

## **CURRENT SCENARIO, GROWTH, AND FORECASTING OF ELECTRIC VEHICLES IN INDIA**

**Jyoti Singh,**

Research Scholar

Department of Commerce

**Dr. Krishna Kumar Verma**

Professor & A.D.S.W.

Department of Commerce

Hemvati Nandan Bahuguna Garhwal University,

SRT Campus, Tehri, Uttarakhand

### **Abstract**

The Department of Heavy Industry is administering the scheme “Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India”, popularly known as the FAME India scheme since 01<sup>st</sup> April 2015. Electric Vehicles are those which are getting power from the batteries installed inside the vehicles instead of fossil fuel. There are four types of electric vehicles in the market, Battery Electric Vehicles (BEVs), Plug-in-Hybrid (PHEVs), Hybrid Electric Vehicles (HEVs), and Fuel cell electric vehicles. This study is based on secondary data which were collected from the Ministry of Road Transport & Highway, Government of India and data are classified into regions for our study. From the study, it is found that Uttar Pradesh had the highest number of electric vehicles registered in the north zone in the last nine years i.e. 214663. In the west- zone, Gujarat has a high volume of vehicles registered i.e.176156 and it is followed by Goa (62722) during the last nine years. At present, Maharashtra has the highest number of vehicles. It is surprising that all states in the south region have an increasing number of registrations of electric vehicles. Bihar is the state having the highest number of vehicles registered in 2014 i.e. 424 and positive 9-year change results in West Bengal (549100). It is also observed from the central region that Madhya Pradesh has the highest number of electric vehicles registered in the last nine-year and has a positively changed 85827 as compared to Chhattisgarh (18518). It is well-known that Delhi has registered the highest number of electric vehicles in the Union Territory whereas Jammu and Kashmir showed positive changes in 9 years as compared to others. It is also seen that the number of customers of e-vehicles in Jammu & Kashmir and Chandigarh has increased in 2022. The overall study examined, that the North region

consumers are interested to purchase electric vehicles having 363592 registered in the last nine years followed by the south-region i.e. 244983. It is estimated that during the last 10 years, registered electric vehicle users have increased at the rate of 10 percent. It indicates that awareness among consumers regarding the environment is increasing and sustainable development.

**Keywords:** Electric Vehicles, Consumer, Vehicles Registered, Forecasting, Compound Annual Growth Rate.

## Introduction

Electric vehicles are one of the eco-friendly products in the automobile industry, and they have created a new era in the automobile business at the world level. The electric vehicles industry is a growing industry in India. Various schemes and incentives have been launched by Central and state governments to promote electric mobility in the country. Electric Vehicles are those which are getting power from the batteries installed inside the vehicles instead of fossil fuel. The batteries are used for engine power and the functioning of wipers and lights also. In our country, there are four types of Electric Vehicles running: Fuel Cell Electric Vehicles (FCEV), Plug-in Hybrid Electric Vehicles (PHEV), Hybrid Electric Vehicles (HEV), and Battery Electric Vehicles (BEV).

Types of Electric Vehicles	Battery Electric Vehicles (BEV)	Hybrid Electric Vehicles (HEV)	Plug-in Hybrid Electric Vehicles (PHEV)	Fuel Cell Electric Vehicles (FCEV)
Define	They are powered purely by an electric battery with no internal combustion (IC) engine (Petrol/Diesel) parts.	Both an engine and an electric motor. The energy runs engines that come from fuel or batteries.	They have both engine and a motor. You can choose among the fuels, conventional fuel (such as Petrol) or alternative fuel (such as bio-diesel)	They employ 'fuel cell technology' to generate the electricity required to run the vehicles.
Main Components	Electric Motor, Inverter, Battery, Control Module, Drive train	Engine, Electric Motor, Battery pack with controller inverter, Fuel tank, Control module	Electric motor, Engine, Inverter, Fuel tank, Control module, Charger (if onboard model).	Electric motor, Fuel-cell stack, Hydrogen storage tank, battery with converter and controller.

Example	MG ZS, TATA Nexon, TATA Tigor, Hyundai Kona, Mahindra E20 plus, Mahindra Verito etc.	Toyota Prius, Maruti Suzuki Invicto, Maruti Suzuki Grand Vitara, Honda City Hybrid eHEV, Ford Fusion Hybrid etc.	Hyundai Sonata, Kia optima, Volvo XC 90 T8, Mercedes 5550e, Fiat 500e, Mercedes C350e etc.	Toyota Mirai, Riversimple Rasa, Hyundai Tucson FCEV, Honda Clarity Fuel cell, Hyundai Nexo etc.
---------	--	--	--	---

