



TRANSITION OF ELECTRIC VEHICLE IN INDIA

¹Ar. Bhagyashree Thakkar, ²Ar. Meera Chatwani, ³Ar. Mayank Patel

¹Student of Master's in Urban & Regional Planning, ²Professor & Dean, ³Assistant Professor

¹ Institute of Architecture,

¹ Hemchandracharya North Gujarat University, Patan, Gujarat, India

Abstract: Today, Due to depleting fuel reserves in addition to a climate crisis, property is gaining ground, and electrical vehicles (EVs) are emerging to be the new face of this field. This thesis argues for an approach which goes beyond the conventional urban climate governance view. With engagement in social-technical practices, a more sustainable and inclusive way of transforming the city can be accomplished. One way of doing so is with the offering of the urban living lab as a playground for real-life experiments. With a purposive intervention in an urban socio-technical system, the three-dimensional idea of urban environmental governance, socio-technical experiments and strategic experiments with designed policies can create a more sustainable urban transition.

As the present trend suggests, this mode of transport is probably going to switch combustion engine (ICE) vehicles in the near future. EVs can cause significant impacts on the environment, power system, and different connected sectors. The present power system could face large instabilities with enough EV penetration, but with proper management and coordination, EVs can be turned into a major contributor to the successful implementation of the smart grid concept. There are possibilities of immense environmental benefits as well, as the EVs can extensively reduce the greenhouse gas emissions produced by the transportation sector.

Index Terms – Introduction, Literature review, data analysis, Conclusion.

I. INTRODUCTION

Global warming and factors contributing to this such as greenhouse gas emissions (GHG) are fundamental aspects to be tackled in the 21st century (WHO, 2011; IPCC, 2014; Gnann& Patrick, 2015; UNFCCC, 2015). As the IPCC is stating, GHG emissions need to be reduced by 50% by 2050 from the 1990 levels. Combustion engine cars demand has been increasing with the continuous countries' development. The transport sector is currently one of the main contributors of climate change with a 20% share in GHG emissions (Gnann& Patrick, 2015), with the road transport holding a share of 16% of man-made CO₂ emissions.

India is one of the fastest growing economies in the world and has a high dependence on oil resources to fuel its transport needs (GWI, 2017). According to the Ministry of Petroleum & Natural Gas 2014 press release, Petrol consumption is almost entirely accounted by the transport sector with a 99.6% (GOI, 2014). India imports around 80% of its crude oil and 18% of its natural gas requirements (Aggarwal Bhaskar, 2017). BP Energy Outlook predicts that India's oil imports are expected to rise by 165%, for gas with 173% and 105% in coal imports by 2035. India imported 202 million tons of oil in 2015-2016.

Nationally Determined Contribution (INDC) that enlists electrical vehicles as a focus area under transport mitigation actions (Ray, 2015). Recently, in India was launched the National Electric Mobility Mission Plan (NEMMP) that follows to incentives electric vehicles production and sales having a total proposed investment of around USD 4 Billion (Rs 224 billion) by 2020. India is supporting and expressed its desires to create a domestic EV industry and also to target the export market as stated in the NEMMP (Gulati, 2012). Electric vehicles, especially electric cars (EVs), have a low presence in the market and in consumers' choices and manufacturing of electric 2 wheelers, 3 wheelers and electric cars in India has just recently started. It is known that only few car manufacturers began producing electric automobiles in India. At the same time, there was steady growth in Indian economic activity.

the current established auto manufacturing industry in India accompanied by the accelerated growth in transport demand and the recent interest in electric vehicles offers a good perspective for India to create a domestic E-car business and even emerge as a global leader in E-car manufacturing market

Thereby, a strong and urgent need exists to carry out a critical in-depth examination of the various regulatory aspects impacting the land development process in the real estate sector, to identify the loopholes and come up with reforms and modifications that will help enable a more efficient mechanism of delivering urban serviced land, thus provide the much necessary impetus to the housing and residential real estate sector.

II. LITERATURE REVIEW FINDINGS

The shortage of EVs and EV models were identified as impediments to EV adoption. The lack of expertise and unqualified vehicle dealerships may deter EV adoption, according to the literature. The EV. India has a low acceptance rate for EVs, and the majority of people are unaccustomed to driving them. An EV may cost more up front, but its ongoing operating and maintenance costs are often inexpensive.

One of the variables is the impact of perceived economic benefit (PEB) on adoption. Since EC is becoming more widely known, it is also hypothesized that this factor is affecting the uptake of EVs. Adoption of high engagement products can be influenced by social influence (SoC.In) and self-image (IM). The dependent variable is behavioral intention (BI), while the mediating variable is attitude (ATT).

