

THE FUTURE IS ELECTRIC: A SUMMARY OF INDIA'S ELECTRIC VEHICLE MARKET, OPPORTUNITIES & CHALLENGES

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Introduction

As the threat level of climate change rises, any contribution towards its mitigation is essential. A majority of the top 10 most polluting cities in the world are in India. Air pollution is a major cause of severe disease and health related problems for the people of India. Vehicular traffic accounts for approximately 29% of the total air pollution in the country and this number is likely to increase as India moves from being the 5th largest to the third largest automobile market in the world. (Express News Service, 2019) A proposed solution to the greenhouse gas emitting internal combustion engines is electric vehicles. A major benefit of electric cars is their contribution to improving urban air quality by reducing emissions that occur over the life of the car.

This reduction in pollution would lead (according to the American Thoracic Society) to a rapid and substantial benefit on health. This includes a reduction in childhood asthma, respiratory and irritation symptoms, such as shortness of breath, cough, phlegm, and sore throat (American Thoracic Society, 2019). For these reasons countries like India are encouraging a shift to electric cars.

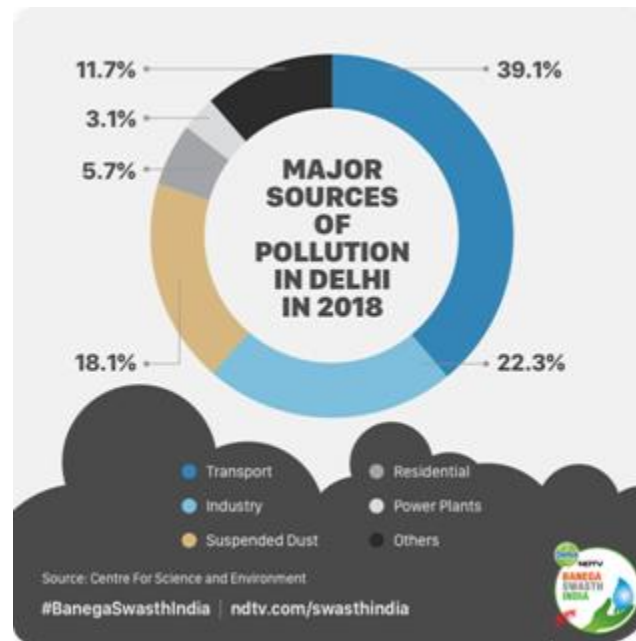


Image Source: NDTV (<https://swachhindia.ndtv.com/year-2019-how-bad-is-the-air-we-are-breathing-and-what-will-it-take-for-india-to-curb-air-pollution-40629/>)

The benefits of Electric Vehicles

Firstly, as a result of removing internal combustion engines, overhead costs would reduce with decreased fuel consumption and fewer moving parts reducing the required maintenance. On average, Electric Vehicles are 65-70% cheaper in terms of fuel, maintenance, and other overhead costs like road tax for which electric vehicles are exempt. A combination of these factors makes them widely appealing for the lower income sectors. Additionally, the adoption of electric vehicles would lead to a large reduction in fuel costs. On an average an Indian spends 1.3 lakhs (\$1500) on fuel alone (Business Standard, 2019). That being said, one must remember that a large amount of the Indian market consists of the low-income sector. This means that any saving is hugely beneficial, which also means that any cost reduction methods would be greatly utilised. This creates a large market for electric vehicles in India, particularly when it comes to two and three wheeled vehicles, which are generally more affordable and therefore more accessible to the lower income sectors. These two and three wheelers currently make up 83% of the Indian transportation sector. Thus, widespread adoption of Electric Vehicles in this part of the sector would be advantageous to the country's initiative of reducing climate change. (Shakti sustainable energy foundation, 2020).

