TO STUDY THE IMPACT OF SOCIO-ECONOMIC ISSUES ON CONSUMER PREFERENCES RELATED TO ALTERNATE ENERGY TRANSPORT

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CHAPTER 5 - SUMMARY AND CONCLUSION

5.1 Summary

The results from the conducted study gives rise to numerous possibilities to analyze EVs market from many perspectives that can be used for different purposes. It can be used to understand consumer preferences which enable the companies to focus on research, branding, pricing etc. in order to match the demand side of the market by fulfilling consumer aspirations. The supply side constraints, challenges, infrastructure requirements can be understood by the opinions and concerns of different stakeholders. An opinion about EVs in different Indian cities is highlighted in the study. A comparison has been made about the global scenario of EVs vis-à-vis the Indian scenario.

Several researches have highlighted the limitation or benefits of EVs but very little research has been conducted on whether the consumers are willing to pay premium for EVs and the amount of premium that they are ready to pay. This study has tried to find out the percentage of premium the consumers are willing to pay for the EVs. This study also highlights how the consumers will react to the new technology driven EV market once they are available for mass consumption.

This study highlights the important source of information which can be used by the Original Equipment Manufacturers to promote the EVs in Indian market and influential factors which impacts the vehicle purchase decision of individuals. This study has identified the target group of prospective consumers which can be approached by AET manufacturers to boost the sale of Alternative Energy Transports among Indian Consumers. This study has highlighted the existing challenges in adoption of Alternative Energy Transports and possible solutions which can be taken by policy makers or manufacturers.

This study also discusses the role of Government of India and various state governments to encourage and motivate Indian automobile manufacturers through incentives, tax exemption or reduction and other modes to innovate and produce electric vehicles. The awareness level among consumers of National Electric Mobility Mission Plan even after 6 years of its launch has not been studied in any of the previous studies which are necessary as this scheme is going to end in 2020. This study also highlights the important and effective role of the media which should be used by

the government to increase the public awareness of its EV policy. This will go a long way in generating public interest and creating a feeling in people that the government is very serious and committed to EV. This study has analysed this aspect as well.

The study has highlighted that the major concern of the consumers is the price of the EVs and the range of the charge of the battery and fast charging of the batteries. Transformation of an entire nation towards electric mobility is going to be a huge effort. It will be important that polices are framed in a collaborative manner with a long-term vision in mind. Implementation of policy measures will require close coordination at several levels and amongst various departments and ministries of the central / state government and other public and private stakeholders.

5.2 Findings of the Study

Demographic Information

Gender: The sample consist of 352 (75.7%) Men and 113 (24.3%) Women.

Age Group- The data was collected from 465 respondents, this resulted in a sample where 34.2% of respondents were 21 to 30 years old, 53.1% of respondents were 31 to 40 years old, 10.5% of respondents were 41 to 50 years old and 2.2% of the respondents were above 50 years old.

Education- Out of 465 respondents, 10.8% had a bachelor's degree, 8.4% had Post Graduate (Technical) degree, 19.1% had Post Graduate (General) degree, 50.5% had Post Graduate (Managerial) degree, 8.6% had Higher Education (M.Phil., PhD.) degree and 2.6% had other degree such as CA, CWA etc.

Marital Status - 71% of the respondents shared that they are married, 27.1% of the respondents were single and 1.9% were divorced.

Household Size- In total 465 respondents recorded their preferences on number of their family members. 76.3% of the respondents shared that they have family members between 3 to 5, 15% shared that the family members are more than 5, however 9% of respondents shared that the family size is was 2 members. The Census of India 2011 also highlights that the average size of household is 4.9 members per household (http://www.censusindia.gov.in, 2018).

Occupation - 68.6% of the respondents were employed in private sector.

Family Type - 55.7% of the respondents live in nuclear family, 40.4% of the respondents in joint family and 3.9% of the respondents were from extended family.

Earning members in family – 46.5% of the respondents have 2 earning members, 29% of the respondents have one earning member in their family, 19.4% of the respondents have 3 earning members in their family and 5.2% of the respondents shared that they have more than 3 earning members in their family.

Annual Income – It was analyzed that, 210 (45.2%) shared that they have a yearly income between above INR 12 Lakhs, 89 (19.1%) shared that their yearly income is between INR 8 Lakh to INR 12 Lakh, 74 (15.9%) shared that they have yearly income between INR 5 Lakh to INR 8 Lakh whereas 8 (1.7%) reported that their yearly income is less than INR 1 Lakh. After analyzing the income groups, it can be concluded that more than 60% of the respondents has yearly income more than INR 8 Lakh and can afford the Electric Vehicles.

