

# Is India Ready for Electric Vehicles?

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**Abstract:- The automobile industry is changing globally. All businesses are considering a as it is essential for sustainable development, a better substitute for fuel-based vehicles. Which is when electric cars (EV) as an alternative are considered. electric automobiles can lessen the harmful pollutants that fuel-based cars generate that can seriously harm the environment to the surroundings. However, these vehicles have unique difficulties. In this paper, we'll address numerous infrastructural issues or obstacles for electric cars. Paper furthermore offers India's current state and whether it is ready for electric automobiles. What will happen Before electric vehicles became a common alternative, a few conditions had to be met. The study also covers the government policies that must be implemented in order to achieve sustainable development. Users encounter a variety of issues with charging stations. As a result, the document also offers information on the specs of the batteries and the availability of charging stations, which shortens the procedure a little. The report also discusses technical developments in the automotive sector with reference to electric cars. The article also discusses the government's policy regarding electric automobiles.**

**Keywords:-** *Electric Vehicles; Charging Stations; Sustainable Development; Government Initiative; Smart Charging; Charging Infrastructure.*

## I. INTRODUCTION

Rapid URBANIZATION and the growth of the automotive industry have had a major influence on people and the environment recently. The bulk of the cities in the nation experience urban air pollution at quite high levels, primarily in the form of CO, SO<sub>2</sub>, NO<sub>2</sub>, and PM (Particulates). The transportation sector is a significant contributor to environmental pollution. about 70%). The largest pollutant released by the transportation sector is CO. 90 percent of the total emissions. Hydrocarbons follow CO in the order. One of these 90 % of all carbon dioxide emissions are produced by the transportation industry, which uses either ither gasoline or diesel.

The automobile industry will account for half of all greenhouse gas emissions by 2030, according to the IEA. The evaluation strongly implies that the present transportation paradigm is unsustainable and requires a significant revamp. India is the third-largest emitter of CO<sub>2</sub> in the world, and in 2018 its emissions rose by 4.8 percent to 2.9 billion tones, with the transport sector accounting for 87 percent of all emissions. The aforementioned facts and figures serve as a stark reminder that India requires a more environmentally friendly and energy-efficient transportation system. Electric

vehicles (EVs) are one of the many possibilities for sustainable transportation, and they are gaining credibility as an alternative form of transportation (CVs). measurement and others are deliberate, using specifications that anticipate your paper as one part of the entire proceedings, and not as an independent document. Please do not revise any of the current designations.

Based on the energy source EVs can be classified into three types 1 BEVs (powered by only battery) 2 HEVs (hybrid small battery and conventional engine) 3 PHEVs (plug in with a large battery and a small engine).

BEVs are regarded as the purest type of electric mobility since they are powered exclusively by batteries and lack a traditional engine, but HEVs are seen as the most useful form of mobility because they have both battery and an engine. Electric vehicles are more environmentally friendly and less harmful to the environment than their traditional counterparts.

## II. LITERATURE REVIEW

The main goal of this paper is to determine whether India is prepared for electric vehicles or not. This will be determined using a variety of criteria, including the infrastructure for electric vehicles, government initiatives, social influence, the steps the Indian automotive industry has taken, and others.

### A. Shakya and Dixit (2021)

An overview of the work in the field of electrical vehicles is provided by Shakya and Dixit. It analyses the various types of electric vehicles and provides a development report for the EV industry. The problems and issues covered in this study are numerous. Finally, it outlines the potential for electric cars in India in the future. Some significant benefits of electric vehicles have the potential to *revolutionize* the car industry. India is the fifth most polluted country in the world, and automobiles that run on petrol are a major contributor to this problem. By 2030, India aspires to be a nation that only uses electric vehicles.

### B. Khurana et al. (2019)

Structured Equation Modeling (SEM) and Structured Dynamics Modeling were used to examine the data (SDM). Few people are familiar with these vehicles' qualities. A standardized questionnaire that asked about demographic, sociodemographic, and model variables was used to collect the data. A model has been suggested by the study to analyze variables that may affect the uptake of electric cars (EVs). It was discovered that the PEB and the BI's adoption of EVs are unrelated. Instead, it significantly improves ATT and the SoC. I support the widespread use of EVs.

