# An Empirical Analysis of Determinants of Consumer Purchase Intention for Electric Vehicles in a Hilly State of India

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## Abstract

The rising global trend toward sustainable mobility has greatly increased consumer curiosity and purchase intention in electric vehicles (EVs), which are considered as green alternatives to conventional vehicles.   This study investigates the variables impacting Consumer Purchase Intention (CPI) for EVs in Himachal Pradesh, India, a hilly state with unique socioeconomic conditions and transportation restrictions. A methodical survey was distributed to 600 respondents from four districts (Shimla, Solan, Mandi, Kangra), focusing on characteristics such as consumer awareness, environment awareness, technology awareness, charging infrastructure, government policy, and price. The correlation study shows that Environmental Concern ($r = 0.528$, $p < 0.01$), Government Policy ($r = 0.485$, $p < 0.01$), and Price ($r = 0.497$, $p < 0.01$) are the most influential factors that influence customer purchase intention. Charging Infrastructure ($r = 0.168$, $p < 0.01$) and Consumer Awareness ($r = 0.087$, $p < 0.05$) show positive but lesser correlations. These findings indicate that supporting government policies, improved charging infrastructure, and increased consumer awareness are critical for boosting adoption of electric vehicles in Himachal Pradesh. The findings have significant implications for policymakers, manufacturers, and sustainability advocates, since they provide practical suggestions for increasing EV penetration in emerging and geographically restricted nations.

Keywords: Electric Vehicles, Consumer Purchase Intention, Environmental Awareness, Government Policy, Charging Infrastructure, Himachal Pradesh.

## 1. Introduction

Going green appears to be a crucial step in the direction of a sustainable world. The world is constantly striving toward sustainability through a number of initiatives and SDGs. However, the world's reliance on energy intensity raises the likelihood of environmental deterioration over time. According to the International Energy Agency (IEA), carbon dioxide emissions are thought to be one of the main causes of climate change, with the

transportation sector accounting for one-fifth of these emissions. Road transport accounts for three quarters of these emissions. Cars and buses make up the majority of this, accounting for 45.1%. Trucks that transport cargo account for the remaining 29.4%. The automotive sector has undergone a revolution as a result of the concerning levels of carbon emissions and environmental damage. Electric vehicles have been proposed as a long-term remedy for the negative consequences of conventional transportation, particularly with regard to the environment. India is also becoming more committed to curbing pollution and lowering its carbon footprint. By 2030, the nation is getting ready to switch to electric vehicles. EV's have numerous benefits like lower running and maintenance costs, zero tailpipe emissions, no noise pollution, financial as well as tax benefits. Our earth is being destroyed by the use of gasoline and diesel, EV's help in limiting the use of diesel and petrol. It's admirable how convenient it is to charge EVs at home.

Hybrid electric vehicles, plug-in hybrid electric vehicles, and battery electric vehicles are the three main categories of EVs. Fuel and electricity are used to power hybrid electric vehicles (HEVs), which feature both an engine and an electric motor. Power produced by the battery is charged by the braking system. Similar to HEVs, plug-in hybrid electric cars (PHEVs) have bigger batteries and a smaller engine. Recharging the batteries is either by connecting to an external electric charging station or by using the braking system. Battery electric vehicles don't have an engine; instead, they are propelled by electric motors that store energy in batteries. They rely on outside power outlets for battery charging.

