ISSN:3048-6505 (Online)
Shodh Samarth- Research Journal of Commerce, Management & Economics
Vol.3(1), January 2026, pp. 226-236

DRIVING SUSTAINABLE CHANGE: INDIA'S PRESENT AND FUTURE ELECTRIC VEHICLES LANDSCAPE

Dr. Jyoti Singh

Assistant Professor

Department of Commerce and Management

Ramanand Institute of Pharmacy &Management, Haridwar, Uttarakhand

Email : jyotisngh01@gmail.com

Dr. Krishna Kumar Verma

Professor

Department of Commerce

Hemvati Nandan Bahuguna Garhwal University (A Central University), Srinagar, Uttarakhand

Email: profkkverma3@gmail.com , Contact no.9410148464

Abstract

This study examines the current status and future prospects of electric vehicles in India. In this study, electric vehicles are divided into three categories: two-wheeler, three, and & four-wheeler, i.e., cars. The present articles, based on data from the last 10 years (2015-2024), were compiled from government reports and the RTO office. After collecting the data, it was then analyzed using statistical tools, such as simple growth, 5-year change, and 10-year change, as well as forecasting electric vehicle sales for the next 10 years, i.e., from 2025 to 2034. The results show positive changes in the registration of electric vehicles in the RTO offices. The number of registrations increased year by year, indicating that consumer interest has shifted from fuel-based vehicles to electric vehicles. It means Consumer awareness about environmental a dynamic shift toward a sustainable future. The study's findings indicate that the growth in the registration of electric vehicles at the RTO office increased from 2015 to 2024; however, in 2020, it showed a negative result due to the COVID-19 pandemic. It can be

concluded from the analysis that the automobile industry is well-structured in terms of sustainability and process innovation in the study area at present. Further, electric vehicles are good for our clean environment.

Keywords: Electric Vehicle (EV), Two Wheeler (TW), Three Wheeler (TH.W), Four Wheeler (FW), Sustainable Development

Introduction

The Automotive Industry is a significant driver of economic growth in India. Automobile production is a strategic industry forming the backbone of the manufacturing sector in many countries. Innovation is crucial for companies to remain competitive, meet evolving customer demands, and address global challenges such as environmental sustainability and safety. Automotive companies, particularly in the manufacturing sector, should consider both socio-economic and environmental aspects while promoting innovation.

Current trends such as zero-emission vehicles and carbon-neutral manufacturing demonstrate the growing significance of sustainability in the automotive industry. (https//www.pwc.de.)
An Electric vehicle (EV) is a type of vehicle that primarily uses one or more electric motors for Propulsion, unlike traditional vehicles, which rely on internal combustion engines (ICEs) powered by fossil fuels.
The term electric vehicles encompasses a range of different configurations.

Battery Electric Vehicles (BEVs): Also known as all-electric vehicles, BEVs run exclusively on electricity stored in their battery pack. They have no internal combustion engine and produce zero tailpipe emissions.

Hybrid Electric Vehicle (HEV): A HEV combines a gasoline engine with an electric motor and a smaller battery. The electric motor assists the engine to improve fuel efficiency, but the battery is primarily charged through regenerative braking, and the engine itself is not charged by plugging in.

Plug-in Hybrid Electric Vehicle (PHEVs): PHEVs are similar to HEVs but have longer batteries that can be charged by plugging into an external power source. They can operate in all-electric mode for a certain distance before switching to the gasoline engine.

