

# Electric Vehicles are a sustainable option to Internal Combustible Vehicles: Review based Article

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## ABSTRACT

Electric vehicles are the need of an hour, as they are seen as an eco-friendly option of internal combustible vehicles. Though the government of all the nations are taking all possible steps to make electric vehicles acceptable to the public by providing purchase incentives, building charging stations, promoting the use of EV by providing different subsidies, but when it comes to social acceptance there is a long road to cover as ICV are having a strong hold not only on the market but also the mind-set of people. In order to overcome this hurdle, it is necessary to bridge the gaps of income, information, and knowledge about electric vehicles.

**KEYWORDS:** Electric vehicles, sustainability, green environment.

## 1. INTRODUCTION

Concerning the 2030 Mission of the Government of India, the availability of all types of E-Vehicles is increasing in Indian Market, as per the report published by the newspaper The Hindu (**Balachandar, 2021**) the sale of E-Vehicles is witnessing a steep rise, but in order to achieve the target of 2030 only the rise in sales is not enough, these E-Vehicles will also have to sustain in the market for a longer period of time and to attain that sustainability they have to fulfil the sustainability norms which if taken from the principle of Triple Bottom Line to ensure Sustainability are social acceptance, economic impact, and environmental benefit. As per the study conducted by **Gimenez Cristina, (2012)** on 19 developed and developing countries it was witnessed that there are companies in these nations conducting various internal and external programs to achieve the sustainability role, but even after all possible efforts they are able to achieve the only environmental and social benefit, thus the attainment of all the three benefits is still a question even for them. On other hand India is a country with great environmental concerns with reference to the IQ Air report (**IQ Air, 2020**) India has maximum cities with the highest rate of pollution, now when taking into consideration the average age of our nation once upon a time India was considered to be the world's youngest nation whereas as per the mapping done by Avery Koop (**Koop, 2021**) in his report on Mapping the world's oldest and youngest nations, India is now holding 91st position in the world, whereas as per the report published by Mint (**S, 2020**) Rajasthan will be holding 7th position in India concerning increase in population by 2036.

If the above data is taken into consideration, in the coming years India will be having a considerable young generation hence the responsibility to conserve the climate and achieve the target of 2030 lies on the shoulders of today's Generation Z people. In order to achieve the goal of sustainable living and conserve the climate the first action that needs to be taken is the conservation of natural resources by minimizing their usage and the upcoming E-vehicle if accepted by Indians can become a stepping stone in that direction and in achieving the Goal 2030. There is a huge range of E Vehicles available in the market when it comes to 2 wheelers and four-wheelers, and both of them have different specifications e.g. an E-Bike can be treated as a replacement to a regular bicycle which has no major impact on the environment as a regular bicycle works on physical energy but it has an economic negative impact as it is costlier as compared to a regular bicycle, but this is not the case of E-Scooters and E-Cars, as their regular version i.e. the ICV (Internal Combustible Vehicles) runs on fuel which is not only costly as compared to electricity but is a major cause of smoke which causes air pollution, resulting into a rise in health hazards. The AQI index published by **IQ Air, (2020)** is very alarming and if no action is still taken the days are not far when the list of the most polluted 15 cities in the world will have only Indian names, as based on the report published in an article of Down to Earth (**Roopak, 2021**) the climate change is not a hoax but is now becoming a hard-core reality as in the year of 2021 the tea gardens of Assam did not see the second crop and as per the report of AQI index (**Desk, 2021**) of Delhi the schools had to be closed due to students health concern, thus can be seen that the concern is grave.

To help the Government of India to achieve the Goal 2030 and not achieve this 15 cities target is the primary duty of every Indian which is possible by changing their preferred mode of personal transport. But whenever the talks about this change take place the first problem that anyone faces is if not an ICV then what? They have to travel long distances on daily basis. The solution to this problem came in the face of E-Vehicles but this option is still in the process of gaining acceptance in Indian society, especially in urban India, thus with the help of this study the researcher has made an attempt to shortlist the pressure points, and by utilizing these pressure points the sustainability issue of E-Vehicles is addressed.

## 2. LITERATURE REVIEW

**Faria Ricardo et al. (2012)** conducted a study based on Well-To-Wheel (WTW) Methodology as a special type of Life Cycle Assessment. This study was conducted taking into account different aspects of energy supply and vehicle technologies into consideration. It was concluded that the BHEVs are having comparatively less consumption of energy and hence lower emission rate also, but on the cost aspect, both ICV's and EV's were standing on the same grounds.

**Aronson J et al. (2012)** mentioned the three basic gaps which are necessary to bridge even in today's scenario that is the income gap between rich and poor, the information gap between scientists and consumers, and the ideological gap between economists and ecologists. The information gap is now bridged but all other gaps are still to be bridged to attain sustainability for e-vehicles.

**Onat C N et al. (2014)** studied 19 different types of powered vehicles by charging them through the existing power grid in the U.S it was concluded by them that electric vehicles have the lowest greenhouse gas emission and ecological damage as compared to their contribution to the US economy. But the study didn't fully favour electric vehicles as they didn't perform well in the water-energy ratio.

