

# **A study on the influence of government initiatives toward the adoption of EVs in India and Globally**

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**KEYWORDS**

Electric Vehicle,  
Government  
Initiatives,  
Infrastructure support

**ABSTRACT**

The problem of pollution across the globe is increasing day by day. This is one issue where we have seen the world coming together and trying to address it. However, indeed, we are far from achieving the solution due to the diversity. One of the common points where we have seen the acceptability across nations and geography is the adoption of Electric Vehicles. In many countries including India, the government is working hard to make people aware of the benefits of Electric Vehicle. This study is an honest attempt to present the different measures taken by countries around the world including India on the government initiatives taken to make people aware of the Electric Vehicle. The study is based majorly on secondary research done in the past. There is primary research done in Karnataka and few of the data points are taken from that study. A sample of 384 respondents were given a questionnaire. This study includes the findings from the above primary research for government initiatives in India.

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**1. Introduction**

Electric vehicle adoption is becoming a top priority because of the growing concerns about climate change, air pollution, and the depletion of fossil fuels. As cities become increasingly congested and urban air quality deteriorates, the environmental impact of traditional automobiles is becoming unsustainable. Electric cars provide a more environmentally friendly option.

The automotive industry is undergoing a radical transformation, driven by the need for more sustainable and environmentally friendly transportation solutions. One of the most significant changes in this sector is the global shift toward Electric Vehicles (EVs). As the world grapples with the growing concerns of climate change, pollution, and the depletion of natural resources, electric vehicles have emerged as a viable alternative to traditional internal combustion engine (ICE) vehicles. The adoption of EVs is seen as one of the most promising solutions to reduce carbon emissions, improve air quality, and decrease dependence on fossil fuels.

**1.1 Global EV Market Growth****North America**

North America has been an early adopter of electric vehicles, particularly in the United States. The EV market in the U.S. is dominated by Tesla, which has been a key player in popularizing electric cars and pushing the boundaries of what electric vehicles can offer. Tesla's innovative approach to EV design, battery technology, and autonomous driving features have helped shift consumer perceptions about electric cars, showing that they can be high-performance vehicles with long driving ranges.

The U.S. federal government has also played a significant role in supporting EV adoption through incentives, such as tax credits for consumers purchasing EVs and funding for the installation of charging infrastructure. However, the market is not without its challenges. While EV sales in the U.S. have grown steadily, they still represent a relatively small portion of the

overall automotive market. In 2023, electric vehicles accounted for around 8% of total vehicle sales in the U.S.

In March 2012, President Obama announced the EV Everywhere Grand Challenge-to produce plug-in electric vehicles (PEVs) as affordable and convenient for the American family as gasoline-powered vehicles by 2022. The U.S. Department of Energy developed a framing document and conducted a series of public workshops to obtain input on the plan, leading to an EV Everywhere Blueprint issued in January 2013. DOE released a funding opportunity announcement for up to \$50 million of R&D to support EV Everywhere in March 2013. The solicitation sought projects on advanced batteries, electric motors, and power electronics for electric drive systems, vehicle lightweighting, climate control technologies, and charging infrastructure. This paper describes the specific technical targets set forth and describes the areas of research to be undertaken to achieve the targets and goals

Many revised projections still show a path to the 50% sales threshold by 2030. The internal forecast done by Recurrent suggests that we remain on pace for that target, which includes entering the 15% “Mass Adoption Phase” by the end of 2025.

Boston Consulting Group (BCG) maintains a projection model that is published annually. It accounts for factors like battery costs, vehicle selection, and government support. The team gave Recurrent an early look at their estimate in April 2024 ahead of several large industry shifts, including revised EPA targets and updated import tariffs. There are the following observations done by Recurrent which are a bit encouraging as far as Electric Vehicle in the US is concerned

1. Battery costs have hit a new low and are projected to drop 40% from 2022 to 2025
2. Vehicle selection is increasing each year with lots of new models available for consumers
3. Government programs are working, including at the state level. Around 17 states have committed to aggressive zero-emission timelines.
4. The used EV market is getting more affordable with nearly 60% of vehicles priced below USD 30,000.

