the New York Times (1911), in previous years, it was often difficult to make arrangements to have electrics readily charged unless the vehicles were stored in garages where owners of electrics were catered to. Still, this affair of state has been changed. Now, an electric power owner can install his charging plant in his stable, and electric power companies are anxious to connect their feed wires to these individuals' charging plants. After enjoying great success at the start of the 20th century, electric cars began to lose their position in the automobile market. A good number of developments contributed to such a situation. By the 1920s, travel times have improved thanks to the road infrastructure, creating a need for automobiles with a greater range than electric cars (Wikipedia, 2023). The news surrounding electric vehicles is not all positive, and loopholes exist. Some experts have mourned the high prices and limited range, but the manufacturers' new electric vehicle options have begun to silence these critics. Electric vehicle options become less expensive as the years pass and offer a significantly greater range (Cornell, 2017). The interest in electric vehicles revived around the 1960s, and it has kept increasing with the introduction of the Honda EV Plus, Mitsubishi i-MiEV, Tesla, and more.

Study Objectives

1. To assess the awareness and perceptions of Bangladeshi consumers on electric vehicles and its benefits compared to the conventional vehicles
2. To report the current state of charging infrastructure for electric vehicles across different regions of Bangladesh

3. To find Bangladesh's key government policies and incentives for promoting electric vehicle adoption and assess the major challenges hindering the growth of the electric vehicle market in Bangladesh

4.To assess the potential environmental impact of a widespread switch to electric vehicles to reduce carbon emissions and improve the air quality in Bangladesh

Methodology

The methodology employed in this study was a combination of primary and secondary research. For primary research, a quantitative survey will be administered to a diverse sample of potential electric vehicle consumers, vehicle owners, and stakeholders. The survey data will be analysed using descriptive statistics and thematic analysis to quantify consumer preferences, perceptions, and demographic trends and identify recurring patterns, themes and qualitative insights regarding policy effectiveness and challenges. Key findings will be presented using tables, graphs and charts. For secondary research, a comprehensive review of reports, documents, and journals will cover topics such as electric vehicle trends, technological advancements, and environmental implications, including secondary data on electric vehicle sales, energy consumption patterns, and charging infrastructure development.

- **Primary Research:** The primary research involved surveying consumers, vehicle owners and stakeholders (Mango Telecom, Nitol Niloy Group) in Bangladesh.
- **Secondary Research:** The secondary research involves analysing existing articles, theses, newspapers, and journals on the relevant topic.
- Sources include Harvard Extension School, The New York Times, The Daily Star, and Business.org.
- **Quantitative Method:** The quantitative method was used to gather objective data on the number of vehicles and produced emissions through statistical and market analysis.
- **Qualitative Method:** The qualitative method was used for a more in-depth understanding of the social, economic, and cultural factors influencing the adoption of electric vehicles in Bangladesh.

Pie charts and bar graphs have been made to represent the key findings from the survey responses visually. These visualisations provide a concise overview of the responses.

Are you aware of Electric Vehicles (Evs)"

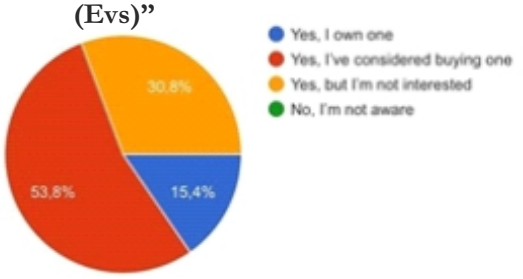

Figure 2

On a scale of 1 to 5, how likely are you to consider buying an electric vehicle in the next 5-10 years/

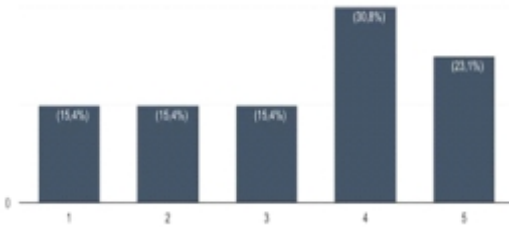

Figure 3

The data is segmented into five categories, ranging from "Least likely" to "Most likely." Notably, the graph reveals that a significant 53.9% of respondents fall within the higher likelihood categories: 30.8% consider themselves "Very likely" to adopt an electric vehicle, electric vehicles in the future. Additionally, 15.4% of respondents each fall into the categories of "Least likely," "Somewhat likely," and "Neutral".