By offering incentives, several governments are pushing individuals to switch to electric vehicles. With 70% of Indian consumers contemplating electric cars for their next vehicle, compared to the world market's 52.1%, the government asserts that India will embrace an electric vehicle future. In 2019, the government unveiled the phase II Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME) Policy. In order to accomplish this goal, several Indian states have implemented policies pertaining to electric vehicles. Understanding the demands of consumers in hilly areas about electric vehicles (EVs) is critical. Although much of the study on EV adoption in India has focused on major cities, there is still a significant dearth of understanding on how geographical and regional variables influence customer preferences in hill states like Himachal Pradesh. The area's particular demographics, challenging terrain, and limited infrastructure can all have a significant impact on the acceptability and use of electric vehicles. In addition, while environmental consciousness, knowledge of technology, initiatives from governments, and climate change concerns have been shown as factors influencing EV purchasing intentions, there has been little empirical study on these topics in semi-urban and rural mountain regions. Among these, knowledge of technology stands out as an overlooked feature, despite its major effect on adoption attitude. Further, current research frequently indicates a mismatch between people's environmental awareness and their actual purchasing choices, but little proof exists at the state level to explain this gap. Infrastructure-related research also tends to centre around urban environments, offering little insight into the access challenges faced in hilly regions. Furthermore, comparative analyses across different education and income groups in these states are scarce, leaving a significant gap in understanding the social dimensions of EV adoption in less urbanized parts of India.

## 2. Review of Literature

Environmental pollution is one major problem that electric vehicles have the ability to reduce. (Hladik Greg and others, 2024). In order to reduce air pollution, pollution and lower emissions of greenhouse gases, EVs are typically seen as promising substitutes for internal combustion engine vehicles (ICEVs) (Huh, Lee, & Shin, 2015; Onat, Kucukvar, & Tatari, 2015; Wolfe & McAuliffe, 2010; World Wildlife Fund, 2014).

Electric vehicles are characterized by an electronic motor that draws power from an on-board battery that needs to be charged. usually by connecting the car to a recharging station that is part of the regional electrical

grid European Environment Agency (EEA), 2022). With the advent of storage batteries, electric vehicles were created and quickly proliferated by lowering noise, vibration, and odour in contrast to gasoline-powered automobiles (Wilson, 2022).

When compared to a similar conventional vehicle, the high cost of EVs discourages adoption. According to studies, the incentives provided encourage EV adoption. In their analysis of the advantages of hybrid cars in the United States, Beresteanu and Li (2011) found that income tax incentives contributed to a rise in HEV's market share. Compared to EVs, the energy cost of other fuel-powered vehicles was eight times greater. Lower operating costs are the outcome of low energy consumption and power tariffs. As a result, the overall cost of ownership is reduced, offsetting the higher price of an EV.

(Malagi, 2022) discovered that the population's understanding of the environmental advantages of EVs was the primary factor influencing buying decisions. According to (Cyriac et al., 2022), one of the main reasons why consumers are converting to EVs is environmental sensitivity, specifically the decrease in air pollution. (Singh and Dixit, 2022) built on these results by creating a machine learning model that found a number of factors that were important in influencing EV purchasing decisions, including as age, gender, income, and environmental concerns. (Joshi et al., 2022) highlighted how government policies operate as a mediator between variables that affect adoption intentions, such as cost, EV awareness, and infrastructure requirements.

According to Sarkar et al. (2021), while insufficient facilities and high expenses for upkeep remained major obstacles to electric vehicle acceptance, educational levels, job status, and improvements in technology everything had an advantageous effect on the willingness of customers to purchase EVs. These results were corroborated by (Lokare et al., 2021), who noted that cost considerations and climate awareness were important considerations for Indian buyers thinking about buying EVs. Sevastyanova (2010) examined how buyers view the eco-friendliness of electric cars as a key element in their decision to buy even when buying electric cars is subsidized.

## 3. Research Objectives, Hypothesis and Theoretical model Objective of the study

1.     To determine the association between the consumers awareness level and consumer purchase intention towards electric vehicles.
2.     To examine the role of demographic factors and government policy in shaping consumer purchase intention for electric vehicle.
3.     To analyse the impact of technology awareness, environment awareness, climate change, charging infrastructure and price on consumer purchase intention.

