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A STUDY ON USAGE OF ELECTRIC VEHICLES AND ITS IMPACT ON THE ECOSYSTEM

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Abstract:

The study focused at the link between electric vehicles (EVs) and ecosystems, with the goal of better understanding their environmental impact. With the global push for sustainable transportation, EVs have emerged as a possible alternative to traditional fossil-fuel automobiles. The research paper examines the, affordability and sustainability of different vehicle modes, and the role of EVs in reducing dependence on fossil fuels. The research paper explores the eco-friendly benefits of electric vehicles (EVs), their potential to reduce reliance on fossil fuels, emphasizing the importance of considering EVs for daily transportation. The scope of the study suggests a promising future for EVs with government support and technological advancements. The methodology involves descriptive research to analyse the potential of EVs and the data is collected through Google Forms in the form of a structured questionnaire. Findings indicate that while initial maintenance costs of EVs may be higher, overall ownership costs are lower due to reduced fuel expenses. Consumers perceive EVs as environment friendly due to their zero-tailpipe emissions, despite concerns about maintenance charges and battery expenses. But with the widespread usage of EVs, there is a need for innovation in battery technology, electric motor systems, etc. to make them usable for long- distance travelling purpose. The study concludes by suggesting in adoption of EVs for lower environmental impact, creating a better environment and emphasizes in increasing sustainability.

Keywords: *Electric vehicles, ecosystem, sustainability, non-renewable resources, government, technology.*

Introduction:

In today's world, the usage of electric vehicles or EVs are increasing day by day as the government and various private companies create awareness among the citizens to adopt green energy, which can reduce carbon emissions in the environment. As we all know, fossil fuels like petrol, diesel, gasoline, coal, etc. have been used as a fuel for many years in transportation and in various industries around the world. But now, due to their widespread usage, it leads to various environmental issues like air pollution, declination of resources, etc.

In the face of growing environmental concerns and the urgent need to address climate change, the transportation industry remains a key contributor to greenhouse gas emissions and air pollution. As a result, the adoption of electric vehicles (EVs) has gained increased attention as a critical technique to offset the negative effects of traditional combustion engine vehicles on the ecosystem.

Vehicle pollution, mostly caused by emissions from combustion engines, has a considerable impact on weather patterns and other aspects of the environment. These emissions emit pollutants like Carbon-Dioxide (CO_2), Nitrogen Oxide (NO_x), Particulate matter

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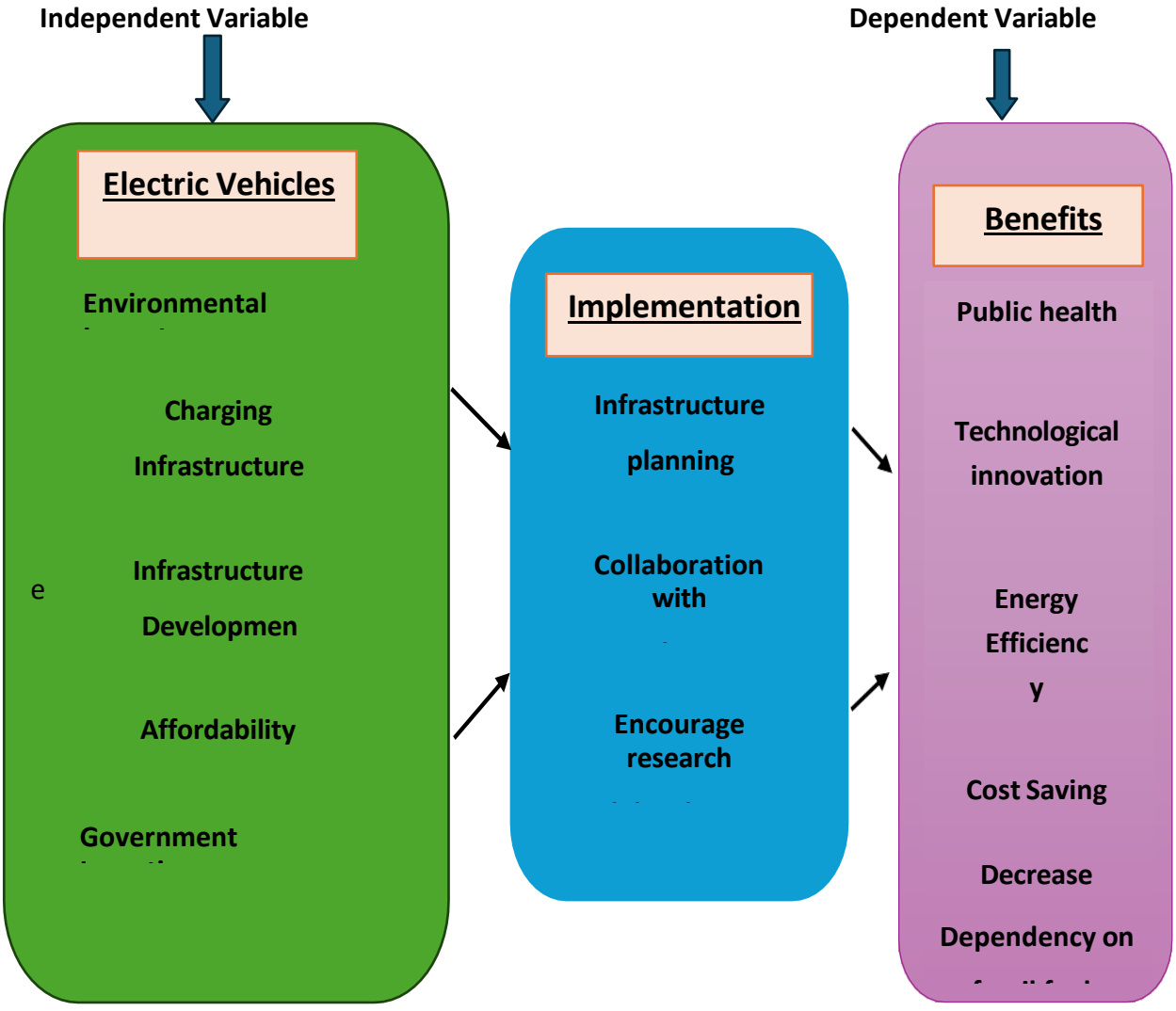
(PM), Volatile organic compounds (VOCs), and Sulphur Dioxide (SO2) into the atmosphere. These pollutants lead to the creation of smog and air pollution, which can have a negative impact on weather patterns, damage soil, water bodies, vegetation, and wildlife, leading to ecosystem degradation and loss of biodiversity.

