Adoption of Electric Vehicles

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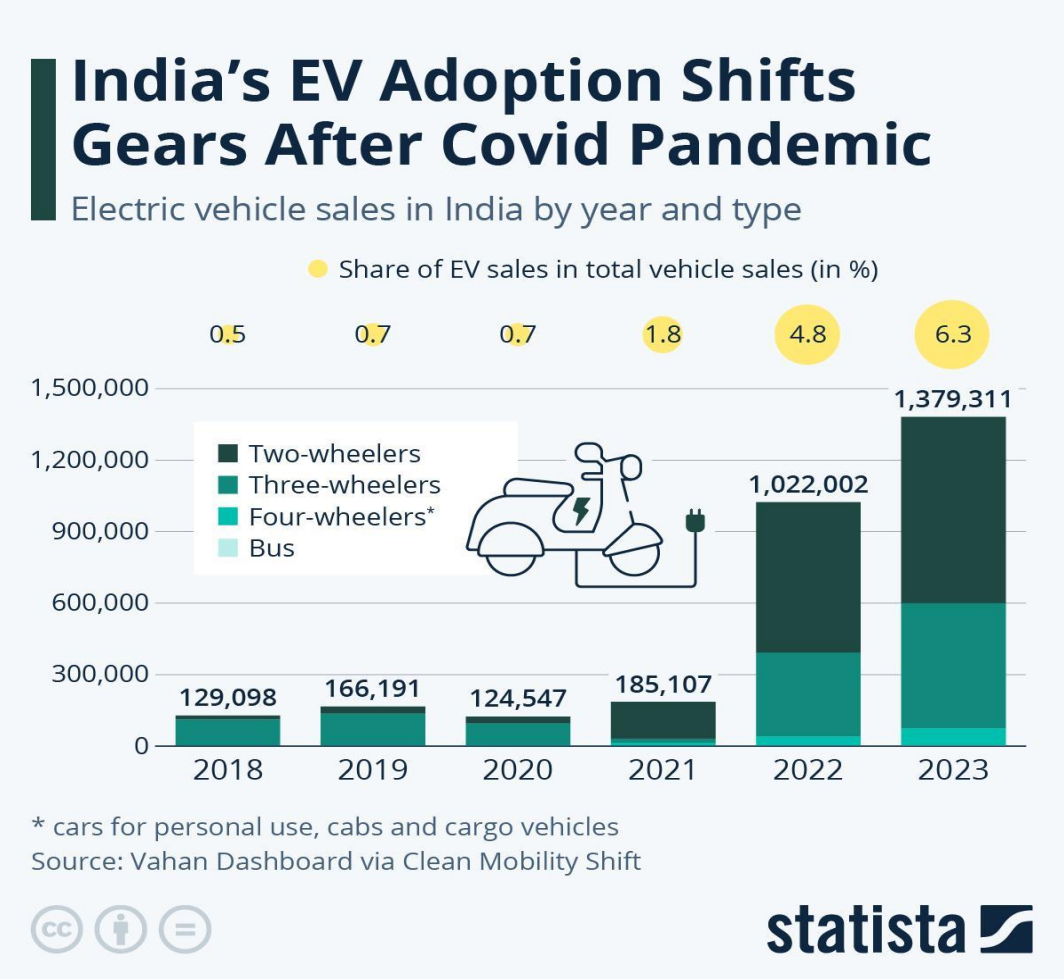
ABSTRACT: The adoption of battery electric vehicles is a crucial step for reducing harmful gas emissions caused by road transport, Ships, Airplanes and other. However, Past studies have explored the long-term adoption of these mobility solutions and conventional automobiles.