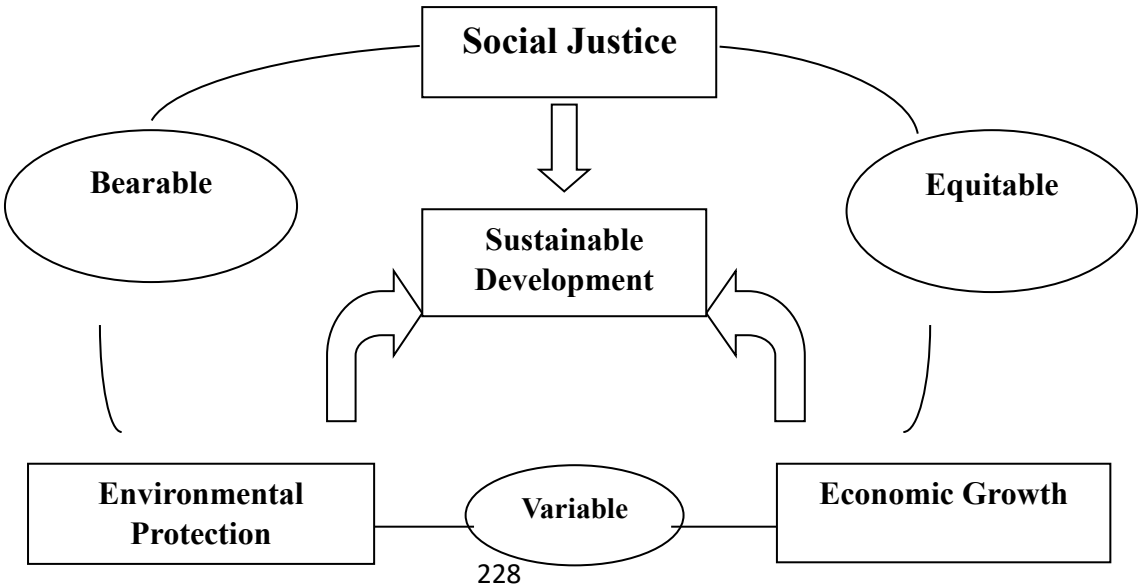
Fuel Cell Electric Vehicle (FCEVs): FCEVs generate electricity onboard through a chemical reaction between hydrogen and oxygen in a fuel cell, emitting only water vapour. They don't need external charging and are refueled with hydrogen.

Sustainable development aims to create a future that meets the needs of the present without compromising the ability of future generations to meet their own need. Their involvement involves achieving a balance across the three dimensions, often referred to as the pillars of sustainable development.

1. **Environmental Sustainability-** Focuses on the well-being of the environment and the preservation of natural resources. Key aspects include protecting biodiversity, reducing pollution, managing waste, mitigating climate change, and promoting resource conservation**.**
2. **Social Sustainability-** Prioritizes the well-being of people and communities, focusing on social justice, equity, human rights, and access to basic needs like education and health care. It aims to create inclusive societies where everyone can participate and benefit from progress.
3. **Economic Sustainability-** Emphasis on maintaining a healthy and stable economy that promises long-term financial viability without harming society or the environment. Key aspects involving promoting sustainable economic Growth, Resource efficiency, innovation, fair labour practices, and financial sustainability**.**

   These three pillars are interconnected and interdependent

Three Pillars of Sustainable Development



Source: https://greenly.earth

Literature Review

Arya N. (2019) studies automobile performance and Growth in India, examining the strong domestic sales of vehicles, which indicate a robust demand for vehicles. The support of government policies has led to a rise in the Indian Automobile Industry. Data is collected from a secondary source, i.e., from the SIAM website.

Chattopadhyay M and Mukherjee S (2019) study the automobile production trend and Foreign Direct Investment (FDI) in the Automobile sector, finding the correlation between Automobile production and FDI, automobile export trends, Automobile Domestic sales trends, and Gross turnover trends in the Indian Automobile Industry over the last decade. In this paper, the researcher collects data from secondary sources, i.e., authentic books, newspapers, and related websites. Data analysis with the help of statistical tools like average, percentage, compound Annual Growth Rate, Average Annual Growth Rate, and Correlation trend analysis.

N. Chandrasekar and Palanivelu V.R. (2018) studied the growth rate of two-wheelers, which was higher than that of other types of vehicles, and analyzed the trend and growth of the automobile industry in India. The data is analysed with the help of simple percentage, mean, standard deviation, coefficient of variation, and compound annual growth rate over the study period. The study also reveals that the export of automobiles from India has increased significantly.

Kaur. A (2020) examined the Automobile Industry performance. Data were collected from secondary sources, and the recorded data were measured by calculating the Compound Annual Growth Rate (CAGR), the year-over-year growth of production, the total export share, the trade balance, and the compound annual growth rate of the export market share worldwide. The report revealed the comparative advantage of the automobile industry.

Kanupriya & Kumar. S (2014), studies that FDI and de-licensing bring growth in the Automobile Industry rapidly, and enter the global market. In this paper, the trend of FDI inflow in the Automobile Industry is presented from 2004 to 2014, and the results show that both FDI inflow and production are in an increasing mode. This paper is based on secondary sources, with data collected from publications such as SAIM, DIPP, RBI, and other government

agencies. It is based on descriptive research. In this paper, data analysis is conducted using time series analysis. Study the trend of production in the automobile sector.

Objective

- To study the growth of electric vehicles in India.
- To forecast the electric vehicles in India.