Electric motors are powered by electricity and are stored in the form of rechargeable batteries. As a result, electric vehicles (EVs) emit no tailpipe pollutants, making them an environmentally friendly choice for society, as well as reducing the government's expenditure on petroleum imports. Common public transportation, such as buses, trains, and metros, is the greatest alternative for public transportation since it is a government-provided transportation service that reduces carbon emissions created by individual-owned automobiles. If someone wants a car, they should select electric over gasoline or diesel because they reduce noise pollution and carbon emissions while also improving the environment and preserving the ecosystem.

Conceptual Framework of Study:



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Research Methodology :

Research Methodology is a logical, systematic way of finding solutions to the Research Problems. A Methodology details the approaches to the Research ensures reliable, valid results that addresses their aims and objectives. A Research Methodology not only includes research methods but also the logic behind the method used in the research.

Hypothesis:

Hypothesis 1:

H0: There is no significant impact of EV on betterment of ecosystem.

H1: There is significant impact of EV on betterment of ecosystem.

Hypothesis 2:

H0: The long-term affordability and sustainability of traditional gasoline vehicles and electric vehicles is not significantly different.

H1: Electric vehicles are more affordable and sustainable in the long term as compared to traditional vehicles due to low maintenance cost.

Hypothesis 3:

H0: Electric vehicles do not play significant role in reducing dependence on fossil fuel.

H1: Electric vehicles play significant role in reducing dependence on fossil fuel.

Significance of the Study:

The present study is significant because it addresses the extent to which electric vehicles contributes in the reduction of the air pollutants as compared to traditional petrol or diesel vehicles. In this we will also find whether these electric vehicles can reduce the dependency on the non-renewable resources and create a better environment for the future. Through this research paper we will try to increase awareness among people about electric vehicles and how it helps in maintaining our existence and ecosystem by reducing

The current research focuses on the behaviour of citizens towards the usage of Electric vehicle.

Objectives:

To study the impact of EVs towards betterment of Ecosystem.

To study which mode of vehicle is more affordable and sustainable.

To study the role of Electric Vehicles in decreasing dependence on fossil fuels.

pollution, saving our natural resources, less production of carbon monoxide, and other harmful gases which emits from petrol / diesel vehicles.

Scope of the Study:

The scope of electric vehicles for future is exceptionally promising. As the Government is concerned about technological advancements, infrastructure development, and policy support converge, EVs are set to become the mainstream mode of transportation. With the government's commitment to promoting the use of EVs, increasing consumer awareness and acceptance, and advancements in technology all set to drive growth in the EV market.

