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Factors Influencing EV Purchase Decisions and Behaviour

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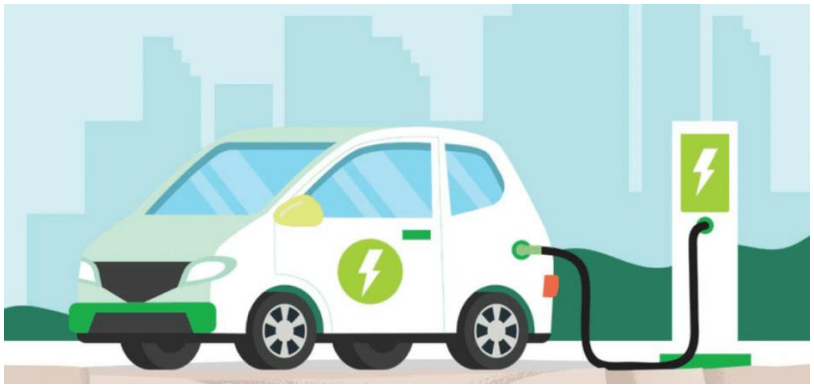
Introduction

At this turn in history, the global automotive industry stands at a very crucial point since it is moving from a vehicle with a traditional internal combustion engine (ICE) to electric vehicles. One of the reasons for this transition is the urgent need to reduce carbon emissions in combating climatic change, a phenomenon that has been fueled by decades of dependence on fossil fuels. EVs provide a future road that is capable of an alternative to ICE-based vehicles, primarily because there are no tailpipe emissions. This would highly reduce the environmental impact of transport. Not merely a technological evolution, it is indeed a historical necessity toward completing the sustainable development goals, among which reduction in greenhouse gas emission and improvement in air quality represent two of the challenges at the top of the stack.



There are growing demands for EVs due to increased environmental awareness and tremendous technological improvements in addition to policies by governments that support sustainable energy utilization and economically sound factors such as rising fuel prices. Other attractions involve favourable government incentives of governments of other countries in addition to strict regulations, which lays a solid platform for the usage of EVs, and advancements in technology regarding batteries are doing well in increasing ranges and reducing costs further. In addition, growing awareness about climate and environmental degradation has led to public awareness at an all-time high which makes

consumers want to choose environmentally friendly transportation. However, the above encouraging trend, the adoption rate of EVs is very spotty across regions and demographic segments.

Divergent rates of adoption of EV reveal the complex factors interacting in consumer behaviour and choice. The high initial cost and fear of not saving money in the long run are important economic factors that keep the potential buyer from owning an EV. There are also infrastructural challenges such as the availability of charging stations that shape consumer choices alongside economic factors. Cultural and social factors, for example, attitudes toward technology, and status perceptions concerning vehicle ownership, differentiate the type of adoption in each market. Understanding these diverse influences will accelerate the transition toward more sustainable transportation solutions.

Background of the Study

This study bases itself in the acknowledgment that the shift into electric vehicles is not a question of purely technological or environmental issue but rather one of multidimensional challenges linked to economic, social, and policy-related dimensions. While significant progress has been made in the EV market globally, its growth has been uneven across different regions worldwide, with developed regions in Europe and North America leading other developing regions. Significant barriers include the higher cost of EVs; limited infrastructure; and lesser consumer awareness about the benefits to the environment. "Range anxiety" is also a concern-where consumers who would be potential buyers are concerned about the driving range of EVs and charging facilities.

Of course, also significant for attitudes to consumers was the evolution of EV technology primarily in terms of battery innovations. Progress toward better efficiency, a faster charging time, and higher energy density help alleviate some common concerns associated with EVs. Additionally, new business models-about using battery swapping and subscription models to own an EV-began to address some of the current challenges. These technologies may be game changers in lifting consumer confidence to embrace electric vehicles and making them a reasonable option for a larger number of consumers in these respects. However, it remains to be seen if these technologies are enough to overwhelm long-established behaviours and preferences for conventional vehicles.

The readiness of the ecosystem and readiness in charging infrastructure, availability of maintenance services, and trained technicians will also be key determinants of mass adoption of EVs. Such supportive infrastructure is really crucial to make sure a customer friendly experience and to encourage the shift from ICE vehicles to EVs. Countries which have relatively well-developed networks of charging have had higher adoption rates, while the opposite tends to be true for regions that have poor infrastructure. This underlines a holistic approach that requires not only the evolution of vehicles but also that of supporting infrastructure and services leading to sustainability in the adoption of electric mobility.

Objectives of the Study

The objectives of this study are outlined as follows:

1. **To identify key factors influencing purchase decisions of electric vehicles (EVs) across different demographics:** This objective aims to pinpoint the elements such as environmental consciousness, cost concerns, or technological interests that play a significant role in consumer decision-making. The study will explore differences in these factors across age, income, and education groups.

2. **To evaluate the role of environmental awareness and incentives in shaping consumer behaviour related to EV purchases:** This involves examining how consumers' understanding of environmental issues like climate change, as well as government initiatives (e.g., subsidies, tax incentives), affect their likelihood of purchasing an EV.

3. **To examine the economic factors that influence EV purchase decisions**: EV ownership involves upfront costs, fuel savings, and long-term maintenance. This objective explores how consumers weigh the financial aspects, such as the total cost of ownership, against traditional vehicles.

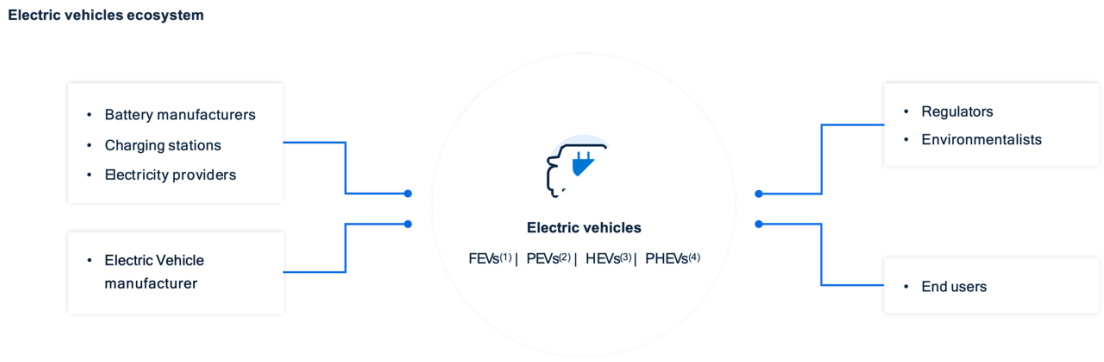
4. **To analyze social and psychological factors like peer influence and social status on EV adoption:** Beyond financial and environmental considerations, social factors play an important role. This objective focuses on understanding how social norms, peer pressure, and perceptions of social status influence the decision to adopt EVs.

5. **To assess challenges and barriers to EV adoption and propose solutions to enhance market penetration**: This includes identifying the key obstacles such as insufficient charging infrastructure, range anxiety, and high upfront costs and suggesting strategies that could improve adoption rates. The study will also evaluate how these challenges differ between urban and rural settings.

Literature Review

- **History of EVs**

  The early developmental efforts of electric vehicles traces back to over a century now, by companies like General Motors (GM). Their research started around 1916, but it wasn't until the 1960s and oil crises that made their attempts more serious. The initial prototypes were powered by silver-zinc batteries, like GM's Electrovair I and II. But they were unable to commercialise them because they had high battery's cost, weight, short cycle life but these prototypes performed well in terms of acceleration and speed.



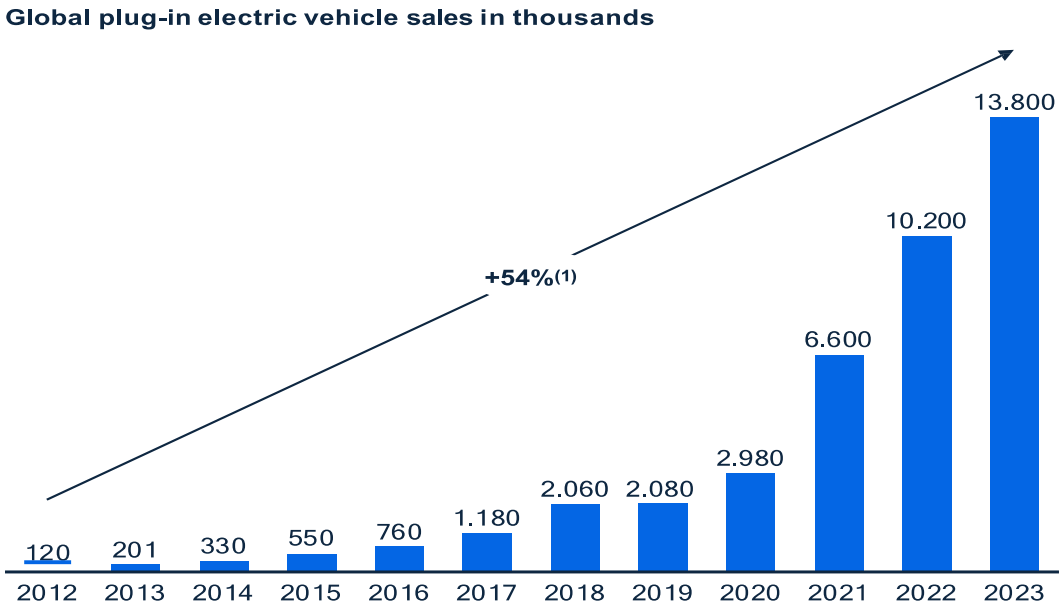
In 1966, GM unveiled the Electrovan, the world's first fuel-cell-powered vehicle, but it too suffered from high costs and technical complexities. Throughout the 1970s and 1980s, GM remained committed to electric propulsion and operated experimental vehicles such as the Electrovette with nickel-zinc batteries for increased performance and reliability.

In the 1990s, GM came up with IMPACT which was a production ready EV, it marked a turning point with the use of dual induction motors and advanced electronics, and offered a range of 120 miles with a top speed of 100 mph. It acted as a foundation for the modern electric vehicle technology. Over the past 2-3 decades there have been a great improvement in battery technology, electronics, and vehicle design but the challenges still exists like initial cost and battery limitations.

- **EV market share in Automotive Industry**

At global stage, electric vehicles have gained a significant share in the automotive industry, with countries like Norway, China, and Sweden leading in market share . In Norway, 80% of the total car sales came from EVs, which is largely driven by progressive governmental policies that offers tax exemptions, free parking, and toll discounts. The largest market of EVs in the world is China, they have achieved rapid growth through combination of manufacturing and subsidies support from the government, extensive infrastructure development including public charging stations.

On the other hand, India's EV market is still at its initial stage, and it makes up only a small percentage of the total industry. Today, EVs account for less than 1% of total vehicle sales, and a number of factors have hindered their adoption, including high upfront costs, shortage of charging infrastructure, and range and durability issues with the vehicles. Even though cities such as Delhi and Bangalore are readily embracing EVs more rapidly, huge parts of the country, especially its rural regions, lack electric vehicle infrastructure as well as access.



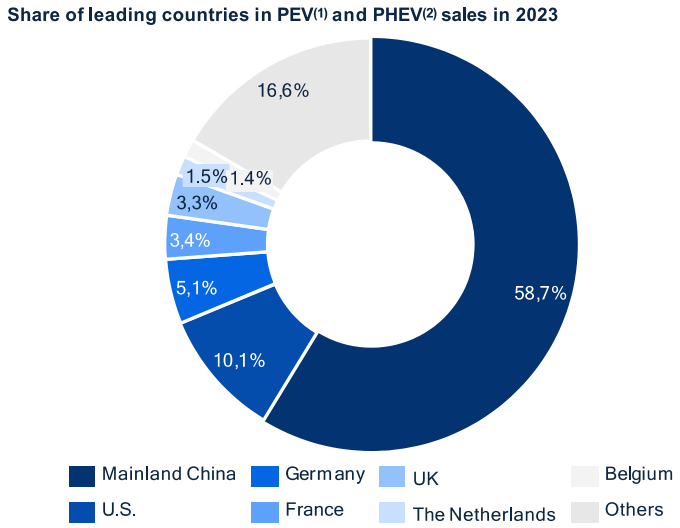
Globally, the EV market have shown significant growth due to strong policy support, affordable vehicle options, and consumer awareness. By leveraging financial incentives and public charging networks, countries like Germany and Netherlands have shown promising growth in EV adoption. However, India lags behind, majorly due to ineffective policies, limited financial support, and infrastructure gaps.

- **Governmental Policies for EVs**

There is a pivotal role of governmental policies in driving electric vehicle adoption, majorly through incentives, tax exemptions, and infrastructure development. EV ownership is highly attractive in countries like China and Norway due to their favourable policy environments. Norway offers tax exemptions for EV buyers which covers value-added taxes and registration fees. Also, they get benefitted from perks like free public parking, toll exemptions, and use of bus lanes. These policies have created an ecosystem, which ensures that EVs are the most cost-effective than internal combustion engine (ICE) vehicles.

China has implemented stringent production standards which require auto manufacturers to produce a specified percentage of electric vehicles. The government also provides significant fiscal incentives to both producers and consumers in order to increase affordability. Coupled with massive investments in public charging infrastructure, this has made China the world's greatest electric vehicle market with millions of electric cars being sold every year.

