



# Exploring Socially Responsible Corporate Management & Policy Preparation for Electric Vehicle Adoption & Global Sustainability

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## Abstract

**Purpose:** The purpose of this study is to explore how to apply socially responsible corporate management and public policy to perceive awareness and adoption of electric vehicles for global sustainability. This study examined i) how perceived factors such as economic, environment, convenience, uncertainty, and efficiency factors differ based on experiences of electric vehicles, ii) how actual and potential customers perceive management and policy issues on electric vehicles differently, iii) how proposed factors including policy planning for the management of electric vehicle, prospect of electric vehicles, and socially responsible corporate activities affect overall attitudes toward electric vehicles? iv) how overall attitudes affect growth of electric vehicle industry and development of automobile industry? **Research design, data and methodology:** This study conducted an online survey and applied *t*-test, ANOVA, factor and regression analysis. **Results:** This study found that policy planning for the management of electric vehicles, prospect of electric vehicles, and corporate activities affect overall attitudes toward electric vehicles and actual and potential customers showed mean differences on management and policy on electric vehicles. **Conclusions:** This study provides managerial and policy implications. This study suggests promoting policies for better adoption of electric vehicles and regulatory policies to enhance global sustainability and prospect of electric vehicles.

**Keywords:** Electric Vehicles, Socially Responsible Management, Policy Preparation, Customer Adoption, Sustainability

**JEL Classification Code:** M30, M31, M20, M10

## 1. Introduction

Electric vehicles are experiencing a rise in popularity over the past few years as the technology has matured and costs have declined, and increased support and charging opportunities (Muratori et al., 2021), while how customers perceive and adopt electric vehicles remain a concern. Customer perception and behavioral changes on electric vehicles and intention to purchase electric vehicles have been discussed in previous studies. According to research by Najman (2022), adoption models of electric vehicles are accelerating and electric vehicle projections have continually been revised to increase the rate of adoption.

Niese et al. (2022) analyzed that electric vehicle adoption is shifting into overdrive by generating fresh challenges for automakers and fueling creative solutions. A previous study by Niese et al. (2021) also estimated that the shift to adopt electric vehicles will accelerate dramatically with prediction that electrified vehicles will account for more than half of light vehicles sold globally by 2026. Afroz et al. (2015) indicated that individual consequences relating to cost and convenience of consumers are negatively related to intention to purchase electric vehicles. Morton et al. (2016) researched the understanding of consumer response to electric vehicles by evaluating if consumer innovativeness is related to the expressed preference towards electric vehicles.

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Bhalla et al. (2018) researched that various factors that influence the purchase decision of car buyers include individual perception on dimensions like environmental issues, cost, trust, technology advancement, infrastructure, and society acceptance. According to Gärling and Thøgersen (2001), substituting electric vehicles for traditional ones could reduce local pollution and greenhouse emissions from the transportation system, while there are goals to develop technologies to compete head-on with internal combustion engine vehicles (ICVs) and remaining questions whether individuals would rather prefer an electric vehicles with a shorter driving distance. Krishna (2021) addressed that since the high emissions figure has increased, the most viable and popular success is electricity-based propulsion, known as electric vehicles. She et al. (2017) stated that battery electric vehicles are an effective way to reduce fossil fuel consumptions and greenhouse gas emissions.

Based on these considerations, the purpose of this study is to investigate how actual and potential electric vehicle customers perceive factors that are related to the adoption and attitude toward the electric vehicle differently and how actual and potential electric vehicle customers perceive management and policy issues related to the electric vehicle differently. This study also examined effects of perceived policy planning for management, prospect of electric vehicles, and corporate activities for electric vehicles on overall attitude to electric vehicles and effects of overall attitudes on the growth of electric vehicle industry and the development of automobile industry. Therefore, the following research questions are proposed: i) how perceived factors such as economic, environment, convenience, and uncertainty factors differ based on experiences of electric vehicles, ii) how actual and potential customers perceive management and policy issues differently, iii) how proposed factors including policy planning for the management of electric vehicle, prospect of electric vehicles, and socially responsible corporate activities for electric vehicles affect overall attitudes toward electric vehicles? and iv) how overall attitudes affect growth of electric vehicle industry and development of automobile industry?