Research Methodology

In the present article, secondary data were collected. The Secondary data were those recorded in books, newspapers, and other government documents. These are related to the past period. Under the present study, secondary data were collected for electric vehicles from different aspects, i.e., the list of companies, different types of vehicle lines, two-wheelers, three-wheelers (E-auto and E-rickshaw), and light four-wheelers (car), were recorded, and details were presented in the draft. Data collected from RTO Office as per the government report (2015 to 2024). Growth was estimated with the help of the following formula -

1. Simple Growth = $\frac{\text{C.Y-P.Y}}{\text{PY}}$ = times
2. 5-year challenge = $\frac{\text{C.Y-B.Y}}{\text{B.Y}}$ = times
3. 10-year challenge = $\frac{\text{C.Y-B.Y}}{\text{B.Y}}$ = times

   Where , C.Y current year, PY = Previous year, B.Y= Base year

Data Analysis And Interpretation

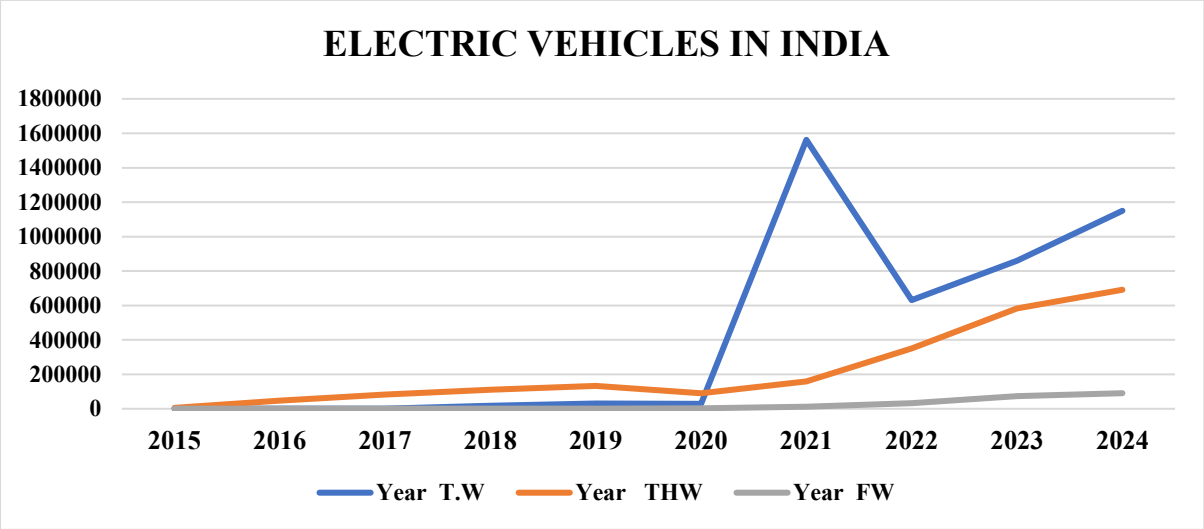
Table -1 Growth of Electric Vehicles in India changes over the previous year (times)

Year	TWO-WHEELER		THREE-WHEELER		FOUR-WHEELER	
	Number	Change	Number	Change	Number	Change
2015	1449	-	5416	-	679	-
2016	1461	0.008	46903	7.660	619	-0.088
2017	1528	0.046	83347	0.777	827	0.336
2018	17064	10.167	110136	0.321	1043	0.261

2019	30388	0.781	133491	0.212	963	0.011
2020	29112	-0.041	90447	-0.322	3206	2.329
2021	1562114	4.366	158197	0.749	12258	2.823
2022	631087	3.040	350255	1.214	33191	1.708
2023	859964	0.363	583445	0.666	73154	1.204
2024	1149407	0.337	691299	0.184	90549	0.238

Source: Ministry of Road Transport & Highways, Government of India, Authors' Compilation and Calculation.

2024 = EV(BOV) + PURE EV



The status of electric vehicles, i.e., two-wheeler (E-bike and E-scooty), three-wheeler (E-rickshaw and E Auto), and small four-wheeler, i.e, E-car, was presented in Table 1 The ten years of data from 2014 to 2015 for the country were stated in the table. It can be seen from the table that a total of 2,149 two-wheelers were registered in 2015. It is observed from the table that the number of electric two-wheeler is increasing with the advancement of years up to the year 2018. The negative changes observed in 2020 due to the COVID-19 pandemic were followed by positive changes in the subsequent year.