Source: <https://e-amrit.niti.gov.in>

FAME (Fast Adoption and Manufacturing of (Hybrid&) Electric Vehicles) Scheme of India: It is divided into two phases: The First Phase of the scheme was initially approved for a period of 2 years which was started from 1st April 2015. From time to time the Scheme has been extended with the last extension allowed for a period up to 31st March 2019 and continued until March 31, 2022. The Central government recently declared it is again extended Phase II until March 31, 2024. This Scheme provides various benefits such as, encouraging the use of **renewable energy sources** through charging systems, reducing **environmental** issues **and natural fuel conservation**, promoting **eco-friendly** public transportation, giving subsidy benefits to various vehicle segments, and installing charging stations on roadsides. (<https://fame-india-scheme>)

During the I Phase of FAME India scheme, the authorities of the scheme concentrated on four main areas i.e. pilot projects, creation of demand, platform of technology, and facilities of charging infrastructure. During this stage, the government located **427 charging stations**.

In the Government notice, it was said that in the II Phase of FAME Scheme will be of a budgetary of Rs. 10,000 crores for five years commencing which will commerce from 1<sup>st</sup> April 2019 to promote hybrid/ electric technology in transportation field in order to reduce dependency on fossil fuels and to reduce vehicular emissions. In the case of electric three-wheelers, e-buses, and electric four-wheelers (e-4W), the scheme facilitates a subsidy to those vehicles which are used in public transportation and for commercial use. For electric-wheelers, privately owned vehicles are also provided with subsidies. II Phase of FAME India supports 5 lakh e-three Wheelers, 7,090 electric-Buses, 55,000 electric four Wheeler Passenger Cars (including Strong Hybrid), and 10 lakh electric two-wheelers. (<https://pib.gov.in>)

## Research Question

What is the status of electric vehicles region-wise and the future of electric vehicles in India?

## Objectives

- To study the status of Electric vehicles in India
- To analyze which zone has the maximum number of users of Electric Vehicles.
- To find out the forecasting of Electric Vehicles in the next 10 year

## Research Methodology

This study is based on the secondary data which were collected from the annual reports of the Ministry of Road Transport & Highway, Government of India for the last nine years i.e. from 2014-2022. and then it was analyzed with the help of these data five-year change, nine-year change then forecasting for the next ten years is calculated, and CAGR (Compound Annual Growth Rate) is also computed.

**Table-1 Electric Vehicles registered in North-zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014 (%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Himachal Pradesh	1010	1	2	1007	100	50250	10060
Punjab	14419	29	361	14029	1145	3786	48276
Uttarakhand	20590	9	5069	15512	56222	206	172255
Haryana	29963	5	4531	25427	90520	461	508440
Rajasthan	82947	84	4663	78200	5451	1577	92995
Uttar Pradesh	214663	133	53197	161333	39898	203	121203
Total	363592	261	67823	295508			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation

From the above North zone, it is observed that Uttar Pradesh has 49 more electric vehicles as compared to Rajasthan in 2014 whereas 48128 more electric than Uttarakhand in 2018. During the last five-year change in 2018 over 2014 change analysis showed 90520 percent in Haryana followed by 56222 percent in Uttarakhand. In contrast, 100 per cent positive result show in the state of Himachal Pradesh and the lowest per cent of change of electric vehicles were registered in Uttar Pradesh i.e. 203

percent in the last 5 years in 2022 over 2018, Himachal Pradesh and Punjab have taken an interest to purchase electric vehicles as compared to other states in the North zone shown in same. Haryana show better results in the last nine years as compared to others. The overall study shows the highest number of electric vehicles run in Uttar Pradesh 213653 more than the least number of electric vehicles i.e. Himachal Pradesh.

**Table-2 Electric Vehicles registered in North-East Zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Arunachal Pradesh	3	-	1	2	100	100	100
Assam	48036	-	7402	40634	100	448	100
Manipur	379	-	38	341	100	797	100
Meghalaya	45	1	2	42	100	2000	4100
Mizoram	36	-	-	36	-	100	100
Nagaland	3	-	-	3	-	100	100
Tripura	4203	-	32	4171	100	12934	100
Total	52705	1	7475	45229			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation, \*\*Sikkim Data is not available

It is examined that Assam is the state where the highest number of consumers registered electric vehicles in 2018 whereas Mizoram and Nagaland are the two-state no of electric vehicle users found in 2018. As per analysis five-year change of 100 percent change in north east region except the Mizoram and Nagaland. During the year 2022,36463 more electric vehicles in Assam followed by Tripura. Meghalaya increasing at increasing date next five years i.e. 2000 percent as compared to other states. Nine-year change found better results for electric vehicle users. It indicates that consumers are aware of electric vehicles.

