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# Enhancing Electric Vehicle Sales in Nepal: A Study of Consumer Buying

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**ABSTRACT:** The electric vehicle sector has developed massively in the past decades. But the adaptation rate has been very minimal. Along with the world, Nepal is also going through an energy crisis. Nepal lies between India and China both are the leader in the manufacturing of electric vehicles. Nepal has failed to take advantage and decrease its burden of fossil fuel requirements. There are many different factors that affects the sales and enthusiasm of the customers buying the Electrical vehicles in Nepal. Generally, it is motivated by the availability of the basic infrastructure of charging and maintenance of the vehicle that comes after it being sold to the customer. The high upfront cost of the EV and limited public awareness of their benefit over the ICE engine vehicles have yet not been well versed to the Nepalese customers.

This report was conducted to understand the reason that is hindering the electric vehicle development and poor sales performance in Nepal by studying the consumer buying behavior from Biratnagar (A city in Nepal). Both primary and secondary data accumulated from the Vehicle consumer market were used while analyzing the factors affecting the sales rate. For collecting the necessary data and information simple random sampling method was used. The online survey was done to obtain quantitative data. All the participants were from Biratnagar, Nepal.

**KEYWORDS:** Electric Vehicle, Adoption rate, Energy Crisis, Nepal, Consumer buying behaviour, Choice of vehicle.

## I.INTRODUCTION

The market for electric vehicle technology is rapidly expanding, driven by the concept of sustainable development goals 2030. While some European and American automobile companies have ceased production of new ICE engine vehicles to comply with global standards, this trend is not universal. In Nepal, which relies heavily on imports for electronics and vehicles, ICE engines were imported from various countries with different power and price ranges, and petrol is already expensive. Nepal has imported a few electric vehicles from Japan, China, and India over the past three decades, but the Nepalese market and vehicle buyers are heavily influenced by geographical distribution, availability of charging infrastructure, and model reliability on Nepalese roads. Despite the government's plans to replace ICE engine vehicles with EVs, market trends suggest otherwise. The government has changed its taxation policies to import vehicles and parts from India, with EVs having significantly lower taxes than ICE engine vehicles. However, the scarcity of proper after-sales services and charging infrastructure has discouraged many customers. Many Nepalese people still follow myths and prefer ICE engine vehicles even when they can afford EVs in the long run. This study is based on a survey conducted by the team, analyzing the ideology of Nepalese people when purchasing an electric vehicle. The paper presents effective suggestions collected from interviews and recommends policy revisions to the National government.

## II.LITERATURE REVIEW

**Electrical Vehicle Technology in Nepal:** Sushila Maharjan, MIT, in 1993, the Kathmandu valley initiated the development of EVs to combat the sever rise in air pollution. The implementation of Evs involved

government intervention, NGO advocacy, international donor support, and private sector involvement. IT was considered a successful model for other South East Asian cities to Follow never, the model failed only after 6 years, The main barriers of the implementation of the EV industry were the driver's interest and goals of stakeholders, particularly the opposition of fossil fuel interest, and insufficient human resources and support network. This research advocates the must form of coalition between government and supportive actors for sustainable EV policies and its growth in Nepal.

**Challenges in the penetration of electric vehicles in developing countries with a focus on Nepal: Mali, Bijen, et al., Renewable Energy Focus (2022)**, explores the transition towards an electric based transportation system due to climate change and unreliable field markets. Completed projects, policies and infrastructure development related to EVs in developed countries are studied to develop a plan to expedite the EV sector in developing countries A five factor dependent plan is proposed and applied to Nepal as a case study.

**Climate Resilient Pathway for Developing Nations: Case Study of Evs Market in Nepal: Abarta Pandey**, The IPCC special report warns that we are not doing enough to combat the climate crisis, which is set to worsen as developing economies pursue economic growth. To address this, a climate resilient pathway for development is urgently needed, in the transportation sector being key rea for reducing greenhouse gas emissions. Evs offer a promising solution, but developing countries face obstacles such as a lack of government policies, infrastructure and supply, as well as brain drain. The research conducted on consumers in Nepal highlights these challenges and underscores the need for coordinated Government efforts and international financing to achieve a sustainable transformation.