Disposable Income - In total 465 respondents recorded their preferences on disposable income. 40.6% of the respondents shared that their Disposable Income is less than 10% on Transportation.

Numbers of Cars - 46.5% of the respondents have a car at home, 35.7% of the respondents have 2 cars in their family, 7.7% of the respondents have 3 cars in their family and 10.1% of the respondents shared that they have more than 3 cars in their family.

Residential Status - 69.5% of the respondents have their own house whereas 30.5% of the respondents live in rented accommodation.

Transport mode - Respondents shared their views regarding public transport (bus, metro, shared auto, e-rickshaw) and private transport (scooter, car, auto, office transport and pooled car). The data shows that majority of respondents prefer bus followed by metro in public transport for their daily travel. Respondents prefer car and office vehicle for their daily transport in private transport.

Driving Behavior

Type of vehicle currently own/drive -205 (44%) respondents shared that they uses 4 wheeler (price between 5-10 lakhs), 204 (44%) respondents uses 2 wheeler, 158 (34%) respondents uses 4 wheeler (price less than 5 lakh), 56 (12%) respondents uses 4 wheeler (price greater than 10 lakh) and 43 (9%) respondents uses public transport.

Estimated average daily drive – Out of 465 respondents, 202 (43.4%) respondents shared that they travel up to 25 km in a day, 168 (36.1%) travelled between 25-50 km in a day, 56 (12%) travelled between 50-80 km in day whereas 39 (8.4%) travelled more than 80 km in a day. It can be easily interpreted that the percentage of respondents who travels less than 50 km per day is 79.6%. This group if incentivized can think of using electric vehicles.

Vehicle Use- 52.3% of the respondents uses their vehicle for personal purpose, 46.5% use for personal and business both. Only 1.3% of the respondents use their vehicle for business purpose.

Analysis of Consumer Preferences

Fuel Type preferred car - Petrol cars were rated as Rank 1, Hybrid cars (combination of conventional and battery operated engine, e.g., Maruti Ciaz SHVS, Toyota Camry Hybrid, Toyota Prius) are rated at Rank 2, Petrol + CNG cars are rated at Rank 3, Diesel cars are rated at Rank 4 and Electric (pure battery operated engine, e.g., Tesla, Mahindra Reva e2O) are ranked at the lowest in the given choices, i.e. Rank 5. State owned Energy Efficiency Services Ltd has the responsibility of replacing the Petrol and Diesel cars used by government officials and aims to roll out 10,000 Electric Vehicle by March 2019 (India sees slower shift to electric vehicles, 2018).

Use of electric vehicle - There are 53.1% of the respondents who still do not use the electric vehicle as a mode of transport and rest 46.9% of the respondents uses the electric transport which includes the Metro and E-rickshaws.

Type of Car preferred - Majority of respondents (81.3%) are in favor of purchasing a new car in next five years which clearly shows that these respondents are potential customers of Electric Vehicle if properly targeted. Maximum respondents (46%) are looking for mild hybrid car followed by pure electric car (20.2%). 15.1% of the respondents are in favor of strong hybrid car. However, 18.7% of the respondents are in favor of buying a traditional petrol/ diesel 4-Wheeler.

Awareness about new technology – The respondents were questioned to understand their sources of information and awareness of the new EV technology. The options available in the market were given to the respondents. It was found that 465 respondents got information from television, 267 respondents from newspapers, 53 respondents from radio, 162 from various magazines, and 398 from the internet, 98 from word of mouth marketing whereas 26 got information from other sources like their friends, relatives, family members and various hoardings.

Influence on vehicle purchase decision - Out of 465 respondents, 388 respondents (83.4%) followed market survey while taking the decision about purchasing any vehicle, followed by Peers (79.1%), Friends (65.6%) and Elders (55.3%). It can be concluded from the above data that elders, friends, market survey and self-analysis play a key role in decisions related to purchases of vehicles.

Views about purchasing a new technology vehicle -Out of 465 respondents, 269 (57.8%) preferred to wait till the new technology is widely accepted and proven, 148 (31.8%) shared that they will read the reviews and buy if the reviews are favorable whereas only 48 (10.3%) would be among the first ones to purchase the new vehicle.

Important considerations (for choosing the vehicles) – Data highlights that more than 50% of the respondents shared that fuel efficiency, safety (air bag), vehicle power, reliability, expected operating costs (for maintenance and repair), fuel type (e.g. petrol, diesel, CNG), vehicle emissions and pollution and air conditioner are absolutely essential factors for choosing the vehicle.