### Hypothesis Formulated

H01- There is no significant relationship between level of consumer awareness and consumer purchase intention of electric vehicles in Himachal Pradesh.
H02- There is no significant relationship between climate change and consumer purchase intention of electric vehicles in Himachal Pradesh.
H03- There is no significant relationship between price of electric vehicles and consumer purchase intention of electric vehicles in Himachal Pradesh.
H04- There is no significant relationship between charging infrastructure and consumer purchase intention of electric vehicles in Himachal Pradesh.
H05- There is no significant relationship between environment awareness and consumer purchase intention of electric vehicles in Himachal Pradesh.

H06- There is no significant relationship between technology awareness and consumer purchase intention of electric vehicles in Himachal Pradesh.

H07- There is no significant relationship between governmental policy and consumer purchase intention of electric vehicles in Himachal Pradesh.

H08- There is no significant relationship between demographic factors and consumer purchase intention of electric vehicles in Himachal Pradesh.
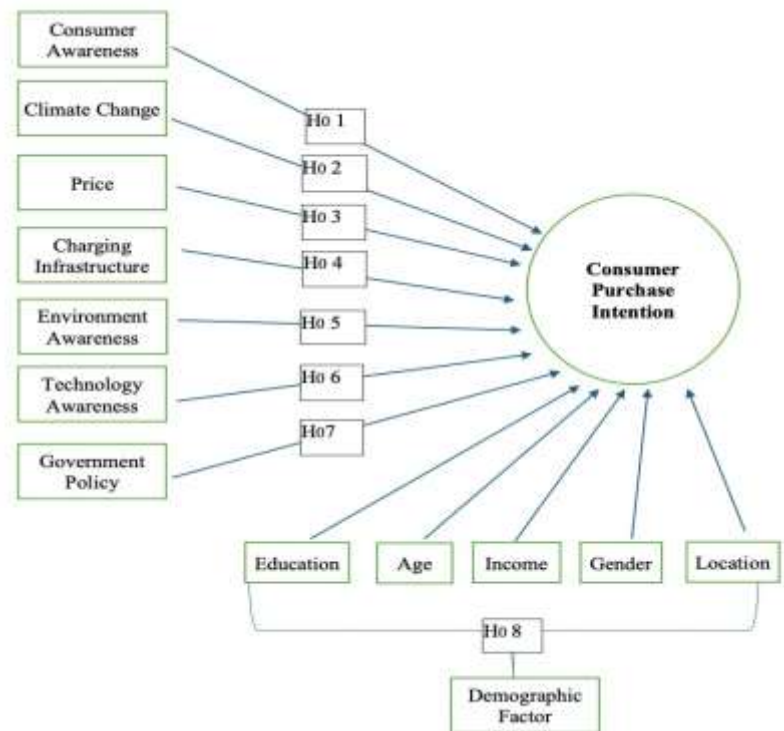
**Theoretical Model**



Figure : Theoretical Model

## 4. Research Methodology

**4.1 Research Design -** The current study used a descriptive as well as analytical approach to research to assess the factors that impact the intention of customers to buy for electric vehicles (EVs) in the state of Himachal Pradesh.  The approach allows for both the description of present views among customers and a review of correlations between significant variables.   Primary data was collected using a questionnaire with structure that was carefully designed utilizing validated measurement tools from prior empirical research on EV uptake and sustainable buying habits.

**4.2 Sampling and Data Collection** - A well-organized survey was implemented as the primary tool for collecting details on all the variables influencing EV purchasing intentions in the state. The scale was developed after a thorough study of the literature and was based on previously validated scales routinely used in research on buyer behavior, environmentally friendly item usage, and acceptance of technology.   The questionnaire had two main sections:

Section A focused on the demographic information provided by respondents, such as gender, age, educational qualification, occupation, income level, and district.

Section B includes words about significant study constructs such as consumer awareness (CA), concern for the environment (EC), understanding of technology (TA), government policy (GP), charging infrastructure (CI), price (P), and consumer purchase intention (CPI).