Research Methodology:

The nature of this research is descriptive research. As this research consists of both data collection methods i.e. Primary and secondary sources. Primary data was collected from vehicle owners of the Kalyan city of Thane district, via electronic medium through Google forms in the form of structured questionnaire which is a research instrument for this study.

Secondary data was also been used for detailed study. The research approach for this study is survey. The sample size was of 50 responses as the data was collected from the group of people who are the owners of two, three or four-wheeler vehicles in the KDMC region. Simple random sampling method had been used here to collect the data from the sample or group of individuals.

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Limitations: The current research study will not be able to adequately investigate their impact in the limited time.

This study only looks at a tiny percentage of the whole population; it does not capture the ideologies of all city residents.

This research is limited to Kalyan city of Thane District only.

The research is based on the answers collected from the respondents which are based on limited set of questionnaires.

Although the research does not include information from a single electric car manufacturer, it concentrates on the impact of electric vehicles on ecosystems.

The range of data is restricted since only the preferences, opinions, and problems faced by city residents may be revealed due to the selective data collection process.

As the data is collected from selective individuals only the preference, point of view, problems of citizens belonging to the city can come to light which shortens the range of data.

Review of Literature:

A literature review is a part of the research report where the researcher analyses and discussed published information relating to the subject area under research. A literature review surveys articles, books and other sources relevant to particular issue, area of research, or theory by providing a description, summary and critical evaluation of each work.

Review of Literature:

(Izakova, 2023), In this study the author tries to explain, that the impact of increasing electric vehicle fleets on the environment is uncertain, but studies suggest that switching to electric vehicles improves air quality in cities. However, achieving this requires state support and tax incentives. The future of the global automotive industry depends on consumer demand, as electric cars could replace internal combustion engines if consumers perceive them as environmentally friendly and low-carbon. Technological progress in battery recycling is crucial for the future of the global automotive industry.

(Parab, 2022) In this research study, the advancements in technology are making electric vehicles more practical for long-distance travel, with high-end models like the Tesla Model and Tata capable of using domestic electric power. These vehicles save on gas and contribute to sustainable transportation. However, they come at a high cost, potentially making them prohibitive for working-class families. Despite this, electric vehicles' benefits to society and the environment will eventually be accepted.

(Monika B., 2019), In this research study investigated customer perceptions in Bangalore by learning about their attitudes, feelings, and perceptions. The researchers discovered the level of EV knowledge and the elements that influence client purchase decisions. The majority of buyers are aware of the environmental benefits of electric vehicles. As a result, half of the customers were environmentally sensitive and may like to adopt it. They believe that installing charging stations will aid in the growth of EV sales.

(Kishore, 2021), In this research study, others attempted to determine consumer perceptions of electric vehicles in the research article consumer perception of electric cars. According to the study, the majority of consumers prefer environmentally friendly vehicles, with prices ranging from Rs. 5 lakhs to Rs. 10 lakhs. They prefer EVs since they emit less carbon; nevertheless, one of their results was that EVs take longer to charge and have fewer charging stations.

(Zulfiqar, 2021), In this research, others attempted to investigate aspects influencing consumer intention to adopt EV, including inventive, technological, environmental, and economic benefits. According to the findings, consumers' own attitudes and opinions

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have an impact on their decision to purchase electric automobiles.

(Rajper, 2020) In this study the author analysed material on the potential of electric vehicles in developing countries. The study focused on electric two-wheelers (E2Ws), hybrid vehicles, and electric four-wheelers. In developing countries with a high number of gasoline-powered two-wheelers, E2Ws could be a viable solution. Delay E4W implementation in nations until economies of scale can lower associated costs. HEVs may become more popular in underdeveloped nations because to their lower cost compared to E4Ws.

Research Gap:

This Research on the environmental impact of electric vehicles has primarily focused on immediate benefits like air quality improvement, etc. Yet gaps exist in understanding their long-term effects,

Most of the literature emphasises how crucial consumer perception is in propelling the adoption of electric vehicles (EVs). However, little study has been done to examine the variables influencing consumers' attitudes towards EVs, especially in developing nations or areas with uneven infrastructural development.

Though integrating charging stations is thought to help increase EV sales, there is a research vacuum regarding the efficiency of various charging infrastructure strategies in encouraging EV adoption broadly and elimination of potential obstacles like range anxiety and convenience concerns.

Despite substantial study on environmental effect, consumer views and potential in developing countries, there appears need for Further study to incorporate the issues and provide a comprehensive understanding of the problems and potential in boosting electric vehicle adoption on a worldwide basis.