Willingness to buy Electric Vehicle – Data highlights the willingness of respondents to buy electric vehicle if the factors such as fuel efficiency, safety (air bag), vehicle power, reliability, expected operating costs (for maintenance and repair), fuel type (e.g. petrol, diesel, CNG), vehicle emissions and pollution and Air conditioner are available in the car. 89.7% of the respondents were in favor of purchasing the vehicle if it meets absolute essential factors which are mentioned above. Data highlights that the 37.8% of the respondents are willing to make the Electric Vehicle as a Secondary Vehicle. 66.9% of the respondents will not hesitate to pay premium for hybrid car between 1% to 30% whereas 33.1% respondents are not willing to pay any premium for hybrid car.

Transport issues- The Respondents considered all the variables such as Traffic congestion, Traffic noise, Vehicle emissions that affect local air quality and contribute to global climate change, Health hazards caused by vehicular pollution, Traffic congestion experience while driving extremely serious and expressed their desire to have some alternate solution for mitigating the traffic related risks.

Reasons for purchasing electric vehicle in the future (Environmental factors) - Out of 465 respondents, 64.1% respondents opined that saving money on the cost of operation (using electricity rather than gasoline) as being extremely important. Similarly driving vehicle which has least impact on the environment (62.7%) and driving a vehicle with more advanced or innovative technology (57.8%) is very important for the respondents for considering the electric vehicle in future.

Concerns about electric vehicles (Vehicle attributes) - Respondents shared their views on reasons that would be limiting them for considering purchase or leasing an electric vehicle in the future. A higher purchase price than for a comparable conventional vehicle (52.3%), concerns about limited access to recharging locations (64.3%), reliability of the vehicle (60.4%), On-going maintenance and operative costs including battery replacement (63.9%), after sale service (62.2%) and road side assistance in case of emergency (52.9%) are extremely important factors for the respondents while purchasing the electric vehicle in future.

Analysis of Consumer Awareness on NEMMP

Awareness of NEMMP - Data highlights the awareness level among the respondents about National Electric Mobility Mission Plan 2020. Only 16.1% of the respondents were aware of the NEMMP 2020 launched by Indian Government to promote Alternate Energy Transport among society, significant number of respondents (48.8%) were partly aware of the scheme but they needed more information. 35.1% of the respondents were not at all aware of the NEMMP-2020. The data shows that despite the scheme being launched in 2013, only 16.1% were totally aware of the scheme. The rest of the respondents were not aware or required more information. The data clearly reflects that the government needs to organize various advertising campaigns to raise public awareness of the practicality and joy of owning and driving an EV.

Encouragement of electric vehicles by State and Central Government - 79.8% of the total respondents were in favor of promoting an EV-friendly transport policy both for public and private transport. 14.2% respondents were in favor of only public transport. Only 6% of the respondents did not find the current policies sufficient to promote the electric vehicle in the market.

Ways to encourage electric vehicles through government policies – Data highlights the different ways by which government can encourage the sale of EVs by introducing various policies. 91.6% of the respondents shared that building road network to support the EVs should be the focus of Government, 59.6% of the respondents wants that the government should ensure sufficient supply of electricity for each family, 48.2% respondents opined that the Government should provide infrastructural support by installing charging stations. 72.9% and 62.2% of the respondents were not in favor of providing subsidy to consumers and manufacturers respectively.

Incentives to promote EVs – Respondents indicated that direct incentives may promote the sale of EVs in the market. Respondents shared that various exemptions such as toll tax (96.1%), road tax (95.5%), registration fees (94.8%), commercial tax (98.1%), emissions test (100%) can promote the sale of EVs in the market. 95.5% of the respondents shared that bonus payment to EV buyers can also promote the sale of EVs. Respondents were also in favor of indirect incentives and highlighted that government can initiate car exchange program (95.5%), free charging in public space (98.1%), buy back guarantee (96.8%), and free space in parking (97.4%).

Employment Opportunities by EVs – The switch from the internal-combustion engine to hybrid and EVs is happening now. All the major motor manufacturers are contributing in this global shift. The EV industry is expected to create employment opportunities in the coming years. Respondents in **Error! Reference source not found.** highlights that 41.9% of the respondents feels that the EVs will provide employment opportunities to the young generation in coming future, whereas 51.4% of the respondents shared that it will provide employment opportunities in a limited way. Only 6.7% of the respondents were of an opinion that EVs will not create employment opportunities for the young generation in coming future.