**Table-3 Electric Vehicles registered in West Zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Goa	5685	9	22	5654	144	25600	62722
Gujarat	69258	39	479	68740	1128	14251	176156
Maharashtra	140462	899	4530	135033	404	2881	14920
Total	215405	947	5031	209427			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation

Table -3 reveals that Maharashtra is the state that has the highest number of electric vehicle users found in every year followed by Gujarat in the west zone of our country.

During the last five years analysis of changes has shown that Gujarat has increased in 2018 over 2014, Goa in 2022 over 2018 i.e. 25600. Gujarat has good results of nine-year changes of consumer of electric vehicle users.

**Table-4 Electric Vehicles registered in South-Zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Andhra Pradesh	29841	12	1155	28674	9525	2382	238850
Karnataka	97153	577	1973	94603	242	4695	16296
Kerala	39839	25	258	39556	932	15231	158124
Tamil Nadu	68150	71	1306	66773	1739	5013	93946
Total	234983	685	4692	229606			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation, \*\*Telangana Data is not available

It is found above table that Karnataka has a higher number of electric vehicles as compared to other states in the southern zone of our country. During the last 5-year changes in 2018 over 2014 results Andhra Pradesh had a good response for electric vehicles i.e. 9525 followed by 1739 in Tamil Nadu whereas Kerala (15231 percent) showed better results in the next five-year change in 2018 over 2014 followed by Tamil Nadu (5013). It is an analysis of during nine-year change in 2022 over 2014 Andhra Pradesh results in higher changes. Telangana is a state where electric vehicles are not available on the government website.

**Table-5 Electric Vehicles registered in East-Zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Bihar	64628	424	8466	55738	1879	558	13046
Jharkhand	15587	4	1956	13627	48800	597	340575
Odisha	29697	49	1268	28380	2488	2138	57818
West Bengal	17705	2	6719	10984	335850	63	549100
Total	127617	479	18409	108729			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation

It is observed from the above study, West Bengal (335850) has higher changes as compared to other states in the last five years during 2018 over 2014 but the least changes in 2022 over 2018 in the western zone of our country. West Bengal (549100) and Jharkhand (340575) have increased electric vehicle users at an increasing rate last nine-year change.

**Table-6 Electric Vehicles registered in Central-Zone**

State	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Madhya Pradesh	36839	40	2428	34371	5970	1315	85827
Chhattisgarh	23624	120	1162	22342	868	1823	18518
Total	60463	160	3590	56713			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation

It is observed from the study in the central -zone of our country that in 2014 Chhattisgarh state had 80 more electric vehicles as compared to Madhya Pradesh but changes in five years 2018 showed 5970 percent increases in Madhya Pradesh followed by Chhattisgarh. It is surprising results of Madhya Pradesh 31943 more electric vehicles run on the road as compared to the last five years and positive changes in the last nine-year i.e.85827. It indicated consumers are more aware of environmental concerns so they move to purchase eco-friendly products.

**Table-7 Electric Vehicles registered in Union Territory**

Union Territory	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
Ladakh	30	-	-	30	-	100	100
Jammu & Kashmir	4781	3	90	4688	2900	5109	156167
Puducherry	1550	3	87	1460	2800	1578	48567
Delhi	80194	47	20800	59347	44155	185	126170
Chandigarh	2890	-	213	2677	100	1157	100
Dadra and Nagar Haveli and Daman and Diu	141	-	18	123	100	583	100
Andaman & Nicobar	40	-	20	20	100	0	100
Total	89626	53	21228	68345			

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation, \*\*Lakshadweep Data is not available

It is found from the above study of Union Territory electric vehicle registered, Delhi has a higher number of electric vehicles consumer as compared to others in the last nine years. It is seen from the table Jammu & Kashmir and Chandigarh increase in customers in 2022. During nine-year changes shown Delhi and Jammu Kashmir had better results. It indicates that north part of our country is aware of electric vehicles.

**Table 8: Zone-Wise Distribution of Electric Vehicles**

Zone-Wise	Total Electric Vehicles	2014	2018	2022	5-year change in 2018 over 2014(%)	5-year change in 2022 over 2018(%)	9-year change in 2022 over 2014(%)
North-Zone	363592	261	67823	295508	25886	336	113121
North-East Zone	52705	1	7475	45229	747400	505	4522800
West-Zone	215405	947	5031	209427	431	4063	22015
South-Zone	234983	685	4692	229606	585	4793	33419
East-Zone	127617	479	18409	108729	3743	491	22599
Central-Zone	60463	160	3590	56713	2144	1480	35346
UT	89626	53	21228	68345	39953	222	128853
Total	1144391	2586	128248	1013557			

Source: Authors' Calculation

From the above study, it is found that 128609 electric vehicles run in North Zone as compared to the South -zone in our country. It is to be assumed that North-Zone consumers shifted to eco-friendly vehicles as compared to another zone. In the case of, the North-East zone there is only 1 electric vehicle consumer in 2014 gradually increases by 7474 (747400 percent) in the next 5 years but the west-zone have the least change in the next five years. During the five-year change in 2022 over 2018 found that 4793 percent changes in the south zone followed by the west zone.