To develop effective strategies for promoting sustainable transportation in urban areas, there is a research gap in completely appreciating the multifaceted factors influencing EV adoption in Bangalore, including consumer preferences, charging infrastructure, and broader policy and regulatory frameworks.

The research is only focusing on the impact of EVs on the environment but not discussed the issue of public health. So, the research could investigate the specific health benefits of reduced air pollution due to electric vehicle adoption, focusing on respiratory diseases and overall public health outcomes.

Data Analysis & Discussion:

This study was done to find does there would be any impact created by promoting the usage of electric vehicles in maintaining environment, saving cost of the consumers over maintenance of vehicles.

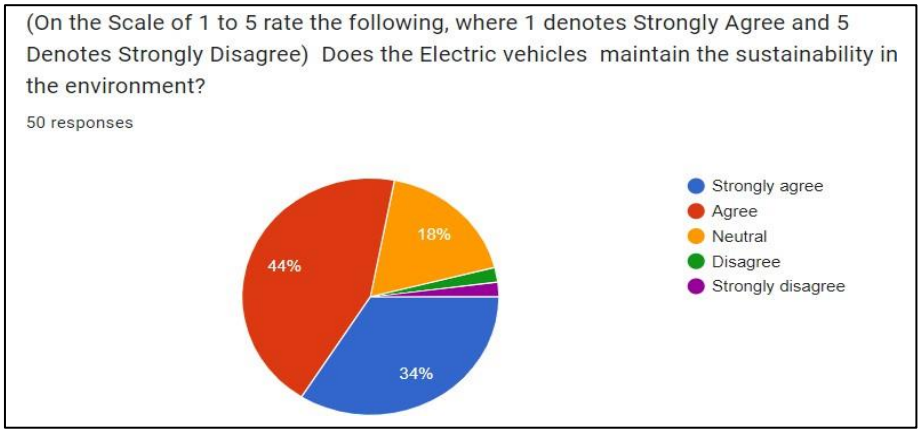

Chart 4.1.1 EV maintain sustainability

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From the above chart, it is observed that 17 (34%) and 22(44%) respondents are strongly agreeing and agree with the statement that electric vehicles maintained the sustainability in the environment. While 9(18%) are neutral on this and 1(2%) & 1(2%) show's disagreement.

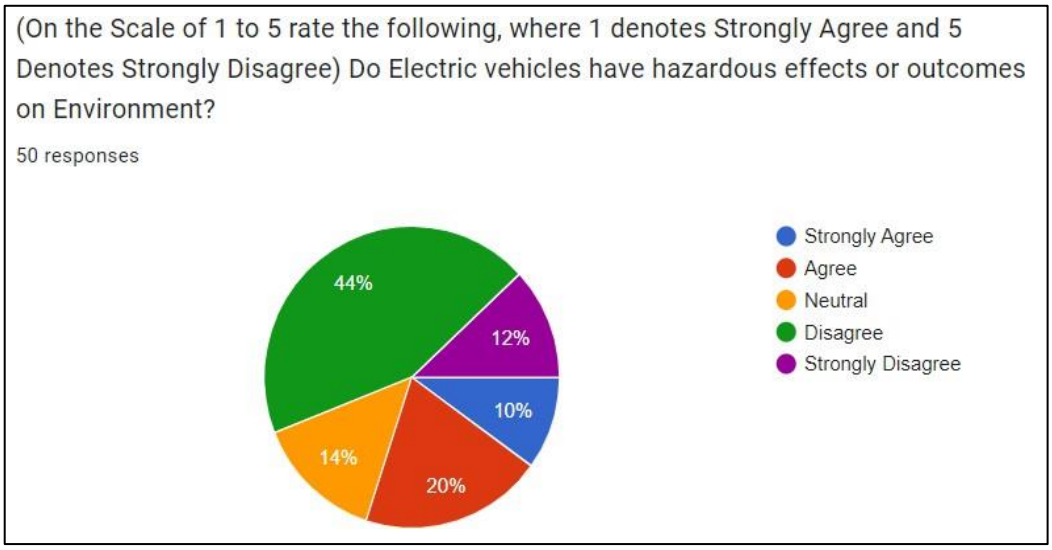

Chart 4.1.2 EV have hazardous effects

From the above chart, it is observed that 5(10%) and 10(20%) respondents are strongly agreeing and agree with the statement that electric vehicles have hazardous outcome on environment. While 7 (14%) are neutral on this and 22(44%) & 6(12%) show's disagreement.