In the case of electric three-wheelers, the registration of such vehicles was shown in 2016 (7,660), followed by 2022 (1,214). The fluctuation in the number of three-wheeler onward, 2019 was observed. The number of vehicles increased up to 2019, decreased during 2020, and then further increased up to 2024. This may be due to reasons such as a lack of infrastructure facilities, including charging points, good road conditions, confidence in the vehicle, and the high cost of replacement batteries. As seen from the table, during the survey period of 2015-2024, India had 679 electric cars in 2015. The number of electric cars in India

was 90549 in 2024, which were running on the road. This indicates better market coverage and a promising future scope for electric cars in the country, as well as a positive impact on the environment. From the above facts and figures, it is evident from the table that the interest of people in shifting from conventional vehicles to electric vehicles increased with the advancement of time in the country.

Table-2 Details of Electric Vehicles and Changes in 5 and 10 year

TYPES	2015	2019	5 YEAR	2020	2024	5 YEAR	10 YEAR
T.W	1449	30388	19.97	29112	1149407	38.48	792.24
TH.W	5416	133491	23.65	-	691299	6.64	126.64
F.W	679	963	0.41	3206	90549	27.24	132.36

Source: *Ministry of Road Transport & Highways, Government of India, Authors' Compilation and Calculation.*

Table 2 shows the details of electric vehicles, including two-wheelers, three-wheelers & four-wheelers, for the years 2015, 2019, 2020, and 2024. According to the table, a significant number of electric vehicles were registered at the RTO Office for obtaining a license in 2015. It is worth noting that in 2024, a significant number of electric two-wheelers (1149407) and electric four-wheelers (90549) were registered.

However, the number of three-wheeler registrations increased during 2024, i.e., 691,299, as compared to 90,447 during the year 2020, accounting for a 6.64 times increase in 2024 over 2020 in electric three-wheeler registrations. It was further stated that the change from 2020 to 2024 in the case of electric two-wheelers accounted for a 38.48 times increase. It shows that the interest of vehicle owners shifting from conventional vehicles to electric two-wheelers is advancing. Surprisingly, the interest of electric four-wheeler users increased rapidly over the 10-year period, and changes were estimated to have occurred in 132.36 times the number of electric four-wheeler users registered in 2024. It has been observed from the table that the number of electric vehicles increased positively over time.

It was further observed from the survey that electric vehicles faced numerous challenges in the field due to the limited availability of charging stations and charging points in the study area, highlighting the need for increased infrastructure.

Table -3 Forecasting of Registration of Electric Vehicles in the RTO office from 2025 to 2034 in India

YEAR	EV T.W	EV TH.W	EV F.W
2025	1232451	604107	72125
2026	1378650	672983	81302
2027	1524849	741858	90480
2028	1671048	810733	99657
2029	1817247	879609	108834
2030	1963445	948484	118012
2031	2109644	1017359	127189
2032	2255843	1086235	136367
2033	2402042	1155110	145545
2034	2548241	1223985	154722

Source: Authors' Compilation and Calculation.

The above table revealed the projected data of different types of electric vehicles would be registered during 2025 to 2034 calendar year, which may help in the planning of available different types of electric vehicles i.e. two wheeler, three wheeler and small four wheeler (i.e cars) for budgeting, capital marketing strategic resources uncertainly and their management and utilization of different skilled for product of different types of vehicle design mention year. The forecast of the largest may be helpful in informing production, consumer demand, and market demand. The results shown in the table above indicate an increase in the registration of electric vehicles year by year. This is favourable to environmental sustainability.

Table 4 Forecasting of growth and change in 5-year and 10-year

Types	2025	2029	Change	2030	2034	Change	Change
T.W	1232451	1817247	0.47	1963445	2548241	0.30	1.07
TH.W	604107	879608	0.46	1017359	1223985	0.20	1.03
F.W	72125	108834	0.51	118012	154722	0.31	1.15

Source: Authors' complication and calculation

The table revealed the 5-year and 10-year changes, i.e., 2025, 2029, 2030, and 2034, of different types of electric vehicles registered in the coming 10 years. It is seen from the above table that the electric two-wheeler change in 5 years, i.e., 2029 over 2025, is 0.47 times and 0.17 times decrease (2034 over 2030), followed by 2029 over 2025. In the case of the electric

three-wheeler, it was observed that the change from 2029 to 2029 is greater, as compared to the next five years, and the same situation was observed in the case of the electric four-wheeler. Over the next 10 years, changes have shown positive results, specifically a 1% increase in the case of different types of vehicles mentioned in the study. It is concluded that consumer year shifted interest to electric vehicles.