- **Europe**

Europe has emerged as one of the largest and fastest-growing markets for electric vehicles. Several European countries have been at the forefront of promoting EV adoption, with Norway leading the way. Norway has one of the highest per capita EV ownership rates in the world, and nearly 54% of all new cars sold in 2023 were electric. This success is largely due to the country’s aggressive government incentives, including tax exemptions, free tolls, and the absence of VAT on EV purchases.

The European Union has also set ambitious goals to reduce carbon emissions, with a target to make the continent carbon-neutral by 2050. As part of this effort, the EU has introduced regulations that push automakers to meet stricter emissions standards, encouraging the production of more electric vehicles.

Countries like Germany, France, and the Netherlands have also introduced substantial incentives for EV buyers, including purchase subsidies, tax breaks, and free access to public charging stations. The growth of EVs in Europe is further supported by the continent’s strong commitment to building out EV charging infrastructure and ensuring that consumers have access to reliable and convenient charging solutions.

The government is playing a major role in this transition and taking the right measures to increase electric vehicle ownership. Some of the important initiatives taken are as below

1. Austria: Tax benefit for the EV owners – Exemption from the ownership tax for all zero-emission passenger cars. Exemption from pollution tax for zero-emission passenger cars  
Incentive – Bonus (Until the end of 2024) for the purchase of the new car (Private Use)
2. Bulgaria: Tax benefit for the EV owners – Tax exemption for electric vehicles  
Incentive – No other incentive is available
3. Croatia: Tax benefit for the EV owners – Exemption from special environmental tax electric vehicles  
Incentive – Incentive scheme once in a year (limited Funds). The purchase deadline was 31<sup>st</sup> Dec 2024. The vehicle must be kept for at least two years and cost must be less than 50,000 Euros.
4. Denmark: Tax benefit for the EV owners – Ownership taxes are based on CO2 emissions. Zero-emission cars and cars with 58g/km pay minimum semi-annual tax.  
Incentive – No other incentive is available.
5. France: Tax benefit for the EV owner – No benefits available  
Incentive – Bonus for the new BEV ( Battery Electric Vehicle) and FCEV (Fuel Cell electric vehicle) eligible for the minimum environmental score. A scrappage scheme for a secondhand or new BEV or FCEV up to 47,000 Euros
6. Germany: Tax benefit for the EV owner – 10 years exemption for BEV or FCEV registered until 31<sup>st</sup> Dec 2025. The exemption granted until 31<sup>st</sup> Dec 2030 at the latest  
Incentive – No other incentive is available
7. Portugal: Tax benefit for the EV owner – Exemption for BEVs

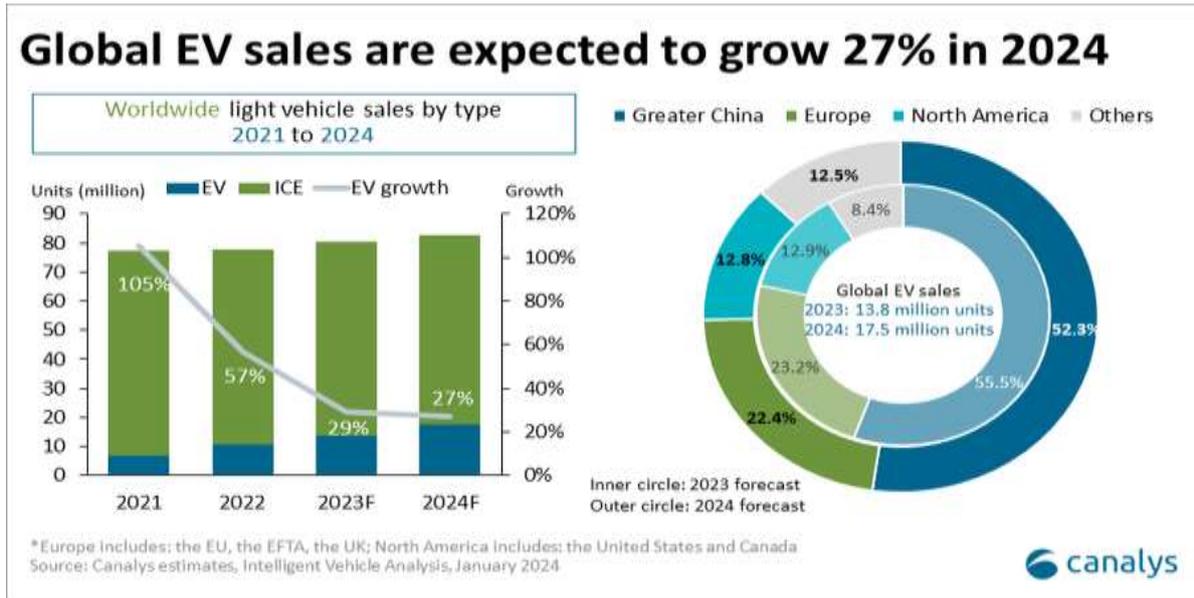
Incentive – Private user: 3,000 Euros to buy a new BEV, with a purchase price of up to 62,500 Euros, limited to one vehicle per person.