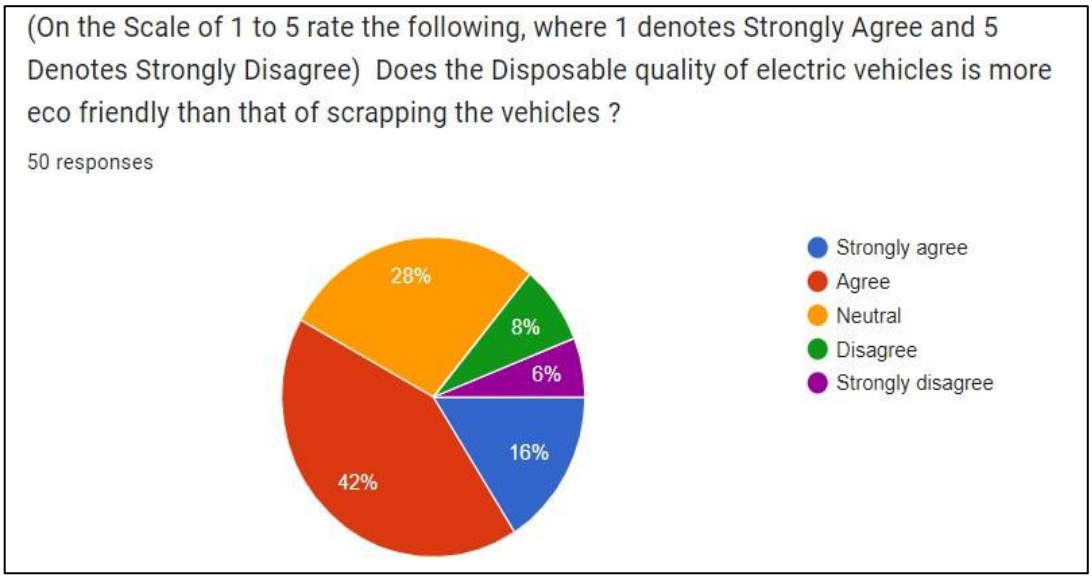

Chart 4.1.3 EV has disposable quality

From the above chart, it is observed that 8 (16%) and 21 (42%) respondents are strongly agreeing and agree with the statement that the disposing quality of electric vehicles is more eco-friendly than traditional vehicles. While 14 (28%)

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are neutral on this and 4 (8%) & 3(6%) show's disagreement.

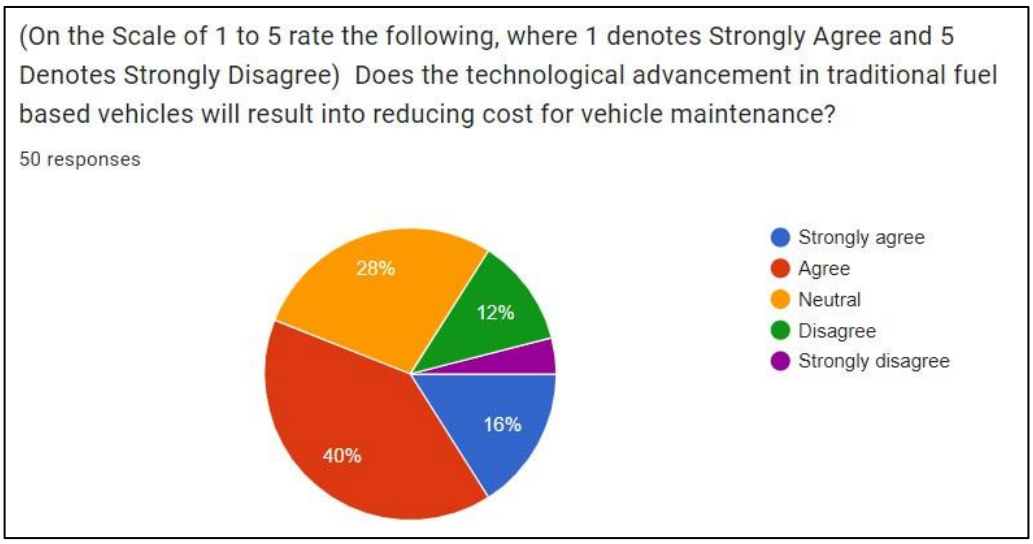

Chart 4.1.5 Technological advancement will lower the cost

From the above chart, it is observed that 8(16%) and 20 (40%) respondents are strongly agreeing and agree with the statement that due to technological up gradation in traditional vehicles leads to cost savings. While 14 (28%) are neutral on this and 6(12%) &2(4 %) show's disagreement.