**Barriers and Opportunities to Electric Vehicle Development in Nepal: Allyson Krupa (2019),Independent Study Project (ISP) Collection**, As the global carbon dioxide level hits a historic high (407.4 parts per million), energy systems must shift from fossil fuels to renewable powered sources. With the transportation sector contributing almost a third of global greenhouse gas emission, electric mobility provides a significant opportunity for reducing these emissions. The demand for electric vehicles has been on the rise globally, and in Nepal, a clean energy transition is crucial for quality of life, socioeconomic development, and climate change adaptation in the face of increasing urbanization and air pollution. It explores the barriers and opportunities for electric vehicle development in Nepal through document analysis, social media analysis a stakeholder interviews.

**Study on economic plausibility of electric vehicle charging stations in Nepal: D.D. Tiwari, G.C. Pokhrel, KU**, the 2030 SDG goals of Nepal is to develop over 1500 MW in rural areas causing surplus electricity. As major economy's hub concerns have recently sifted to EVs, Nepal reliant on imports India, Germany, Japan and China also follow the trends to suit up. This study predicts number of locations of Evs charging station, compares the energy cost per unit distance of Evs petrol and diesel vehicles, calculates the payback period of setting up an Evs charging station on Nepal.

**Policy Discourse on electricity mobility on Nepal: Prasant Bist, KUSOED, Currently**, Nepal lacks political stability and required improved law to incorporate the effective EV system. This study seeks to analyse the problem of Evs and formulate by the state and provide governments to encourage the adoption of Evs. This highlight and display the successful plan to implement which are adopted by the neighbouring countries and global leaders in the Evs world.

### III.METHODOLOGY

#### Sampling

Collecting data and information on tan entire population can be a daunting task. To overcome this challenge and obtain information quickly and cost-effectively, researchers often rely on sampling methods. For this research paper a "Simple Random Sampling Method" was chosen to collect data and information, with a sample size sampling from 50 - 100 individuals from Biratnagar, Nepal. Participation in the study was randomly chosen to ensure unbiasedresult. This sampling method provides representation for every group of people, chosen entirely by chance , and allows for an ideal level of population diversity in term of background and age. Compare to nonprobability sampling method, it offers quantitatively more reliable results.

### Data Collection Method

The success of research work relies on the accuracy and relevance of the collected data, which is then analyzed, interpreted, and used to draw conclusions. The deductive approach was employed in this research, which allows the analyst to explore and expand upon existing theories and test hypotheses to determine the relationship between findings and research. (Devault, 2018) To collect quantitative data, an online survey was conducted to gather information from consumers in Biratnagar regarding the challenges faced by electric vehicle companies and the reasons behind the hindrance of its market growth. Surveys provide a vast range of information that can be used to examine values, beliefs, behaviours, and attitudes. Secondary data were also collected from credible and trustworthy sources, such as journals, websites, books, and reports. This method of data collection is beneficial, as it is less time-consuming and more cost-effective. The widespread use of the internet has made it easier to access information from various reports and documents pertaining to the company.