Finding

The study reveals that the registration of electric two-wheelers at the RTO office increased year by year from 2015 to 2024. The change in the current year compared to the previous year shows a positive trend, with a growth rate of 0.008 times in 2015 and 0.337 times in 2024 over 2025. In the case of the electric three-wheeler, there was a 1.214% change in 2022 compared to 2021, followed by increases at a decreasing rate thereafter. In the case of the electric four-wheeler, a fluctuating situation was observed; however, the number of vehicle registrations has increased year by year. In 2020, negative changes were observed in the case of all types of vehicles due to the COVID-19 pandemic situation.

According to the table, the 5-year challenge from 2015 to 2019, specifically for two-wheeler (19.97), Th.w (23.65), and F.W (0.41), showed a positive increment. The net fine year changes, i.e., (2024 over 2020), are 20 times more in T.W17, 10 times less in Th. W, and 27 times more in F.W, as compared to the previous fine year challenge (2019 over 2015). The 10-year challenge showed positive results for all types of electric vehicles mentioned in the Study. The forecasting of the next 10 years' data shows an increase year by year in Table 3.The positive changes shown in 2029 over 2025, 2034 over 2030, and 2034 over 2025 in all types of electric vehicles.

Conclusion

The study concludes that consumer interest has shifted from fuel-based vehicles to electric vehicles. Electric vehicles present a promising shift toward Sustainable transportation, offering benefits such as reduced emissions and lower operating costs. Consumers are increasingly aware of the environment and are using environmentally friendly products to

help save the environment for future generations.

Suggestion

- Rapidly expand the O network of public charging stations, especially fast chargers on highways and in Tier-2 and Tier-3 cities.
- Make EV loans more accessible and affordable by encouraging banks and financial institutions to offer lower interest rates and flexible loan terms.
- Educate the public on the environmental, economic, and practical benefits of EVs, including lower running costs, reduced emissions, and improved driving experience.
- Ensure the availability of accessible and reliable after-sales service and maintenance support for EVs, especially in remote areas.

Reference

Arya.N (2019), A review of the growing Automobile Industry in India, International Journal

of Research and Analytical Reviewshttp://ijrar.com/ eISSN2348-1269, printISSN2349-5138

Chattopadhyay.M, and Mukherjee.S (2019), Automobile Industry in India: A Recent Study, International Journal of Scientific Research and Reviews, ISSN 2279-0543, www.ijsrr.org

Chandrasekar. N & Palanivelu V.R. (2018), Automobile Industry in India: Its trend and

growth, www.ijrar.org (E-ISSN 2348-1269, P-ISSN2349-5138), International Journal of Research and Analytical Reviews (IJRAR)

Kaur. A (2020), An Analysis of the Performance of the Automobile Industry, Asian Journal

of Applied Science and Technology (AJAST), Quarterly International Journal, DOI:10.38177/ajast.. 2020.4211, Online ISSN:2456-883X, Website: www.ajast.net

Kanupriya & Kumar. S (2014), A study on the Automobile Industry in India, ABS International Journal of Management

Sankaran. P (2016), Indian Automobile Industry Vision 2020, GJRA-Global Journal for

Research AnalysisIF:3.62, IC Value 70.36ISSN No 2277-8160

Suresh R. & Chandrasekhar. G (2018), The performance of the Indian Automotive

Sector -Actual and Forecast: A Statistical Analysis, Indian Journal of Applied Research, Volume 8, Issue 1, print ISSN-2249-555X

S. Jatinder (2014), India's automobile industry: Growth and export potential, Journal of

Applied Economics and Business Research, JAEBR,4(4)246-262 (2014), ISSN 1927-033X

Manickkavasagam . N & Radhika. R.R (2019), A study on growth and performance of the Indian Automobile Industry: current scenario, International Journal of Research and Analytical Reviews (IJRAR)www.ijrar.org,(E-ISSN 2348-1269, P-2349-5138), Volume 6, Issue 1, IJRAR19YP025.

Miglani . S (2019), The Growth of the Indian Automobile Industry: Analysis of the Roles of Government Policy and other enabling Factors, Indian Council for Research on International Economic Relations (ICRIER)

https://doi.org/10.1007/978-981-13-8102-7_19,smiglani@icrier.res.in.

https://www.pwc.de

https://vahan.parivahan.gov.in/vahan