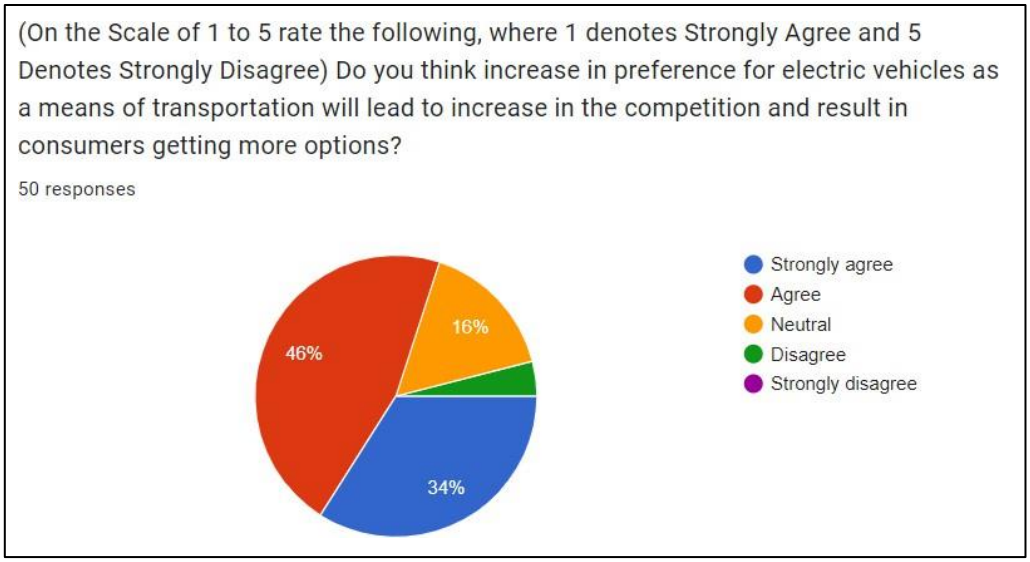

Chart 4.1.6 Increase in usage of EVs.

From the above chart, it is observed that 17 (34%) and 23 (46%) respondents are strongly agreeing and agree with the statement that adoption of electric vehicles as a mode of transport for daily use will leads to increase competition in the market which results in multiple options for the consumers. While 8(16%) are neutral on this and 2(4%) show's disagreement.

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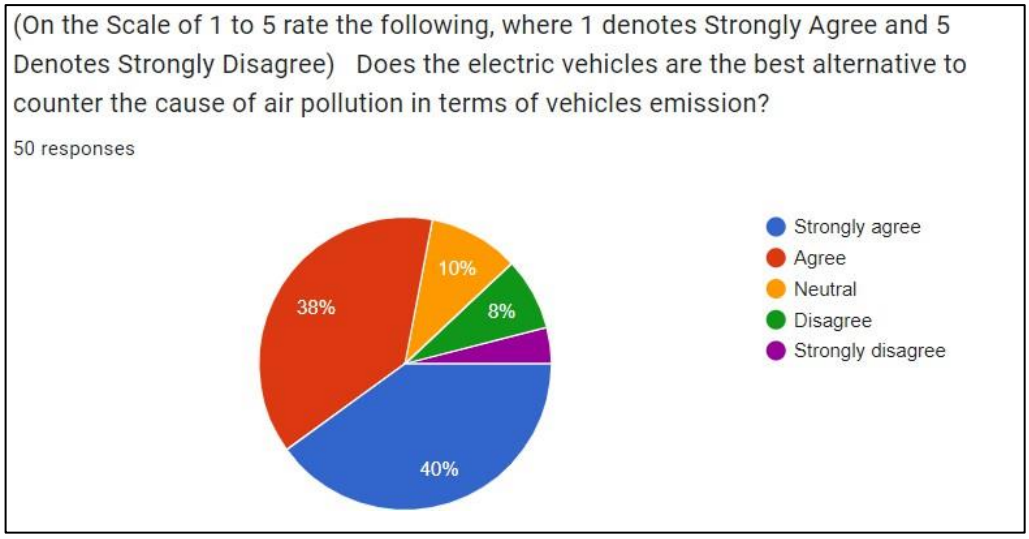

Chart 4.1.7 Alternative method for reducing air pollution

From the above chart, it is observed that 20(40%) and 19 (38%) respondents are strongly agreeing and agree with the statement that electric vehicles are the best alternative to counter the cause of air pollution. While 5(10%) are neutral on this and 4 (8%) &2(4%) show's disagreement.