### C. Kambli (2022)

Vehicle electrification is a game-changer for the transportation industry because it has significant energy and environmental benefits, including zero tailpipe emissions, a reduction in petroleum dependence, and high vehicle efficiency (EVs are roughly 3–4 times more efficient than comparable internal combustion engines, or ICEVs). With the aid of secondary research, the goal of this magazine was to comprehend the prospects and trends for electric cars in the future. According to the author, vehicle electrification integrates synergetic ally with changes in mobility, such as urban micro mobility, automation, and mobility-as-a-service options. It also aligns with larger electrification and decarbonization trends.

### D. Mishra et al. (2021)

The purpose of this paper by Mishra is to discuss the important factors that must be taken into consideration while developing the infrastructure for electric vehicle charging stations. The report discusses the technical advancements that are being made to improve charging station infrastructure design and management practices.

### E. Digalwar et al. (2021)

With the potential to be original equipment manufacturers and service providers in the electric vehicle sector, Digalwar seeks to develop and evaluate the elements impacting the sustainable production of electric vehicles in India. A thorough literature search was needed to comprehend the expansion and development of the electric car market. From internet databases including Emerald Insight, Google Scholar, Inderscience, ScienceDirect, Taylor and Francis, etc., 79 research publications from the years 2009 to 2019 were gathered and rigorously examined. Technological, social, cultural, economic, political, geographical, and environmental issues were noted.

### F. Mathew & Varaprasad (2022)

The research of Mathew and Varaprasad is important for determining the elements that influence the uptake of electric cars in India. For the case analysis, both qualitative and quantitative tools may be employed. The goal of Mathew and Varaprasad is to identify the elements that affect EV adoption in India. Many of these elements play a significant part in why the country is still falling behind in the adoption of cutting-edge technology like EVs. Various statistical methods are accessible for the in-depth analysis.

### G. Shalender & Sharma (2020)

India faces significant pressure to lower its energy needs and greenhouse gas emissions because it is a major energy consumer. Shalender and Sharma anticipate the adoption intention of 326 customers toward the purchase of EVs using an enhanced TPB model. According to the study's empirical research, purchasers' adoption intentions are positively correlated with attitude, subjective norm, perceived behavioral control, moral norm, and environmental concern. The study tested for non-response bias in accordance with the recommendations of Armstrong and Overton and Hill et al. They gathered demographic and socioeconomic data from

respondents as they distributed the questionnaire in order to determine the precise number of responses.

### H. Patel et al., (2021)

In this study, a survey of Indian individuals is conducted to see what they truly believe about electric vehicles compared to traditional I.C. engine vehicles. In a Google form, the following parameters are turned into questions with five response possibilities, ranging from 1 to 5, where 1 indicates a strong disagreement and 5 indicates a strong agreement. This paper's major goal is to comprehend the impact of performance expectations, effort expectations, perceived danger, social influence, perceived safety, behavioral intents, financial rewards, and perceived environment on Indian consumers' decisions to buy electric cars (EVs).

### I. Kesari et al., (2019)

Over the past ten years, the global market for electric cars has experienced tremendous growth. In this essay, Keshari analyses the potential for electric vehicles in India. Discuss the many frameworks and policies the Indian government has put in place to encourage the use of electric vehicles. Finish by describing how India may profit from these tactics both locally and nationally.

### J. Gujarathi et al., (2018)

To comprehend the actual situation, Gujrati, Shah, and Lokhande provided a case study from the viewpoint of the consumer. The needed rules, promotions, and obstacles to the expansion of the Indian market are reviewed. The present state of Indian road transportation is examined along with government policies and initiatives. Additionally, the study discusses the two- and four-wheeler industry participants as well as the existing Indian EV market.