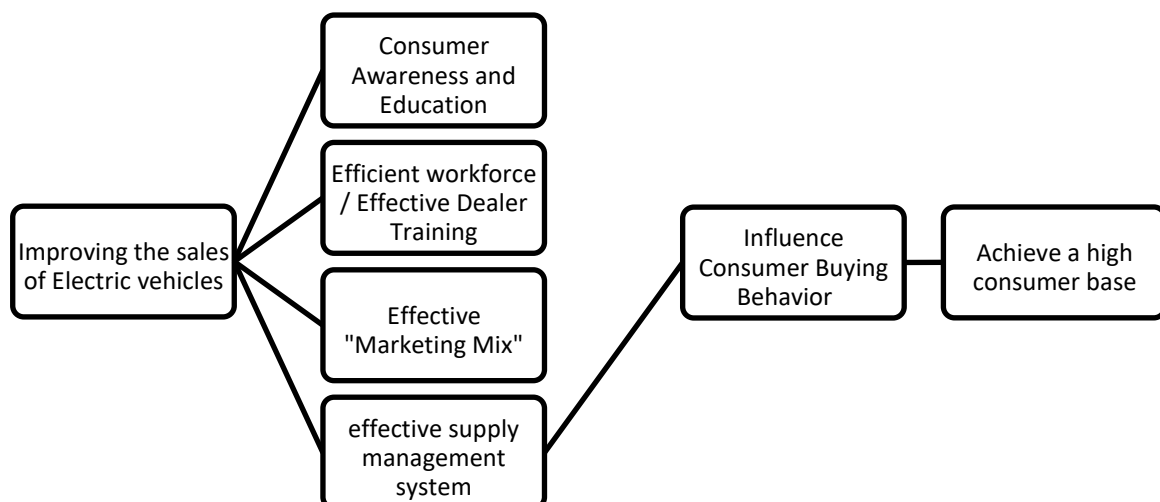
### Data analysis method

Raw data consists of a collection of random information that requires thorough analysis and processing to transform it into meaningful information that is crucial for research purposes. The objective is not simply to analyse the data, but to derive valuable insights from it, which is dependent on the interpretation of the data. Statistical analysis is commonly utilized to transform quantitative data into visual representations such as graphs, charts, and tables. In the present study, a Google form was employed as analytical software to analyse the questionnaire data. Qualitative data, on the other hand, was analyzed using content analysis methodology.

### Ethical Consideration

The ethical considerations play a significant role in research. Researchers are expected to adhere to ethical principles such as honesty, respect for individuals, and avoiding any errors or deception. In this study, ethical considerations were taken into account during the data collection process. Participants were required to provide their consent before participating, and their anonymity was maintained. The research was conducted without any bias or discrimination towards any particular group, and care was taken to avoid causing any offense to anyone. Participation in the survey, interview, and focus group was voluntary, and the participants were fully informed about the purpose of the research. These ethical considerations were followed throughout the study to ensure the validity and reliability of the research findings. (Global Advocacy for HIV Prevention, 2018)

### Conceptual Framework



### Conceptual justification

According to the chart presented above, it is evident that the sales of electric vehicles are positively impacted by the dependent variable [5]. The independent variables that influence this dependent variable include consumer awareness and education, effective workforce/dealer training, efficient marketing mix, and an effective supply

management system. These variables collectively affect consumer behaviour and can lead to a significant increase in the consumer base. [6]

### DATA ANALYSIS AND FINDINGS

A questionnaire was presented to a number of people in *Biratnagar (A city in Nepal)*, considering the case of sampling and post-survey analysis to understand the mentality of the customers in the area. The data set hence taken forms the group of individuals which will be considered as the average population of Nepal for further data analysis and evolution.

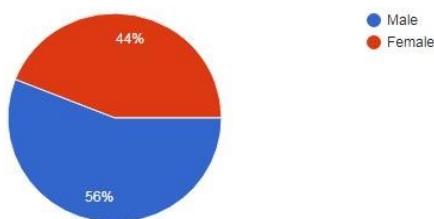


Figure 1: Pie-chart of Male and Female ratio in the survey

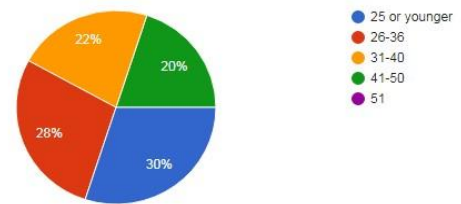


Figure 2: Pie-chart representing the age group of the participants

In the survey taken, 56% of the participants were male and there was a representation of 44% female as shown in *figure 1*. Similarly, the *figure 2* demonstrates the age group of the participants in the form of a pie chart. Here, 70% of the participants are from the age group who will own a car or already own a vehicle for their own. Hence, the survey was targeted to cater the awareness and collect opinions from the same-aged population.