Focusing on the Lithium-ion batteries, electric passenger cars and public transport in India and the World, frequently finding exponential uptrends. In 2023, EVs accounted for 6.5% of total vehicles sold in india. while adoption is increasing, it varies by vehicle type:

- **Three-wheelers: More than half of the three-wheeler passenger segment is electrified, and the cargo segment has seen a 10% increase in adoption each year.**
- **Two-wheelers: While sales increased by 35% in 2023, adoption only increased By 0.9%.**
- **E-cars: Adoption is low due to high upfront costs, lack of incentives, and a lack of economic product models.**
- **E-buses: Sales increased by 38% in 2023, but adoption decreased due to a 90% increase in ICE bus sales.**



INTRODUCTION

Climate change will pose significant challenges for the future of humanity. It's primarily driven by human activities that release greenhouse gasses, especially carbon dioxide. To fight climate change, we need to cut down on carbon dioxide emissions a lot and quickly. A major contributor to greenhouse gas emissions, India has experienced a near doubling since the beginning of the century.

India emits around 4 billion metric tons of carbon dioxide annually. In 2019, transportation alone was responsible for 30% of U.S. emissions, 18% in Europe, 9% in India, and 7% in China, with higher emissions in more densely populated countries. However, it hasn't reduced its carbon footprint in recent years.

Human actions are primarily responsible for most environmental problems. For the future of our planet, our behavior must change to adopt EVs. EVs produce no tailpipe emissions, which means they contribute nearly zero to air pollution or greenhouse gas emissions, Evs can help with improving air quality by reducing air pollution. This can be especially helpful in crowded cities and urban areas.

LITERATURE REVIEW

History of Electric Vehicles:

The Beginning of electric vehicles in the 1800s led to the first electric vehicle on the road or Experimenting batteries. Interest in EVs resurfaced during oil crises of the 1970s, and the government started support for research into electric and hybrid vehicles.

Benefits of EVs:

Today, EVs are becoming more accessible, with advancements in battery technology. There are now numerous models available, and as consumer interest grows alongside rising gas prices, EVs are positioned for significant future growth, potentially reducing oil dependency and carbon emissions.

Charging Network:

Easy access to charging stations is crucial for the adoption of plug-in vehicles or EVs . A good multi, well-developed charging infrastructure or station needed potential EV buyers, making them more willing to invest in electric vehicles.

Access to convenient charging options both public and residential encourages more people to consider EVs as practical to standard Fossil fuel-powered vehicles.

Government Policies:

The Government of India has several policies and Strategies to boost electric vehicles to reduce air pollution and dependence on imported crude oil.

Policies as follows-

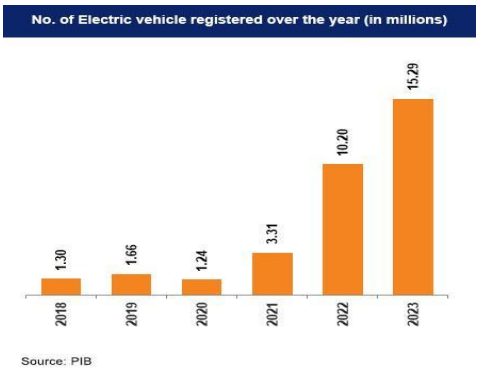
1. Exemption from customs duties for importing machinery and equipment for lithium-ion cell batteries.
2. Electric vehicles both commercial and private receive green license plates and are not required to obtain permits.
3. The GST rate for EVs has dropped from 12% to only 5%.

METHODOLOGY

Market Volume:

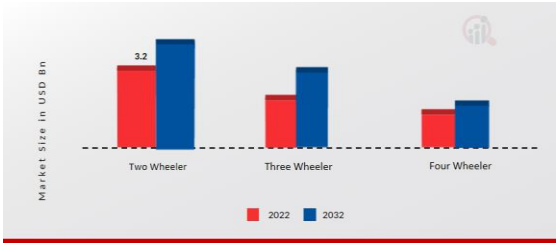
The Indian Battery Electric Vehicles (BEV) Market is expected to grow from US$ 3.21 billion in 2022 to US$ 113.99 billion by 2029, driven by a 66.52 percent CAGR (Compound annual growth rate),%, according to Fortune Business Insights.