Whereas, the Indian government have introduced policies such as the FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) Scheme, which offers subsidies for EV purchases and infrastructure development. But the implementation of this scheme have been inconsistent across regions which has impacted the effectiveness of FAME and the financial incentives have also been insufficient. The Indian policies are more focused towards the urban areas leaving behind the rural ones. Moreover, the implementation of Bharat Stage VI emission norms have made the traditional ICE vehicles more expensive, presenting an opportunity for EVs, but without sufficient subsidies and tax exemptions, the high initial costs of EVs remain a barrier for most Indian consumers.



It has been found that most effective coordinated policy frameworks align the incentives of consumers with the development of infrastructure. European countries have also adopted the concept of emission-reduction targets and scrappage schemes, offering financial incentives to migrate away from older polluters toward cleaner electric vehicles.

- **Barriers to EV Adoption**

The EV adoption faces various challenges globally, particularly in emerging markets like India. These barriers can be divided into 5 categories which are as follows:

a) Infrastructural Barriers: In India, the most significant obstacle to EV adoption is lack of adequate charging infrastructure. Public charging stations are rare, and charging at their homes is not feasible for most of the consumers due to inconsistent electricity supply, also there is a problem of slow charging at home chargers. In rural areas, the electricity grid is very unreliable, making the day-to-day use of EVs difficult. However, countries like China, Sweden, Norway have invested heavily in public charging stations but there also the issue of long-distance travel still prevails.

b) Technical Barriers: Battery performance is a key worry in India, for example, with hotter and more humid climates causing batteries to degrade faster than expected. Limited mileage per charge, coupled with apprehension over the technology's reliability, has a direct impact on consumer confidence. In India, imported components, including lithium-ion batteries, make the production of EVs more expensive and less scalable. While battery advancements and longer range models have mitigated some concerns globally, emerging markets like India continue to struggle with cost and availability of technology.

c) Financial Barriers: Even after the subsidies from the government the initial purchase cost remains high, which is a significant barrier for most Indian consumers. While comparing EVs with traditional ICE vehicles, EVs are still considerably more expensive, further the total cost of ownership including battery replacement and maintenance discourages adoption. In global markets, countries with strong policies such as tax exemptions and subsidies have reduced the cost gap between EVs and conventional vehicles, making EVs more attractive option.

d) Behavioural Barriers: Consumer perception and unawareness about the environmental and long-term financial advantages of EVs create a barrier in India. Most of the consumers are ignorant about the overall cost-benefit savings in the long run and hesitant about the safety and reliability of EVs. Additionally, sale and service margins of the automobile dealers are low for EVs, which creates a further obstacle in consumer access to information. Globally, early adopters, particularly in Sweden and Germany, have experienced similar learning curves but benefit from better education about EV technology and maintenance.

e) External Barriers: Indian state-level policies, even if well-intentioned, frequently suffer from inconsistent implementation, and therefore, effective progress is highly fragmented. The lack of coordinated action in levelling any supportable measures across infrastructure, favourable financial incentives, and consumer education constrains effective policy frameworks. For example, China's central government's top-down approach, which combined its policy directives with necessary

infrastructure support and subsidies for consumers, played a very crucial role in rapid EV market penetration.

- **Motivators to EV Adoption**
  Despite the various challenges, several motivators are driving the adoption of electric vehicles globally, particularly in environmentally conscious markets.

  a) Environmental Concerns: As the awareness about climate change is gaining pace and there is a need to reduce carbon emissions, these factors are a significant driver of EV adoption, majorly in Europe and North America. In Sweden, the early adopters have cited the environmental benefits as a key motivator of owning an EV. In India also, the rising concerns about air pollution and the government's push to reduce their dependence on fossil fuels have started to encourage interest in electric vehicles.

  b) Financial Incentives: Key motivators for EV take-up include government subsidies, tax incentives and the fact that long-term cost savings will be achieved through these vehicles. In Norway and Germany, for example, generous government incentives have lowered the price of EVs relative to ICEs. China has also pushed through large-scale subsidies that minimize the price difference between EVs and conventional cars. In India, while there are subsidies under the FAME program, they are not always enough to make EVs an economical replacement for fuel-burning cars.

  c) Technological Advancements: There have been an increasing appeal of EVs due to improvements in battery technology and charging infrastructure. In global markets, advanced vehicles with longer battery ranges have come up, addressing concerns about range anxiety and makes EV more practical for daily use. In India, more research is required particularly in terms of ensuring that EVs can operate efficiently in diverse climates and terrains.

Research Methodology

In the current study, a quantitative approach has been used with the aim of providing unbiased research findings about factors that motivate the purchase of electric vehicles, EVs. This section describes the research design, sampling strategy, data collection techniques, and methods of data analysis used.

a) Research Design:

This research uses a descriptive design that has been devised to study the relationships between various determinants of choices and actions with regards to buying an electric vehicle. Indeed, using a quantitative approach, measured data will be gathered for further analysis into insights based on consumer decision-making behaviour. A descriptive research design will allow for the description of general circumstances and the nature of relationships between the variables involved.

b) Population and Sampling:

The current study zeroes in on the urban consumer of India's metropolitan regions, which include Delhi and the National Capital Region (NCR). Following incentives from the Indian government, improved infrastructure, and an awareness among urban consumers about the environment, the regional growth in EV sales has been promising. At

the same time, it can be found that adoption levels are varied across the different groups of demographics, so the factors propelling or hindering their purchases need closer analysis.

A total of 200 will be taken on the survey, with a representative cross-section of urban consumers from all ages, income levels, and educational backgrounds. To avoid bias, random sampling techniques will be adopted to ensure that the sample reflects actual consumer behaviour towards EVs.

c) Data Collection Instruments:

Data will be collected using a mix of both structured questionnaires, though preferably with closed-ended questions allowing a quantitative response. Major topics that include the following items below appear on the questionnaires.

- Perceptions by consumers about the environmental benefits, cost benefits, and technological appeal of EVs.
- Acquisition costs, operating costs, and prospects of saving money through fuel compared to any conventional vehicle.
- Effects of government incentives-tax rebates, subsidies, and charging infrastructure access-on purchase choice
- Social and psychological influences-and opinions held by one's peers or members of society at large-why people perceive the adoption of EVs

Participants will be of all age groups and all categories of income to make sure that the sample is robust.

d. Data Analysis:

The data will be analyzed using statistical tools; for instance, SPSS to look for patterns and relationships in the data. Two-staged approach for the analysis of data:

- Descriptive Statistics: Through the use of summary statistics, this stage can give an overview of consumer attitudes and behaviours toward EVs. General trends related to levels of environmental awareness and the key factors influencing a purchase decision may be identified.
- Inferential Statistics: During the study, different statistical techniques have been used for investigating the relationship between various factors influencing the demand for EVs. The applied techniques include:
    1. Regression Analysis: To find out the effects of several independent variables-of revenue, government incentives, and environmental issues-on the dependent variable-probability of buying an EV. This will determine the strength and significance of such relations.
    2. Correlation Analysis indicates the strength of relationship between variables, for instance, how much related is income level and the willingness to buy an EV.
    3. Chi-Square Tests are applied for establishing the kind of association between categorical variables such as demographical factors (concerned with age groups, educational levels etc.) and preferences relating to EV.

This will be a combination of the techniques to help develop an understanding of which factors are most highly correlated with driving or inhibiting the adoption of electric vehicles.

e) Expected Outcomes:

The results of this study are likely to be as follows:

- Environmental Awareness Effect: Environmentally conscious consumers will tend to like EVs.

- Economic Effects: Although more expensive in front-end, operating cost is significantly less and with governmental incentives, these are likely to be drivers of purchase.
- Technology Effect: Issues related to technology such as the range of the battery and charging infrastructure would be significant inhibitors of using the vehicle.
- Social Forces: Peer effects and social norms may be highly relevant for the decision to buy EVs, especially in large cities where the use of EV is associated with both status and pro-environmental behaviour

This body of findings will provide actionable recommendations to policymakers and manufacturers on shaping targeted strategies for promoting adoption.

Comparison of Governmental Policies

Global and Indian EV Policy Comparison To analyze the policy measures for Electric Vehicles (EVs) in the global vs. India market, we will be looking at major government initiatives & schemes along with key policies, incentives & regulatory advisory across various regions. These have been instrumental in changing the EV narrative into one which is not only limited to fossil-fuel pollutants, this analysis will delve deeper and consider how various approaches are helping deployments along markets dynamics also driven by policy frameworks — ranging from government incentives all the way through infrastructure development to improve upon regulation. The breakdown of that comparative is as follows:

1. Overview of Global EV Policies

The global emergence of the electric vehicle market can be attributed to a myriad of government initiatives that have been done in recent decades as well by fully implementing schemes for greener and cleaner modes of transportation so its strategic approach leads less carbonization. Many countries implemented long-term policy measures aimed at facilitating EV purchases via incentives, infrastructure deployment and deregulation of ICE vehicles.

2. Government Initiatives in Leading Global Markets

2.1. United States

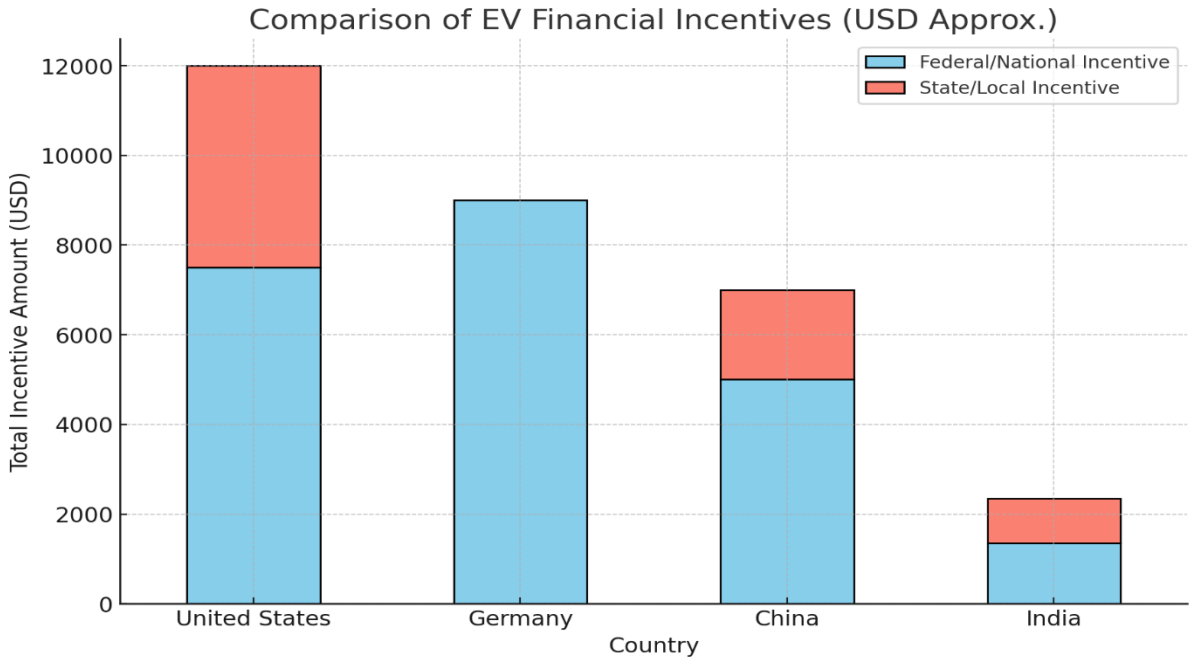
The U.S. is the big kid on the block in EV technology, with policy action ranging among federal and state laws through to local zoning rules:

Federal Incentives: The federal government will give you a few grand to help purchase a new plug-in, up to $7,500 depending on the vehicle and battery size. But this incentive begins to phase out for manufacturers after selling 200,000 qualifying vehicles—something that has hit companies like Tesla and General Motors.

State-level incentives- most States offer above and outside the federal tax credit, whether in NMC 'non-monetary compensation' like reduced registration fees or free parking to an instant rebate check of up to $10k. Also, some states offer low-income rebates for purchasing new EVs– up to $4,500 in California.

U.S. infrastructure: U.S., we have invested in the American Infrastructure with big money to build national EV charging network, etc… The $7.5 billion for constructing a national network of EV chargers is part of the "Infrastructure Investment and Jobs Act" of 2021.

Regulatory Compliance: Some states, such as California, have imposed stringent emissions standards and a goal to ban all ICE vehicles by 2035. 9Image Result For California Zero Emission Vehicle Program



2.2. European Union

The European Union has had ambitious targets for EV uptake, made possible by a strong policy suite that focuses on decarbonizing transport:

Emissions Regulations: The EU's severe CO2 emissions standards for vehicles have spurred the transition to EVs. Automakers are liable to significant fines if their fleet average emissions surpass the set limits.

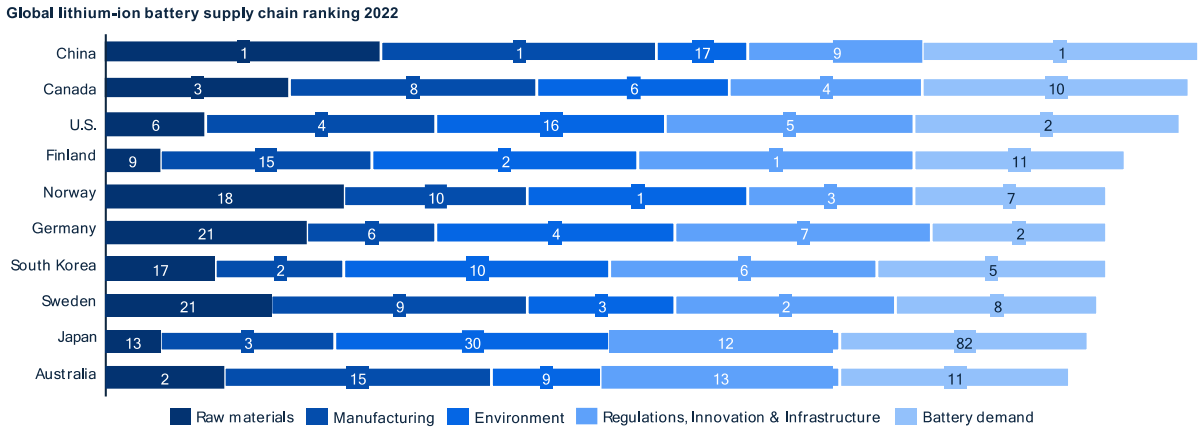
Financial Incentives: Several EU member states are in a position of offering the consumers subsidies or tax relief in purchasing the EVs. Germany promises a subsidy of €9,000 on buying the electric car and France up to €6,000.