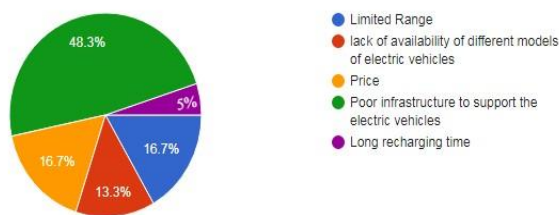


Figure 3: Pie-chart on factors to consider while purchasing a EV

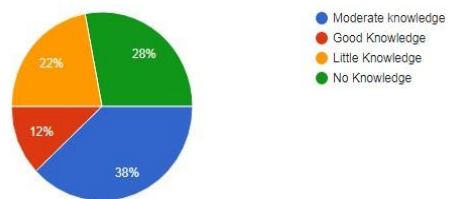


Figure 4: Pie-chart on knowledge bloom levels of the participants

The *figure 3* represents the factors people consider while buying their vehicles. The same factors are considered while buying an EV too. 48.3% of the population have said that they could have bought an electric vehicle but due to poor infrastructure to support the electric vehicle they have been constantly discouraged. Hence, this shows the infrastructure and post sales service offered by the available companies in Nepal makes a hinderance and hence people choose ICE engine vehicles over Evs [7,8,9]. The survey questionnaire also comprised of few self-awareness related questions for the participants. Hence, when asked about their awareness level and knowledge on Evs which were later represented in a pie-chart mentioned above in *figure 4*. Here the maximum number of participants i.e., 38% have responded opting a Moderate knowledge level. The other factors affecting the choice of Evs are limited range of the Evs, price, etc. [10,11,12]. The sales are highly affected by these factors. When presented with the choice between a Suzuki SWIFT priced at 35 Lakhs and a TATA Nexon EV

priced at around 47 Lakhs, most people prefer the Suzuki SWIFT. Despite the TATA Nexon's superior engine and build quality, the Suzuki SWIFT offers comfortable seating for up to 5 passengers, well-crafted in-car electronics, and a lower cost of ownership. This is particularly important in Nepal, where ICE vehicles are taxed at 300%, making the Suzuki SWIFT a more affordable option with better mileage and after-sales service.

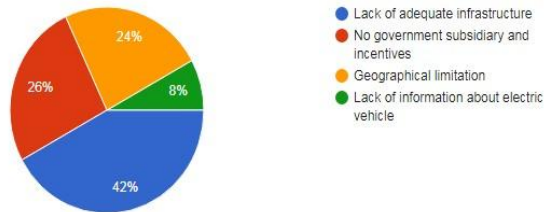


Figure 5: Pie-chart about problem faced by EV companies in Nepal

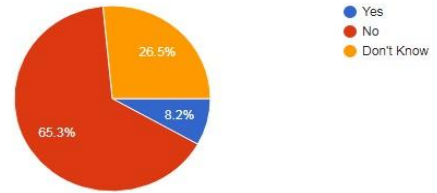


Figure 6: Pie-chart about incentives involved to purchase EVs

The **figure 5** shows surveyed participants were asked about the challenges that electric vehicle automakers are currently facing in the Nepalese market. The results showed that 42% of respondents believed it was due to a lack of adequate infrastructure, 26% attributed it to the absence of government subsidies and incentives, 24% pointed to the geographical limitations of Nepal, and 8% felt that it was due to a lack of information about electric vehicles.[13,14,15] The majority of respondents cited the lack of adequate infrastructure as the main hindrance for electric vehicles to function properly in Nepal. However, if the government instills trust in this sector, it could attract numerous investors and help electric vehicles flourish in the market. Nepal's unique geographical features pose a challenge to electric vehicles, as most available models are not designed for driving in hilly terrains.

Infrastructure is crucial for any sector to function efficiently, and all stakeholders must play their part in making electric vehicles more accessible. It is not the responsibility of just one party to lead the way towards this goal. It is imperative for the government to establish policies and regulations that cater to electric vehicles in Nepal. The current import tax on vehicles in Nepal is steep, but reducing taxes on electric vehicles can make them more affordable for the public. The adoption of electric vehicles could significantly reduce the excessive demand for fuel, ultimately benefiting the environment. Kathmandu, the capital city of Nepal, is grappling with pollution, and vehicle emissions are a major contributor. In this regard, the integration of electric vehicles could be a useful solution in reducing pollution levels within the Kathmandu valley. In spite of average sales, many experts argue that the Evs are the future of the world. The growing demand and the production of the Evs are the proofs of the argument proposed. After some years the cost of the Evs will drastically reduce when the conventional vehicles will be reduced on the roads and the production will be focus on the Evs [16,17].