- **Asia**

Asia is home to some of the largest EV markets, particularly in China, Japan, and South Korea. China, in particular, has emerged as the world's largest market for electric vehicles. In 2023, over 6 million electric vehicles were sold in China, accounting for nearly half of global EV sales. The Chinese government has made significant investments in EVs, with a focus on improving the nation's air quality, reducing dependence on imported oil, and supporting its domestic EV manufacturers, such as BYD, NIO, and XPeng.

Japan, while not as large a market as China, has been a pioneer in EV technology, particularly through the efforts of automakers like Nissan and Toyota. Japan has focused more on hybrid vehicles, with the Toyota Prius being one of the most well-known hybrid cars globally. However, Japan is slowly increasing its commitment to fully electric vehicles, with Toyota announcing plans to release more EVs in the coming years.

South Korea has also made substantial strides in the EV market, with companies like Hyundai and Kia producing popular electric models. The South Korean government has introduced various incentives for consumers, including tax breaks and subsidies, to accelerate the adoption of electric vehicles.

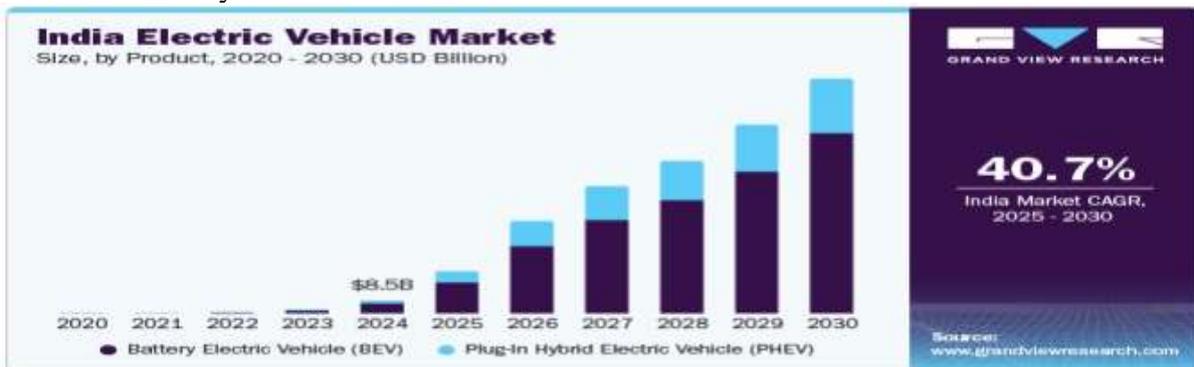


## 1.2 Electric Vehicles – In India

India, one of the world's most populous nations and a major consumer of fossil fuels, is at a crossroads when it comes to its transportation system. The demand for cleaner, greener alternatives is growing, and Electric Vehicles (EVs) have emerged as a promising solution to the country's environmental challenges. EVs have the potential to transform India's transportation ecosystem, reduce carbon emissions, and reduce dependence on imported oil. In India, where urban air pollution, traffic congestion, and greenhouse gas emissions from the transportation sector are major concerns. With a growing middle class and an increasing number of vehicles on the road, India's transportation needs are evolving, and EVs are seen as a sustainable alternative.