## 2. Literature Review

### 2.1. The Adoption of Electric Vehicles

Barkenbus (2020) stated that the transformation from conventional vehicles with internal combustion engines to electric vehicles is underway, while its timeline is still uncertain. Kester et al. (2018) researched a lack of

consumer awareness and knowledge of consumers on electric vehicles about range, charging, running costs, and so on. According to Rajper and Albrecht (2020), there are several driving forces associated with electric vehicles' adoption such as the reduction in greenhouse gas emission, efficient energy use, gasoline savings and low operational cost. According to Krishna (2021), practical issues and price play a bigger role in car purchase decisions than environmental benefits. Bhalla et al. (2018) examined the perception and adoption of electric vehicles in various studies focused on technology including speed, distance, efficiency, cost, infrastructure, social acceptance, and reducing co-emission for the environment. Rajper and Albrecht (2020) investigated several advantages of electric vehicles over vehicles powered by internal combustion engines including lower operating cost, less interior noise and vibration, better low-speed acceleration, convenient home-charging, higher fuel economy, etc. Javid and Nejat (2017) assessed demand for plug-in electric vehicles by exploring a more comprehensive set of factors including demographic and travel-related characteristics, socio-economic variables, infrastructural, and regional specifications. According to She et al. (2017), a large portion of customers have a "wait- and see" attitude and are unsure about battery electric vehicle performance, with safety, reliability, and range per charge being the major concerns.

### 2.2 Electric Vehicles and Policy Preparation

Morton et al. (2016) addressed that the diffusion of electric vehicles is regarded as an important aspect of government policy which aims to generate a transition to a low-carbon mobility system in the U.K. and the wider European context. Rietmann and Lieven (2019) investigated that electric vehicles have been promoted through policy measures by governments across the world and determined the impact of governmental incentives and a country's charging infrastructure on electric vehicle market shares in different countries. Wang et al. (2017) examined that consumers are the acceptors of government policies and their evaluation of electric vehicles related policy incentives is of importance. Helmus and van den Hoed (2016) analyzed that municipalities have the ambition to stimulate clean air, need to play a facilitating role for electric mobility by providing charging facilities, and consider limiting customer complaints. Egnér and Trosvik (2018) also addressed that public procurement of battery electric vehicles has the potential to be an effective policy instrument and highlighted the necessity of adjusting policy instruments to the specific characteristics of municipalities and make them visible to the public.

Haddadian et al. (2015) explored that the transportation sector is responsible for large amounts of CO<sub>2</sub> emissions and of fossil fuel consumption and therefore is central to any discussion about attaining global energy and climate policy goals. Rajper and Albrecht (2020) stated that policymakers need to understand the barriers and opportunities related to different types of electric vehicles. Bakker and Trip (2013) also considered the effectiveness, efficiency, and feasibility policy measures that cities may adopt to stimulate the uptake of electric vehicles. Wang et al. (2017) explored how policy measures influence adoption and intention of electric vehicles and supported relationships between policy measures and electric vehicle adoption intention and how consumers' environmental concern moderates the relationships.

### 3. Hypothesis Development

This study developed hypotheses for effects of perceived policy planning for management and prospect of electric vehicle and corporate activities for electric vehicles on overall attitude to electric vehicles. Hypotheses proposed in this study are supported by well-known theories. Wood (1991) addressed that the concept of corporate social performance can provide a coherent framework for the field of business and society by integrating the conceptual advances and suggested principles of corporate social responsibility including public responsibility and legitimacy, processes of corporate social responsiveness including environmental assessment, and outcomes of corporate behavior including social impacts and policies. Another theoretical conceptualization by Matten and Crane (2005) examined the extended perspectives of the element of citizenship and conceptualizes corporate citizenship as the administration of a bundle of individual citizenship rights including social, civil, and political conventionally granted and protected by governments. The theory of planned behavior (Ajzen, 1985) investigated intentions of performing behavior with attitudes toward the behavior by addressing subjective norms, and perceived behavioral control, and these intentions (Ajzen, 1991).