Data analysis highlights that 20.6% shared that the EV industry is expected to provide employment opportunities in the organized sector in new manufacturing plants and through service stations. 3.9% respondents opined that employment generation in the unorganized sector is also

expected to be created by EV industry through new drivers and roadside mechanics. 68.8% percent respondents were of an opinion that the employment opportunities are expected to be created in both sectors, i.e., organized and unorganized sector. Nandini Tornekar highlights in her article that "Employment can be created through e-auto, to e-cab drivers, to charging station operators and to EV service mechanics".1 EV market would require trained mechanics, re-training of existing manpower, training of new manpower and significant Research and Development. It will also create employment opportunities in the field of manufacturing units, remote technical support and software solutions (Tornekar, 2018).

Measures for improvement in urban transport system (in context with alternate transport)

In the opinion of the respondents almost all the areas mentioned in the questionnaire are crucial to develop a better transport system in the city. The eight measures are equally important for the respondents to build a sound transport system. Measures like restraining the use of polluting vehicles and fuels, promoting car sharing, enhancing transport coordination through real time updates, improving the efficiency of bus transport operations, encouraging green modes of transport and tightening vehicle emission standards and inspection and maintenance have to be taken into consideration by the government seriously in order to implement the Alternate Energy Transport System.

98.5% of respondents have said restraining the use of polluting vehicles and fuels is a crucial measure to promote the green transport. (98.5%) of respondents have also equally emphasized on promoting car sharing/pooling and (98.1%) of respondents feel that enhancing transport coordination through real time updates is important for green transport. During the interviews, respondents from Delhi NCR had expressed that the population in their area has been increasing since the last two decades and the public transport facilities available are not able to meet the needs of the people. To provide a good transport system, the government must adopt all the initiatives that promote increased usage of the alternate transport system.

[1] Tornekar, K. (2018). Electric Vehicles Industry Job Opportunities in India. Retrieved from https://electricvehicles.in/electric-vehicles-industry-job-opportunities-in-india/

Services that may improve in near future – Respondents shared that transport related services will improve in near future. There are various services categorically mentioned here and each service has its own significance in promoting an Alternate Energy Transport for the city.

It can be concluded the majority of respondents strongly agree or agree that there will be an improvement in the area of car share platform, parking management, traffic management, Information of availability of means of transport, charging points for cars, drop in electricity prices, increased government subsidies and real time traffic update.

Possibilities for electric vehicle – The respondent's views on possibilities of Electric Vehicle in Transport System were recorded through structured questionnaire. Respondents were optimistic for inclusion of Electric Vehicle in two wheelers (65.8%), three wheelers (55.7%), cars (68.8%) and Train (68.2%). Maximum number of respondents were neutral on inclusion of electric vehicle fleet for buses, light and heavy commercial vehicles.

Findings from Cross Tabulation Observations

Analysis of Responses by Gender

Estimated average daily travel- There is no significant difference between travel distance covered by male and female respondents. It is evident from the table that approximately 77% of male respondents and 80.4% of female respondents travel up to 50 km in a day for their routine work.

Planning to buy a new car - 79.5% of the male respondents are willing to purchase the alternate energy transport compared to 86.7% of the female respondents.

Information sources for new technologies - The main source of information for male and female respondents is the internet. Television followed by newspapers and magazines were the other important information sources for male respondents. On the other side, newspapers followed by television and magazines were the other important information sources for female respondents.

Vehicle purchase decision - Women respondents give more priority to market survey while male respondents to their own analysis.

Reaction to new vehicle - Male respondents (11.9%) are likely to be among the first to purchase the new vehicle compared to 5.3% of female respondents.

Important factors for choosing vehicles by Gender - 60% of the both male and female respondents shared that fuel efficiency, safety and reliability are the most essential factors for choosing a vehicle. Female respondents were more concerned about the purchase price and operating cost than compared to male respondents and rated them as absolutely essential factor.

Response for buying an Electric Vehicle – Data shows that there is no statistically significant difference between the male and female for buying the electric vehicle, however 34.1% of the male respondents were not willing to pay any premium for EVs compared to 30.1% of the female respondents. Data also highlight that male respondents are willing to use electric vehicle as a primary vehicle compared to female respondents.

Seriousness for various issues related to Transport - Female respondents were more concerned about traffic congestions than male respondents.

Awareness of the NEMMP Scheme - There is no significant difference between the awareness level of both male and female respondents. The data shows despite the scheme were launched in 2013, only 16.8% female respondents and 15.9% of male respondents were completely aware of the scheme.