### K. M et al., (2018)

Petroleum-based cars are being replaced by electric ones. Electric engines will be cost-effective for customers and significantly cut pollution when internal combustion engines are replaced. The authors have observed the possibilities and difficulties associated with the introduction of electric cars in India. They discovered that the main goals of EV adoption in India are to lower greenhouse gas emissions and lower oil costs. Additionally, they recommended that the government make the most of the potential offered and develop effective solutions to the problems that would arise from the adoption of EVs in 2030.

## III. OBJECTIVE OF THE STUDY

- To identify different sections where India is lacking in infrastructure development for Electric Vehicles (EV).
- To understand different initiatives taken by government to adapt electric vehicles in India.
- To understand market scenario of electric vehicles after covid situation and different aspects that will be challenges to the EV's in India.

#### IV. RESEACRCH METHODOLOGY

Thorough literature study was needed to comprehend the general viewpoint, existing situation, and potential impact of electric vehicles on India. Through a variety of internet resources, including Google Scholar, Inderscience, ScienceDirect, ScienceHub, and others, we have retrieved 12 research papers for secondary data covering the years up to 2022 and methodically examined them. The majority of those research were centered on why EVs are vital for the planet, particularly in India, and what are the problems connected with them, as well as what actions have been made by the Indian government and the country's auto sector. We discovered that the main limiting issues were a dearth of infrastructure for charging, a shortage of competent labour, a dearth of items created in India, etc.

This paper is purely based on secondary research data and proper citations have been done at the end of the paper.

#### V. ELECTRIC VEHICLE MARKET SCENARIO

India has one of the major automotive industries in the world; it is now the fifth-largest vehicle sector globally but is predicted to rise to the third position by 2030. If India switches to electric cars, it might benefit in the automotive sector in a number of ways due to the relative abundance of sustainable energy sources and the significant amount of manpower present in this market in India.

##### A. Market Review

The Indian Electric Automobiles Market was estimated to be worth USD 5.1 billion in 2020, and it is anticipated to grow to USD 47.3 billion by 2026, with an average annual growth rate of 44%+ throughout the anticipated time frame (2021-2026). India's automobile industry has suffered as a result of the countrywide shutdown and travel restrictions brought on by the COVID-19 virus. The nation's market for electric vehicles is continuing expanding despite the suspension and disruption of the logistic production and supply units.

While the Indian government is working hard in this area and electric car adoption is happening quickly in India, it is currently rather challenging for Indian consumers to embrace electric vehicles on a large scale. EVs are still a threat to the two-wheeler sector, but much more work needs to be done because they are not comparable to fuel-based vehicles. Two-wheelers powered by fuel get better mileage and are more cost-effective. The utilization of electric vehicles for delivery purposes is a new endeavor being launched by e-commerce behemoths like Amazon. This innovative programme will help India become pollution-free. The Indian government is also aiming to make electric vehicles, such E-buses, one of the main public transportation options.

##### B. Current scenario of electric vehicles in India

The COVID-19 pandemic had a tremendous impact on the automobile industry, but demand for electric cars is still rising in part because of new models like the Tata Nexon EV, Tata Tigor EV, and Mercedes-Benz EQC. The supply of

lithium-ion battery packs has been hampered by the COVID-19 pandemic. Additionally, the Indian government has stopped receiving battery shipments from China due to internal issues, pushing it to focus on battery production. India is giving electric cars a lot of attention in order to open up economic opportunities. The government has put in place a variety of regulations regarding electric vehicles that promote business development and customer education.

##### C. Government Initiatives

The Indian government developed NEMMP 2020 (National Electric Mobility Mission Plan) in 2013 and set the aspirational aim of having 30% of Indian cars be electric by 2030 after seeing the potential benefits of EVs (DHI 2017). Additionally, the Indian government revived the NEMMP 2020's FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) project, spending a total of Rs. 264 crores (PIB, 2018).