**Dhar, et al. (2017)** in the study conducted to test the long term co-benefits of EV in India, the researcher has analysed the existence of EV based on the continuation of the existing EV policies, the continuation of supply of EV's but without a budget constraint, and a 'low carbon' scenario which uses the external price for CO<sub>2</sub> in line with the global target of 2 °C temperature stabilization. The researcher has made a comparison of co-benefits as well as co-costs, considering local air quality, national energy security, and CO<sub>2</sub> emissions in India as benefits and sourcing of raw materials for batteries and battery reprocessing and disposal as co-cost. As per the study, electric two-wheelers were gaining ground and were expected to achieve the target by 2030, but the same cannot be said for 4-wheeled electric vehicles. It was concluded by the researcher that the use of electric two-wheelers was though not making a significant contribution towards air pollution and energy security but has proved fruitful in the case of carbon emission, which stated that the early push policies were working in favour of electric two-wheeler, and policies are required to gain better co-benefits.

**Aboushaqrah N. N. M et al. (2019)** stated that Qatar is targeting to achieve a total of 10% coverage of electric vehicles by 2030, they stated that as per comparisons of 9 different types of vehicles based on the Life Cycle Sustainability Assessment framework it was found that electric vehicles are a better option in terms of various environmental factors and cost-effectiveness whereas they do not contribute much when it comes to national economic terms.

**Bandeira R A M et al. (2019)** in a study conducted in Rio de Janeiro it was concluded by the researcher that when Light Delivery Electric Vehicle are compared with E Tricycle for the parcel delivery purpose the tricycle proved to be a more beneficial option when it came to the economic, environmental, and social aspect.

**Zagorskas J & Burinskiene M (2019)** stated that the use of E-Vehicles is beneficial as a Personal Mobility Vehicle and thus can sustain in the urban setting but at the same time, it has certain drawbacks also which are problems with street space sharing, road safety, and traffic offenses.

**Pisu M et al. (2019)** conducted a study to check the sustainability of E-Bikes as compared to ICV using the Life cycle assessment model and Performance assessment model, it was derived in the study that based on LCA Lithium-Ion batteries were considered best for private E-Vehicles, in order to achieve the sustainability goals it was mentioned that the efforts should be made to make a hybrid E-bike whose weight is similar to that of a normal E-Bike and can give better performance only then these bikes can sustain in the market.

**Bahamonde-Brike (2020)** has stated in the article that many aspects are triggering and hampering the adoption of E-Vehicles. It is stated in the article that many researchers have considered that E vehicles are a God-given gift for Decarbonization, but it is not considered that in countries using the non-renewable source of energy for electricity generation the benefits generated from the use of E-Vehicles is nullified, whereas in countries using renewable sources of energy for electricity generation the decarbonization process has become neutral.

**Sun Q et al. (2020)** have concluded in the study on the modal shift of e-bike use in the Netherlands, that people arriving at retirement age, people staying in rural areas, and youngsters tend to reduce their car use after acquiring an E-Bike. Moreover, people use a shorter transit route while using an e-bike as compared to cars. The researcher has suggested that improvement in cycling tracks could increase the use of e-bikes in the urban areas too.

**Viola (2021)** has conducted a study pointing out various constraints every nation is facing in encouraging the use of EV's in their nations some of them are range, charging facilities, explosive EV and so on, moreover the researcher has also pointed out in the survey that ecological concerns are more acute for females as compared to males. Though the vehicles are registered in the name of male family members but are usually used by female as they are compact, useful, and has ZZZZZZZzzzzz sound as compared to Vroom Droom or Bhroom Bhroom. But the study concludes that as the stated concerns were addressed in the studied region of Sweden, the barriers to owning an electric vehicle are removed and the acceptability ratio increased.

**Alramadhan, et al. (2022):** have conducted a study in the Gulf Corporation Council region of Kuwait, which is comparatively arid and has major oil reserves. In this study, the triple bottom line aspects of environment, economic and social aspects are checked based on the mathematical model. In which environmental factors are tested based on the Life cycle assessment table, the economic aspect is checked with the help of NAV and the social aspect is checked by the response received from the stakeholders, overall it was stated from the analysis that there was no major gap in between the environmental impact and the economic aspect was tightly held with the government incentives but the social impact was in favour of ICV it was witnessed that EV were not still an embraced concept, but economically and environmentally they can be a suitable option even for an oil-rich nation.

**Kumar, et al. (2021)** have stated that though EV's are acknowledged as a safe transportation option acceptance as commercial vehicles has not received the desired response in the Indian market, as it is facing many financial and technological hindrances, from the three-stage evaluation to find out the conducive factors for EV adoption, it was concluded by the researchers that India is providing a very conducive environment for the EV's to grow by providing every possible government support in its production. In further stages, it was concluded that the two-wheeler sector is the best venture for any automobile investor in India as the Hero moto cop is holding the highest net worth. The biggest enabler to enhance the market of EV in India were found to be battery chemistry advancement and expansion of production capacities, and the work is done in both the aspects, thus it was finally stated by the researcher that in order to fight climate depletion the Government of India should EV promotion.

### 3. CONCLUSION

The study indicates that irrespective to nation, electric vehicles are a better option to internal combustible vehicles on environmental grounds as they produce lesser pollution, thus, are helpful in achieving the 2030 target of stabilizing the temperature at 2 °C, but it is to be taken into consideration that in order to make the electric vehicles acceptable there is a dire need make them acceptable in other contexts such as economic and social front also. Though the government of all the nations are taking all possible steps to make electric vehicles acceptable to the public by providing purchase incentives, building charging stations, promoting the use of EV by providing different subsidies, but when it comes to social acceptance there is a long road to cover as ICV are having a strong hold not only on the market but also the mind-set of people. In order to overcome this hurdle, it is necessary to bridge the gaps of income, information, and knowledge about electric vehicles.

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