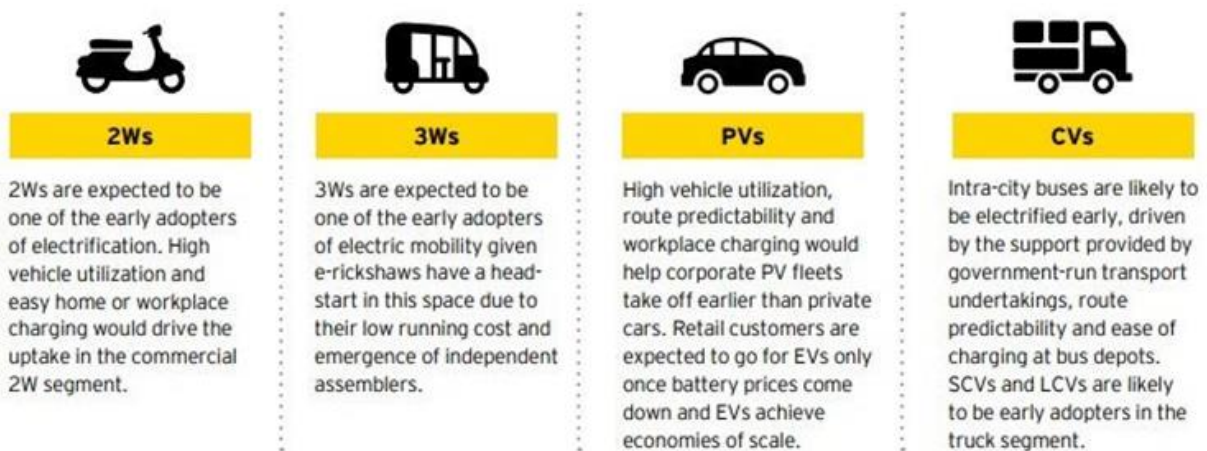


Image Source: EY analysis

Secondly, electric vehicles offer a greater convenience factor. With people able to charge their vehicles using electric sockets in their homes, the usage of petrol pumps greatly decreases, which eliminates a detour from people's daily lives.

A further benefit of EVs is that they would reduce the national reliance on oil. This is a major benefit to countries like India, which import a majority of their oil, as it would help reduce trade deficits. With 82% of Indian oil being imported, and 99.6% of petrol being consumed by the transportation industry, a reduction in its usage would greatly reduce Indian reliance on OPEC and its inflating oil prices (World oil, 2021) (Press Information Bureau 2014). Hence, electrification of the transportation industry would greatly reduce Indian import costs and would allow for more capital to be invested into development and education of the country. Additionally, a major contributor to inflation in the country is rising oil prices. If the reliance on OPEC and its ever-rising oil prices is reduced, the government would have to spend less time and effort on its monetary policy to combat inflation.

For these reasons, India is attempting to create more batteries domestically for electric vehicles, which also contributes to the *aatma nirbhar* or self-sustainability goals of the country. These batteries usually have a range of 200-250 kilometres on a single charge. However, in order for these India-made batteries to achieve their potential in terms of energy self-reliance, the government also needs to improve and increase charging infrastructure. While currently lacking, increasing the charging infrastructure is one of the main aims of the government with the final plan being to convert all petrol stations into charge points for EVs. With increasing technology and infrastructure, the government aims (by 2025) for 30% of new vehicles sold to be electric.

(From interview: SubhenduSinha).

Challenges to Widespread Adoption of Electric Vehicles

While the change envisioned sounds very optimistic, its execution is still being put to the test. The Indian government continues to fund the long-term solution of creating indigenous electric vehicles and their batteries, yet they appear to neglect the interim period we are currently in, where there is consumer acceptance of electric cars but a lack of choice. With strict Indian import laws and hefty import duties, globally produced electric vehicles have a preexisting barrier of entry in the Indian market. This results in a lack of consumer choice and thus oversight of electric vehicles. While the country's long-term solution would be hugely beneficial by creating jobs and increasing Indian exports, climate change continues to increase and worsen with every passing day. Thus, it would be fruitful for the country to allow some imports into the country until local production catches up with the demand of electric vehicles in the country.

Currently the infrastructure of EVs in India is also lacking. At the moment only home charging stations exist, which acts as a disincentive for consumers. For a complete adoption of electric vehicles, their charging points should be as accessible and widespread as their petrol counterparts. While the government does plan to convert petrol pumps into charging stations by 2025, at the moment no such infrastructure exists or has been put in place.

As per the data published by Central Electricity Authority, there are 927 public charging stations in India, as of 30th June 2020. Department of Heavy Industries sanctioned 3,397 charging stations under FAME-I & FAME-II. Under FAME-I, 427 charging stations were established in different cities of India. This number also includes charging stations established on some well-known highways connecting major cities. Under FAME-II, 2,877 stations have been sanctioned with the target of Pan-India coverage. The top 5 states (Maharashtra, Tamil Nadu, Gujarat, Andhra Pradesh and Madhya Pradesh) have been allocated ~48% of total charging stations under FAME-II. Effective implementation of these charging stations is likely to positively impact the consumer sentiments towards apprehensions about charging vehicles and range anxiety. (Shakti foundation, 2020).