What do you think is the main reason people in Bangladesh do not choose electric vehicles?

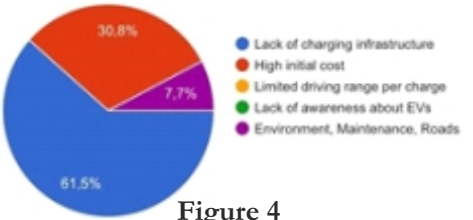

Figure 4

A striking 61.5% of respondents identified "Lack of charging infrastructure" as the primary obstacle, suggesting that the absence of points is a substantial deterrent. In contrast, 30.8% of respondents pointed to the "High initial cost" of electric vehicles as a significant concern. Additionally, 7.7% of respondents attributed their reluctance towards environmental concerns, maintenance issues, and road conditions, emphasising the multifaceted nature of the challenges faced.

What range do you think is acceptable for an electric vehicle in terms of kilometers per change?

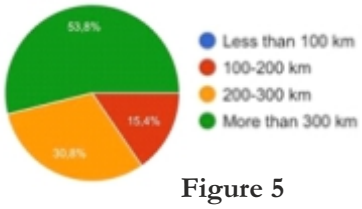

Figure 5

Notably, a significant majority (53.8%) of respondents preferred electric vehicles with a range exceeding 300 km per charge. This dominant segment signifies a substantial demand for electric vehicles that cover long distances. Additionally, 30.8% of respondents indicated a range between 200 to 300 km as acceptable, indicating a slightly lower demand. Lastly, 15.4% of respondents considered a range between 100 to 200 km acceptable, representing a minority.

Would you be more likely to consider an electric vehicle if there were government incentives or subsidies?

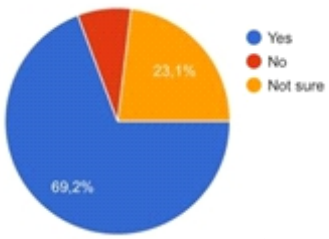

Figure 6

69.2% of respondents expressed a positive inclination, indicating that they would be more likely to adopt electric vehicles if government incentives or subsidies were in place. Additionally, 23.1% of respondents fell into the "Not sure" category, reflecting a segment that remains undecided, possibly awaiting more concrete information.

What do you think about the environment benefits of electric vehicles compared to traditional gasoline/diesal vehicles?

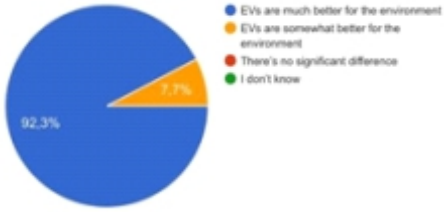

Figure 7

92.3% of respondents firmly believe that electric vehicles are much better for the environment than gasoline or diesel. Additionally, a small yet noteworthy 7.7% of respondents expressed that electric vehicles are somewhat better for the environment, suggesting a nuanced perspective within a minority segment.

In your opinion, how important is it for Bangladesh to transition to electric vehicles to reduce air pollution?

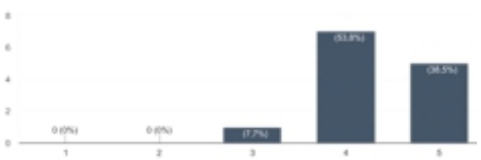

Figure 8

A significant 92.3% of respondents, combining the categories of "Very likely" (53.8%) and "Most likely" (38.5%), express a high level of importance attached to transitioning to electric vehicles. Moreover, the 7.7% of respondents who indicated a "Neutral" stance offer a perspective that warrants exploration.

to a more sustainable and profitable future for Bangladesh.

Are you aware of any local initiatives or organizations promoting electric vehicle usage in Bangladesh?

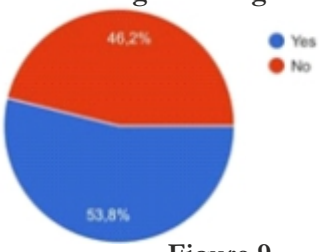

Figure 9

The data reveals that 53.8% of respondents know these initiatives or organisations. Conversely, 46.2% of respondents stated they are unaware of such local initiatives or organisations.