Encouragement of electric vehicles by State and Central Government - 83.2% of the female respondents shared that the State and Central Government should encourage the EVs for both public and private transport whereas 78.2% of the male respondents shared their views on the same.

Incentives to promote EVs - All female respondents shared that EVs should be exempted from commercial tax whereas 97.4% of male respondents agreed on the same. All the female respondents were in favor of free parking space for electric vehicle compared to 96.6% of the male respondents. More than 90% of the both male and female are in favor of direct incentives to the EV buyers.

Employment opportunities by EVs – Data highlights that 44.9% of the male respondents shared that EVs will provide employment opportunities whereas 32.7% of the female respondents shared the same.

Analysis of Responses on basis of Education

Estimated average daily drive - 85% or above Respondents from all education categories travelled up to 80 km in a day. This shows that EVs can be easily promoted for all the education groups considering the respondents daily travel need.

Planning to buy a car in the next five years – Data highlight that 43.6% of the respondents from education category of post-graduation (technical) were willing to purchase 4-Wheeler Pure Electric Vehicle (e.g., Tesla, Mahindra Reva e2O) and not even a single respondent from this education category was willing to purchase a traditional petrol/ diesel 4-Wheeler. Around 30% of the respondents from higher education (M.Phil., PhD) category were willing to consider only a traditional petrol/ diesel 4-wheeler for their next purchase.

Information source for new technology - More than 50% of the respondents from all the education categories are dependent on television and internet. Newspaper also plays a significant role in creating awareness among all the education groups.

Influence on vehicle purchase decision – Data shows that more than 50% of the respondents from the entire education group are dependent on friends, market survey and their own analysis while making purchase decision for any vehicle.

Purchasing a new technology vehicle - More than 50% of the respondents from all education groups were in favor to wait until the new technology is widely accepted and proven before considering purchasing it.

Important factors for choosing vehicles – Data highlighted that more than 50% respondents from all the education groups rated fuel efficiency, safety, and vehicle reliability and air conditioner as absolutely essential factors for choosing the vehicle.

Willingness to buy Electric Vehicle - More than 80% of the respondents are willing to buy Electric Vehicle provided they can get the vehicle which has all the desired factors. Data also

highlighted that all the respondents who were postgraduate in technical field and 97.8% of the respondents who has completed post-graduation in general category were willing to buy the EVs in future.

Willing to pay premium for EVs – Survey data shows that more than 20% respondents across all the education group does not want to pay any premium for the mild hybrid/EV. No respondent from any education group wanted to pay the premium which is above 30% of the compared petrol/diesel car. This is an important factor which EV manufactures needs to consider while making the different models of EV.

Awareness on National Electric Mobility Mission Plan - Overall there is very low level of awareness on the National Electric Mobility Mission. More than 25% of graduates are aware of the NEMMP compared to less than 10% technical postgraduates and 15% PhD students.

Encouragement of electric vehicles by State and Central Government - More than 70% of the respondents from all education categories are in favor of transport policy of the state and Central Government which should encourage electric vehicles.

Ways to encourage electric vehicles through government policies - Majority (>90%) of the respondents from all education category except 'other education' suggest that government can encourage electric vehicles by building a supportive road network.

Incentives to promote EVs - More than 75% of the respondents from all the education categories were in favor of bonus payments to EV buyers, exemptions in toll tax, road tax, commercial tax and registration fees. All the respondents from all education categories were in favor of free parking space for EVs.

Employment Opportunities by EVs - 56% of the graduates were hopeful that the EVs will provide employment opportunities in coming years whereas 12% of the respondents were not very optimistic.

Views on hazards due to fossil fuel cars in near future - More than 70% of the respondents from all education groups strongly agreed that the fossil fuel cars are the cause of air pollution. They

also shared that the social use of outdoor space due to traffic has also been reduced in last few years.

Services that may improve in near future - Respondents from higher education category were not in favor of government subsidies, only 22.5% of respondents from this education category strongly agreed that government subsidies will improve in near future however 82.1% of the technical (post graduate) respondents shared that they strongly agree that government subsidies will improve in future.

Possibilities for Electric Vehicle - 60% or more respondents from every education category strongly agreed that EVs has strong future for two-wheeler segment. 50% or more respondents from each education category strongly agreed for the inclusion of three-wheeler segment. Similarly, 55% or more respondents from each education category strongly agreed for the inclusion of four-wheeler (Car) segment. Respondents were not so much in favor of inclusion of heavy commercial vehicle in EV segment.