Despite the government's concerted efforts, the market share of electric cars in India's automotive industry is still quite small. There were 25,000 EVs purchased in 2016-2017, 92 percent of which were two-wheelers and the remaining 8% were four-wheelers, making up even less than 2% of the 25 million-strong country's transportation industry (SIAM 2017). The percentage fell even lower in 2018, with electric motors making up only 0.06 percent of all vehicles sold in India (PIB 2019). Each of these elements suggests that government support is necessary for electric vehicles to become popular.

##### D. Charging infrastructure

Batteries that power electric cars must be fully charged in order for them to run. What transpires, though, if the cars lose their charge? In this situation, it has to be charged at a charging station. There are now just 300 operational charging stations in India, which highlights a lack of adequate charging infrastructure. The government is thus concentrating on this period and formulating a plan for taxing infrastructure development.

#### VI. MAJOR CHALLENGES

##### A. High Cost

Customers cannot bear to spend so much money on something new. When compared to a car with a fuel-based combustion system, which costs up to 9 lakh Indian rupees with the same facilities, the new Tesla Model 3's price of roughly 60 lakh Indian rupees cannot be justified by those who want to purchase one. As a result, the pricing should be kept affordable for Indians in order to entice individuals to participate in electric vehicles. To make it feasible, we must first cease importing supplies from other nations, as doing so drives up the cost of materials, then offer some form of incentives to EV producers in order to motivate them to produce more EVs.

##### B. Lack of Technology

The worldwide development of electric cars is more reliable than Indian electric vehicle technology. Electric cars in India fall short in terms of efficiency, dependability, and

velocity. It affects the development of electric cars. Additionally, India's imports are growing as the value of its currency declines since India depends on other nations, such as China, for the equipment for electric vehicles. India is currently manufacturing its own EV parts thanks to proactive efforts as imports of items and parts from China have been stopped due to the COVID19 infection.

#### C. Lack of skilled Workers

Any industry needs a skilled worker, but the electric car industry needs it more than others because most individuals don't have any prior knowledge of the vehicles. Working in the EV industry has become difficult without it. Staff should get thorough training on electric car technology to overcome this issue, which will improve productivity and accuracy of electric vehicle manufacture

#### D. Lack of Made in India Initiatives

The consumer's wallet will undoubtedly take a significant hit if they purchase an EV from a multinational corporation like Tesla that is located outside of India since they would have to pay exorbitant taxation and excise duties. This is also one of the main reasons why consumers in India are not purchasing electric vehicles (EVs), as they have a very limited selection of models and face serious issues like a lack of skilled labour (where will the consumer go if they experience a problem in the middle of the journey) and a lack of charging points.

## VII. DISCUSSION

According to the abovementioned conclusions and analysis, India is prepared for EVs, but the government and automakers like Tata and Mahindra still have a lot of work to do. The car industry in India has a tonne of opportunity for electric automobiles. In addition to the fact that numerous Indian businesses, like Tata Motors, are trying to enhance their electric car concepts, Tesla is already seeking to create a foothold in India. There is a significant likelihood that EVs will become a new trend in India because the Indian government is working to make the country an all-electric car country by 2030. However, there are several areas to which greater focus must be given, such as:

- Recharging Stations.
- Research and Development in Battery Technology
- A non-profit organization called EVs Education was founded with the goal of teaching people about electric cars.
- The price of electric automobiles.

The future of electric cars is tough to predict, but this sector has a great deal of opportunity to grow and become a significant one not just in India but worldwide.

## VIII. CONCLUSION

Electric cars have a number of important advantages that might completely change the automobile industry. India is the fifth most polluted country in the world, and gasoline-powered cars are a big contributor to this problem. Electric

cars won't produce noise or smog; thus, they'll help India reduce its environmental issues as well as noise pollution.

After much discussion, it has become clear that electric vehicles are the way of the future. However, there are now a number of challenges in the EV market that may be resolved by government efforts, research, and policies. By 2030, India wants to have only electric cars on the road. Therefore, all of these initiatives will succeed in improving India's infrastructure for electric vehicles and flexibility.

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