Based on the above **figure 6**, it can be deduced that 65.3% of individuals surveyed believe that the Nepalese government does not offer any incentives for purchasing electric vehicles. 26.5% of respondents were unsure about the existence of incentives, while only 8.3% confirmed that the government provides such benefits. It is worth noting that the Nepalese government does not currently offer any tax benefits or incentives to consumers who purchase electric vehicles [18]. In contrast, in countries where electric vehicles have flourished, the government has played a significant role by offering incentives. Such incentives can have a massive impact on the growth of electric vehicles in a country [19,20].

Apart from financing selected research projects, the government can influence the market by defining technical standards and affecting market demand. The most effective way of boosting demand is by subsidizing the

purchase of electric vehicles for both private and public sectors [21,22]. Currently, incentives are necessary to reduce the high cost of electric vehicles, which can be attributed to the high cost of technology. Nepalese consumers cannot afford such high prices, so they need incentives to make electric vehicles more accessible. Nepal can take advantage of being neighbors with India and China, which are leaders in electric vehicle production. However, it is essential to note that government incentives alone will not suffice in the long run. Nepal needs to be self-sustained and create a strategy and framework that can pave the way for achieving sustainability [23,24,25].

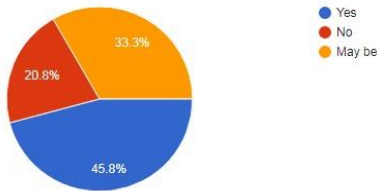


Figure 7: Pie-chart about people’s plan to buy an EV in future

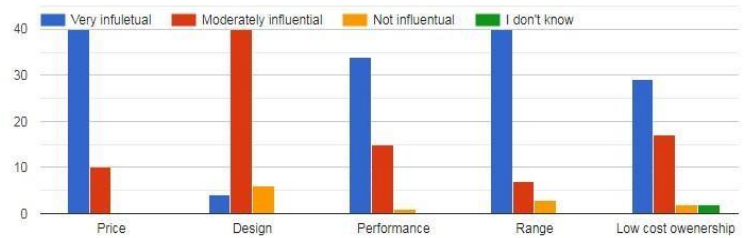


Figure 8.1: Pie-chart about influential factors for buying electric vehicle

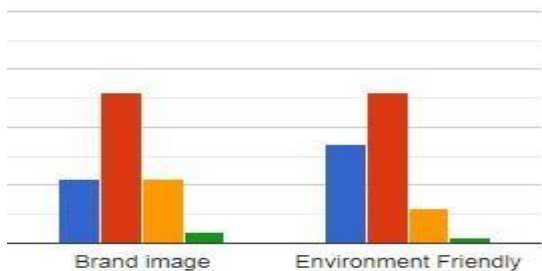


Figure 8.1: Pie-chart about influential factors for buying electric vehicle

In *figure 7*, we can see that 45.8% of the people may consider EV as an option for their future vehicle but only after the better establishment of charging facilities and after sales services by the companies. The government policies and change in the taxation that has been newly introduced to Nepal may give a rise in this percentage in the coming future.

The survey asked respondents about the factors that influence their decision to purchase an electric vehicle. The bar graph in *figure 8.1 and 8.2* above clearly indicates that a large number of people consider *price, range, performance, and low cost of ownership* as the most important factors. *Design, brand image, and environmental friendliness* were found to be moderately influential. Based on these results, it can be concluded that the Electric Vehicle Company should prioritize improving the vehicle's performance and range while lowering the price to promote low cost of ownership for consumers [26].