Analysis of Responses by Age Groups

Type of vehicle currently own/drive - Data shows that in age group of 50 and above there is no respondent who owns a four-wheeler which has a price of over INR 10 lakhs.

Estimated average daily drive – Data shows that more than 85% of the respondents from each age category travels less than 80 kms in a day and can easily be targeted for EVs.

Planning to buy car in next five years - More than 75% of the respondents from every age group are planning to buy a car in the next 5 years. 60% of the respondents from above 50 years would like to 4-Wheeler Mild Hybrid (e.g., Maruti Ciaz SHVS) and remaining 40% would only consider buying a traditional petrol/ diesel 4-Wheeler.

Awareness about new technology – Data shows that Internet, television and newspaper are three major sources of information for all the age groups and can be used by manufacturing organizations to promote EVs in future.

Influence on vehicle purchase decision - Market survey, self-analysis and recommendations of friends are the influencing factors for vehicle purchase for majority of age groups.

Purchasing a new technology vehicle - More than 50% of the respondents from age group of 21 to 40 would like to wait until the new technology has been widely accepted and proven before considering it.

Important factors for choosing vehicles - More than 50% of the respondents from each age group have rated factors, i.e. safety, purchase price, reliability, air conditioner, vehicle emission and pollution as an essential factor.

Willingness to buy Electric Vehicle - All respondents who were above 50 years age were willing to purchase the EVs. Data highlighted that more than 50% of the respondents from all age categories are willing to use the EVs as a primary vehicle. Data also highlighted that 30% of the respondents from each age group are not willing to pay any premium for EVs compared to a conventional (diesel/petrol) engine vehicle, however 40% of the respondents from all the age categories are open to pay premium of 1-10% for EVs. No respondent had shown interest to pay more than 30% premium for EVs.

Extremely important concerns about electric vehicles - More than 50% of the respondents shared that the after-sale service, roadside assistance (Emergency) and on-going maintenance and operative costs (including battery replacement) are extremely important for all age group.

Awareness on National Electric Mobility Mission Plan - Less than 20% of the respondents from all age groups were fully aware of NEMMP. This shows that Government must promote the NEMMP scheme and EVs among the consumers.

Encouragement of electric vehicles by State and Central Government - Data shows that 65% or above respondents from all the age group strongly feel that State and Central Government should encourage electric vehicles for public and private transport.

Ways to encourage electric vehicles through government policies - Above 85% of the respondents from all age group were in favor of building road network to support the Electric Vehicle through government policies.

Incentives to promote EVs - More than 90% respondents from all age groups were in favor of direct incentives of Bonus payments to EV buyers, Exemptions in toll tax, Exemption for road tax

and Exemption from commercial tax. All the respondents from above 41 years of age were in favor of indirect incentives of car exchange program, free charging in public space, battery buyback guarantee and free space in parking slots to promote the EVs in market.

Employment Opportunities by EVs - Data shows that above 55% of the respondents from all age groups expects the EVs will create employment opportunities in both organized and unorganized sectors.

Views on hazards due to fossil fuel cars - All the respondents of above 50-year age category strongly agreed that air pollution, noise pollution, acid rain, stress and anxiety are due to fossil fuel cars.

Services that may improve in near future - All the respondents above 50 years were in favor of charging points for electric cars and government subsidies for promoting the alternate transport.

Possibilities for Electric Vehicle - More than 80% of the respondents either strongly agree or agree with the statement that possibilities of introducing two-wheeler, three-wheeler, four-wheeler (Car) and train is very high in Electric Vehicle segment.

Analysis of Responses by Income Group

Expenditure percentage on transportation from yearly income – Data concluded that the higher the income category of the respondents, more amount is spent on transportation.

Estimated average daily drive of the respondents - From each income group more than 80% of the respondents travels up to 80 km in a day which means they can be easily targeted customer considering the driving range of existing models of EVs in India.

Plans for purchase of new car in next five years - Close to 80% of above respondents are planning to purchase car in next five years. Around 2/3rd of the respondents are willing to start with 4-Wheeler Mild Hybrid (e.g., Maruti Ciaz SHVS) and 4-Wheeler Pure Electric Vehicle (e.g., Tesla, Mahindra Reva e2O). There are responedents (24.3%) who has yearly income above INR 12 Lakh still would like to consider buying a traditional petrol/ diesel 4-Wheeler in their next purchase.

Awareness about new technology – Data reveled that there is a difference between sources of information among yearly income groups. In all income group, internet is the main information source followed by television and newspaper. Radio is the least information source for all the income groups.