Data was gathered in four districts of Himachal Pradesh: Kangra, Mandi, Shimla, and Solan, using both online and offline survey technique. Respondents were chosen using convenience and purposive sampling, with the goal of communicating to those who are familiar with electric vehicles or who are considering purchasing one. In total, 600 questionnaires were distributed.

**4.3 Measurement Constructs -** The questionnaire comprised seven constructs: Consumer Awareness (CA), Climate Change (CC), Environment Awareness (EA), Technology Awareness (TA), Charging Infrastructure (CI), Government Policy (GP), and Price (P), measured using a five-point Likert scale ranging from 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

**4.4 Data Analysis -** Data were analysed using SPSS. Descriptive statistics and Pearson's correlation coefficient were applied to identify relationships between independent variables and consumer purchase intention (CPI).

# 5. Result & Discussion

**Table 5.1. Demographics of survey respondents**

| Items | Option | Frequency | Percentage (%) |
|---|---|---|---|
| Gender | Male Female | 418<br>182 | 69.7<br>30.3 |
| Age | 18-24<br>24-34<br>34-44<br>44-54<br>Above 54 | 132<br>383<br>47<br>32<br>6 | 22<br>63.8<br>7.8<br>5.3<br>1 |
| Educational Qualification | Post graduation<br>Graduation<br>Intermediate<br>Matric | 121<br>433<br>25<br>21 | 20.2<br>72.2<br>4.2<br>3.5 |
| Income Level | Up to 3,00,000<br>3,00,001-6,00,000<br>6,00,001-9,00,000<br>9,00,001-12,00,000<br>12,00,001-15,00,000<br>Above 15,00,001 | 297<br>134<br>73<br>49<br>31<br>16 | 49.5 22.3<br>12.2<br>8.2 5.2<br>2.7 |
| District | Shimla<br>Mandi<br>Kangra<br>Solan | 125<br>153<br>232<br>90 | 20.8 25.5<br>38.7<br>15 |
| Vehicle Owned | One<br>Two<br>Three<br>More than three | 39<br>198<br>313<br>50 | 6.5<br>33<br>52.2<br>8.3 |

**Cronbach's Alpha and Scale Reliability**

The total Cronbach alpha value is .892 > 0.7, for 38 statements taken for study. Thus, the identification of statements under all variable is effective enough to measure respondent's consumer purchase intention. There exist a reliability of all the statements in measuring the variable, with a Cronbach's Alpha of .892. This shows that all the statements of identification variable would be considered for the study.

**Content Validity**

Content validity refers to the extent to which the research instrument adequately covers all the relevant dimensions of the construct under study. In this research, the questionnaire was developed after an extensive review of existing literature on consumer behaviour, consumer purchase intention, and electric vehicle purchase intention. Inputs from subject experts, my guide and academicians were also incorporated to ensure that the items included comprehensively capture key aspects such as environmental awareness, government policy, financial incentives, price, charging infrastructure, consumer awareness, and perceived benefits of EVs. Thus, the instrument demonstrates strong content validity as it represents all critical factors influencing EV purchase intention.

**Face Validity**

Face validity is the degree to which the research tool appears appropriate, straightforward, and relevant to participants and experts on an outside level. For face validity, the survey was reviewed by instructors, study specialists, and an insignificant pilot group of potential responders. Their reply verified that the items in question were intelligible, rationally written, and appeared to measure what they claimed they were designed to assess: consumer attitudes and intentions about buying electric vehicles.   It indicates that the instrument has good apparent reliability.