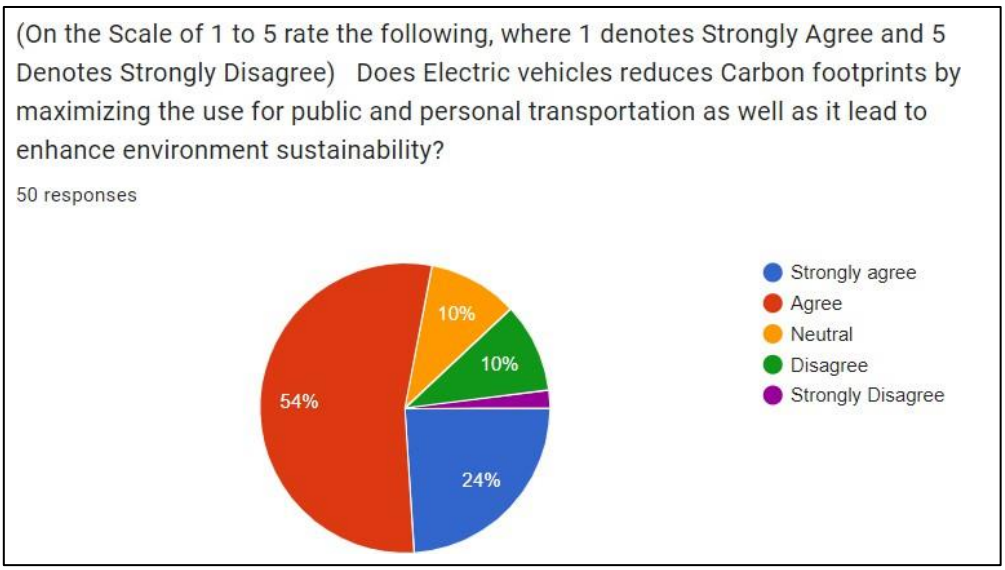

Chart 4.1.8 Maximizing usage of EVs for transportation

From the above chart, it is observed that 12 (24%) and 27(54%) respondents are strongly agreeing and agree with the statement that due to maximizing the usage of electric vehicles it will results in less carbon footprints and more towards environment sustainability. While 5 (10%) are neutral on this and 5(10%) &1(2%) show's disagreement.

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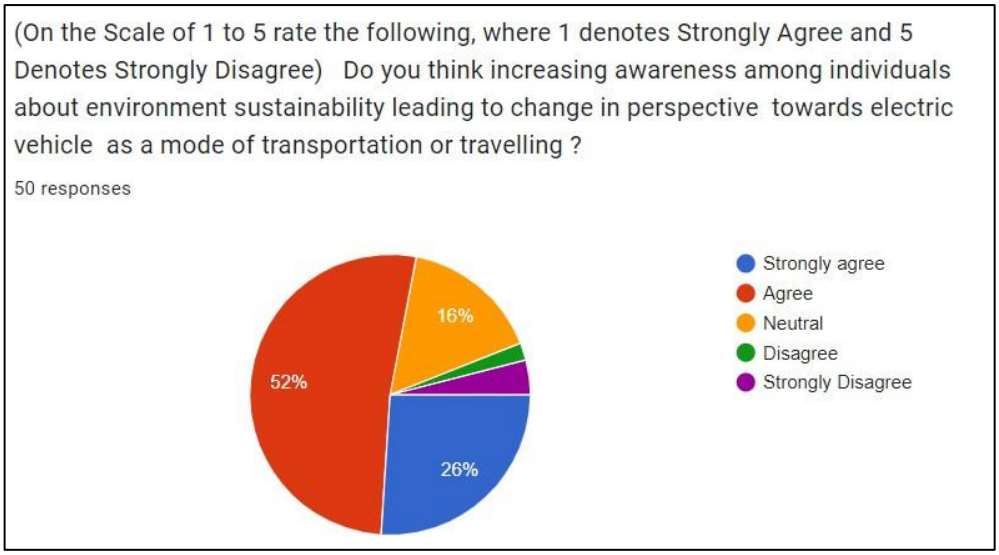

Chart 4.1.9 Increasing awareness

From the above chart, it is observed thqt 13(26%) and 26 (52%) respondents are strongly agreeing and agree with the statement that individuals with environmental awareness will opt electric vehicles as a mode of transport as it will leads to sustainable environment. Uh While 8(16%) are neutral on this and 1(2%) &2 (4%) show's disagreement.

