

Transitioning to electric vehicles: Opportunities and challenges

Gurdev Singh *

SDWG Govt. College Beetan Distt. Una, Himachal Pradesh-1760601, India.

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Abstract

The rapid improvements in India's financial status and the inadequate transport system have significantly contributed to the surge in cars and two-wheelers. However, these motor vehicles, which predominantly run on petrol and diesel, pose a severe threat to the environment as they emit greenhouse gases such as carbon dioxide, carbon monoxide, Methane, sulphur oxides, and nitrous oxides and particulate matter etc.. These emissions contribute significantly to air pollution, posing a grave threat to human health, especially in urban areas. It is imperative to take action now to safeguard the planet from future catastrophes and ensure a safer environment for both current and future generations. One significant step we can take is transitioning to electric vehicles (EVs), which have far less environmental impact compared to those running on petrol and diesel. The Government of India has initiated several initiatives to promote EV usage. According to Statista, as of March 2023, there were 225,103,000 units operational EVs of all types in India. Electric vehicles emit significantly lower carbon emissions than gasoline vehicles, making them a crucial part of reducing environmental harm. According to recent studies, by 2030, EVs are expected to reduce nitrogen oxide by 17%, particulate matter by 18%, carbon monoxide by 18%, and carbon dioxide by 846.3 million tons. This paper highlights the transitioning towards zero emission public transport and the positive impacts of Electric vehicles on environment and the challenges before EV industry.

Keywords: Green house gases; Catastrophes; Impact; Matter; Gasoline; Imperative

1. Introduction

The rapid growth of industries and economies worldwide has greatly increased the demand for energy. This demand is mostly met by using fossil fuels, which produce greenhouse gases and other harmful substances that damage the environment. It's now time for each of us to do something to protect the environment by reducing carbon emissions. It's well known that vehicles running on gasoline emit a lot of harmful gases like carbon monoxide, carbon dioxide, sulfur oxides, nitrogen oxides, and particulate matter. In contrast, electric vehicles produce much fewer emissions. By switching to electric vehicles, we can all contribute to safeguarding the environment from potential disasters for both current and future generations. Currently, there are three types of electric vehicles: Type A, Type B, and Type C.

2. Types of Electric Vehicle's

- **Type A Electric Vehicles:** Type A electric vehicle operates solely on electricity stored in rechargeable batteries. These vehicles do not have an internal combustion engine and rely entirely on electric motors to propel them. Type A electric vehicles are also known as Battery Electric Vehicles (BEVs). They considerably reduce air pollution and greenhouse gas emissions. These vehicles are designed to offer environmentally friendly transportation solutions with lower operating costs compared to traditional gasoline or diesel vehicles.
- **Type B Electric Vehicles:** These electric vehicle refers to a Plug-in Hybrid Electric Vehicle (PHEV). These vehicles combine an internal combustion engine (typically gasoline) with an electric motor and a rechargeable

* Corresponding author: Gurdev Singh

battery pack. Type B electric vehicles can operate in two modes: electric-only mode using the battery, and hybrid mode where both the gasoline engine and electric motor work together. They offer flexibility by allowing drivers to switch between electric power and gasoline power as needed, making them suitable for both short urban trips and longer journeys. Type B electric vehicles typically emit lower levels of greenhouse gases and pollutants compared to conventional gasoline or diesel vehicles, contributing to reduced environmental impact.

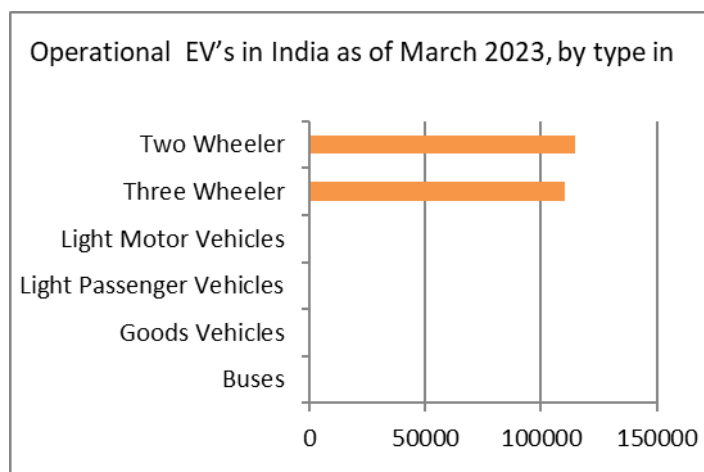
- **Type C Electric Vehicles:** Type C electric vehicle encompasses various advanced technologies in the electric vehicle (EV) category. It includes: Hydrogen Fuel Cell Vehicles (FCVs), Extended-Range Electric Vehicles (EREVs), Other Advanced EV Technologies. Type C electric vehicles represent cutting-edge solutions in sustainable transportation, offering alternatives to traditional gasoline and diesel vehicles with lower emissions and reduced environmental impact. They are at the forefront of technological advancements in the automotive industry, contributing to efforts to combat climate change and improve air quality