Would you prefer an electric vehicle over a traditional vehicle over a traditional vehicle if both were priced similarly?

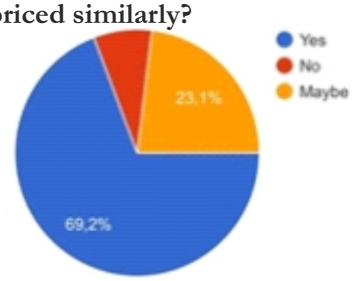

Figure 10

A significant 69.2% of respondents clearly preferred electric vehicles under these conditions, showcasing a substantial majority favouring sustainable transportation options. A significant 69.2% of respondents preferred electric vehicles under these conditions, showcasing a substantial majority favouring sustainable transportation options.

Do you think the government should invest more in building charing stations to promote electric vehicle usage?

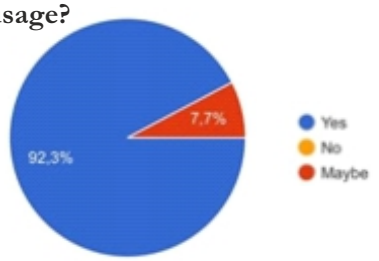

Figure 11

A remarkable 92.3% of respondents firmly advocate for increased government investment in building charging stations, underscoring strong public demand for essential infrastructure to support electric vehicle adoption. Conversely, the 7.7% of respondents who expressed a more cautious "Maybe" stance suggests a minority segment with reservations or uncertainties.

FINDINGS

Although the electric vehicle market in Bangladesh is still in its early stages, Audi Bangladesh is the first automotive brand and manufacturer to launch officially registered Battery Electric Vehicles under the EV category with BRTA. Dhaka has no public charging stations, making it difficult for electric vehicle owners to charge them. There are only 14 electric vehicle charging stations with a combined capacity of 278 kW nationwide as of December 2020 (The Daily Star, 2023). Countries like China and India expressed their interest in investing in establishing electric vehicle manufacturing plants and facilities in Bangladesh. China's proposed plant is willing to manufacture almost 60% of the components of the vehicles, allowing a driving range of 200400 km (The Business Standard, 2023). In Bangladesh, transitioning to Electric Vehicles will significantly reduce air pollutants and carbon emissions, leading to better air quality and a more sustainable transportation system, while also providing economic benefits for individuals and businesses. This benefit will be enhanced along with incorporating renewable energy sources into charging infrastructure, solving concerns over Electric Vehicles' energy generation. Furthermore, favourable government regulations and incentives, alongside environmental conscio usness, will play a vital part in driving the adoption of Electric Vehicles, enabling the country's transition to a cleaner and more efficient mobility environment. In summary, the research findings point to a bright and innovative picture for electric vehicles in Bangladesh, with a receptive public prepared to adopt electric vehicles if supported by appropriate regulations, policies, economic infrastructure, charging infrastructure and price strategies. The found data indicates a rising need for government initiatives, emphasising the importance of investing in charging infrastructure to expedite the transition to sustainable mobility ameliorate Bangladesh's environmental concerns.

CONCLUSION

In conclusion, it can clearly be said that the transition to Electric Vehicles in Bangladesh will result in significant reductions in air pollutants and carbon emissions, leading to better air quality and a more sustainable transportation system while also providing economic benefits for individuals and businesses. This benefit will be enhanced along with incorporating renewable energy sources into charging infrastructure, solving concerns over Electric Vehicles' energy generation. Furthermore, favorable government regulations and incentives, alongside environmental consciousness, will play a vital part in driving the adoption of Electric Vehicles, enabling the country's transition to a cleaner and more efficient mobility environment. Thus making the said hypothesis true.

RECOMMENDATIONS

Based on the findings, policymakers in Bangladesh are recommended to implement regulations that incentivize the use of electric vehicles, such as tax breaks and subsidies. To promote widespread use, businesses should also

consider investing in electric vehicle infrastructure, such as charging stations. Finally, individuals can contribute to this effort by considering the purchase of an electric vehicle for their personal use.

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