

LITERATURE REVIEW

this section of the report focuses on the few factors that influences the scope of electric vehicles. we have stated cost comparisons, the sales trends followed in India, and comparison of Indian markets with that of global EV markets. many reports and works have been done in this regard but they are primarily focused on the developed nations and China. so, the review material here is mostly picked up from blogs and articles (newspaper column, WIKIPEDIA etc.).

MARKET PERFORMANCE: SALES AND TRENDS

The push for Electric Vehicles (EVs) is driven by the global climate agenda established under the Paris Agreement to reduce carbon emissions in order to limit global warming. India is among a handful of countries that support the global EV30@30 campaign, which aims for at least 30% new vehicle sales to be electric by 2030, (IJRASET., 2022).

The India electric vehicle market size was **USD 1.45 billion in 2021 and is projected to grow from USD 3.21 billion in 2022 to USD 113.99 billion in 2029, growing at a CAGR of 66.52% during the 2022-2029 forecast period.**

currently we see this rise in the market size of EVs. however, the pandemic period did take a toll on the sales and contribution of EVs as well.

Electric vehicle (EV) sales declined by a quarter during the pandemic-stricken financial year ended 31 March despite a surge in sales in recent months...

Read more at: https://economictimes.indiatimes.com/industry/auto/auto-news/sales-of-evs-in-india-fell-20-per-cent-in-fy21-to-236802-units-smev/articleshow/82195011.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

THE EFFECT OF COVID PERIOD ON EVs:

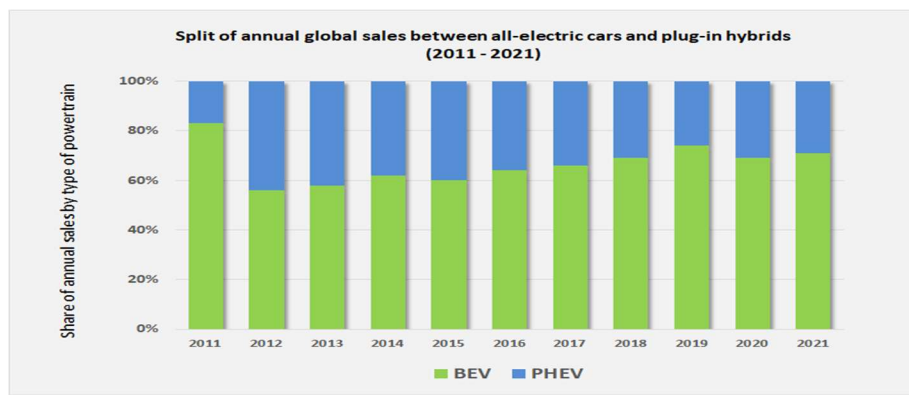
- The total sales in the **FY19** were **163459** units sold. Out of which: -
- The 2-wheelers were 29,756. The 3-wheelers were 131375. The 4- wheelers were 847 and buses and goods carriers were 468 and 53 respectively
- The total sales in the **FY20** were **121654** units sold. Out of which: -
- The 2-wheelers were 28632. The 3-wheelers were 88227. The 4- wheelers were 3179 and buses and goods carriers were 88 and 13 respectively.
- There is **25.5%** net decline in the pandemic period. There are possibly two main reasons stated for this decline.

- One of the first casualties of the economic crisis has been the [falling global crude oil prices](#). Low oil prices at the pump reduce the economic viability of EV adoption vis-à-vis combustion vehicles, especially in countries with limited fiscal incentives for EVs.
- Another key risk for EV adoption comes from disruptions in supply chains. China is the largest component supplier to the global EV manufacturing ecosystem. Disrupted supply chains due to lockdowns are having a short-term negative impact on EV manufacturers around the world. (www.wbcsd.org, Jasmeet Khurana, 2020)



As we can see there is an upward sales trend in the market size of electric vehicles with an exception of 2020 (COVID-19 impact). But as of right now, the PHEVs are in full swing with the registering growth rate of 7.8% from 2022 to 2030. The global **plug-in hybrid electric vehicles (PHEV)** market size was valued at USD 122.6 billion in 2021 and is expected to hit around USD 279.4 billion by 2030 with a remarkable CAGR of 9.58% from 2022 to 2030.