#### 3.1. Effects of Policy Planning for the Management of Electric Vehicle on Overall Attitude to the Electric Vehicles

Afroz et al. (2015) addressed that the government is encouraging private firms to put in place the necessary infrastructure for efficient operation of electric vehicles and also developing regulations and standards for firms

that plan on setting up charging stations for electric vehicles. Bakker and Trip (2013) measured supporting citizens and businesses, supporting charging-infrastructure build up, regulatory measures, raising awareness, government as lead user, and governing the transition with other levels of government for widespread adoption of electric vehicles and to solve urban mobility-related problems. Wang et al. (2017) researched the impact of policy measures to motivate consumers to adopt electric vehicles and examined that financial incentive policy measure, information provision policy measures, and convenience policy measures are significantly related to electric vehicle adoption intention.

Rietmann and Lieven (2019) researched that governmental measures to promote electric mobility reflect consumers' preferences in the respective countries. Wang et al. (2017) proposed the framework of electric vehicle policy incentives that include electric vehicle production such as vehicle model development reward and production/marketing reward for the adoption and development of electric vehicle policy. Therefore, policy planning for the management of electric vehicles is necessary to enhance customer attitude and adoption of electric vehicles. Hossain et al. (2022) also recommended the development of electric vehicle business and policy plans for customer's products and services about electric vehicles. Based on the consideration, this study hypothesized the effects of policy planning for management of electric vehicles positively on overall attitudes to electric vehicles. In particular, this study proposed the necessity of government's support on installation of electric vehicles' charging stations, subsidies on electric vehicles in the case of adoption of electric vehicles, electric vehicles' charging rate policy preparation by the government, collaboration of the central and local governments and companies to increase adoption of electric vehicles.

**H1:** Perceived policy planning for management of electric vehicles positively affects overall attitudes to electric vehicles.

#### 3.2. Effects of Prospect of Electric Vehicles on Overall Attitude to the Electric Vehicles

Larson et al. (2014) addressed that electric vehicles offer substantial economic and environmental benefits by substituting grid based electricity for fossil fuels. Egnér and Trosvik (2018) researched that a transition towards a higher share of electric vehicles has the potential to significantly reduce greenhouse gas emissions. Kester et al. (2018) discussed governance reforms and principles of policy advice and developed arguments for the creation of stability and predictability

through long term planning and clear signaling to accelerate adoption of electric vehicles. Hossain et al. (2022) addressed advancements and future prospects of electric vehicle technologies and revealed global demand and growth of electric vehicles along with electricity and battery demand with the development of a smart city concept as a new aspect. Barkenbus (2020) highlighted prospects for electric vehicles by actively promoting those through consumer incentives and government regulations concerning climate change. Based on the consideration, this study hypothesized the effects of the perceived prospect of electric vehicles on overall attitudes to electric vehicles. In particular, this study considered electric vehicles' continuous growth, contribution to the development of the automobile industry, and expectations of companies that produce electric vehicles continuous growth in the future.

**H2:** Perceived prospect of electric vehicles positively affects overall attitudes to electric vehicles.

### 3.3. Effects of Socially Responsible Corporate Activities on Overall Attitude to the Electric Vehicles

Wellbrock et al. (2020) addressed that sustainability is currently one of the main issues in society as a whole and for the automotive industry, topics such as electric motors and the associated optimization areas such as light weight construction and CO2 emission reduction are key issues. Hetterich et al. (2012) analyzed motives for the adoption of green or sustainable materials for car interiors and researched customers' acceptance of green car components. Moisescu (2017) investigated that both practitioners and scholars recognized the fact that embracing customer-based perceptual corporate sustainability principles enhances customer loyalty and produces several relevant business benefits. Cao et al. (2021) investigated that electric vehicles are promoted as the possible solution to main environment concerns in the future and the integration of the electric vehicles' value chain solves strategic planning on the corporate level. This study considered that socially responsible corporate activities include how firms respond to climate change, consider resource circulation, the preservation of the natural environment, and sustainable growth, grow together with the local community, and create customer value. Based on the consideration, this study hypothesized the effects of perceived corporate activities for sustainability via electric vehicles on overall attitudes to electric vehicles. In particular, this study considered corporate activities in response to climate change, resource circulation, the preservation of the natural environment, and sustainable growth.