Electric vehicles are facing challenges in Nepal due to issues related to range, performance, and high cost. To overcome these obstacles, EV manufacturers need to focus on attracting millennials who are interested in adopting modern technology and innovation. However, they should not overlook essential features such as design and safety. Currently available EV models in the market do not meet these criteria convincingly [27]. Although companies like Tesla, Toyota, and BMW produce advanced EVs, their high price point makes them impractical for the Nepalese market. (The Kathmandu Post, 2017) The Nepalese market is more suitable for three-wheelers, scooters, mopeds, motorcycles, and small cars. In Biratnagar, three-wheeled electric vehicles

have become very popular and replaced risk haws as the primary mode of public transportation within the city. The surge in E-rickshaws has created numerous employment opportunities and is both lightweight and affordable. In addition to benefitting low-income individuals, e-rickshaws are also helping Nepal reduce its dependence on imported oil-based products [28, 29]. Importantly, three-wheelers have the potential to mitigate the effects of climate change by decreasing our reliance on fossil fuels and reducing pollution. While these vehicles can travel more than 100km on a full charge within the city, their efficiency is lower in mountainous regions, so their use should be encouraged in the southern plains. In fact, they are already performing well in such areas and have become so popular in some cities that they have replaced the previously ubiquitous cycle rickshaws. (Scientific American, 2013)

#### IV.RESULTS ANDDISCUSSION

General strategies have been driven after talking to the associates of the companies selling Evs in Nepal. This report has the accumulation of the responses from the test population about their choice and preference in any vehicle hey buy and why it can be or may not be a ELECTRIC vehicle over any other. *The general strategies suggested by the business owners and the consumers are mentioned below [30]. The following point are backed by the study of the researches from different organizations in different countries.*

*There are several strategies that can be implemented to enhance the sales of electric vehicles in Nepal:*

- 1. Government subsidies and incentives:** The government can offer subsidies and incentives to promote the use of electric vehicles, such as tax breaks, reduced import duties, and cash rebates. This will help make EVs more affordable and attractive to buyers.
- 2. Charging infrastructure:** The development of charging infrastructure is crucial for the growth of the EV market. The government can work with private companies to establish charging stations in urban areas, along highways, and in remote regions to ensure that EV owners have access to charging facilities.
- 3. Education and awareness:** A lack of awareness and understanding of electric vehicles is a major barrier to adoption. The government, manufacturers, and industry associations can collaborate to educate consumers about the benefits of EVs and address common misconceptions.
- 4. Collaborations and partnerships:** Collaboration between automakers, battery manufacturers, charging station operators, and other industry players can accelerate the growth of the EV market. Partnerships can facilitate the development of new technologies, reduce costs, and improve supply chain efficiency.
- 5. Demonstration projects:** The government can launch demonstration projects to showcase the benefits of electric vehicles. This could include initiatives such as EV car-sharing services or government fleets of electric vehicles.
- 6. Incentivize local production:** Encouraging and incentivizing local production of electric vehicles and components could lead to more affordable and accessible EVs for Nepalese consumers.
- 7. Financial assistance for EV loans:** Financial institutions can offer special loan packages for the purchase of electric vehicles, with lower interest rates or longer repayment periods. This can help make EVs more affordable for buyers.
- 8. Public procurement:** The government can lead by example and adopt electric vehicles for its own fleets. This can create a market for EVs and also demonstrate the government's commitment to reducing emissions and improving air quality.
- 9. Incentivize EV charging at home:** The government can offer incentives to encourage EV owners to install charging stations at home. This can help overcome range anxiety and make EV ownership more convenient and accessible.



**10. Develop EV-friendly policies:** The government can develop policies that are friendly to electric vehicles, such as providing EVs with priority access to high-occupancy vehicle lanes or exempting EVs from certain tolls or fees. This can help increase the appeal of EVs for consumers.

**11. Focus on fleet electrification:** Fleet electrification can have a significant impact on reducing emissions and improving air quality. The government can work with companies and organizations to encourage the adoption of electric vehicles for their fleets, such as taxis, buses, and delivery vehicles.

**12. Collaboration with neighboring countries:** Nepal can collaborate with neighboring countries, such as India and China, to develop a regional EV market. This can help reduce costs and improve supply chain efficiency, leading to more affordable and accessible EVs for Nepalese consumers.