Charging Infrastructure: The "Alternative Fuels Infrastructure Directive" of the EU demands from the member states that there be a minimum public accessible charging points put up, therefore encouraging a dense charging network.

Phase out of ICE cars: Several European countries have declared an intention to sell no more new cars with ICE; Norway is expected to ban them in 2025, while the UK and France have moved the deadline to 2030 and 2040, respectively.

2.3. China

China is the largest market for electric vehicle production, and in order to fulfill the need of this growing sector, the government has implemented various policies:



Subsidies and Tax Incentives : China offers high subsidies on new energy vehicles, that is, fully electric as well as plug-in hybrids. The subsidy varies with driving range and also battery energy density.

Quota System for Automakers: The "New Energy Vehicle Credit" policy forces the companies to manufacture a percentage of new energy vehicles in comparison to total vehicle output. It attracts penalties otherwise.

Charging Infrastructure Investment: China has the world's largest network of EV chargers. Behind all this investment is a really substantial investment from the government. The government remains committed to increasing infrastructure, especially in urban areas.

City-level Incentives: Local governments, such as in Beijing and Shanghai, also provide incentives. For example, some cities, such as Beijing and Shanghai, now provide for license plates free of charge to EV owners. License plates could otherwise be quite expensive to obtain for conventional vehicles, making them difficult to acquire in many locations.

3. Government initiatives in India

In India, the policy approach towards increasing the uptake of electric vehicles over the last ten years has been in response to local challenges around affordability and infrastructure, as well as raising public awareness.

3.1. National Policies

FAME Scheme: This is the most well-known FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles scheme) programme in India to promote EVs. Launched in 2015, it had aimed at offering incentives for electric two-wheelers, three-wheelers, four-wheelers, and buses. FAME-II launched in 2019 saw this expansion, with ₹10,000 crores or $1.3 billion targeted toward financial incentives for public and shared transportation for electric buses and development of charging infrastructure.

Production Linked Incentive (PLI) Scheme: The PLI scheme through provision of financial incentive will induce domestic manufacturing of advanced battery technology. This scheme encourages the manufacturers of electric vehicle component and lithium-ion battery cells, besides India's objective of breaking free from reliance on imports and bringing in EVs within affordable reach.

Indian Tax Benefits: Schemes to encourage the sale of electric vehicles have also been implemented in India, as it has exempted the interest paid on loans up to ₹1.5 lakh for the purchase of electric vehicles. GST rates have also been cut-down 5% for Electric Vehicles while 28% for ICE.

3.2. State Policies

Indian states have developed distinct policies for promoting the adoption of electric vehicles:

Delhi's EV Policy: In Delhi, 25% of all new vehicle registrations shall be electric by 2024. Fiscal incentives in terms of purchase of the vehicle, exemption on road taxes, and setting up subsidy infrastructure are part of it.

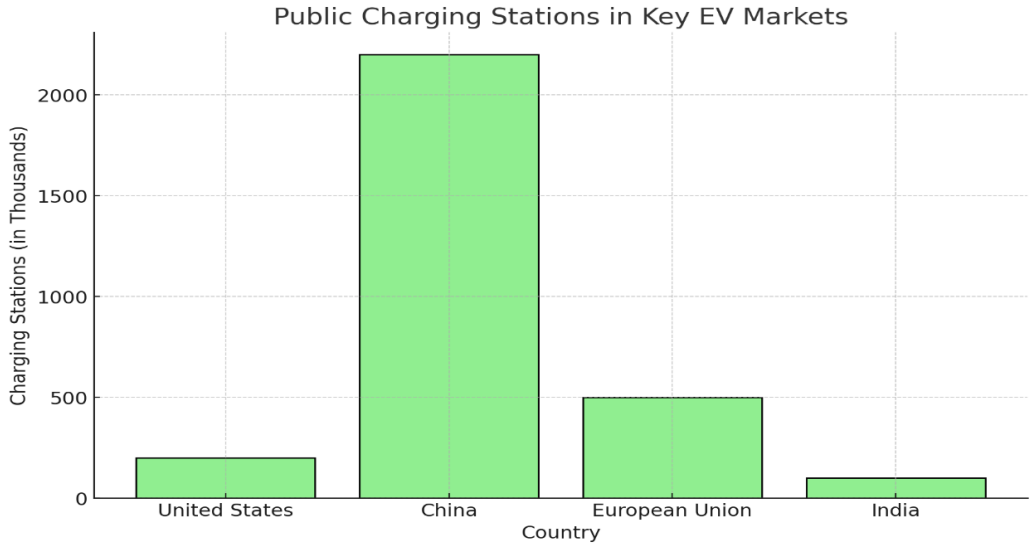
Maharashtra and Tamil Nadu: They offer land concessions along with electricity duty exemptions to attract investment for the manufacturing of EVs.

Andhra Pradesh and Telangana: Offer concessions like road tax exemption along with discounts on the product price that is offered to the buyers of an electric vehicle.

3.3. Charging Infrastructure Development

An expansion of the charging infrastructure in India includes

Public Private Partnerships: The Indian government is collaborating with public and private companies to establish charge points throughout the country. It aims to deploy more than 1,000 EV charging stations along highways and in major urban centers.

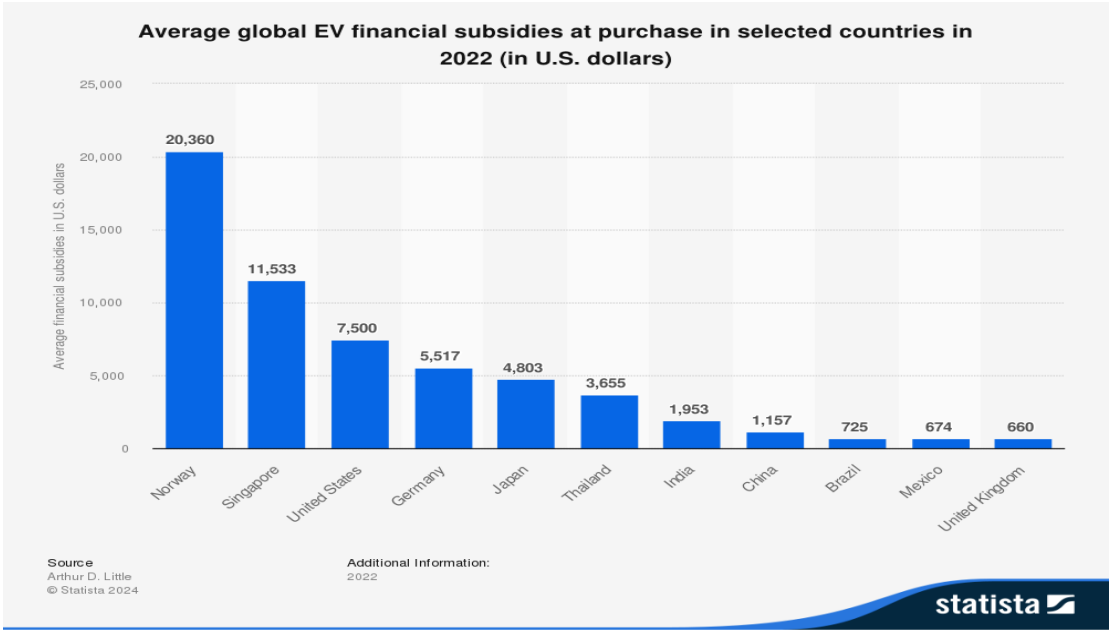


Battery Swapping Incentive: Considering the range anxiety and burden of charging time, the Indian government is also encouraging battery swapping stations for two-wheelers and three-wheelers.

4. Comparative Analysis: International vs. Indian EV Initiatives

4.1. Fiscal Incentives

International Context: In countries as the U.S., China, and Germany, the subsidies available on the cost of EV acquisition constitutes a significant per cent. In Germany, for example, it amounts to 25% of the new EV price. More than that, they also provide other fiscal incentives through free parking, access to bus lanes or totally exemption from the tolls.



India's Strategy: The FAME-II scheme provides funding, but the incentives offered in terms of subsidies are relatively on the lower side compared to global norms. The strategy for India, however, would be to make electric two and three wheelers affordable as these are more popular than electric cars. Tax benefits also bring about the ownership cost.

4.2 Infrastructure Development

Global Initiatives: China and the U.S. are heavily investing in building scale charging networks, including ultra-fast chargers. Europe brings standardization of charging points across countries to make it as seamless as possible for an EV owner in one country to use his vehicle in another country.

India Challenges: The charging infrastructure is being built, but in India, it is far from what exists across the world. India's strategy is on affordable and accessible solutions - such as public-private partnerships and battery swapping for two-wheelers.

4.3. Control Measures and Target Setting

Global Regulations: The EU's stricter standards on the emissions had compelled car manufacturers to make a strong drive towards electrification. A dozen countries have set a deadline to cease the sale of new internal combustion engine cars by 2030.

Indian Approach: The timeline for complete phase out of ICE vehicles has not yet been announced by India. However, measures undertaken include making the three-wheelers and buses electric in some states and the government targets 30% of its sales to be electric by 2030.

4.4 Manufacturing and Local Production

Global Trends: China leads the count in EV production, as its supply chain is well-developed and supported through governmental policies favouring local producers. The U.S. and European countries have also encouraged local manufacturing through subsidies and various joint ventures.

India's Focus: In a bid to reduce dependence on import, India's PLI is promoting the evolutionary phase of local battery and component manufacturing. State-specific incentives have also made it attractive for companies to set up in-house EV manufacturing facilities.

5. Key Challenges and Opportunities

5.1. Challenges in the Global Market

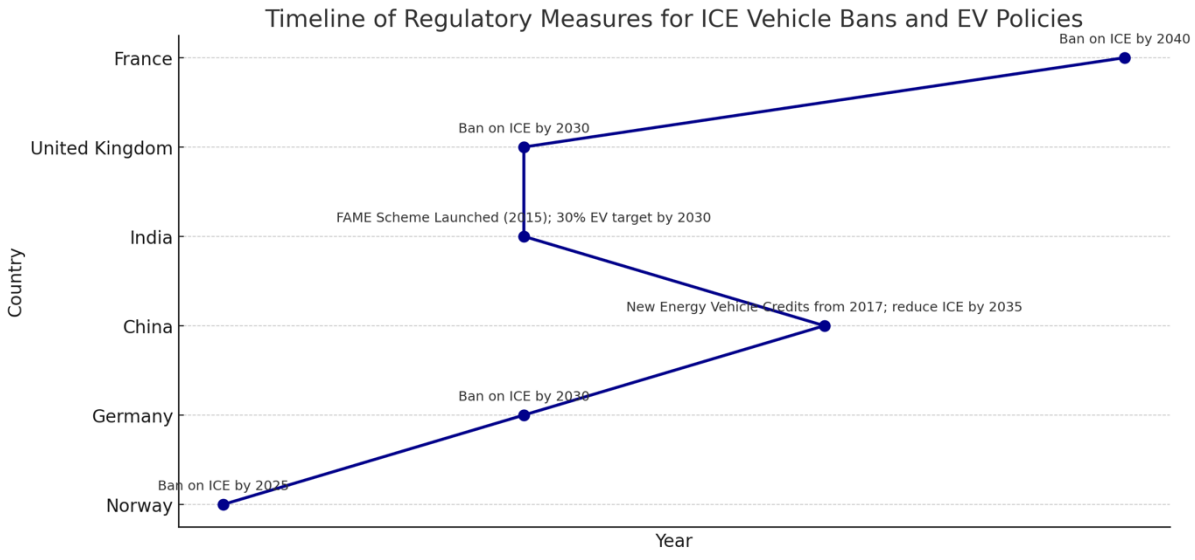
Battery Supply Chain: As growth in the demand for EVs continues to climb, a concern is how to secure resources for the raw materials of batteries (lithium and cobalt). Countries are working to diversify supply chains and invest in the recycling of batteries.

Standardization: The diversity of charging standards creates problems for the global traveller. A step towards overcoming this problem has been taken by the EU standardizing connectors and charging protocols.

5.2. Indian Market Barriers

Affordability: The price remains a significant challenge for most Indian buyers, especially two wheelers and three wheelers, to have more affordable electrification.

Electricity Grid Reliability: India must assure a secured power infrastructure to achieve mass-scale charging of EVs in the rural context.