**Table 9: Electric Vehicles Registered in India**

Year	Two-wheeler	Three-wheeler	Four-wheeler	Total
2014	2094	12	480	2586
2015	1448	5416	679	7543
2016	1457	46903	618	48978
2017	1529	83346	827	85702
2018	17067	110134	1047	128248
2019	30389	133489	962	164840
2020	29113	90384	3207	122704
2021	156243	158129	12259	326631
2022	630180	350247	33130	1013557
Total	869520	978060	53209	1900789

Source: (1) Ministry of Road Transport & Highway, Government of India, (2) Authors' Calculation

It is observed from above that two-wheeler electric vehicles are registered in higher numbers i.e. 2094 followed by four-wheeler electric vehicles (480). It is a surprising result showing three-wheeler electric vehicles registered in the next six years from 2015 to 2020. Next year a higher number of two-wheeler electric vehicles registered in our country. It is seen that the total number of four-wheelers i.e. 53209 registered from the year 2014 to 2022 in our country.

**Table 10: Forecasting of Electric Vehicles for India**

Year	Two-wheeler	Three-wheeler	Four-wheeler	Total
2023	578222	319936	32760	980918
2024	713430	370423	40306	1124159
2025	848638	420910	47852	1317400
2026	983846	471396	55399	1510641
2027	1119054	521883	62945	1703882
2028	1254263	572369	70491	1897123
2029	1389470	622856	78038	2090364
2030	1524678	673343	85584	2283605
2031	1659886	723829	93130	2476845
2032	1795094	774316	100676	2670086
Total	11866581	5471261	667181	18005027
CAGR	13%	10%	13%	12%

Source: (I) Authors' Calculation

It is forecasting the next 10 years of electric vehicle production and sale in our country. In case of two-wheelers shows a gradual increase in the coming year at 13 percent of the compound Annual Growth Rate same as four-wheeler electric vehicles i.e. 13 percent but in the case of three-wheeler passenger vehicles increases at lower as compared to the rest of electric vehicles.

### Findings

It is found from the above study that Uttar Pradesh is the state in which the highest number of electric vehicles registered in the last nine years from 2014 -2022 i.e. 214663 followed by Rajasthan 82947 in the north zone in our country. Haryana have a higher change in 9 years as compared to other states in this zone. The north-east zone has positive changes i.e. 100 percent during nine-year. Maharashtra has 71204 more electric vehicles as compared to Gujarat. In the south zone, Andhra Pradesh has had higher changes during the last nine -years i.e. 238850 percent. Bihar is the state in which a higher number of electric vehicles (64628) are registered in the east zone. But during the last nine-year changes observed West Bengal have positive change i.e. 549100 followed by Jharkhand (340575). In the case of the central zone, Madhya Pradesh has a higher number of electricity registered as compared to Chhattisgarh. Union Territory examined the positive changes in the last nine years of registration of electric vehicles in that area. Overall study shows that North-zone customer registered the highest number of electric vehicles (363592) in the last nine-year 2014 -2022 followed by the south zone i.e. 234983. During the last nine years 2014-2022, changes had positive results in the north and north-east zone in our country. After analyzing the forecast next

10 years i.e. from 2023-2032 two-wheelers, three-wheelers, and four -wheelers showing positive results and the growth rate of two-wheelers and four-wheelers having 13 percent indicates consumer awareness about environmental concern and saving the environment for the next generation using purchase personal electric vehicles.

## **Conclusion**

It is concluded from the study that consumers are aware of environmental concerns they move to eco-friendly products i.e. electric vehicles. The Government has introduced the FAME scheme for the adoption and promotion of Electric Vehicles in India. The advancement of technology, tightened environmental regulations and time-bound efforts from government as well as automobile industries shall help in a steady and smooth shift to Electric Mobility. Our country is rapidly moving towards electric mobility as observed from the collected secondary data of different regions. The major gains of the adoption of electric vehicles include a reducing in environmental pollution, a reduction in oil import, an improvement in national security, a better economy, and a better way for the utilization of renewable resources.

## **References**

<https://parivahan.gov.in/parivahan/>

<https://e-amrit.niti.gov.in>

<http://fame-india.gov.in/index.aspx>.

<https://heavyindustries.gov.in/UserView/index?mid=1378> .

<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1911399>

[https://fame2.heavyindustries.gov.in/content/english/1\\_1\\_AboutUs.aspx](https://fame2.heavyindustries.gov.in/content/english/1_1_AboutUs.aspx)

<https://currentaffairs.adda247.com/fame-india-scheme-objectives-benefits-challenges/>