NITI Aayog and RMI estimate India's BEV finance market will reach Rs. 3.7 lakh crore (US$ 50 billion) by 2030.



India EV Platform Insights:

The India Electric Vehicle market segmentation, based on platform includes Two Wheeler, Three Wheeler, and Four Wheeler. The four wheeler segment dominated the market mostly. In general, four-wheelers have greater driving ranges than two- and three-wheelers. Due to their increased range, electric automobiles are more suitable for longer trips and commutes, which attracts a wider spectrum of buyers..



RESULTS

India's expanding electric automobile sector is set to deliver significant environmental and economic

advantages. With the goal of having 80 million BEVs on the road by 2030, India will cut emissions and improve air quality. The rise in EVs retail sales will also stimulate economic growth through job creation, technological advancements, and increased investment, establishing India as a global leader in the EV industry while promoting a sustainable, eco-friendly economy.

Benefits of Electric Vehicles:

Reduced expenditure for operations:

EVs are much cheaper to operate than petrol or diesel vehicles. For example, an EV may cost 0.44 to 1.45 rs per kilometer depending on area, while a petrol car may cost 9.16 rs per kilometer. By using solar energy, charging electric vehicles is not only cheaper but also greener compared to Fuel-based vehicles (gasoline or diesel).

Low Maintenance and Servicing Cost:

The maintenance and servicing costs for an EV are generally lower than those of a petrol or diesel cars, Since they have simpler mechanics than petrol or diesel vehicles. As a result, the annual running cost of an EV is much lower.

Tailpipe-Free Emissions:

Driving an electric vehicle (EV) reduces your carbon footprint with zero exhaust emissions. You can further minimize your environmental impact by using solar energy to charge your vehicle at home.

Noise-Free Driving:

Electric vehicles operate quietly because they lack an engine, resulting in no engine noise. This silence is so noticeable that manufacturers sometimes add sound features to safeguard pedestrians from accidents.

DISCUSSION

Obstacles to the EV Transition in India:

While the move to battery electric vehicles may seem appealing, there are various challenges that need to be addressed. Here are a few of them:

Total Cost:

A major challenge in adopting electric vehicles in India is the high initial cost. EVs typically have a higher purchase price than traditional ICE vehicles. The cost of EV parts like batteries is greater, which can deter buyers and make EVs less accessible. This may also result in higher insurance costs for electric cars.

Charging Network:

A strong charging infrastructure is crucial for electric vehicle (EV) adoption. In India, the charging infrastructure is underdeveloped, with limited stations that are sometimes non-functional and long charging times, leading to range anxiety for EV owners.

Lack of Clean Energy:

In India, much electricity comes from coal, which diminishes the environmental benefits of EVs. To ensure a cleaner transportation system, we need to focus on increasing renewable energy sources alongside EV adoption.

The Dark Side of Electric Vehicle Batteries:

Electric vehicle batteries depend on minerals like cobalt, lithium, nickel and other, whose mining raises concerns over unethical practices, child labor, and environmental damage, known as 'blood batteries. To support EV adoption, the industry must prioritize responsible and sustainable sourcing of these minerals.

CONCLUSIONS

Battery electric vehicles are adopted across India increasingly rapidly.The transition to electric vehicles (EVs) represents a crucial step in addressing environmental challenges and reducing greenhouse gas emissions from the transportation sector. As this study highlights, the adoption of EVs in India is influenced by various factors, including financial incentives, charging infrastructure, and consumer awareness. Policymakers and manufacturers need to recognize the price expectations of both potential and current buyers to boost EVs adoption in India.

REFERENCES

[1] GHG emissions in India - Statistics & Facts | Statista
[2] Chart: How Many EVs Are Sold in India? | Statista
[3] The History of the BEV | Department of Energy
[4] India's Govt policies Green Revolution
[5] Electric automobile sector in India: Market Growth & Innovations | IBEF
[6] BENEFITS OF ELECTRIC VEHICLES