Conclusion

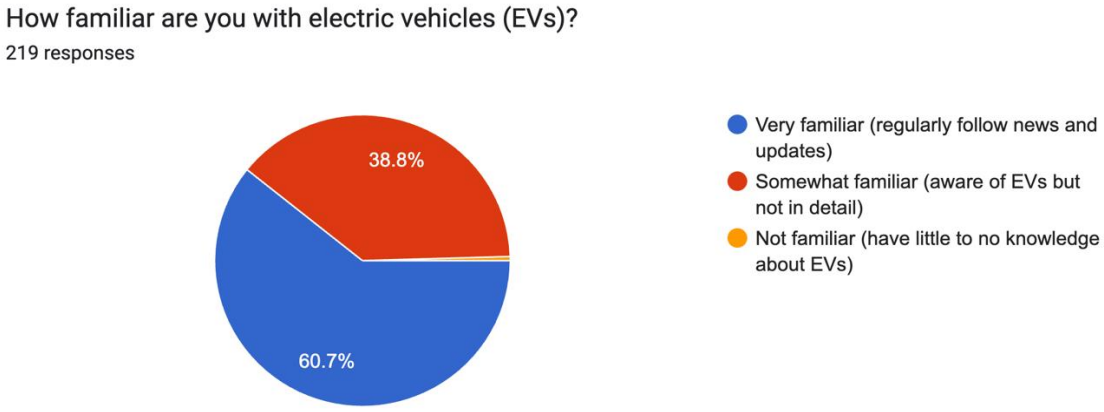
Global leadership, by U.S., Europe, and China, has been aggressive in terms of promoting adoption through policy intervention, infrastructure investment, and regulation frameworks, but it is still in its infancy for India. As a reflection of market characteristics, policies are more on affordability and localized solutions. India will have to learn from the international best practices and it will also have to increase financial assistance to consumers, charge infrastructure, and other regulatory reforms at the highest speed. Once national and state-level projects get aligned with the trends globally, India can actually have a sustainable and thriving eco-system of electric vehicles.

Data Collection and Analysis

A thorough survey of the factors influencing decisions to purchase EVs was conducted and aimed at different groups of respondents. The most important demographic insights as well as levels of awareness and perceptions regarding EVs, and specific barriers against adoption are garnered in the survey. Analyzing this collected data, we can begin detecting critical patterns and trends that affect consumer behaviour within the auto market in relation to EVs. This analysis helps provide light on the motivation and concerns of EV-buying intents, while also providing actionable insights to inform strategies that accelerate electric vehicle adoption.

Presentation and Interpretation of data

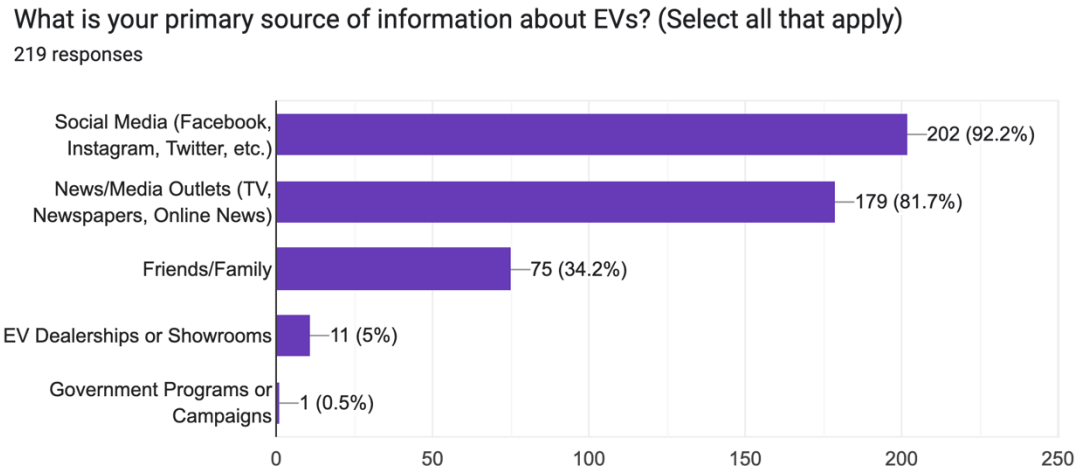
1) Familiarity with EVs



Interpretation: Most respondents report being “very familiar” with EVs, showing a high level of awareness among potential adopters. This familiarity can be leveraged to engage consumers at a deeper level, focusing on specific benefits or addressing common concerns (like battery life and charging infrastructure).

Action: Shift messaging from introductory EV information to more specific, benefit-focused content. Use comparisons with traditional vehicles to emphasize total savings and convenience, especially for undecided consumers.

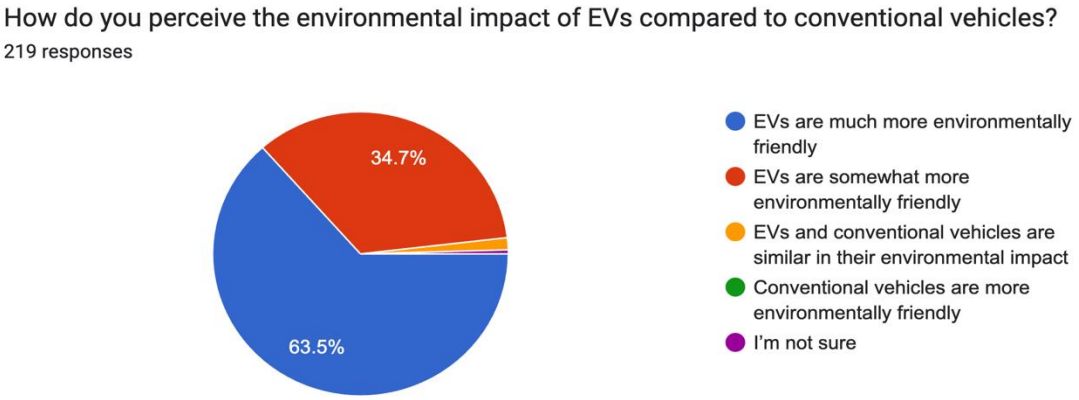
Primary Source of Information



Interpretation: Social media is the top source for EV information, highlighting its role in shaping consumer perceptions. This suggests that consumers rely on social media for updates, reviews, and opinions on EVs.

Action: Increase visibility on social media platforms with engaging ads, influencer collaborations, and user-generated content. Leverage social media channels for targeted content and respond actively to questions and comments to build trust.

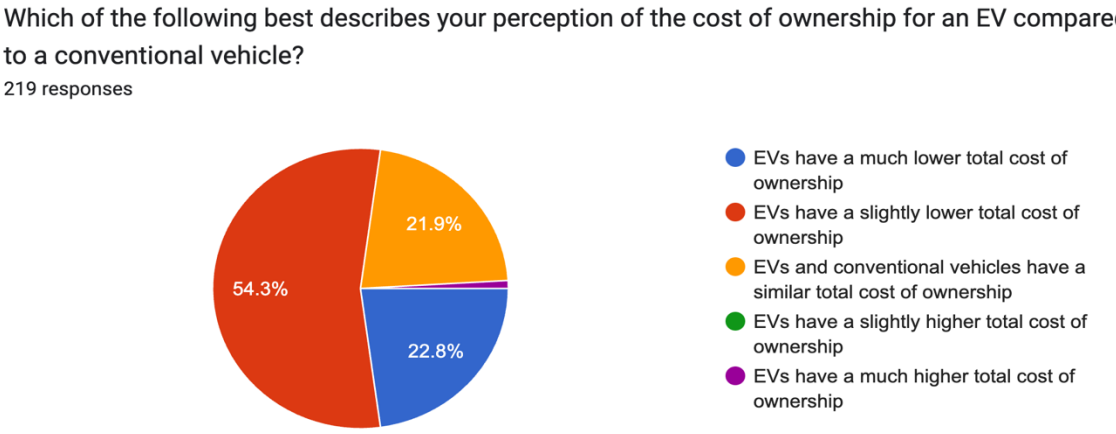
2) Environmental Impact Perception



Interpretation: Most respondents believe EVs are environmentally beneficial, which reinforces their appeal as a sustainable choice. This perception is a valuable asset for promoting EV adoption, particularly through campaigns that emphasize how EVs reduce carbon footprints.

Action: Reinforce the environmental benefits of EVs in all campaigns. Include specifics on emissions reductions and promote the sustainable practices of the EV industry to strengthen the eco-friendly appeal.

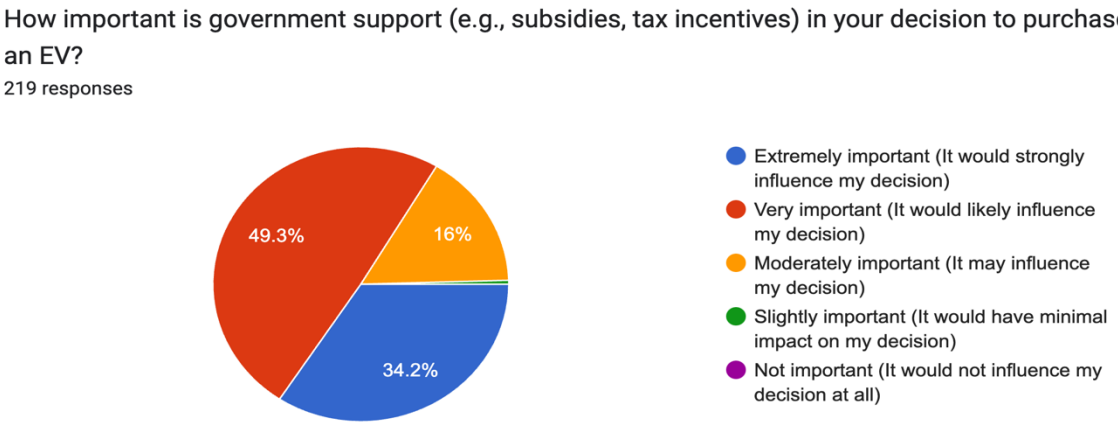
3) Cost Perception



Interpretation: Respondents are split on EV cost, with many viewing it as more affordable but others perceiving it as expensive. This mixed view underscores a need for clearer messaging around total cost benefits, emphasizing savings in fuel and maintenance.

Action: Offer clear, detailed cost-benefit analyses in marketing materials, highlighting total cost savings. Emphasize available subsidies and government incentives that reduce initial costs, reshaping EVs as a smart, long-term financial choice.

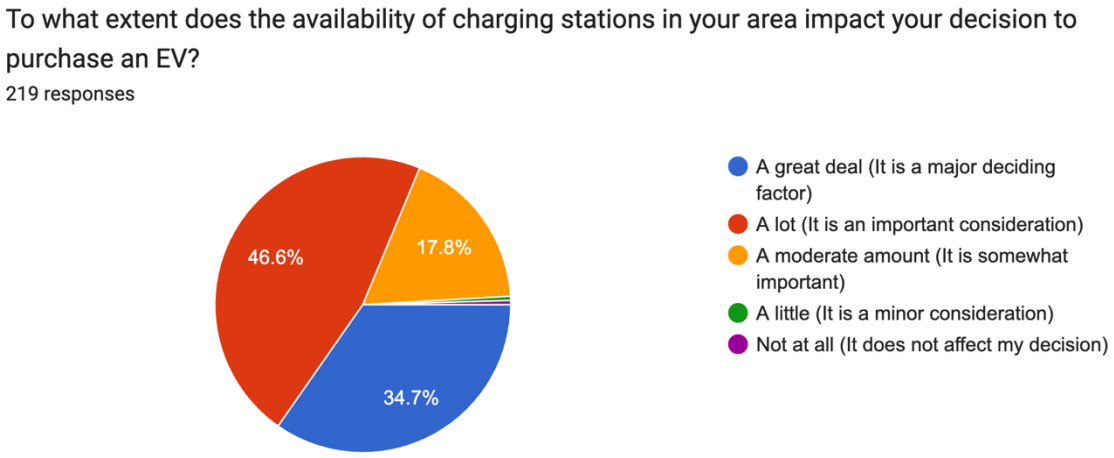
4) Government Support Importance



Interpretation: The strong emphasis on government support, rated as very important, highlights the critical role of subsidies, tax breaks, and infrastructure investments in accelerating EV adoption.

Action: Partner with policymakers to amplify visibility of subsidies, tax incentives, and charging networks. Educate consumers on the benefits of these programs and make accessing information straightforward to enhance perceived value.

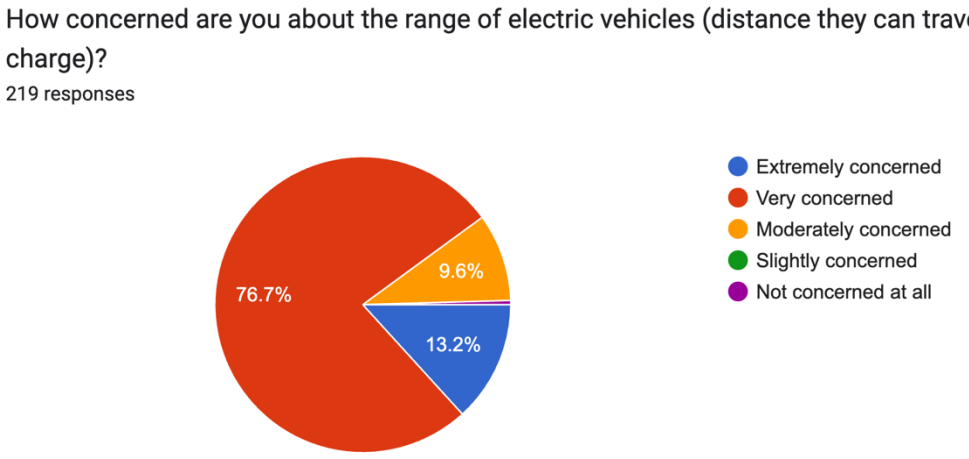
5) Charging Infrastructure



Interpretation: Charging infrastructure is crucial to adoption, with many respondents viewing it as a major deciding factor. The availability and accessibility of charging stations impact consumer confidence in daily EV usage.