There are several government policies that can support the rise in use and sales of electric vehicles in Nepal. Here are some examples [31]:

**1. Tax incentives:** The government can provide tax incentives to EV manufacturers, importers, and buyers. For example, the government can reduce or waive import duties, VAT, and excise taxes on EVs to make them more affordable for consumers.

**2. Charging infrastructure development:** The government can invest in the development of a robust EV charging infrastructure, such as public charging stations in urban areas and along highways. This can help overcome range anxiety and make EV ownership more convenient.

**3. Subsidies for charging infrastructure:** The government can provide subsidies for the installation of home charging stations, workplace charging stations, and public charging stations. This can encourage more people to adopt EVs by reducing the cost of charging infrastructure.

**4. Renewable energy promotion:** The government can promote the use of renewable energy sources, such as solar and wind power, for EV charging. This can help reduce greenhouse gas emissions and make EVs even more environmentally friendly.

**5. Green public procurement:** The government can mandate the purchase of a certain percentage of electric vehicles for its own fleets, such as buses and government vehicles. This can create a market for EVs and also demonstrate the government's commitment to reducing emissions and improving air quality.

**6. Education and awareness campaigns:** The government can conduct education and awareness campaigns to inform consumers about the benefits of EVs, such as lower fuel and maintenance costs, and their positive impact on the environment. This can help increase demand for EVs and drive sales.

**7. Zero-emission vehicle mandates:** The government can implement regulations that require automakers to produce a certain percentage of zero-emission vehicles, such as electric cars, as part of their overall fleet. This can help increase the availability of EVs in the market and drive down costs.

**8. Incentives for EV manufacturing:** The government can provide incentives for companies to manufacture EVs in Nepal, such as tax breaks, grants, and low-interest loans. This can encourage local production of EVs and help create jobs in the EV industry.

**9. Green financing options:** The government can provide financing options for consumers to purchase EVs, such as low-interest loans or leasing programs. This can make EVs more affordable for consumers and increase their adoption.

**10. Vehicle emissions standards:** The government can set stricter emissions standards for vehicles to encourage automakers to produce cleaner vehicles, including EVs. This can help reduce air pollution and improve public health.

11. **EV-friendly zoning and building codes:** The government can adopt zoning and building codes that require new buildings and parking lots to include EV charging infrastructure. This can help ensure that EV owners have access to convenient charging options.

12. **Research and development funding:** The government can allocate funding for research and development of EV technology, such as battery storage and charging infrastructure. This can help drive innovation in the EV industry and improve the performance and affordability of EVs over time.

## V.CONCLUSION

The focus of this research paper was to analyze the factors influencing consumers to purchase electric vehicles and identify ways to improve sales. Many countries are collaborating to address the carbon emission crisis and the depletion of non-renewable fossil fuels. Electric vehicles have advanced rapidly in the last decade, but still constitute only a small fraction of the automobile market and have not yet become mainstream. Financial incentives alone may not be enough to persuade large numbers of consumers to switch to electric vehicles. Electric vehicle ownership requires a different outlook, including being prepared to charge at designated locations and driving quietly. However, once consumers embrace electric vehicles, they often find that they never default back.

The literature review examined different aspects of consumer buying behavior and decision-making, including the application of the innovation resistance theory to analyze the barriers to electric vehicle adoption. The CARMA framework developed by Loren McDonald was identified as an important standard that electric vehicle manufacturers should meet to successfully establish themselves in the market. While electric vehicles offer potential environmental benefits, charging them can indirectly produce greenhouse gas emissions, particularly in countries that rely heavily on coal power. As the world transitions to renewable energy, electric vehicles are expected to become increasingly popular. Electric vehicle manufacturers should prioritize producing renewable electricity to avoid undermining their commitment to environmentally friendly technology. It is important to note that this research paper only examined the buying behavior of consumers in Biratnagar, Nepal, and may not be generalizable to all consumers in Nepal. Nonetheless, the findings can serve as a foundation for future research into the electric vehicle market in Nepal.

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