Currently, the cost factor also plays a role in limiting the adoption of EV technology. While there is a reduction in long run costs with the elimination of overheads such as petrol and, to a certain extent, maintenance, there is still a significant short-term investment with a large price disparity between electric cars and their internal combustion counterparts. For example, the price difference between a base model internal combustion Tata Nexon and its electric counterpart is close to 100%. (Carwale, 2022) A near double price increase acts as a large disincentive for

consumers, and causes an unsuccessful launch of the electrified model. This in turn signals to the firms that the demand for these electric vehicles does not exist in the current market and hence leads to the cancellation of these projects. In addition to this, the installation of a home charging module for the electric vehicles acts as yet another large cost. Charging an EV at home also causes the consumers to incur the additional cost of a high electricity bill, which negates some of the benefit provided by a lack of petrol costs. In a market like India, where a large number of consumers usually go for the lower cost alternative, expensive EVs are almost guaranteed to fail.

Secondly, the convenience factor is a large decider for many of the purchases made in the Indian market. If a product provides anything slightly more inconvenient than its substitute, more often than not the Indian market would gravitate to the more convenient substitute.

This is a unique challenge for the EV market for two reasons. Firstly, it is a problem that needs to be addressed on a global scale. Waiting for an hour or half an hour to obtain the same range in an EV that would be done in an IC within 5 minutes is unacceptable and one of the biggest constraints against an EV globally. Secondly, charging is an even bigger problem in India as finding a charging port for an EV is rarer than a blue moon. This is one of the biggest challenges the government has to tackle if they aim for complete adoption and integration of electric vehicles. As per a government representative, efforts are being implemented to convert petrol pumps into electric charging stations.

Thirdly, a widespread stable supply of electricity, that is required to charge an EV, is a tall order for India, having only recently electrified the whole country. Therefore, providing enough electricity to charge an EV across India at the moment is an impractical ask.

Establishing an entire electrical grid with enough power to charge an EV means two things: Either India needs to improve its electrical power supply, or the electric vehicles themselves must have a more efficient charging system to allow for more widespread use, especially in the less developed sections of the country.

Fourthly, with a current shortage of car chips, producing batteries while missing an essential component in the cars production would be fruitless. The *aatma nirbhar* goals of the government push for natively made batteries but have not yet considered producing these chips. Thus, there remains a reliance on foreign imports, essentially diluting Indian self-sustainability. In addition to this there is a shortage of lithium, silver, nickel and other raw materials used in the manufacture of batteries. These ultimately have to be imported which again nullifies the self-sustainability aim of the Indian government.

How the government is helping

The government has already established PLI (the sum of government incentives that are directly linked to manufacturing performance) schemes for the manufacturing of batteries and electric vehicles. They are also providing low-cost financing with interest rates close to zero. (from interview: Subhendu Sinha) The government also plans to subsidise the banks providing these loans in order to make them even more affordable and thus attractive to low-income consumers. The government also plans to begin the conversion of petrol pumps into EV charging stations in metropolitan cities by 2025. These government plans and incentives highlight a clear and promising path ahead for electric vehicles in India.

While these schemes allow for adoption of electric vehicles in more urban areas of the country, the more rural areas are equally important in a country like India where a majority of the population reside outside the cities. The government also needs to sanction the installation of power grids in the more rural areas to be able to fully charge their EVs. Thus, a complete infrastructure creation in the rural areas is also essential. Which adds to another disadvantage of electric vehicles- needing an entire infrastructure to operate.

To provide further insight and context in understanding the current status of EV adoption in India, I conducted interviews with various stakeholders involved in the EV industry. The transcriptions of the interviews are below:

Interview 1 - Ujjwal Mukherjee

Deputy General Manager | Group Strategy Office

What are the current limitations of producing electric vehicles in India?

There aren't any constraints in development in terms of technology but the costs are relatively much higher in India than in the Chinese market which means the price of their imports are a lot lower. This means that natively manufactured goods can't be competitively priced. Which puts them at a disadvantage in the global market even with subsidies.

Has the pandemic worsened the situation?

The aforementioned Issues were already there pre pandemic however, the global supply chain disruption has made it much worse. There was already a lack of demand at the current price. And the added price that a shortage caused further reduces the already negligible demand. The lack of demand is further compounded by a lack of charging infrastructure, without a complete support

system, consumers would hesitate to invest in this new technology.

What sort of support is being received from the government? Are subsidies being provided?

Yes. There is a production linked incentive scheme 25,000 crore of subsidy. Which is an incentive linked to the number of electric vehicles that you produce and are subsidised upto 7-8 percent of the sales value.

What type of electric vehicles do you see having the greatest demand in the Indian market?