Hypothesis Testing (Anova Single Factor):

Anova: Single Factor						
H0: There is no significant impact of EV on betterment of ecosystem.						
H1: There is significant impact of EV on betterment of ecosystem.						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	59	115	1.949152542	0.876680304		
Column 2	59	196	3.322033898	1.497954413		
Column 3	59	144	2.440677966	0.974868498		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	**P-value**	*F crit*
Between Groups	57.0960452	2	28.5480226	25.56918513	**1.8394E-10**	3.047906481
Within Groups	194.2711864	174	1.116501071			
Total	251.3672316	176				
Source: Primary Data						
Findings	**The p value calculated is less than 0.05, hence reject the null hypothesis.**					
Inference	**It's essential to adopt sustainable practices for the disposal and recycling of EV batteries to minimize their environmental impact.**					

Table no. 4.2.1 Hypothesis 1 test result

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Anova: Single Factor						
H0: The long-term affordability and sustainability of traditional gasoline vehicles and electric vehicles is not significantly different.						
H1: Electric vehicles are more affordable and sustainable in the long term as compared to traditional vehicles due to low maintenance cost.						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	59	143	2.423728814	1.213909994		
Column 2	59	144	2.440677966	0.974868498		
Column 3	59	118	2	0.75862069		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	**P-value**	*F crit*
Between Groups	7.355932203	2	3.677966102	3.743604997	**0.025596494**	3.047906481
Within Groups	170.9491525	174	0.982466394			
Total	178.3050847	176				
Source: Primary Data						
Findings	**The p value calculated is less than 0.05, hence reject the null hypothesis.**					
Inference	**While the maintenance cost of electric vehicles may be higher in the initial years, the overall cost of ownership may still be lower due to lower fuel costs.**					

Table no. 4.2.2 Hypothesis 2 test result

Anova: Single Factor						
H0: Electric vehicles do not play significant role in reducing dependence on fossil fuel.						
H1: Electric vehicles play significant role in reducing dependence on fossil fuel.						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Column 1	59	117	1.983050847	1.154880187		
Column 2	59	125	2.118644068	0.864991233		
Column 3	59	123	2.084745763	0.872004676		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	**P-value**	*F crit*
Between Groups	0.587570621	2	0.293785311	0.304769604	**0.02737686**	3.047906481
Within Groups	167.7288136	174	0.963958699			
Total	168.3163842	176				
Source: Primary Data						
Findings	**The p value calculated is less than 0.05, hence reject the null hypothesis.**					
Inference	**Individuals who are well-informed about the environmental impact of traditional fuels are more likely to opt for electric vehicles, which produce lower emissions and contribute less to air pollution.**					

Table no. 4.2.3 Hypothesis 3 test result

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From the data analysis, it is found that EVs creates a better alternative to maintain the ecosystem. As per the sample study, it is found 17 (34%) and 22(44%) respondents are agreeing that electric vehicles maintained the sustainability in the environment. Supporting by 8 (16%) and 21 (42%) respondents by agreeing that disposing quality of EVs are more eco-friendly than traditional vehicles. 20(40%) and 19 (38%) think that EVs can be become a better alternative to cater the problem caused by air pollution through vehicle emissions

12(24%) &17(34%) respondents agree with the statement that cost of maintenance is also lower as compared to traditional vehicles and can be better in future due to technological advancement in EVs and the negative impact cause by EVs on the environment can also be reduced stated by 5(10%) and 10(20%).

About 12 (24%) and 27(54%) individuals believe that daily usage of EVs as a mode of transport can reduce carbon footprints and hence overall condition of the environment can be improved.

Suggestion:

Through this research and findings, we suggest that individuals should think on usage of Electric vehicles (EVs) in their day-to-day work by considering the following points;

1. Electric vehicles have lower impact on the environment due to their zero-tailpipe emission. This is crucial for a greener, more sustainable transportation system, as gasoline contributes to 27% of air pollution and premature deaths.
2. Individuals should shift towards Electric vehicles usage especially in the presence of Government as the subsidies and various tax benefits, incentives are been provided by Government.
3. The running and maintaining cost are also less as compared to traditional gasoline vehicles.
4. The noise pollution created by conventional vehicles is now eliminated by the electric vehicles. For your convenience you can also charge your EVs at home and can use renewable energy to charge your electric vehicles which also saves your money.

Conclusion: The widespread usage of EVs will lead to a significant reduction in carbon emissions, which will help combat climate change. Shifting towards EVs will reduce our dependence on fossil fuels, leading to a more sustainable and secure energy future. It is crucial that we continue to promote the usage of EVs and invest in the infrastructure needed to support their widespread adoption. One can do further research on EVs as there is rapid increase in technology and Electric Vehicles are coming with new features one can do comparative research on traditional vehicles vs electronic vehicles, the challenges and opportunities in the electric vehicle's infrastructure, Advancement in battery's technology and their implications on electric vehicles. Together, we can create a cleaner, healthier environment for future generations to enjoy.

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