Action: Invest in messaging that emphasizes growing charging infrastructure and highlights advancements in charging speed and availability. Collaborate with charging providers to expand networks and increase EV accessibility.

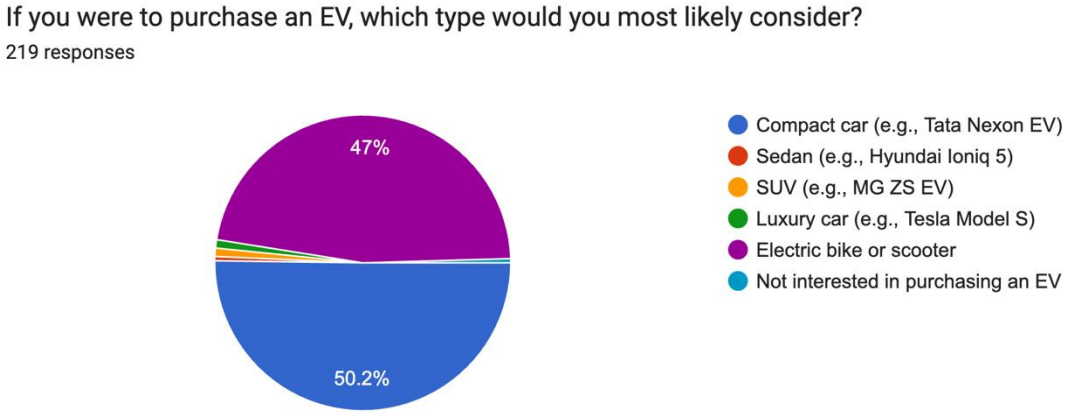
6) Range Anxiety



Interpretation: Range anxiety is a significant barrier, with many respondents expressing high concern over how far EVs can travel on a single charge.

Action: Address range anxiety by promoting models with extended range and faster charging capabilities. Create educational content on how advancements in battery technology are solving range concerns and make this content widely available.

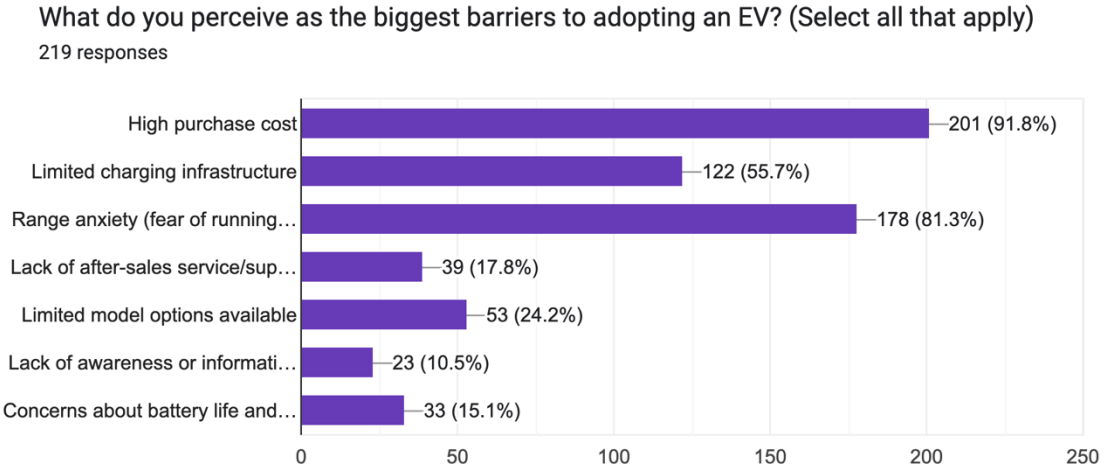
7) Preferred EV Type



Interpretation: Compact cars and Scooters are the preferred EV types, likely due to their practicality and versatility. This insight highlights a demand for accessible, adaptable models that meet daily commuting and family needs.

Action: Prioritize marketing compact EVs and Scooters, which align with consumer preferences for practicality. Promote these models as versatile and reliable choices for everyday use, emphasizing their suitability for urban and family needs.

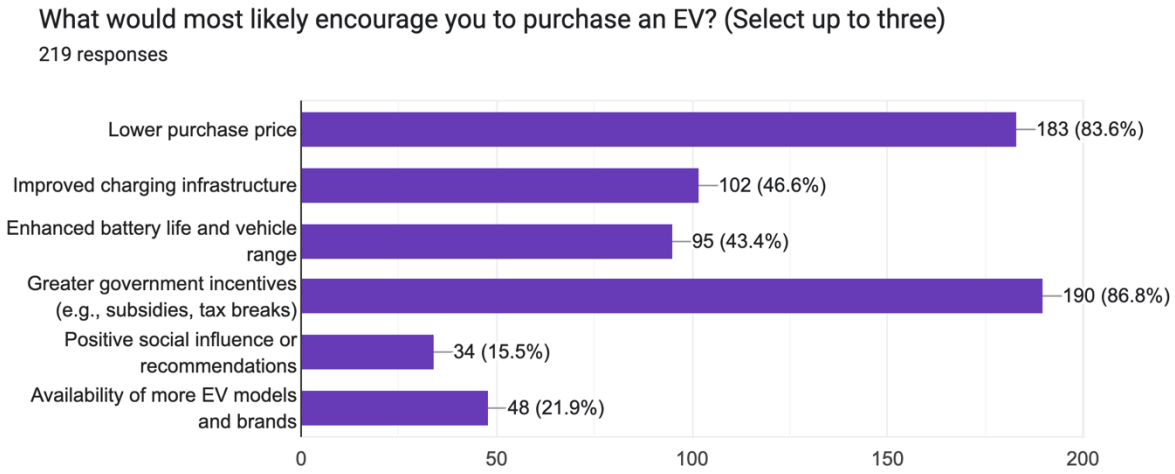
8) Biggest Barriers



Interpretation: High purchase costs, range concern and limited charging infrastructure are the most cited barriers to EV adoption, indicating a need to address both price and accessibility.

Action: Address price concerns by spotlighting financial incentives and long-term savings, and promote the increasing availability of charging infrastructure. Develop partnerships to expand charging stations and provide visibility on their locations.

9) Purchase Encouragement



Interpretation: Lower purchase prices and greater government incentives are the top motivators for considering an EV purchase. This insight reflects consumers' practical concerns and the factors they weigh most heavily in their decision-making.

Action: Highlight affordable models and emphasize advancements in battery life and charging infrastructure. Tailor marketing to address these practical motivators, reassuring consumers that EVs are both cost-effective and convenient.

Hypothesis Formulation

Using the qualitative data or initial survey responses, you can develop hypotheses that reflect observed patterns and relationships in the data. Here are some example hypotheses for the EV purchase decision study:

- **H1**: Financial incentives (e.g., subsidies, tax reductions) significantly increase the likelihood of EV purchase consideration.
- **H2**: The availability of charging infrastructure is positively associated with EV purchase intent.
- **H3**: Younger generations (e.g., under 35) are more likely to consider purchasing EVs compared to older generations.
- **H4**: Environmental consciousness positively influences EV purchase decisions.
- **H5**: Perceived cost barriers negatively affect the likelihood of EV adoption.

Quantitative Data Analysis

Chi-Square Test

1. Hypotheses

- Null Hypothesis (H0): There is no association between Age and EV Purchase Consideration (i.e., age groups do not differ significantly in terms of their consideration to purchase an EV).
- Alternative Hypothesis (H1): There is an association between Age and EV Purchase Consideration (i.e., certain age groups are more likely than others to consider purchasing an EV).

2. Chi-Square Statistic

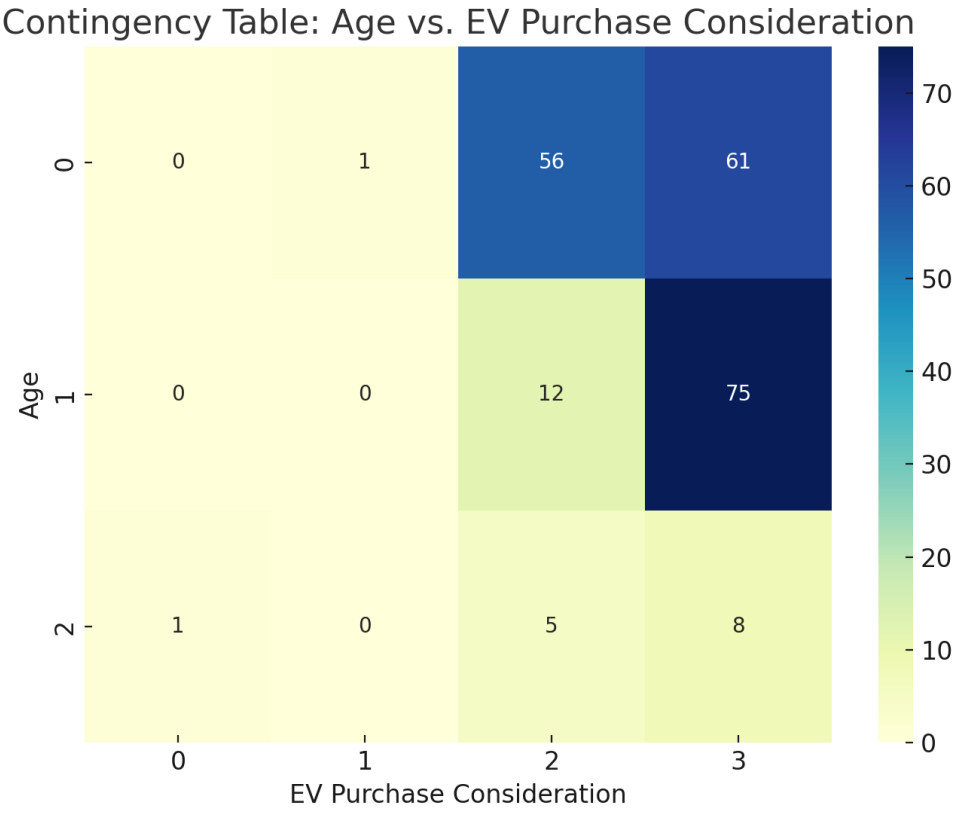
- The chi-square statistic quantifies the difference between the observed values (actual responses) and the expected values (what we'd expect if there was no relationship).
- Result: The calculated chi-square statistic for this test is approximately 14.48, which is a measure of how much the observed counts deviate from the expected counts.

3. Degrees of Freedom (DoF)

- Degrees of freedom are based on the number of categories in each variable and are calculated as (Rows−1)×(Columns−1)(Rows−1)×(Columns−1). Here, we have 4 age groups and 2 categories for EV purchase consideration (Yes or No), so the DoF is (4−1)×(2−1)=3(4−1)×(2−1)=3.

4. P-Value

- P-Value: 0.002
- The p-value indicates the probability of observing the data if the null hypothesis were true (i.e., if there were no association between Age and EV Purchase Consideration).
- Interpretation: Since the p-value (0.002) is below the commonly used significance level of 0.05, we reject the null hypothesis, indicating that the relationship between Age and EV Purchase Consideration is statistically significant.



5. Practical Interpretation

- Conclusion: The results suggest that age is a factor in EV purchase consideration. Different age groups are not equally likely to consider purchasing an EV. This insight could imply that EV adoption strategies might benefit from being tailored to specific age demographics.
- Contingency Table Insights: From the heatmap, we can see if certain age groups are overrepresented among those who consider EVs. For instance, younger individuals might be more open to EVs due to environmental awareness, while older groups may be influenced by other factors, such as cost or range anxiety.

Correlation Analysis

1. Hypotheses

- Null Hypothesis (H0): There is no association between various factors and EV purchase consideration.
- Alternate Hypothesis (H1): There is some association either positive or negative between various factors and EV purchase consideration.

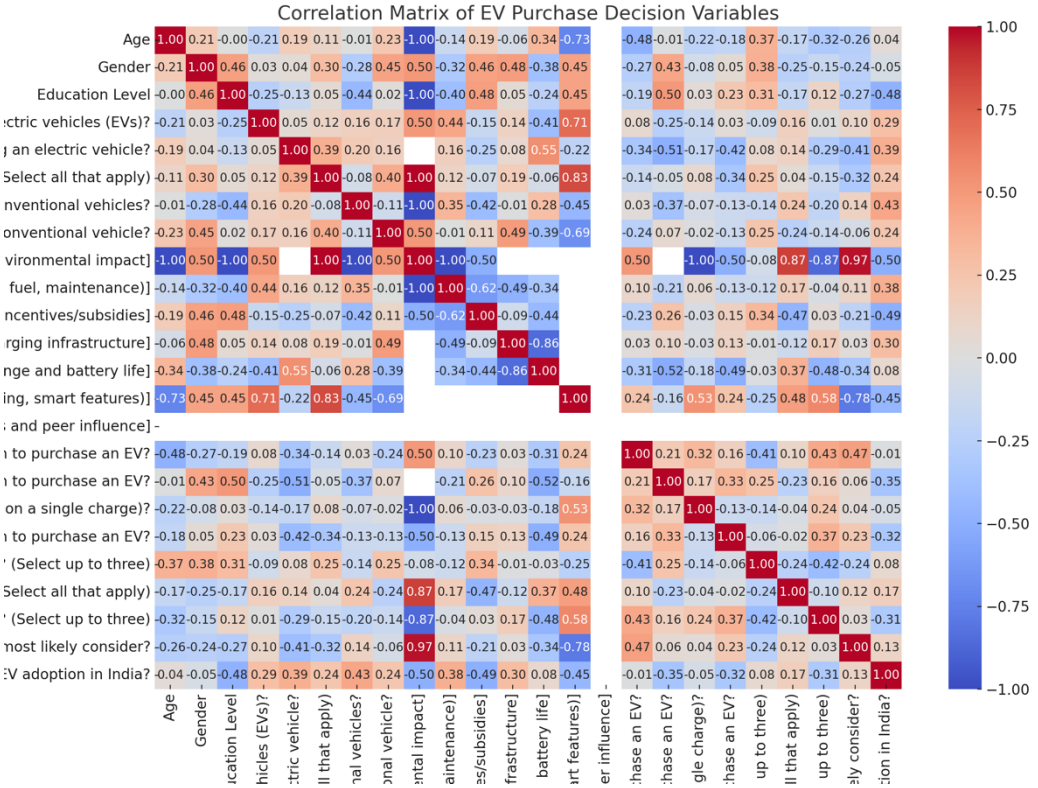
1. Correlation Coefficients

Range: Correlation coefficients range between -1 to +1:

- +1 indicates a perfect positive correlation, meaning as one variable increases the other does
- -1 indicates a perfect negative correlation, meaning that when one variable increases, the other decreases
- 0 shows there is no correlation at all since the relationship between the variables is not linear.