I feel that the demand for 3 wheelers will pick up first before the 4 wheelers. Conventional auto rickshaws are a good example. Lower overhead costs incentivise the switch to an EV

which is why the lower income sector could potentially be the first to adopt EV's. In addition to this, even the consumers get road tax subsidies. State policies go on top of the subsidies received by the consumer from the centre.

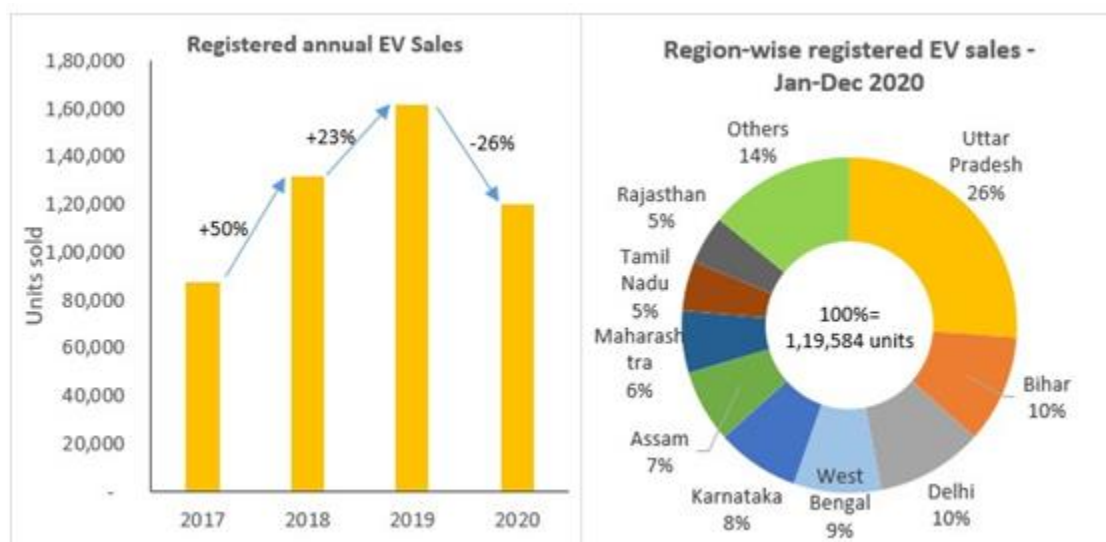


Image Source: EVReporter ([https:// evreporter.com/ev-sales-india-jan-dec-2020-jmk- research/](https://evreporter.com/ev-sales-india-jan-dec-2020-jmk-research/))

However, this grant is limited in the amount of people that can claim it. That being said, the demand is projected to have an upward trajectory even without the grant. One can see the success of Electric vehicles already, electric 2 wheelers were less than 1 percent of the sales in market now constitute close to 7 percent of it in just four years-essentially doubling through the years. Additionally electric 4 wheelers that sold 3000 units in 2020 sold 7000 units in 2021. In

terms of state aid and subsidies- Loans with lower interest rates are being provided for the purchase of EVs. States like Maharashtra and Andhra Pradesh subsidise and provide grants for the manufacturing of batteries.

What are the common reasons consumers gravitate towards electric cars?

Economic reasons are the main driving force for this. EV are much more cost effective for day to day charging and operating costs are much lower. Plus, the loss of convenience is overruled by the cost effectiveness for a majority of the market.

I had a theory that the production of electric cars was more environmentally harmful than the eventual environmental benefit posed by the electric cars. Does the transportation of raw materials as well as the mining of raw materials like nickel offset the benefit of the reduction in pollution? Do you have any information to counter this?

When this is taken into account with a broader picture, the economies of scale and the supply of raw materials in India allow for OEMs to produce the batteries more efficiently for maximum environmental benefit.

How can the government help beyond what they are already providing?

The only thing to speed this up is beyond subsidies. If they step up the ecosystem like charging systems that would be greatly beneficial. Plus making it a priority sector lending for banks beyond the subsidies is one of the most important things that the government could incorporate to stimulate demand.

Interview 2: Subhendu Sinha

Adviser (Infrastructure Connectivity – Transport and Electric Mobility), Mission Director at NITI Aayog.

As of December 2021, what subsidies are being provided to incentivise consumers in the electric vehicle market?

Subsidies and the provisions have existed for a while now. There is a scheme called FAME. There are two versions- one till 2019 and v2 since then. It has been extended to 2024. Provisions for incentives have also been explored. Resulting in 2,3 and 4 wheelers all having different types of incentives attached. Differential incentives- 3 wheelers have high aggregated demand with bulk orders in all 9 cities with a population over four million population. In these cities work is

being done to allow them to set an example for other cities.

How have the results been?