The concept of electric vehicles in India dates to the early 2000s, but it was only in the last decade that the market began to gain traction. In 2020, the EV market in India accounted for about 1-2% of total vehicle sales, a small but steadily growing figure. As of 2024, electric two-wheelers, followed by electric three-wheelers, dominated the EV sales in India. However, the electric car market is still at a nascent stage, and it faces significant challenges to reach mass adoption. Despite this, major automakers, including Tata Motors, Mahindra Electric, and new entrants like Ola Electric, are making significant investments in electric mobility.

The Indian government's push for electric mobility is driven by multiple objectives, including reducing pollution levels, lowering dependence on oil imports, and creating a sustainable future for urban mobility.



## **2. Literature review and Hypothesis development**

There are past studies available that were used to understand the topic more clearly and increase familiarity. Researchers in the past have done the study of external factors like government initiatives across the countries. The research problem and the objectives played an important role in getting the right literature from the huge content available.

Another important parameter to measure the importance of literature is to look at the number of times an article has been cited in different research articles. A high number of citations means that many researchers have found value in that article and hence could be potentially credible and delivering source for our study.

**Armin Razmjoo, Arezoo Ghazanfari , Mehdi Jahangiri, Evan Franklin, Mouloud Denai, Mousa Marzband, Davide Astiaso Garcia and Alireza Maheri ( 2022)** conducted a study about the rapid increase in the efforts from the government for electric vehicle expansion. This study highlighted and analyzed the most critical aspect of the expansion. This study also provided comprehensive information on electric vehicles and their perspectives that's are critical to policymakers, car manufacturers, consumers, and the community.

**Lluc Canals casal, Egoitz Martinaz-Laserna, Beatriz Amante Gracia, and Nerea Nieto (2016)** did the study on sustainability analysis of the electric vehicle in Europe. Monte Carlo analysis was also part of the study done with respect to the electric vehicle energy consumption. European policymakers have pushed the automobile industry to continuously improve the internal combustion engine vehicle, however, there was a limit to it. Hence the electric vehicle was looked upon as an alternative. Furthermore, many of the European countries have adopted the policy suitable to increase of electric vehicle for private use. The electric vehicle is also used for commercial use but there is a long way to go.

**Ivan K.W. Lai, Yide Liu, Xiubo Sun, Hao Zhang, and Weiwei (2015)** in their study of factors influencing the behavior intention toward full electric vehicle was conducted in the city of Macau.

### **The objective of the Study:**

- I. To understand the impact of infrastructural support provided by the government in Karnataka, India for Electric Vehicle Adoption.
- II. To understand the impact of Financial Incentives provided by the government in Karnataka, India for Electric Vehicle Adoption.

### **Research Methodology**

**Research Design:** This research is a type of research design that is used to describe or summarize phenomena, situations, or groups of individuals. In this research, the researcher has used the secondary data available in the public domain. As the topic was related to Electric vehicle adoption policies across the countries, the collection of primary data was not practical as well as expensive. However, there are parts of the findings available in this research paper which is from primary research. The primary data related to the initiatives of the Indian Central and State government is part of this study. The questionnaire also contained a few questions about the external factors for the adoption of electric vehicles. Government initiatives is one of the major factors as it impacts both the supply as well as demand side. There are few subsidies and incentives available for the consumers also for the electric vehicle manufacturers several measures had been taken. This is going to be a continuous process.

**Research design:** Descriptive research – This research is a type of research design that is used to describe or summarize particular phenomena, situations or groups of individuals. It involves collecting data to provide a detailed and accurate picture of the topic under investigation.

**Research plan:**

- Data Source: Primary
- Research Approach: Survey method
- Research Instrument: Questionnaire

### 2.1 Table Path Coefficient

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values
Attitude -> Infra Support	0.444	0.445	0.051	8.695	0.000
Attitude -> Fin Incentives	0.196	0.204	0.063	3.123	0.002

#### Reliability Analysis Table 2.1.a: Infrastructure Support

Scale Reliability Statistics			
	Mean	SD	Cronbach's alpha
Scale	3.215	0.631	0.663

The descriptive statistics for the Infrastructure Support scale reveal a mean score of 3.215 with a standard deviation of 0.631, indicating a moderate level of perceived infrastructure support. **Infrastructure Support** shows a positive correlation with **Awareness** ( $r = 0.492$ ), **Perceived Benefits** ( $r = 0.437$ ), and **Environmental Concern** ( $r = 0.395$ ), reflecting that perceived infrastructure support is associated with higher levels of awareness, benefits, and concern for the environment. It also correlates positively with **Attitude** ( $r = 0.324$ ) and **Behavioural Intention** ( $r = 0.323$ ), indicating that perceived support influences attitudes and intentions.