**H3:** Perceived socially responsible corporate activities positively affects overall attitudes to electric vehicles.

## 4. Methodology

This study conducted an online survey. A total of 145 respondents answered the survey. The survey was developed in English and translated in Korean. Back translation was applied to check reliability of the survey with different versions of languages. For major questionnaire items, this study applied a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree). This study applied descriptive statistics, *t*-test, factor analysis, regression, ANOVA (Analysis of Variance) were applied to measure effects and to test hypotheses. The survey was conducted in S. Korea. Table 1 summarized the demographics of respondents.

**Table 1:** Demographics of Respondents

Characteristics		#	%
Gender	Male	97	67.4
	Female	47	32.6
Age	20 ~ 24 years old	3	2.1
	25 ~ 29 years old	5	3.4
	30 ~ 34 years old	41	28.3
	35 ~ 39 years old	27	18.6
	40 ~ 44 years old	41	28.3
	45 ~ 49 years old	16	11.0
	50 ~ 54 years old	8	5.5
	55 ~ 59 years old	1	0.7
Older than 60 years old	2	1.4	
Education	High School	3	2.1
	2-year Associate degree	13	9.0
	Bachelor's degree	83	57.2
	Master's degree	38	26.2
	Ph.D.	7	4.8
Job	Education Institution	28	19.3
	Public Sector	23	15.9
	Profit Sector	33	22.8
	Research Institution	13	9.0
	Public Officer	14	9.7
	Self-employed	8	5.5
	Housewife	2	1.4
	Student	3	2.1
Income	Below KRW 10,000,000	5	3.4
	Between 10,000,000 ~ 20,000,000 KRW	1	0.7
	Between 20,000,000 ~ 30,000,000 KRW	5	3.4
	Between 30,000,000 ~ 40,000,000 KRW	23	15.9
	Between 40,000,000 ~ 50,000,000 KRW	18	12.4
	Between 50,000,000 ~ 60,000,000 KRW	33	22.8
	Between 60,000,000 ~ 70,000,000 KRW	21	14.5



More than 70,000,000 KRW	38	26.2
<b>Total</b>	<b>145</b>	<b>100</b>

### 5. Data Analysis

Overall, both actual and potential customers stated that positive factors related to the purchase decision of an electronic vehicle include the following order with percentage: i) economic benefits from fuel costs and subsidies (54.5%), ii) realization of carbon neutrality and conformity to eco-friendliness (20.9%), iii) accompanying the high-tech experience and trends (9.0%), iv) comfortable driving and excellent performance (8.2%), v) automakers stop developing internal combustion engine vehicle (4.5%), and vi) efficiency of vehicle management. Overall, both actual and potential customers stated that negative factors related to the purchase decision of an electronic vehicle include the following order with percentage: i) insufficient charging infrastructure and long charging times (47.8%), ii) higher purchase price (19.4%), iii) batter instability (18.7%), iv) high repair cost such as better replacement (9.0%), v) short mileage (3.7%), and vi) reduce subsidies and tax benefits (1.5%).

#### 5.1. Perceived Mean Differences on Factors based on Experiences of Electric Vehicle

This study conducted independent sample’s *t*-test to check mean differences about perceived factors about electric vehicles based on customers who have experiences with electric vehicles or not. Overall, the mean value of attitude toward electric vehicles showed a difference between actual and potential customers with higher mean value in the case of actual customers. Among respondents, 88 respondents have experiences of electric vehicles and 57 respondents do not have experiences of electric vehicles. As shown in Table 2, the results of this study found that there are mean differences in the case of economic factors. Among economic factors, perception of lower management and maintenance cost of electric vehicles than that of non-electric vehicles showed a difference with higher mean value in the case of customers who have experiences with electric vehicles than customers who do not have experiences with electric vehicles. Another perceived mean value of economic factors on the cost of replacing batteries in electric vehicles also showed a difference based on customers who have experiences with electric vehicles with higher mean value in the case of customers who have experiences with electric vehicles than customers who do not have experiences with electric vehicles. Among efficiency factors, perception on mean