GLOBAL EV MARKETS



China

As of December 2021, China had the world's largest stock of highway legal plug-in passenger cars with 7.84 million units, corresponding to about 46% of the global plug-in car fleet in use. Of these, all-electric cars accounted for 81.6% of the all new energy passenger cars in circulation. (Gasgoo News (12 January 2022). "[China's car parc amounts to 302 million units by end of 2021](#)")

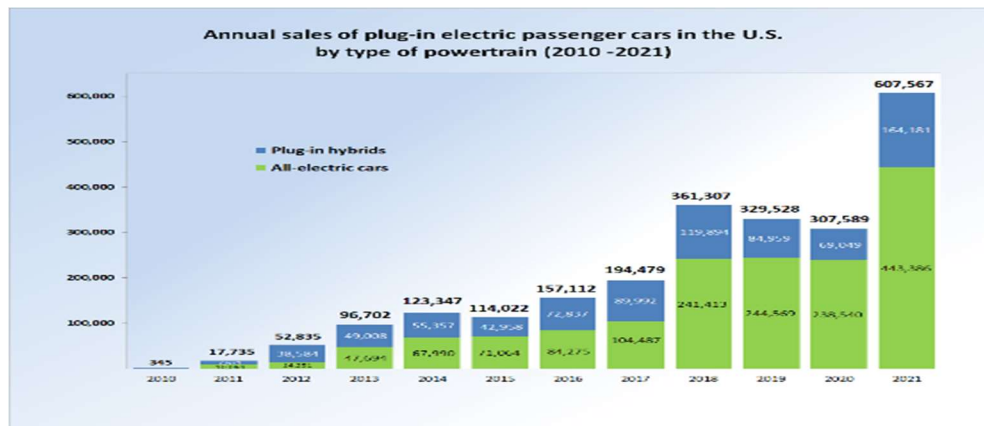
As of 2019, China also dominated the plug-in [light commercial vehicle](#) and [electric bus](#) deployment, with its stock reaching over 500,000 buses in 2019, 98% of the global stock, and 247,500 electric light commercial vehicles, 65% of the global fleet. In addition, the country also leads sales of medium- and heavy duty electric trucks, with over 12,000 trucks sold, and nearly all battery electric. [Energy Agency](#) (IEA), Clean Energy Ministerial, and Electric Vehicles Initiative (EVI) (June 2020)

The [Tesla Model 3](#) was China's top selling new energy passenger car, with 139,925 units delivered.^[121] With less than a year in the market, the Hong Guang Mini, with 119,255 units sold, was China's and the world's second best selling plug-in car after the Tesla Model 3.^{[122][121]}

There were 4.9 million new energy vehicles at the end of 2020, accounting for 1.75% of all vehicles in Chinese roads, of which, 4 million are all-electric vehicles (81.3%).^[14] China accounts for 60% of the world's electric vehicle charging stations

New energy vehicles sales in totaled 3.521 million in 2021, consisting of 3.334 million passenger cars and 186,000 commercial vehicles. (Plug-in electric vehicles in China. (2023, January 4). In *Wikipedia*. https://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_China)

UNITED STATES OF AMERICA



(By Mariordo (Mario Roberto Durán Ortiz) - Own work, CC BY-SA 4.0, <https://commons.wikimedia.org/w/index.php?curid=76121427>) FOR PICTURE

As of December 2021, cumulative sales of highway legal plug-in electric cars in the U.S. totaled 2,322,291 units since 2010

California is the largest plug-in regional market in the country, with plug-in car sales of 237,618 units in 2021, up from 132,742 in 2020 (+79.0%). The state's plug-in segment market share increased from 4.9% in 2017, to 8.1% in 2020, and reached 12.8% in 2021.

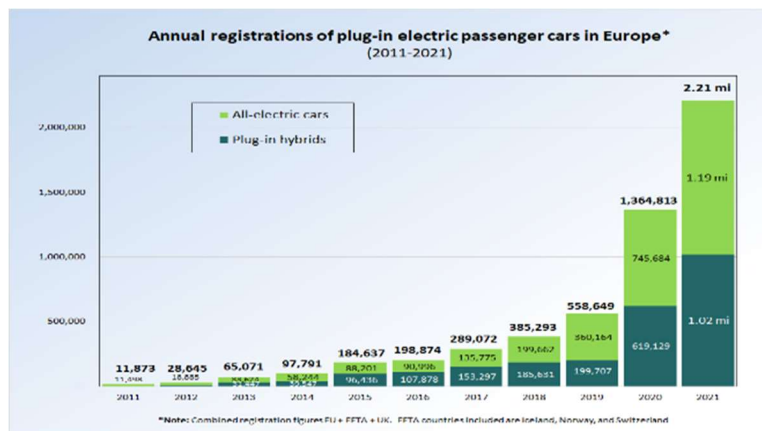
The [Tesla Model 3 all-electric car](#) surpassed in 2019 the discontinued Chevrolet Volt to become the all-time best selling plug-in car in U.S. history, with an estimated 300,471 units delivered since inception, followed by the Tesla Model S with about 157,992, and the Chevrolet Volt with 157,054.

In December 2021, the Biden Administration imposed Executive Order 14057, which is a nationwide federal government mandate that will ban new fossil fuel vehicles from all 50 US States plus Washington D.C. and all US Territories by 2035 to push the transition to electric vehicles.