Magnitude Interpretation:

- High correlation: almost at ±1 (often greater than 0.7 or less than -0.7).
- Medium correlation: between ±0.4 and ±0.7.
- Weak Correlation: Values close to 0.



2. Critical Correlations in the Model

The following are some very relevant relationships that can be seen in the correlation matrix for this specific dataset:

Government Support vs. EV Purchase Consideration:

- Moderate Positive Correlation: Which indicates that those believing government support in the form of subsidies and tax incentives is imperative, are fairly more likely to consider an EV purchase.
- Infer: Thereby it implies that the right incentives from the government might have a substantial role in deciding whether people will drive Electric vehicles or not.

Charging Stations Availability vs. EV Purchase Intention.

- Moderate Positive Relationship: charging stations availability has a moderate positive relationship with the willingness to buy EV
- This relationship suggests that charging options convenience is an influence for someone to consider buying an EV. Hence, enhanced infrastructure on charging may encourage more people to consider buying an EV

Social Influence vs. EV Purchase Intention

- Weak Correlation: Social influence by means of opinion of friends and relatives is a weak correlation with the consideration of buying EV.
- Reasons: No doubt, social influence does have a profound effect on some people's decisions, but taken as a whole has lesser effect than more practical aspects such as infrastructure or cost.

Perception of EVs on the Environment vs. Consideration of Buying EV

- Weak Positive Correlation: There is an extremely weak positive correlation between whether people think that EVs are good for the environment and whether people at least consider ever buying an EV.
- Interpretation: This means, in sum, even if not bad for the environment, environmental positives are definitely not going to be where the primary reasons are to purchase an EV.

3. Visual Explanation of Correlation Matrix

In the heatmap:

- Dark Blue or Red Spots: Symbolize stronger correlations- both positive and negative.
- Lighter Places: These are indicative of less or near-zero correlations, which simply represents less linear relationship between these variables.

4. Practical Interpretations

- High-Impact Focus Variables: Moderate correlations with factors governmental support and charging infrastructure point to the fact that these are high-impact domains for action, in which improvement in these may see more traction for EV adoption.
- Weakly Correlated Variables as Secondary Factors: Social influence and perceived environmental impact, which are weakly correlated, would be ancillary in the process of shaping attitudes but not lead the decision independently.

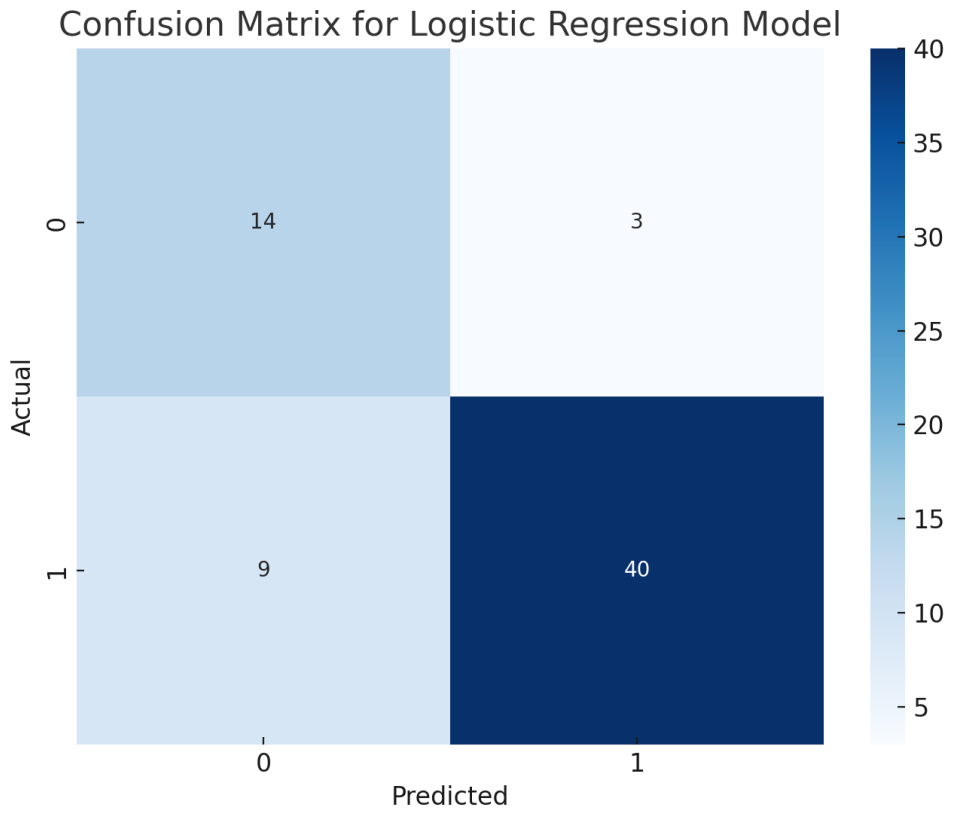
Conclusion

The correlation model shows that **government support and charging infrastructure are the most impactful factors in consideration of the EV purchase**, while social influence and environmental perception are not as impactful. This comes to show that practical elements like financial incentives and accessibility play much stronger roles in motivating people, providing insights for policymakers and marketers focusing on EV adoption.

Regression Analysis

1. Hypotheses

- Null Hypothesis (H0): There is no association between government support and purchase decision.
- Alternate Hypothesis (H1): There is a positive association between government support and purchase decision.



2. Model Accuracy

- Accuracy: 81.8% - meaning the model will be 82% accurate regarding whether a given individual has ever thought about buying an EV.
- Interpretation: This means that the precision is relatively high and that, thus, the chosen variables (government support, charging infrastructure, etc.) are very good predictors of EV purchase consideration.

2. Regression Coefficients

The logistic regression model provides coefficients for each predictor. Each coefficient captures the change in the log of odds of the outcome variable (to buy EV) given a one unit change in the predictor, while keeping all other variables constant.

Some of the important predictors from the model:

- Government Support: It is a positive coefficient, and the more the government support through subsidies and tax incentives, the greater would be the number of people who are likely to consider a purchase of the EV.
- Charging Infrastructure: The same holds with respect to the charging infrastructure. The more charging stations available in the region or making those accessible could increase the consideration of an EV.
- Social Influence: This variable is not as intense as government support and charge availability, hence not much of a determinant in the decision making about consideration of EV.

3. Intercept

The intercept term is the log odds of considering an EV purchase when all the predictors are equal to zero. While it plays more like a baseline in the computation, its value is not so interpretable in the real world because categorical variables do not have a true "zero" state.

4. Confusion Matrix

The confusion matrix is helpful in understanding real outcome predictions made by the model:

- TP: Real life situations the model correctly classified as taking into consideration EV.
- TN: Real life situations the model correctly classified not to take into consideration.
- FP: Misclassification, it had classified this to take into consideration and the person did not.
- FN: Misclassification, it had classified this not to take into consideration, whereas the person took into consideration.

Within our model, the matrix better represents true positive, indicating that our model is better at identifying those who have contemplated buying an EV-this is useful in determining the motivations of people with positive attitudes towards EVs

Altogether, support from the government and charging infrastructure appear to be the critical predictors. Meaning that some policies that may enhance incentives as well as improve the accessibility of charging infrastructure have the potential of influencing decisions made in purchases of EVs. Social influence, though less impactful, seems to fit as a supporting role in the process of decision making by an individual.

Policy Recommendations

Brief on India's EV Landscape: State the importance of Indian electric vehicle adoption towards environment, economic development, and energy security. The shift from ICE to EV could ease or practically minimize air pollution and ease India's reliance on fossil fuels to achieve the global fight against climate change. India has the largest automobile market in the world, and its shift towards electric vehicles can bring monumental positive change.

The key Objectives of recommendations are: increasing local EV manufacturing, strengthening the existing infrastructure, making EVs cheaper for consumers, reducing import dependence, and most importantly, creating a robust ecosystem that will support long-term expansion of the market. Policy recommendations are taken towards making incentives from the government along with consumer interest in tune with the abilities of the manufacturers for smoother and sustainable transition.

1. Recommendations to the Government Policy

1.1 Financial Incentives

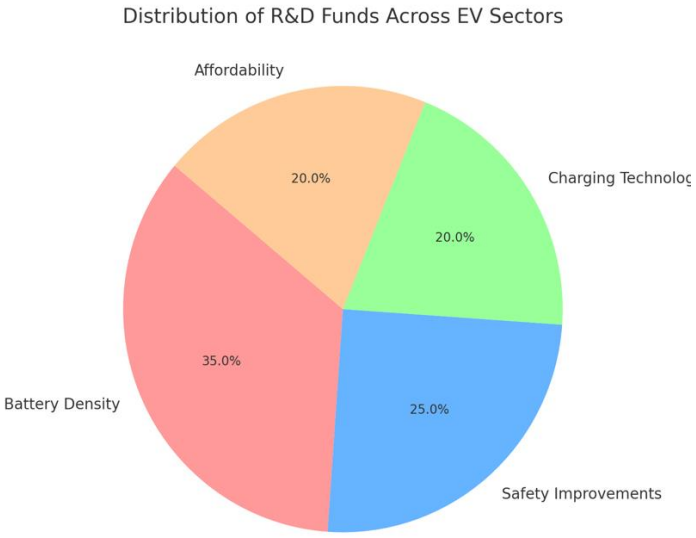
- Recommendations: Strengthen and diversify financial incentives to more easily access EVs across all segments, starting with entry-level and mass-market models such as two-wheelers and three-wheelers widely proliferated throughout urban and semi-urban areas. The incentives should be differentiated based on specific vehicle types, the capacity of the battery, and proposed usage conditions (private vs. commercial).
- Implementation: Expands the scope of FAME II to include all-encompassing sops for private EV buyers for all passenger and commercial vehicles. The government needs to introduce additional subsidies on battery replacement and vehicle maintenance to incentivise long-term ownership. Offers targeted incentives for electric buses and logistics vehicles that could lead to electrification of public and commercial transport.

1.2 Tax Benefits and Low-Interest Loans

- Recommendations: In the system, huge tax rebates along with a deduction on the purchase of EVs and financing options with low-interest rates for loans. The policy should be wide enough to include road tax exemptions, lower registration fees, and income tax deducted on the part of the individual purchasing an EV.
- Implementation: Team up with the public and private sector banks specifically to come up with special auto loans that would be cheaper for the buyers of EVs than the usual auto loans. Tax benefits: Simplify access by ensuring that incentives are part of the sales process at the point of buying at the time of purchase. An example of dealerships applying discounts and tax benefits at the time of purchase that would thus limit consumer access and paperwork in the buying experience for consumers.

1.3 R&D Grants

- Recommendation: Dedicated R&D grants toward advancing EV technology could be allocated along the following projects and lines of investigation: to investigate innovation for improved battery capabilities, alternative energy through hydrogen fuel cells, possibilities related to recycling existing or old batteries, and making the vehicles safer. This requires priority funding by the government to enable increased energy density, low-cost batteries, and general operational efficiency.
- Implementation: Collaborative R&D programs with universities, research centers, and private companies will be established to create a culture of innovation in the EV sector. A tiered funding approach may be adopted with considerable, higher-value grants provided for projects perceived to have very significant commercialization potential or strategic importance to the national agenda for EVs, including battery recycling and second-life applications.