Influence on vehicle purchase decision - 50% or above respondents from all income groups are dependent on friends, market survey, and their self-analysis for purchasing the new vehicle.

Purchasing a new technology vehicle - 50% or above respondents shared that want to wait until the new technology is widely accepted and proven in the market. 23.6% of the respondents from income group of INR 8 lakh to INR 12 Lakh are willing to purchase new technology vehicle without having any prior reviews.

Willingness to buy Electric Vehicle - Respondents from all income groups were interested in purchasing an electric motor vehicle once they become easily available in the next couple of years. Additionally, there is no significant difference among the views of respondents from yearly income group of INR 8 lakh or above.

Willing to pay premium for Electric Vehicle - No respondent from any income group is willing to pay more than 30% of premium for alternate energy transport. 55.7% of the respondents who had yearly income more than INR 12 lakh were willing to pay premium of 1-10% compared to other fossil fuel cars available in market. This shows that the respondents are price sensitive and manufactures must keep the cost into their mind while launching the EVs in market.

5.3 Recommendations

Although EV industry has attracted a lot of media attention in recent years along with government focus, there are still not many players who can manufacture the EVs as per consumer demand. The EV policy should collectively aim at improving affordability and acceptance of electric vehicles by: (1) bridging the viability gap, (2) enabling charging infrastructure, (3) encourage domestic manufacturing, (4) creating public awareness and (5) other enables including battery swapping and battery recycling. The scholar provides various recommendations which can be taken up by industry players, government departments and other like-minded people:

Promotion through various institutions:

- The government should promote environmental education through various institutes such as schools, colleges and universities. The youth needs to be sensitized about various side effects of fossil fuels and the need to reduce our dependance on these fuels. This initiative can control environmental damage.
- Through the study it was revealed that media plays an important role in the promotion of any issue, product or concept. The government and the people associated with electric vehicles can develop strong ties with the media, both print and electronic.

Infrastructure development:

- Significant research is required to reduce the charging time of batteries so that people can purchase more electric vehicles in the future. A phased approach is required by the government for developing an infrastructure which includes charging stations, better quality of roads and vehicle maintenance related to service stations for such vehicles. This will reassure the customers about the feasibility of EVs.
- Production of electric three-wheelers is a viable and meaningful option in India. On an average, three-wheelers in the metro have a daily run of 120 kilometers, with an average trip of 8 kilometers which can be easily fulfilled by an electric prototype. So, the automobile manufacturing companies can be motivated with incentives from the government and huge business opportunities to develop electric three-wheelers with a robust body, designs, and lithium-ion batteries to ensure that they succeed in the market.
- Engineers and automobile manufacturers must work together to develop techniques to quickly charge the EV batteries. Mahindra and Mahindra claims that if its newly launched Reva EV car is charged for 15 minutes; it can travel 25 Kms which is not acceptable by a busy consumer in Delhi or Mumbai.

Providing initial subsidies:

- Infusion of capital support and government subsidies can play a key role in acquiring new customers and establishing the market for electric vehicles in India. Various subsidies such

as exemption from local and state tax, waiving the road tax, exemption from toll taxes and parking charges, access to bus lanes etc. can push the demand for such vehicles.

- The Government of India in association with the state governments should encourage and motivate Indian automobile manufacturers through incentives, tax exemption or reduction and other modes to innovate and produce electric vehicles.

Introduce more environmentally friendly vehicles

- Government needs to push the manufacturers to build the electric vehicles as per the needs and expectations of the customers. Greater competition amongst manufacturers will lead to production of cost effective vehicles which will increase the market size and customer base.
- Public transport, specifically EV buses, could be introduced in smaller routes in cities. Electric buses can be utilized as feeder buses.
- There should a good budgetary provision by the government for Research & Development in electric vehicles and associated areas. Such allocations will motivate the researchers to do extensive research in this area.

Promotion of EVs by Government Bodies

- By introducing a policy and legislation framework, environmental pollution can be controlled. The legislation can include restriction in the uses of private cars or strengthening the public transport system.

To summarize the conclusion of the study, one can say that EV market forecast is indispensable for market evolution, for projection of demand and for positive government initiatives. The direction of innovation and technological development should be environment friendly and should make EVs cost effective for all stakeholders. It is critical that battery charging time is minimized, driving range is maximized and ample charging stations are made available to the consumers. This study has attempted to cover all these aspects hence it can be considered as a futuristic work.