As of December 2021, cumulative sales of highway legal plug-in electric passenger cars in the U.S. totaled 2,322,291 units since 2010. As of August 2020, the U.S. stock consisting of 1,008,118 electric cars (62.7%) and 600,143 plug-in hybrids (37.3%). As of December 2019, the American stock represented 20% of the global plug-in car fleet in use, down from about 40% in 2014. (Plug-in electric vehicles in the United States. (2023, March 12). In *Wikipedia*. https://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_the_United_States)

EUROPE

(Plug-in electric vehicles in Europe. (2023, January 24). In *Wikipedia*. https://en.wikipedia.org/wiki/Plug-in_electric_vehicles_in_Europe)



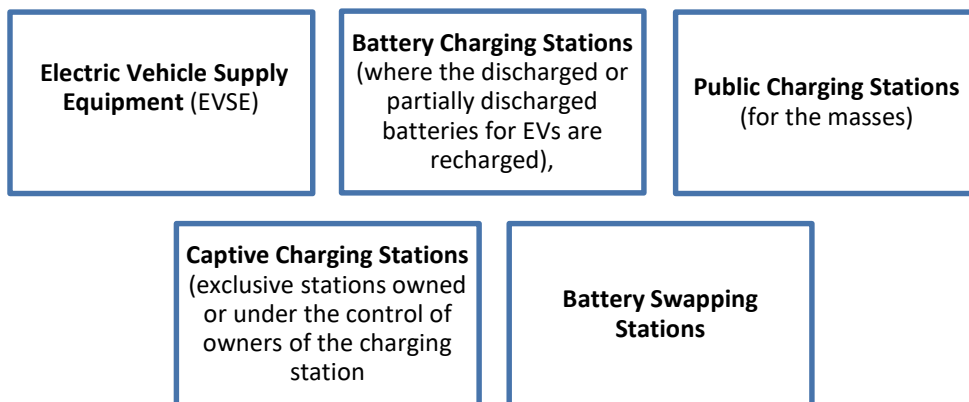
Europe had about 5.6 million [plug-in electric passenger cars and light commercial vehicles](#) on the road at the end of 2021. The European stock of plug-in cars is the world's second largest after China, accounting for about 32% of the global stock in 2021.

Europe also has the world's second largest light commercial electric vehicle stock, 33% of the global fleet in 2020. As of December 2020, France listed as the European country with the largest stock of light-duty all-electric utility vans, with about 62,000 units, followed by Germany (29,500), and the UK (almost 15,000)

The plug-in passenger car segment had a market share of 1.3% of new car registrations in 2016, rose to 3.6% in 2019, and achieved 11.4% in 2020. Despite the segment's rapid growth, as of December 2020, only 1% of all passenger cars on European roads were plug-in electric

In 2020, and despite the strong decline in global car sales brought by the [COVID-19 pandemic](#), annual sales of plug-in passenger cars in Europe surpassed the 1 million mark for the first time. Also, Europe outsold China in 2020 as the world's largest plug-in passenger car market for the first time since 2015

CHARGING INFRASTRUCTURE IN INDIA



The fact is that at the end of 2022, India had 2,700 public charging stations and 5,500 charging connectors.

The country is likely to have 10,000 public charging stations by the end of 2025, according to Counterpoint Research.

The country may require some 20.5 lakh charging stations by 2030. according to another research report, India would need a humongous 20 lakh charging stations by 2030 to cater to a mammoth 5 crore EVs by that year.

Apart from OEMs and independent charging station specialists and service providers, several other players including government agencies, PSUs, DISCOMS, private energy companies and construction and real estate developers would also contribute to the rise in charging stations in the country. They are likely to provide charging facility to both plug-in EVs and battery EVs .

Few measures government could potentially take for increasing the charging point in the foreseeable future are:

- cheaper leasing of land
- placing a cap on rentals for charging stations
- giving financial support to lower the cost of capex in the early stages of setting up the infrastructure.
- cutting down on import duties for inputs and equipment

Read more at:

https://economictimes.indiatimes.com/industry/renewables/charging-infrastructure-needs-big-push-as-ev-adoption-grows-in-india/articleshow/97223763.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

BEST SELLING ELECTRIC CARS IN INDIA 2022

EVs	Units sold	PRICE (In lakhs)	KMs PER CHARGE	BATTERY CAPACITY KWh	Charging speed (at home)
Tata Nexon	1370	14.99	312	30.2	9 hr.
Tata Tigor	432	13.75	315	26	9.5 hr.
MG ZS	245	27	461	50.3	8.5-9 hrs
Hyundai Kona	23	25.94	452	39.2	6hr 10 min
BYD	21	34.49	521	60.48	10 hrs