2.1 Electric mobility in India:

A total of 5,30,560 EVs (including electric two-wheelers [e-2W], electric three-wheelers [e-3W], electric rickshaws [e-rickshaws], electric cars [e-cars], and electric buses [e-buses]) were sold in India (CEEW - Centre for Energy Finance 2020). This remains far from the National Electric Mobility Mission Plan (NEMMP) 2020 target of 6-7 million EV and hybrid sales by 2020. However, there is a steady uptick in the sales of EVs since 2017 as shown in Figure.

A number of high-voltage electric cars were launched towards the end of 2019 and many more models showcased at the Auto-Expo 2020 were being readied for launch, including Tata Altroz EV, Mahindra eKUV100, and MG Marvel X (Carandbike 2020). The unexpected outbreak of the COVID-19 pandemic and its fallout has disrupted the global supply chains for EV components, mainly power electronics, battery, and the minerals that are used in these components (Wood Mackenzie 2020).

The blossoming EV industry in India stares at an unclear future, as experts are divided on how the EV sector will eventually emerge out of the present situation: some have forecast stagnation while others see a possibility of the Indian EV sector becoming a strong contender in the global electric mobility manufacturing space (Panday and Ghosh 2020; Inc42 2020). Policy directives such as Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles Phase II scheme (FAME II scheme) and Phased Manufacturing Plan have been issued with a clear intent to transition to EVs.

2.2 Scenarios:

Comparison between EV sales of 4 per cent in a BAU scenario and a scenario with 30 per cent EV sales by 2030. It's worth noting that the National Institution for Transforming India (NITI) Aayog and Rocky Mountain Institute (NITI-RMI) study projects a much higher share of EV penetration (NITI Aayog and Rocky Mountain Institute 2019).

EV penetration at 30 per cent as India is part of EV30@30 campaign and as the country has committed to achieving that target (Clean Energy Ministerial 2017). See Figure for a fuel mix we have projected for 2030 from our model. project mobility paradigms based on three additional scenarios that could emerge by 2030 and explore the consequences of EV penetration in these scenarios as well. These are widely different mobility paradigms compared to the BAU:

- (i) a high public transport scenario (High PT) with significantly higher share of travel demand met by buses;
- (ii) a high private vehicles scenario (High PV) with substantial increase in the share of cars and two-wheelers (2W) in 2030; and
- (iii) a high shared mobility scenario (Shared) with higher share of shared-car trips and limited car ownership

Mode-share scenarios evolve along different typologies depending upon economic growth rates, which further has an impact on the passenger travel demand. assume a 30 per cent EV penetration in new sales in 2030, allowing other fuel technologies to evolve as per historical trends in the remaining share of vehicles. mode-share scenarios evolve along different typologies depending upon economic growth rates, which further has an impact on the passenger travel demand.

2.3 Social Influence:

People take a particular action as a result of SoC. (Chen & Tung, 2014). According to Axsen, Orlebar, and Skippon, the effect of other people's behavior on an individual's decisions in their social network plays a critical role in EV propagation (2013). The impact of the social network is essential to an individual's adoption. Can Electric Mobility Support India's Sustainable Economic Recovery Post COVID-19? (Council on Energy, Environment and Water (CEEW) Report November 2020 ceew.in)

- Among the avenues for economic recovery and sustained growth after the COVID-19 pandemic dies down, paving the path with a transition to electric vehicles (EV) has immense potential for investment and rapid market growth. In this report, they specifically focus on changes in oil import, value-addition, employment, impact on public finances, market size for EV components, and environmental benefits from reduced local air pollutants and greenhouse gas (GHG) emissions. The 30 percent EV transition in 2030 is likely to have a wide-ranging impact on the economy.
- Attempt at unpacking these issues by projecting the vehicle stock in 2030 in business-as-usual (BAU) and a scenario with 30 per cent EV penetration.
- Also explore three different mobility paradigms – (i) high public transport, (ii) high private vehicle and (iii) high shared mobility to gauge the range of impact of mode-share coupled with 30 per cent EV sales in 2030 on the industry, economy and environment.

III. DATA ANALYSIS:**3.1 Pricing of EVs in India**

- The rate of adoption of EVs in India is moving sluggishly primarily because the EVs are not priced at par with ICE vehicles and come at a premium. This significantly impacts the purchase decision of buyers, more so in the lower-end car segment. Further, the high cost of batteries adds up considerably to the high price of EVs.
- To make things worse, these batteries are being imported from lithium-rich nations such as China, Japan, and Australia, to name a few, and there by making EVs unaffordable as compared to their ICE counterparts.