#### 1. Attitude -> Infrastructure Support

- $H_0$ : Attitude does not significantly affect Infrastructure Support.
- $H_1$ : Attitude significantly affects Infrastructure Support.

Beta Value (Original Sample): 0.444. P-Value: 0.000. The p-value is less than 0.05, so we reject  $H_0$ . Attitude significantly affects Infrastructure Support. The positive beta value indicates that a higher Attitude leads to better Infrastructure Support.

#### Reliability Analysis Table 2.1.b: Financial Incentive

Scale Reliability Statistics			
	Mean	SD	Cronbach's alpha
Scale	3.274	0.738	0.824

The descriptive statistics for the Financial Incentive scale reveal a mean score of 3.274 with a standard deviation of 0.738, indicating a moderate perception of the impact of financial incentives.

**Financial Incentive** has a moderate positive correlation with **Awareness** ( $r = 0.342$ ) and **Perceived Benefits** ( $r = 0.270$ ), and weaker correlations with **Environmental Concern** ( $r = 0.266$ ) and **Infrastructure Support** ( $r = 0.369$ ), indicating that while financial incentives are somewhat related to awareness and perceived benefits, their relationship with other variables is less pronounced.

#### 2. Attitude -> Financial Incentives

- $H_0$ : Attitude does not significantly affect Financial Incentives.
- $H_1$ : Attitude significantly affects Financial Incentives.

Beta Value (Original Sample): 0.196. P-Value: 0.002. The p-value is less than 0.05, so we reject  $H_0$ . Attitude significantly affects Financial Incentives. The positive beta value indicates a positive relationship, though the effect size is relatively small.

Linear regression was conducted to explore the relationship between government policy and consumer adaptation. The R-squared value of 26.1% suggests that government policy explains a moderate portion of the variation in consumer adaptation. The model is statistically

significant, as indicated by the F-statistic of 135 and a p-value less than 0.001. The estimated coefficient for government policy is 0.945, meaning that a 1-unit increase in government policy is associated with an increase of 0.945 units in consumer adaptation. The standardized estimate of 0.511 indicates a strong positive effect of government policy on consumer adaptation. This suggests that government policies significantly influence consumer adaptation, though other factors may also contribute to this relationship.

### 3. Conclusion:

The scale reliability statistics indicate a mean score of 3.215 with a standard deviation of 0.631. The Cronbach's alpha coefficient is 0.663, which suggests a moderate level of internal consistency for the scale. The scale is somewhat reliable, but some items may need to be reviewed or refined to increase consistency and overall reliability.

The item reliability statistics reveal that **INF03 (The charging facilities at workplaces, supermarkets, and shopping malls)** has the highest item-rest correlation at 0.512, indicating a moderate alignment with the overall scale. **INF02 (Home charging infrastructure is better than the public charging infrastructure)** also shows a moderate correlation of 0.451. The remaining items have lower correlations, ranging from 0.314 to 0.368. Given the overall Cronbach's alpha of 0.663, these lower correlations suggest a need for review and potential revision of these items to improve the scale's reliability.

The scale reliability statistics indicate a mean score of 3.274 with a standard deviation of 0.738. The Cronbach's alpha coefficient is 0.824, suggesting a high level of internal consistency for the scale.

These item-rest correlations reflect the strength of each item's relationship with the overall scale score. **FIN03 (I get financial subsidies for purchasing electric vehicles)** has the highest correlation at 0.743, indicating a very strong alignment with the scale's construct. **FIN02 (the Government provides tax relief if I purchase an electric vehicle)** and **FIN01 (I know a lot about the financial incentives provided by the Government of India)** also show strong correlations at 0.696 and 0.683, respectively. **FIN04 (I get a financial subsidy in my electricity bill if I own an electric vehicle)** has a lower correlation of 0.493, suggesting it may not align as well with the overall scale.

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