This study discusses ecological concerns, marketing strategies, the resale value of batteries and EVs, and gender sensitivity, policy decisions, incentive support from the Government, R&D,

and all pertinent issues relating to EVs in India. Policy makers, environmentalists and automobile companies, students, researchers will find answers to the questions they are seeking while getting ready for the era of responsible energy usage. They will benefit from this study about what the Indian consumer wants from electric vehicles in the coming years, and how society can make a concerted effort to ensure that the optimistic forecasts about electric vehicles become a reality in the immediate future. This study has intended to analyze the importance of socio-economic issues that a consumer will consider if he wants to shift to EVs.

This study has identified key influential socio-economic factors that can affect the growth of Alternative Energy Transports in positive or negative way and impact of Alternative Energy Transports and whether any substantial difference will take place in the society once they are introduced at mass level. Researcher has also given insights to the policy makers in government department so that framing of different types of incentives like tax credits, parking rebates, exemption in road tax, upfront subsidies can be done effectively for Alternative Energy Transport.

The scholar has attempted to put forth all the socio-economic factors that play a role in making EVs which is a nascent industry attractive to consumers and attempts to analyze all the key players and bring them on the same table. As EVs will be the future of transport industry, this study could provide all the key players an insight to the mind of the consumer and help them to offer EVs at an affordable price and with high battery charge. There is no doubt that in the next 20 years, EVs will dominate conventional vehicles and this study is an attempt in that direction.

5.4 Social Work Recommendations

Any new concept requires time for the consumers to shift to it en masse provided it fulfils all the consumer expectation. The shift to EVs will be slow as battery, price and charging stations are unresolved issues despite government support. Though the government is strongly promoting EVs, all the above-mentioned problems remain unsolved. Shifting to EVs will benefit mankind socially and environmentally which is the main concern today. India is home to 14 of the most polluted cities in the world and it will get worse in times to come.

The researcher recognised the need of trained social workers who could prevail upon the consumer to shift to EVs despite all the problems. ‘Word of mouth’ marketing is the strongest

marketing and these social workers can gently persuade the consumer to at least think of EV as a possible purchase. Consequently, if there is a demand, the manufactures would invest more in EV technology, produce more and subsequently the price barrier will come down and the charging infrastructure would spring up in many places.

These social workers can also sensitize the public to switch to EVs as their second vehicle. They can act as an interface between the government and companies like Swiggy, Zomato, courier boys for Amazon, Flipkart etc. to switch to an electric two-wheeler at a subsidized rate and could also earn brownie points for these companies. Social workers can act as intermediary between the car manufacturers and car aggregators' like Uber and Ola to shift to Alternate Energy Transport like CNG and EV in the near future.

Children are the future of our country and are now recognised as having a decisive influence on buying preferences of their parents. The social workers can start at school level and give information about the EVs regarding their need, government schemes and benefits to the environment to the children and teachers. These talks may lead to some sale for the manufacturers and awareness among the consumers. They can provide informative materials to the students, teachers and the parents in the workshops conducted by them leading to positive learning.

The researcher recognises the need to conduct such seminars, programs at a school, district, state and national level to sensitize consumers about Alternate Energy Transport need and make a gradual shift to EVs for sustainable development. There should be a constant interaction between these social workers and the consumers buying two wheelers, three or four wheelers to shift to EVs.

Women and female college students can be targeted by these social workers to shift to EVs as it will eliminate the need to stand at gas stations to fill in petrol and their EVs can be charged within the safety of their residences. Women are generally more conscious of their environment and would help in cleaning the pollution levels for the good health of their family members by shifting to cleaner technology.

This study has a tremendous potential to tap into the social sector which can act as an intermediary between the various stakeholders. A different preference backed by facts and figures,

followed by a gentle persuasion can hasten the shift to Alternate Energy Transport. This is the need of the hour and an all concerted effort will help us achieve this progression faster.

5.5 Scope for Future Research

The results from conducted survey gives possibility to analyze EVs market from many other perspectives that can be used for different purposes. There may be inherent distinctions among the urban, semi-urban and rural consumers in their preferences due to different socio-economic characteristics, resulting in a scope for future research to compare the behavior of these three major groups of people.

Additionally, to understand better consumer preferences, companies need to focus on following areas such as brand image of EV, conducting the same survey in others Indian city and comparing the results with this study, EV market forecast to develop market evolution, growing demand, innovation and technology, conducting a survey on current EV users in India for acceptance of the charging time and driving range.

The researcher has attempted to cover many important and relevant aspects which are necessary to bring all the various stakeholders on the same page. This study will provide a direction to the various stakeholders to understand the psyche and aspirations of the Indian consumer and at the same time play a decisive role in leaving a better environment for our future generation.