3. Electric vehicles in India

In India at present two wheelers lead the electric vehicles according to the Statista reports. Operational electric Vehicles in India as of March 2023 by type in (1000 units) is listed hereunder

Table 1 Electric Vehicles in India March2023(1000 units)

Buses	3.77
Goods Vehicles	8.42
Light Passenger Vehicles	11.9
Light Motor Vehicles	76.4
Three Wheeler	110354
Two Wheeler	114725



Source Statista @ 2024

Figure 2 Operational EV's in India March2023(1000 units)

4. Incentives of Electric Vehicles

The government of India offers different types of financial incentives to make electric vehicles more affordable. The key mechanisms for getting these incentives are:

- **Purchase Incentives:** Direct discount provided to the user on the cost of the electric vehicle
- **Coupons:** Financial incentive where the amount is reimbursed later
- **Interest Subventions:** Discount offered on the interest rate while availing loan
- **Road tax exemption:** Road tax at the time of purchase is waived off

- **Registration fee exemption:** One-time registration fee applicable on new vehicle purchase is waived off
- **Income tax benefit:** Provided as a deduction on the tax amount payable by an individual to the government
- **Scrapping incentives:** Provided upon de-registering old Petrol and Diesel Vehicles
- **Others:** Incentives such as interest-free loans, top-up subsidies, special incentives on electric three-wheelers, etc. can also be availed

5. Electric Vehicles impact on Environment

Electric Vehicles would play a vital role in sustainable transportation as they offer a cleaner alternative. The key benefits of electric vehicles on environment may be summarized briefly below:

- **Zero Tailpipe Emission:** Electric vehicles produce zero tailpipe emissions. Unlike traditional Internal Combustion Engines (ICE) that burn petrol or diesel, emitting harmful carbon emissions through the exhaust.
- **Minimise Resource Depletion:** The batteries in EVs can be recycled, reducing the need for new resources and cutting down on waste. Encouraging greater adoption of EVs can substantially mitigate the environmental impact of extensive mining and the depletion of non-renewable resources.
- **Less Harmful Fluids:** Motor oil, commonly found in petrol or diesel vehicles and not in EVs, contains toxic compounds that can contaminate water sources and harm both humans and wildlife. This emphasis on using less harmful fluids makes EVs a more environmentally friendly.
- **Reduced Noise Pollution:** Electric vehicles play an important role in reducing noise pollution, as electric motors operate significantly more quietly. The importance of electric vehicles in noise pollution reduction extends beyond just urban settings.
- **Eco-Friendly Materials:** The electric vehicles importance lies not only in their operational benefits but also in the use of eco-friendly materials. While many manufacturers use recycled materials in smaller components, EV manufacturers lead the way by integrating these materials into the vehicles structure.
- **Increase in Clean EV Battery:** Electric vehicle technology continues to make remarkable developments in reducing carbon footprints linked with their batteries.
- **The eMob Calculator:** UN Environment has developed tools to estimate the potential of saving energy, greenhouse gas and air pollutant emissions as well as money through a dedicated shift to electric mobility. Three separate calculators exist for Motorcycles Light duty vehicles Buses. The eMob calculator gives idea about magnitude cost-benefit analyses of shifting towards a large scale use of electric vehicles can be developed for cities, regions or countries.

6. Challenges before the EV Industry

- Purchase cost of EV is very high as compared to gasoline vehicles.
- people are worried about how far they can travel in an EV before finding a charging station and then having to wait through a long charging session.
- There is limited selection option of EV models.
- There are very few trained EV repair technicians and even fewer qualified independent shops.
- Small charging infrastructure.
- Installation of public charging is very expensive.

7. Conclusions

Electric vehicles are pivotal in shifting the global focus from fossil fuels to cleaner, renewable energy sources. Purchasing an electric car is strongly recommended to support sustainable transportation solutions. By choosing electric cars, individuals actively reduce greenhouse gas emissions, lessen dependence on finite fossil fuels, and promote cleaner air quality for all. This choice not only aligns with environmental stewardship but also fosters innovation in renewable energy technologies, paving the way for a greener and more sustainable future. In this way one can contribute towards making the planet earth safer for present and future generations.

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