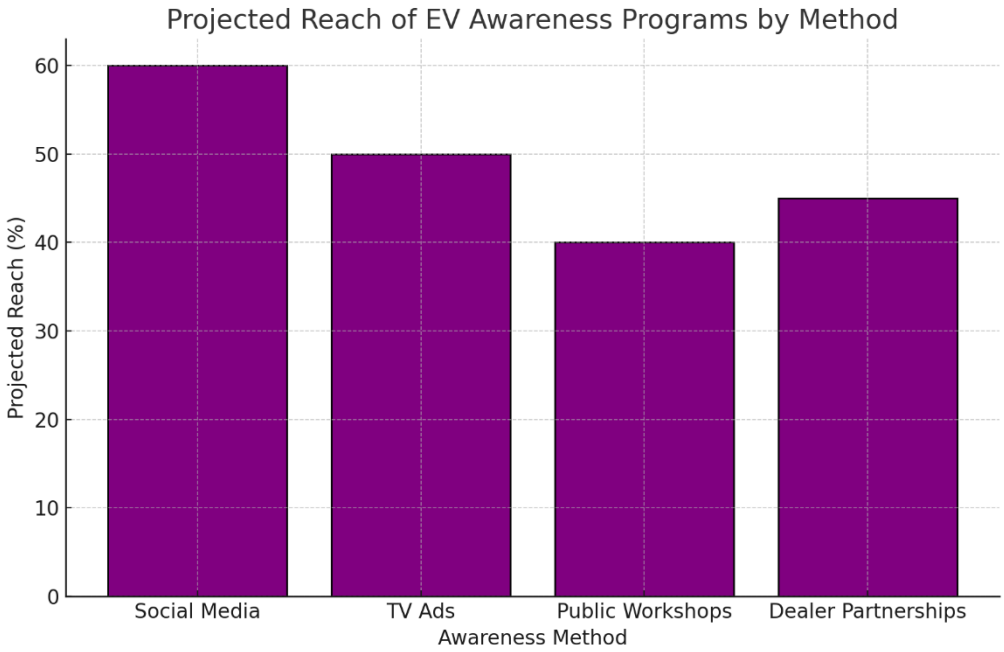
1.4 Investment in Infrastructure and Public-Private Partnerships

- Recommendation: Establish public-private partnerships (PPPs) to ensure the speedy installation and maintenance of highways as well as rural charging stations and other high-density urban centers. The government should incentivize private investment with subsidies, tax breaks, and land grants for establishing private facilities.
- Implementation: Implement tiered subsidies across the entire geography for the charging infrastructure, with higher subsidies available to underserved areas, such as highways and rural regions, given the private sector's inability to invest in the region promptly. Financial incentives are to be provided to companies, which have been investing in next-generation charging technologies such as ultra-fast and wireless charging, making it easier for consumers to charge.

2. Consumer-Centric Policies

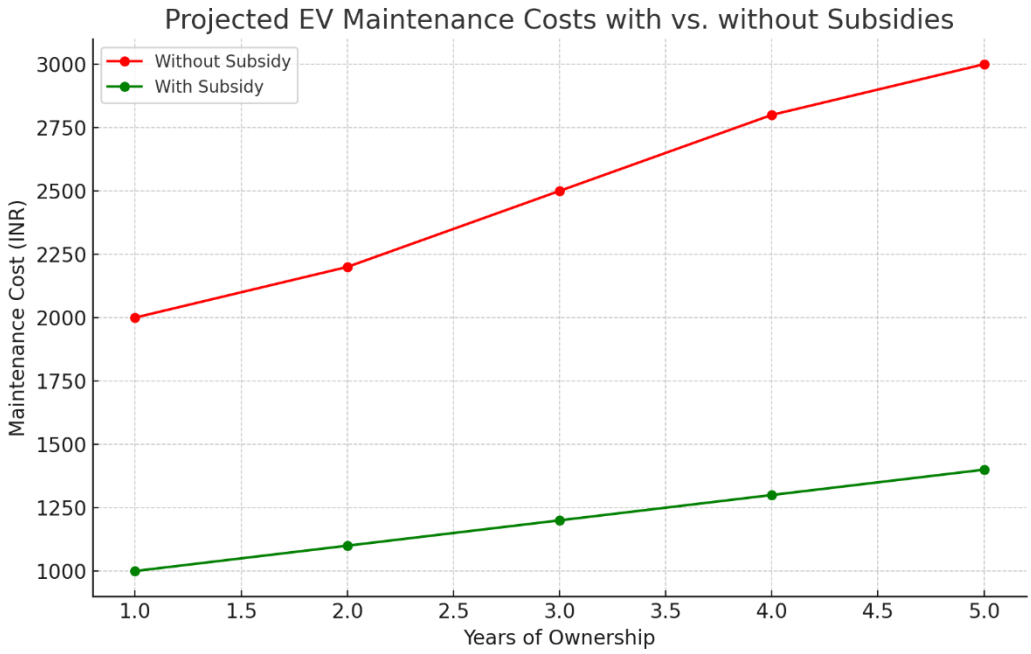
2.1 Public Awareness and Education Programs

- Recommendation: Conduct massive public awareness campaigns to educate consumers on the advantages of EVs in terms of environmental, economic, and social benefits. The awareness programs shall also break some of the myths about EVs such as range anxiety, safety, and battery lifetime.
- Implementation: Employ various media - TV, social networks, newspapers, and public events - to raise awareness about EVs. Collaborate with automobile dealer vendors and community organizations to perform workshops and roadshows that allow customers to experience an EV for themselves. Consider collaborations with schools and universities to integrate EV content into their curricula, so the younger generations hear a lot about such vehicles from an early age.



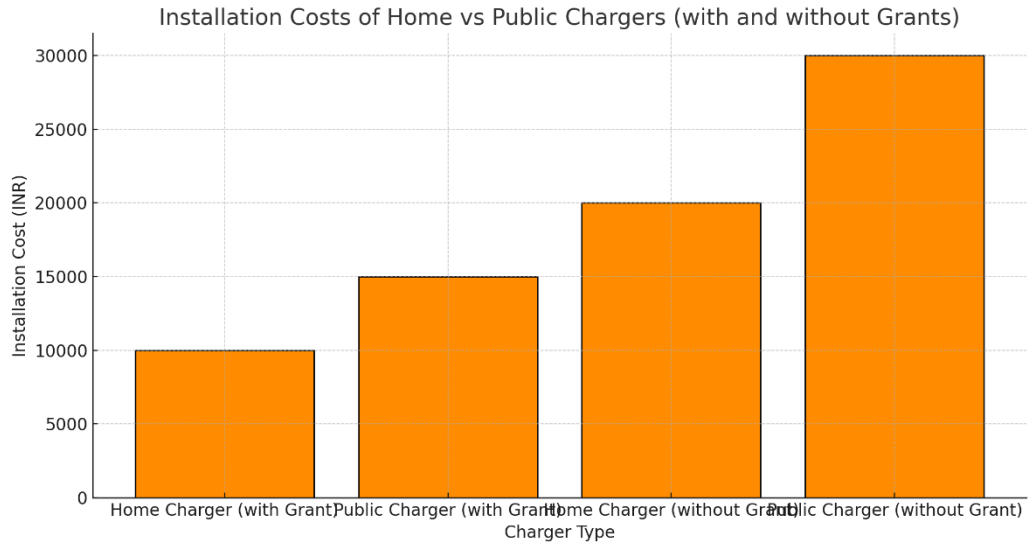
2.2 Subsidized Maintenance Programs

- Recommendation: Programs that subsidize EV maintenance can be developed and perhaps target reductions in cost of battery replacement, servicing, and updates to the software and technology used in the vehicle. Such subsidies would pay for themselves and drive away fears associated with long-term ownership costs, coaxed a lot more consumers into switching over to electric vehicles.
- Implementation: Offer government-backed vouchers for periodic maintenance to the customers, especially of the critical items like batteries and electric powertrains, in the first 3-5 years of ownership. Establish a network of certified EV service centers to provide affordable and reliable services pan-India.



2.3 Expansion of Charging Infrastructure

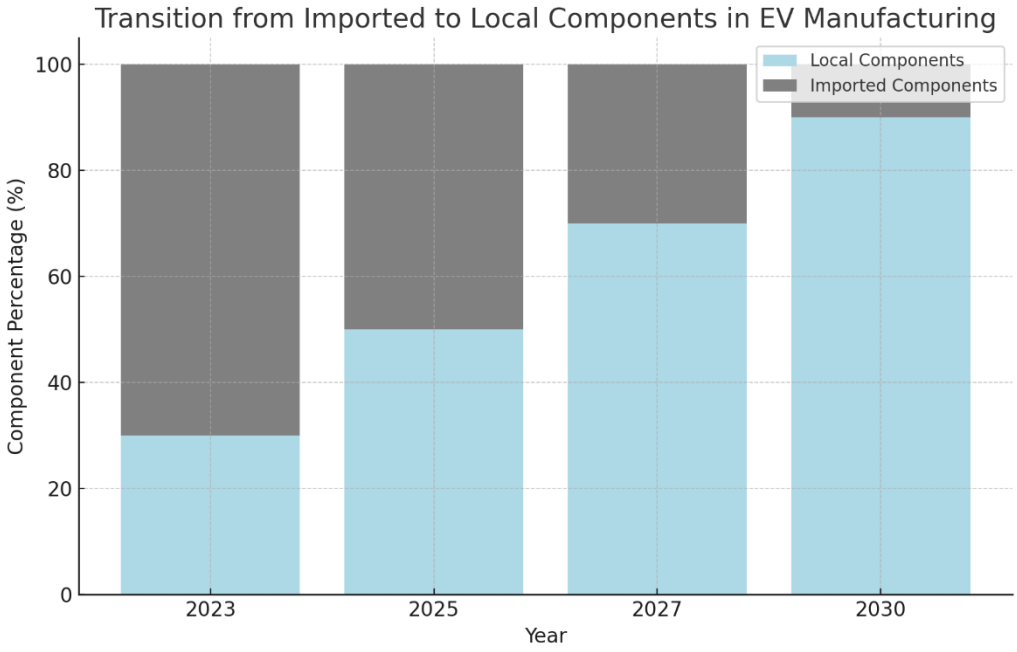
- Recommendations: Introduce a "home charging grant" scheme to encourage house-based chargers and subsidize public charging stations so that charging becomes accessible to one and all.
- Implementation: Grants or rebates for part of the installation costs of residence chargers, with higher incentives for multi-family housing units, where charging installation may be more complex. For public charging, a tiered pricing system where off-peak rates are cheaper are put in place.



3. Manufacturers and Supply Chain Recommendations

3.1 Localization and Supply Chain Support

- Recommendation: Encourage localisation of materials and components sourcing by manufacturers to strengthen the local supply chain, reducing dependency on imports and promoting economic growth.
- Implementation: Design a step incentive program; companies should be rewarded in terms of percentage content of locally sourced materials. Tax benefits may be enhanced for those firms sourcing more than 50% of their components from local sources. Establish raw material processing facilities for critical components in the battery assembly line, such as lithium and rare earth elements.

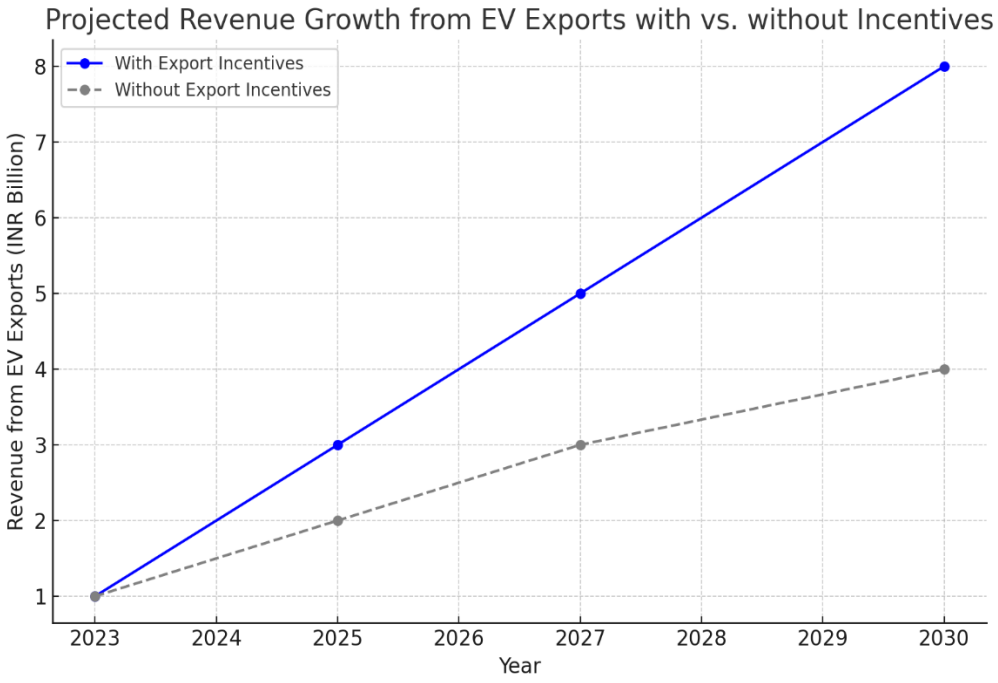


3.2 Battery Manufacturing and Recycling

- Recommendation: Increase capacity of manufacturing homemade batteries, and with proper structure and infrastructure, introduce the ability to recycle batteries to make industry growth sustainable.
- Implementation: Offer incentives and tax cuts to firms that invest in both the production of battery production and recycling technologies. Set uniform processes in the disposal and recycling of batteries to prevent deterioration of the environment as well as retrieval of material.

3.3 Export Incentives for EV and Battery Manufacturers

- Recommendation: Export incentives should be provided to electric vehicle and battery manufacturing in the form of export hubs, with emphasis on exports to nearby countries in the Asia-Pacific region.
- Implementation: Provide tax benefits and subsidy benefits for a company with respect to achievement of exports, encourage joint ventures, and build free trade agreements with a focus on electric vehicle and component exports.



4. Public-Private Partnerships and Collaborative Initiatives

4.1 Expanding Charging Network

- Recommendation: Partner with utility firms, private investors, and local governments for augmenting the EV charging network by focusing on high-density areas of cities and freeways.
- Implementation: Give land for charging stations at reduced costs with streamlined permission procedures. Offer incentives such as monetary benefits so fast chargers are placed in strategic points like transit centers, shopping malls, and public parking lots.

