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Sustainable Strategies and Optimization Techniques Practices on Electric Vehicles in India

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Abstract: *This paper aims to provide an overview of the electric vehicle (EV) industry in India, as well as some key challenges and opportunities that exist within it. It begins with a brief introduction to EVs, followed by a more detailed discussion of the latest trends in India's EV landscape. the study analyzes the current situation and future prospects of electric vehicles (EVs) in India. The analysis is based on a comprehensive literature review, which includes primary as well as secondary sources. Various factors affecting the adoption of EVs such as infrastructure, technology advancements and incentives have been discussed. This paper also focuses on various strategies that can help achieve a sustainable energy future by promoting electrified vehicles.*

Key Words: *Electrified Vehicles, Electric Vehicles, Indian Economy electric vehicles, electric vehicles market, electric car, government incentives for EVs*

1. INTRODUCTION :

Electric Vehicles (EVs) are the future of mobility, but they need to be designed with a focus on sustainability. India is a developing country and has a significant number of electric vehicles today. Electric vehicles (EVs) are slowly but surely taking the automobile market by storm(Hamurcu&Eren, 2020). The Indian government is also strongly supporting the electric vehicle industry, with plans to make India a global leader in the field of electric mobility by 2030. With this goal in mind, several Indian cities have started working on their own EV policies and strategies to promote renewable energy as well as reduce pollution levels in their areas. The Indian government has taken several initiatives to promote electric vehicles in the country, including setting up charging stations in major cities. The state of Karnataka was the first to start working on its own EV policy and strategy, which will be implemented between 2018 and 2020(Power & Diary, 2016). The Indian government is leaving no stone unturned to promote EVs. It has set a target of having seven million electric vehicles (EVs) on the road by 2020. The government has also launched several initiatives, including FAME II, to ensure that this target is met. The Electric Vehicles (Amendment) Bill 2017 was introduced in the Lok Sabha in March and has been referred to a select committee for further examination. However, the transition towards electric mobility is not going to be easy. There are several challenges that need to be overcome before EVs can become an integral part of our lives. One of the major ones is how cities can make sure that their EV policies and strategies do not create more problems than they solve(Alizadeh et al., 2016). India is a developing economy, and its transportation sector is no exception. With a rapidly growing population, India's cities are facing increasing pressure on their infrastructure. To help ease congestion and reduce pollution levels, many Indian cities have started to promote EVs as part of their mobility plans.

2. OBJECTIVES OF THE STUDY

The study aims to understand the current status of EV deployment in India and to identify how cities can best support this transition. It also seeks to develop strategies for improving EV adoption through more efficient use of infrastructure, improved mobility options and better access to clean energy. To understand the challenges faced by India in the transition to EVs and the strategies adopted to overcome these challenges.

3. RESEARCH METHODOLOGY

The study is based on secondary data collected from various government sources, reports, and studies. Primary data was collected through interviews with key stakeholders in the EV ecosystem including public agencies, fleet operators and fleet owners.

4. LITERATURE REVIEW :

India is witnessing a rapid growth in the number of electric vehicles (EVs). According to a report by NITI Aayog, India has more than tripled its EV sales between FY 2016-17 and FY 2018-19. In September 2018, the government announced that it will stop selling petrol and diesel cars from 2030 onwards(de la Torre et al., 2021). As the world moves towards a cleaner and more sustainable future, there is an increasing need for alternative modes of transportation. Electric Vehicles (EVs), which are categorized into three types: battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs) and fuel cell electric vehicles (FCEVs)(Power & Diary, 2016). There is a growing concern regarding the impact of CO2 emissions on climate change and its adverse effects on human health. In order to reduce these impacts, governments around the world have been encouraging the adoption of electric vehicles (EVs). E-mobility is one of the key components of India's efforts to reduce carbon emissions and to ensure a sustainable future. It has been estimated that EV adoption in India could help save up to 45 million tonnes of CO2 emissions per year by 2030(de la Torre et al., 2021).

However, the lack of adequate infrastructure for charging electric vehicles is a major hurdle in the adoption of EVs. The lack of charging infrastructure has been identified as one of the key reasons for low consumer acceptance and limited market penetration of EVs. The Government of India has launched several initiatives to promote the adoption of electric vehicles and charging infrastructure in the country(W. Khan et al., 2018). In 2017, it announced the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme, which provides financial support for a variety of initiatives such as setting up charging stations for EVs, conducting R&D activities on EVs, developing battery swapping technologies and promoting e-rickshaws among others. As part of its climate action plan and strategy, the Government of India has announced its plan to achieve 100% EV sales by 2030. The government has also set an ambitious target that all new cars sold in India will be electric by 2030(Iwan et al., 2021).

The Indian government has announced its plan to achieve 100% EV sales by 2030. The government has also set an ambitious target that all new cars sold in India will be electric by 2030(Enang& Bannister, 2017).The Government of India has announced a number of initiatives under the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) scheme. As part of its climate action plan and strategy, the Government of India has announced its plan to achieve 100% EV sales by 2030(Yun et al., 2018). In addition, the government is also working on developing a national policy for EV charging infrastructure and regulations that will allow drivers to charge their cars at public places(Awwad et al., 2018).