3.2 Potential steps to reduce price of EVs

- India needs to concentrate on creating a supply chain, especially by domestically producing batteries and lowering the price of EVs in India. Tesla Inc. recently formed a Tesla India Motors and Energy Private Limited subsidiary in India with the intention of eventually establishing a manufacturing facility there where Tesla automobiles will be made locally. Similar to this, India must entice both domestic and foreign battery producers to establish regional production facilities. These actions would reduce the price of batteries and EVs, increasing cost competitiveness.
- An instance of domestic investment aimed at reducing battery costs is a power company intending to set up India's first lithium refinery to process lithium or imported from Australia to produce battery-grade material. Further, 3 Indian state-run companies endeavor to purchase and hold mining assets overseas. These mines consist of minerals like lithium and cobalt, which are used for manufacturing batteries for EVs. In order to produce lithium-ion cells, a significant lead-acid battery manufacturer in India has established a technology base in the state of Andhra Pradesh.
- In May 2021, the Government of India introduced a Production Linked Incentive Scheme (PLIS) for the manufacturing of 'Advance Chemistry Cell' in the country to incentivize local production of batteries and reduce dependence on imports. This would provide the necessary push to invest in the research and development of alternatives to lithium, which itself is a limited resource.

3.3 Lack of electric vehicle charging infrastructure in India

- The EV 100 members forming a part of the Climate Group's EV 100 Initiative (a global initiative to bring together companies that are committed to switch their fleets to EVs and to install EVCI for employees and customers by 2030) reported in the EV 100 Progress and Insights Report 2021, a lack of EVCI as the top barrier to EV adoption.
- In India as well, the reason for the protracted growth of the adoption of EVs is the lack of EVCI. The backbone of the e-mobility industry is reportedly EVCI. Due to this, poor EVCI results in fewer EV sales and vice versa, creating a classic "chicken-and-egg" scenario.

3.4 Potential steps to enhance EVCI

- With the launch of FAME II, the DHI provided Rs. 1 billion for the establishment of EVCI in India. The Ministry Has clarified that setting up public EV charging stations would not require a license under the Electricity Act,2003 to transmit, distribute or trade in electricity. This was a welcome step reducing multi folds of regulator engagement.
- Additionally, EVCI must be established in accordance with the Ministry of Power's notification from October 1, 2019, which is titled "Charging Infrastructure for Electric Vehicles -Revised Guidelines and Standards" and was later updated on June 8, 2020.
- The Guidelines and Standards priorities the rollout of EVCI under two general categories: (a) Phase I (with a target time period of 1-3 years), which focuses on developing EVCI in all Mega Cities with a population of 40 lacs or more, expressways connected to such Mega Cities, and highways of significant importance; and (b) Phase II (with a target time period of 3-5 years), which focuses on state and union territory capitals and any other highway which connects such mega cities.
- The Guidelines and Standards state that:
 - a) private charging at home or work is permitted;
 - b) a public EV charging station will receive an electricity connection on a priority basis from the relevant power distribution company in order to facilitate the establishment of EVCI and increase EV sales (DISCOM)
 - c) The Guidelines and Standards advise installing at least one public EV charging station in a grid of three kilometers by three kilometers, and at a distance of 25 kilometers on both sides of the highways or roads. This is because public EV charging stations can now obtain electricity from any generation company through open access. EV users who encounter difficulty finding EVCI during long distance travel are encouraged to follow this recommendation.

Recently, public sector undertakings operating in the Oil & Gas sector have agreed to set up 22,000 public EV charging stations in the next 3-5 years in the country. The Model Building Byelaws, 2016 have also been modified by the Ministry of Housing and Urban Affairs (MOHUA) to facilitate the transition to EVs. It allows for the creation of EVCI depending on building occupancy patterns and the amount of parking available overall. The aforesaid amendments will be applicable on a particular State subject to amendments made to its respective State building bye-laws.

IV.CONCLUSION:

In the new future, e-mobility in India would not be something of luxury but it would be something necessary for the survival because the pollution level is alarming, and the only solution is the green sources and transmission of energy. When it comes down to it, EVs are therefore unavoidable, so it is preferable to plan and organise for how the developments will occur rather than avoiding the shift.

In view of the rising levels of greenhouse gases in the atmosphere, the development that the electric car sector has seen in recent years is not only warmly welcomed but also desperately needed. The advantages of electric vehicles considerably outweigh the expenses, as shown in the economic, social, and environmental analyses parts of this webpage. Cost is the main barrier to the widespread use of electric-powered transportation, as gasoline and the vehicles that run on it are easily accessible, practical, and less expensive. As is demonstrated in our timeline, we hope that over the course of the next decade technological advancements and policy changes will help ease the transition from traditional fuel-powered vehicles. Additionally, the realization and success of this industry relies heavily on the global population, and it is our hope that through mass marketing and environmental education programs people will feel incentivized and empowered to drive an electric-powered vehicle. Each person can make a difference, so go electric and help make a difference.

Undoubtedly, an integrated policy on future of mobility with a focus on zero-emission mobility is the call of the hour. However, such a policy should also consider financial health of the industry, revenue to the government and employment opportunities to millions and millions. The future of electric mobility is here and is here to stay, evolve and widen its reach.

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