Results so far have been good with 2 wheelers sales having hugely increased. For buses 7 out of the 9 cities have asked for 5600 electric buses. For 3 wheelers, bulk orders have been placed with 1 lakh 3 wheelers being ordered. Affordability has also been taken care of with lower cost battery systems. Additionally, to improve the convenience aspect of EV's, 1576 charging structures have been sanctioned on 2247 highways in cities. 520 of those were installed in scheme one. Different states also have different charging structures. South Delhi municipal corporation have also started with the construction of this infrastructure. BPCL are also going to create 22000 charging stations in place of petrol pumps, which will be stationed at the same petrol pumps. By January they aim to pull off this agenda. Apart from this, PLI schemes for automobile components have also been put in place. Advanced chem cell schemes are also being implemented. There is already a 18,100 crore scheme for the advanced chemistry cell. National mission of transforming mobility includes India producing their own batteries with self-sustainability all around.

Tell me a bit about this project

There are two more important initiatives, we have encouraged states to have their own EV policies, 17-18 states have notified their EV policies so far. The rest are in the final stages of Developing and legislating the policies. By the end of the year (march) every state would have the policy. This helps investors to feel more comfortable which means foreign investment in India would increase, allowing aggregate demand of the EV's to increase.

Employment gains would also increase, having a positive knockoff effect. The government has also Encouraged IIT's to create departments etc. to do further research about this EV's. 9 IIT's are working on the same. The teams in IIT also connect with CTO's of oems to better the Indian EV industry. The government is also working on upscaling skills and increase training to boost development. There are over 3 million people involved in working with international companies for upscaling skills. We feel that these initiatives may help India instate more EV's in the country.

Any challenges?

Trying to completely re orient individual pretences of consumers without mandates. Today in the last 6-8 months things have changed people are convinced about the future of EV's. India and within India know that we are advancing and want to catch up with the west.

First challenge - not that affordable yet. Also still trying to make each vehicle in different segments less expensive than its internal combustion counterpart. Can be done with manufacturing our own battery systems. Additionally charging infrastructure must be fully proliferated. Should not be an inconvenience for access. Third, many people don't purchase upfront but with finance. But financing it is very expensive. Risk sharing schemes are being looked at. Inter-operability. Single uniform payment mechanism for charging is also important. They are currently partnering with JLR for batteries. The battery is a storage system. India is currently working on importing it. But these imports become expensive. Right now, there is a cost escalation of about 30% for batteries. If manufactured in India this cost esc would drop. Plus, with Indian scale and cost of about cost is set to reduce by 40%. This reduces upfront price and cost of use. Trying to reduce any logic against electric cars.

What should be done next: we should be going in for awareness campaigns. There should be ongoing nationwide campaigns for at least three years. Increase familiarity with electric vehicles is incredibly important. This would help educate consumers. In India also there should be innovation centres to show the workings of EVs to help build awareness etc. about it. Make the cars more accessible and visible to people. When we start thinking about the pace of transformation and achieving this - India is one of the fastest within 3 years we have achieved so much. 7.5 l vehicles are already on the road. The next big move should be aggregators completely transforming their fleets. This would act as brand ambassadors. So, they can firsthand experience how good they are.

Supply chains should be very robust with as much localisation as possible. Our own systems for everything are important.

The automotive industry is 8% of the GDP. If this is so significant, we should have everything as our own. Getting everything from abroad isn't as helpful. Why get it from outside when we can make it at a cheaper rate. India should be the world's biggest hub. We want to welcome anybody and we are ready to tone down import duties for a limited period of time at least. If manufacturers provide a roadmap to manufacture their vehicles in

India, the government is almost instantly ready to drop duties and tariffs. India can't just be treated as a one sided market, it has to be a win-win situation for both the government and the manufacturer.

Additionally, is there anything you would like to see from the manufacturers to help an increase in demand?

At the moment a large challenge is a lack of awareness about EV's. Thus, it would be beneficial to the industry if the private firms take the initiative to increase awareness and education about electric vehicles. This should contribute to a more seamless integration of electric vehicles in society.

Discussion & Conclusion

In summation, there is a level of agreement between the two parties interviewed. Both shared the belief that the lower income market is going to be the most substantial driver in the adoption of electric vehicles in India. With a high price elasticity of demand, any reduction in costs would have a large positive impact on the demand for EV's. While the asks of the private firms are being pursued by the government by way of priority sector lending for the purchase of EV's, the government also asks that private firms take the initiative to increase education in this space. Creating awareness about climate change and its mitigation through electric vehicles could prove to be one of the best stimulants for demand.

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