Electric vehicles are considered as a cost-effective and clean mode of transportation. The electric vehicles (EVs) can be charged from the grid or through renewable energy sources such as solar power, wind power, etc. In addition, EVs are also known to reduce greenhouse gas emissions by 80% when compared with conventional cars. In recent years, electric vehicles have become a hot topic in the automobile industry(Manogaran et al., 2022). The main motivation behind this shift is the increasing awareness of environmental issues and the need to reduce carbon emissions. Electric Vehicles in India Electric vehicles have been around for a long time(M. M. H. Khan et al., 2021). However, the idea of using electric vehicles as a mode of transportation was not that common until the 1990s. Since then, governments and automakers have taken steps to promote EVs. Moreover, many countries across the world have announced subsidies and incentives for electric cars in order to encourage people to switch from conventional vehicles to electric ones(Deb et al., 2018).

5. Sustainable Strategies and Optimization Techniques Practices on Electric Vehicles in India

In India, there are several players in the EV industry. Tata Motors has been working on electric vehicles since 2008 and currently offers three models: Tata Tigor EV, Tata Nexon EV and e2o Plus. Mahindra & Mahindra is another automaker that has been working on EVs for many years now and offers a range of electric vehicles including its flagship product, the eVerito. India is one of the most polluted countries in the world(Mahesh et al., 2021). According to a report by the World Health Organization, 13 Indian cities are among the 20 most polluted cities in the world. The government and automakers have been promoting EVs as a sustainable form of transportation in order to reduce pollution levels and promote public health. India is the world's fourth-largest automobile market. It has a population of 1.3 billion people, and over 300 million vehicles are in use in the country(Tu & Yang, 2019). India is also the third-largest oil consumer after China and US, with about 4% share of global demand. Electric vehicles are becoming popular with more and more people switching to this mode of transportation. However, there are still some challenges that need to be addressed in order for EVs to become as common as conventional vehicles(Li et al., 2019). For instance, the cost of electric vehicles needs to go down so that they can compete with conventional ones. The government of India has been taking steps towards promoting electric vehicles. In 2016, the government announced that it would provide subsidies on electric cars and buses. Moreover, it also plans to set up charging facilities for EVs

in order to make them more accessible for people. With the government taking steps towards promoting EVs, it is likely that more and more people will switch to using this mode of transportation(Xiong& Shen, 2019). This will help reduce the number of vehicles on Indian roads, which in turn will result in less pollution. The government also announced plans to promote research and development in the field of electric vehicles, so that India can become a global leader in this area. The government is also working towards making electric buses more common by providing subsidies for them. The government's efforts are already paying off(Hussain &Musilek, 2022). In 2018, the sale of electric vehicles surged by almost 70 percent compared to the previous year. In addition, the government has also made it mandatory for all new commercial vehicles to be electric by 2030. This move is expected to help reduce India's carbon emissions by up to 60 percent. However, there are some challenges that need to be addressed in order for EVs to become as common as conventional vehicles. For instance, the cost of electric vehicles needs to go down so that they can compete with conventional ones. In addition, the government has also been working towards increasing the range of electric vehicles. This is important because it will ensure that people feel comfortable using EVs as their primary mode of transportation. The government is also looking at ways to incentivize the use of electric vehicles(Al-Saif et al., 2021). For instance, it has been offering subsidies on manufacturing and purchase of EVs. In addition, various states have started giving preferential treatment to EVs by allowing them to drive on bus lanes or by exempting them from parking fees. The government has also been working towards creating a network of charging stations(Solanke et al., 2020). This will help increase the number of electric vehicles on the road and ensure that people can enjoy smooth commutes in them. In addition, India is also planning to build charging stations along its major highways so that drivers don't have to worry about their batteries running out of charge while traveling long distances. There are already some electric vehicles on the market that have a range of over 200 miles. However, this is still not enough for people to rely solely on them as a mode of transportation. The government is working with auto manufacturers to increase their range so that it can meet its 2030 goal(Gupta et al., 2021). The government has also been pushing for the development of infrastructure that supports EVs. This includes building charging stations, which are currently few and far between. The government is also planning to make it mandatory for all new commercial vehicles to be electric by 2030(Mak et al., 2013).

6. CONCLUSION :

The use of EVs is a step in the right direction for battling climate change. However, we need to do more than just switch to electric vehicles. We also need to improve our infrastructure and make it easier for people to use public transportation. In conclusion, electric vehicles are an important part of the future of transportation. They are more efficient than conventional vehicles, which means that they produce less carbon emissions. As a result, they can help reduce greenhouse gas emissions and fight climate change. As we have seen, EVs are more efficient than conventional vehicles. This means that they produce less carbon emissions and can help reduce greenhouse gas emissions and fight climate change. However, there is still a long way to go before the world makes the shift towards electric cars. Electric vehicles are an important part of the future of transportation. They have many benefits, including being more efficient than conventional vehicles and producing less carbon emissions. As a result, they can help reduce greenhouse gas emissions and fight climate change. However, there is still a long way to go before the world makes the shift towards electric cars. Electric vehicles are an important part of the future of transportation. They have many benefits, including being more efficient than conventional vehicles and producing less carbon emissions. As a result, they can help reduce greenhouse gas emissions and fight climate change.

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