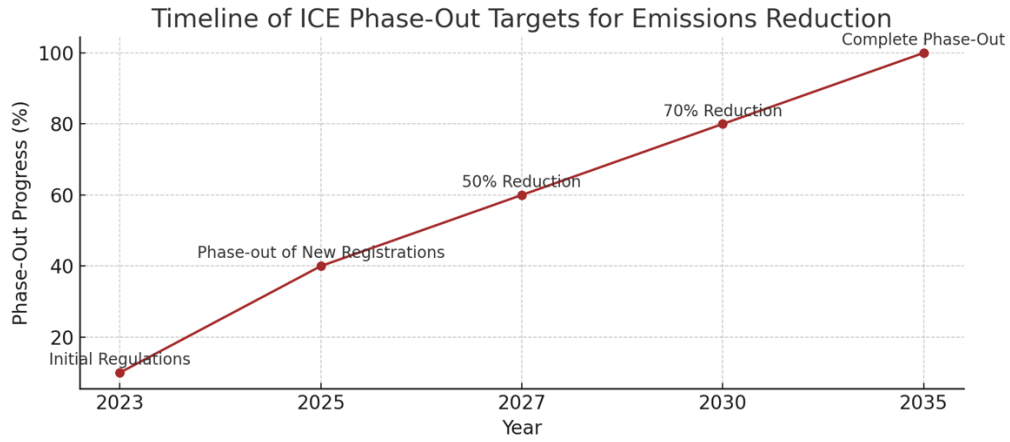
4.2 Joint R&D Ventures in EV Technologies

- Recommendation: Encourage joint R&D ventures to ensure innovation in such EV technologies as wireless charging, advanced driver-assistance systems (ADAS), and new battery chemistries.
- Implementation: Matching grants should be provided for the private companies investing with research institutions to expedite the development and commercialization of new technologies.

5. Long-Term Policy Proposals for Market Viability

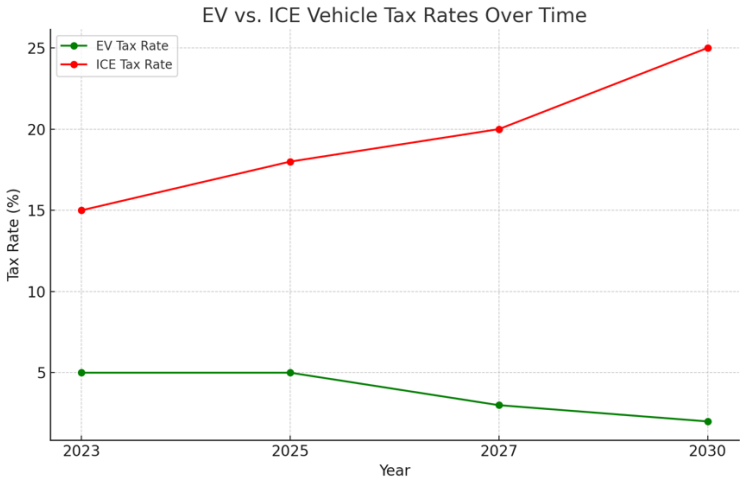
5.1 Emission and Regulatory Standards

- Recommendation: Establish ambitious reduction targets for emissions, tightly phased across the coming decade, and set a date for banning new sales of conventional ICEs from being sold any further, with a full ambition towards 2030 electrification.
- Implementation: Impose penalties on the Original Equipment Manufacturers for not meeting the anticipated level of emission reduction and reward those that surpass the set thresholds. Gradually prohibit new Internal Combustion Engine vehicle registration in cities as a nudging measure for electrification.



5.2 EV-Specific Taxation Reforms

- Recommendation: Reform the taxation system in such a way that EVs are encouraged through waivers of road taxes, registration fees, and import duties for their core components. More taxes on diesel and petrol vehicles shall be levied to opt for electric variants.
- Implementation: Frame tax rebate policy according to carbon footprint savings percentage achieved through switching from ICE to EV wherein benefit is directly proportional to the environmental effect.



5.3 Workforce development and skills training

- Recommendations: Upskilling for appropriate jobs at relevant levels, that is, manufacturing of batteries, development of vehicle management software, and servicing of electric vehicles.
- Implementation: Programs of collaboration with vocational institutes and technical colleges in designing special courses, certifications, and apprenticeship for the newly entering employees from traditional automotive functions into EV-related roles

Conclusion

Summary of Key Recommendations: It is envisaged that due support from the vertically integrated policy will be necessary to take the EV ecosystem towards a more sustainable direction, combining financial incentives with investment in infrastructure, consumer engagement, and support for manufacturers. Government, industry, and consumers are needed to be given a catalytic motivation for action in this regard.

Expected Outcome and Long-term Gains: The expected outcomes and long-term benefits of the above policy recommendations include a much cleaner air quality, decreased concentrations of greenhouse gases, new employment opportunities in new automobile industries and increased economic growth, India as an international leader in sustainable technologies for automobiles. The decrease in dependence on imported oil will eventually enhance national energy security.

Conclusion

The adoption of electric vehicles is affected by a number of factors that vary across regions, including historical context, market share, governmental policies, barriers, and motivators. Historically, there have a significant technological advancements in EVs, particularly in battery and motor systems, which have laid the foundation for today's electric mobility solutions. Globally, countries like China and Norway, have made substantial progress in EV adoption with the help of strong governmental support, while India still lags behind due to infrastructural, financial and behavioural challenges.

The analysis of the governmental strategies shows that significant synergistic initiatives, which include subsidies, tax benefits, and infrastructure advancement, are critical in promoting the adoption of electric vehicles (EVs). The lack of policy integration and the increased initial cost in India remain the primary challenges. Conversely, global leaders in the EV space have witnessed policymaker integration along with consumer incentives balance the competitiveness of EV products against ICE-based vehicles.

Despite such challenges, environmental concerns, technological advances, and incentives to save money on the bottom line remain the push factors that spurs global adoption of electric vehicles. With increased consumer education, especially by better roadway infrastructure in the developing world, such as in India, such widespread adoption is more feasible. A multidisciplinary solution-in combination of policy change, infrastructural investment, and consumer education-would be required to overcome such barriers and push forward with electric mobility.

All these translate to the fact that there is a need for sustained efforts to be put in by governments, manufacturers, and consumers themselves before there can be significant adoption of EVs. The transition to electric mobility can be significantly accelerated, by addressing infrastructural gaps, improving technological performance, and offering financial incentives, and further contributing to a more sustainable future.

Limitations of the Study

1. Geographical Limitation: The study is limited to urban consumers from the metropolitan regions of India, such as Delhi and NCR. It may not reflect the attitudes and barriers faced by consumers in rural areas or smaller towns, where the infrastructure and awareness levels are quite different from those described above.
2. Sample Size and Representation: With the sample size selected at 200, it does not guarantee full generalizability of results to the total population. Thus, it depends upon demographic factors such as age, income, education, that whether the sample drawn is fully representative of all subgroups or not.
3. Self-Reporting: The method takes away from reliance on self-reported data since the use of questionnaires and structured surveys may lead to biased responses such as social desirability bias whereby an individual gives answers that may be more socially acceptable rather than his or her true preference or behaviour.
4. Exclusion of Qualitative Insights: An approach that will be applied to this study is the quantitative approach. Of course, this implies results that are essentially numerical data but excludes the depth that qualitative method, such as interviews or a focus group, can uncover. This may jeopardize the understanding of underlying motivations and attitudes.
5. Quickly changing dynamics of the market: Markets in the EV sector are constantly in flux due to updates in terms of policy, technology, and infrastructure. Findings from this research may become obsolete in case there is some change in these parameters during or close to the date of research.

Scope for Future Research

1. Expansion into rural and semi-urban areas: In the future, the study would be taken forward to understand the adoption of EVs in the rural and semi-urban regions, which could indeed be very different from those observed in the city space because of differences in infrastructure, income levels, and awareness. It can thereby recognize barriers and drivers uniquely applicable in such regions.
2. Longitudinal Studies About Change Over Time: Longitudinal studies can be done where changes among consumers and purchase behaviours over a period of years can be followed. These studies will inform how policy, technology, and market developments influence decision-making.
3. Qualitative Methods for Greater Understanding: Qualitative research methods like interviews, focus groups, or ethnographic studies help in offering deeper insight into what, why, and how consumers get motivated, perceive, and have psychological barriers. Thus, insights gathered from qualitative studies are also complemented with quantitative findings to enhance the analysis.
4. Exploration of adoption of EV among different vehicle segments: The study can be segmented based on the different categories of vehicles like two-wheelers, three-wheelers, and four-wheelers and commercial versus private. It will allow for much greater granularity around the drivers of adoption across these different segments.
5. Technological Changes and Adoption: Impact Future research could further investigate how advancements in battery and charging infrastructures and improvements to smart features influence consumer choices. Analysis of the manner in which consumers respond to innovation in fast-charging networks or swapping, or even wireless charging, may further steer adoption of technology.

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Annexures

Survey Questionnaire

Section 1: Demographic Information

1. **Age Group:**
    a) Under 25
    b) 25-34
    c) 35-44
    d) 45-54
    e) 55 and above
2. **Gender:**
    a) Male
    b) Female
    c) Prefer not to say
3. **Education Level:**
    a) High School
    b) Undergraduate
    c) Postgraduate
    d) Doctorate

Section 2: EV Awareness and Perception

4. **How familiar are you with electric vehicles (EVs)?**
    a) Very familiar (regularly follow news and updates)
    b) Somewhat familiar (aware of EVs but not in detail)
    c) Not familiar (have little to no knowledge about EVs)
5. **Have you ever considered purchasing an electric vehicle?**
    a) Yes, I already own one
    b) Yes, I am seriously considering it
    c) Yes, but I haven't made any decisions yet
    d) No, I am not interested

e) No, I prefer conventional vehicles

6. **What is your primary source of information about EVs?** (Select all that apply)
   a) Social Media (Facebook, Instagram, Twitter, etc.)
   b) News/Media Outlets (TV, Newspapers, Online News)
   c) Friends/Family
   d) EV Dealerships or Showrooms
   e) Government Programs or Campaigns
   f) Other (Please specify)
7. **How do you perceive the environmental impact of EVs compared to conventional vehicles?**
   a) EVs are much more environmentally friendly
   b) EVs are somewhat more environmentally friendly
   c) EVs and conventional vehicles are similar in their environmental impact
   d) Conventional vehicles are more environmentally friendly
   e) I'm not sure
8. **Which of the following best describes your perception of the cost of ownership for an EV compared to a conventional vehicle?**
   a) EVs have a much lower total cost of ownership
   b) EVs have a slightly lower total cost of ownership
   c) EVs and conventional vehicles have a similar total cost of ownership
   d) EVs have a slightly higher total cost of ownership
   e) EVs have a much higher total cost of ownership

Section 3: Purchase Decision Factors

9. **What factors would most influence your decision to purchase an EV?** (Rank the top three in order of importance)
   a) Environmental impact
   b) Lower running costs (e.g., fuel, maintenance)
   c) Government incentives/subsidies
   d) Availability of charging infrastructure
   e) Vehicle range and battery life

f) Technological features (e.g., autonomous driving, smart features)

g) Social status and peer influence

10. **How important is government support (e.g., subsidies, tax incentives) in your decision to purchase an EV?**

    a) Extremely important (It would strongly influence my decision)

    b) Very important (It would likely influence my decision)

    c) Moderately important (It may influence my decision)

    d) Slightly important (It would have minimal impact on my decision)

    e) Not important (It would not influence my decision at all)

11. **To what extent does the availability of charging stations in your area impact your decision to purchase an EV?**

    a) A great deal (It is a major deciding factor)

    b) A lot (It is an important consideration)

    c) A moderate amount (It is somewhat important)

    d) A little (It is a minor consideration)

    e) Not at all (It does not affect my decision)

12. **How concerned are you about the range of electric vehicles (distance they can travel on a single charge)?**

    a) Extremely concerned

    b) Very concerned

    c) Moderately concerned

    d) Slightly concerned

    e) Not concerned at all

13. **How much does social influence (e.g., friends, family, colleagues) affect your decision to purchase an EV?**

    a) Extremely influential

    b) Very influential

    c) Moderately influential

    d) Slightly influential

    e) Not influential

14. **Which of the following technological features would most influence your decision to purchase an EV?** (Select up to three)
    a) Advanced battery technology (longer range, faster charging)
    b) Autonomous driving capabilities
    c) Smart features (e.g., app integration, voice control)
    d) Enhanced safety features (e.g., collision avoidance)
    e) High-performance capabilities (e.g., acceleration, handling)
    f) Connectivity features (e.g., internet, GPS)

Section 4: Barriers to EV Adoption

15. **What do you perceive as the biggest barriers to adopting an EV?** (Select all that apply)
    a) High purchase cost
    b) Limited charging infrastructure
    c) Range anxiety (fear of running out of battery)
    d) Lack of after-sales service/support
    e) Limited model options available
    f) Lack of awareness or information about EVs
    g) Concerns about battery life and replacement costs
    h) Other (Please specify)
16. **What would most likely encourage you to purchase an EV?** (Select up to three)
    a) Lower purchase price
    b) Improved charging infrastructure
    c) Enhanced battery life and vehicle range
    d) Greater government incentives (e.g., subsidies, tax breaks)
    e) Positive social influence or recommendations
    f) Availability of more EV models and brands
    g) Other (Please specify)
17. **If you were to purchase an EV, which type would you most likely consider?**
    a) Compact car (e.g., Tata Nexon EV)
    b) Sedan (e.g., Hyundai Ioniq 5)

c) SUV (e.g., MG ZS EV)

d) Luxury car (e.g., Tesla Model S)

e) Electric bike or scooter

f) Not interested in purchasing an EV

18. **How satisfied are you with the current government initiatives to promote EV adoption in India?**

a) Very satisfied

b) Satisfied

c) Neutral

d) Dissatisfied

e) Very dissatisfied