**Table 5.2 Correlation of measurement items**

|       | CA       | CC       | CI       | EC       | TA       | GP       | P        | CPI |
|-------|----------|----------|----------|----------|----------|----------|----------|-----|
| CA    | 1        |          |          |          |          |          |          |     |
| CC    | .024     | 1        |          |          |          |          |          |     |
| CI    | -.051    | .027     | 1        |          |          |          |          |     |
| EC    | .104*    | .549**   | .242**   | 1        |          |          |          |     |
| TA    | .029     | .401**   | .075     | .549**   | 1        |          |          |     |
| GP    | .005     | .498**   | .057     | .503**   | .509**   | 1        |          |     |
| P     | -.015    | .381**   | .383**   | .530**   | .430**   | .327**   | 1        |     |
| CPI   | .087*    | .421**   | .168**   | .528**   | .417**   | .485**   | .497**   | 1   |

Source: SPSS Output

A correlation analysis has been carried out to look at the connections between the variables of significance influencing consumers' purchase intentions for electric vehicles (EVs). Table No. 5.1 summarizes the correlation results of Consumer Awareness (CA), Climate Change (CC), Charging Infrastructure (CI), Environmental Awareness (EA), Technology Awareness (TA), Government Policy (GP), and Price (P) with Consumer Purchase Intention (CPI). The results show different levels of connection among these factors.   Consumer Awareness (CA) has a weak but positive and statistically significant correlation with CPI ($r = 0.087$, $p < 0.05$), indicating that awareness alone has little effect on buying choices. Climate Change (CC) has a moderate and substantial link with CPI ($r = 0.421$, $p <$ 0.01). This suggests that persons who are more aware of climate change implications are more willing to investigate adoption of electric vehicles. Charging Infrastructure (CI) shows a positive and substantial association with CPI ($r = 0.168$, $p < 0.01$), indicating that dependable and convenient charging facilities increase customer interest in EVs.

Environmental Awareness (EA) has a larger correlation with CPI (r = 0.528, p < 0.01), suggesting that environmentally conscious consumers are more likely to acquire electric vehicles. Technology Awareness (TA) has a moderate and substantial connection with CPI (r = 0.417, p < 0.01), indicating that favourable opinions and knowledge with EV technology influence purchasing intentions. Government Policy (GP) has a positive and substantial correlation with CPI (r = 0.485, p < 0.01), indicating that policy incentives and regulations can influence consumer behaviour. Price (P) exhibits a moderate positive connection with CPI (r = 0.497, p < 0.01), suggesting that affordability and cost efficiency are important factors in EV purchasing decisions. Overall, the data show that all independent factors have positive associations with consumer purchase intention, meaning that taken together, improvements across all dimensions might significantly boost the likelihood of electric vehicle adoption. Environment awareness, government policy, and price emerge as the most influential predictors, demonstrating their significant influence on consumer attitudes and purchase decisions. In contrast, Consumer Awareness and Charging Infrastructure have smaller but statistically significant associations with purchase intention. These findings are consistent with previous studies, which has highlighted the critical role of environmental consciousness, supportive policy frameworks, and financial factors in speeding up the switch to electric vehicles (Li et al., 2023; Sharma & Singh, 2024; Zhang et al., 2025).

## 6. Conclusion

This study examined the interrelationships between the primary factors influencing consumers' purchase intentions for electric vehicles (EVs) in Himachal Pradesh, India. The correlation study results show that environmental awareness, government policy, and price have strong and statistically significant associations with consumer purchase intention. These data indicate that those who are environmentally sensitive and aware of government incentives are more likely to consider buying an EV. As a result, Charging Infrastructure and Consumer Awareness, while positively connected, have comparatively weaker associations, indicating the need for further public outreach and infrastructure support to boost consumer confidence in adoption of electric vehicles. Government-led initiatives, such as financial incentives, tax breaks, and the establishment of accessible charging networks, can significantly increase EV adoption, particularly in hilly areas where geographical and connectivity obstacles persist. Overall, the research shows that consumer adoption of EVs is influenced by a combination of awareness, affordability, concern for the environment, and governmental support. To secure the longterm growth of the EV sector, policymakers and manufacturers should focus on lowering costs, awareness creation, and upgrading the infrastructure. Future research may consider advanced statistics or architectural modeling tools to investigate these dynamics in India's different geographic and demographic situations.

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