value of the length of mileage was different based on customers who have experiences with lower mean value in the case of customers who have experiences with electric vehicles than customers who do not have experiences with electric vehicles. Another perceived mean value of efficiency factor on charging efficiency of electric vehicles was also different based on customers who have experiences with lower mean value in the case of customers who have experiences with electric vehicles than customers who do not have experiences with electric vehicles. However, in the case of perceived good performance with convenience, customers who have experiences showed higher mean value compared to those who don’t have experiences with electric vehicles and significant differences. Perceived mean value of uncertainty regarding battery technology also showed significant difference based on customers who have experiences with electric vehicles or not. The results showed higher mean value with customers who have experiences with electric vehicles than those who don’t have experiences with electric vehicles.

**Table 2:** Perceived Means Differences on Factors by Electric Vehicle Experiences

Questions	User	Non-User	t-test (sig)
Management and maintenance cost of electric vehicles tends to be lower than that of non-electric vehicles.	4.24	3.69	***
The cost is burdensome when replacing batteries in electric vehicles.	4.51	4.23	**
Electric vehicles tend to have shorter mileage.	3.63	3.94	**
The charging efficiency of electric vehicles is relatively low.	3.24	3.73	***
Electric vehicles have good performance.	4.19	3.72	***
There is concern about battery technology of electric vehicles.	3.72	4.15	***

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1 denotes statistical significance

This study also conducted independent sample’s *t*-test to check mean differences about other perceived factors. Among factors, social factors including using electric vehicles related to social responsibility and perceived social trends do not show significant differences based on whether consumers have experiences with electric vehicles or not. Perceived environmental factors including electric vehicles are eco-friendly, improve the environment by reducing emissions, and help obtain carbon neutrality do not show significant difference based on consumers who have experiences with electric vehicle or not, while both groups of consumers showed perceived means between 3.79 to 4.07 where 1-strongly

disagree and 5-strongly agree. Both groups of customers perceive that charging facilities for electric vehicles are not enough, charging time is long, while electric vehicles provide or might provide a comfortable feeling because of reduced noise with agree to strongly agree, and mean values do not show difference. Both groups of customers also perceive that government promotional policies on electric vehicles such as subsidies and tax benefits are inconsistent and there are concerns about delays in receiving electric vehicles due to reasons such as raw material or battery supply disruptions between agree and strongly agree, while mean values do not show difference.

**5.2. Perceived Mean Differences on Management & Policy Issues based on Experiences of Electric Vehicle**

This study conducted independent sample’s *t*-test to investigate mean differences about management policy issues on electric vehicles based on customers who have experiences with electric vehicles or not. Among respondents, 88 respondents have experiences of electric vehicles and 57 respondents do not have experiences of electric vehicles. As shown in Table 3, the results of this study found that how actual and potential customers perceive electric vehicles’ charging rate policy prepared by the government were not appropriate and showed mean differences based on experiences of electric vehicle with higher mean value by customers who have experiences with electric vehicle than those who do not have experiences with electric vehicles. How actual and potential customers perceive a policy that is needed to impose fines for non-electric vehicle charging areas and fines for parking electric vehicles even after finishing charging showed mean difference with higher mean value by customers who have experiences with electric vehicles than those who do not have experiences with electric vehicles. How actual customers and potential customers perceive a policy that is needed to prepare to protect industries that manufacture non-environment friendly vehicles showed mean differences with higher mean value by customers who don’t have experiences with electric vehicles than those who have experiences with electric vehicles.

Further, in terms of management and promoting and regulating policy issues related to electric vehicles, both group of actual and potential customers showed consistent results in terms of agreement on the following: i) government should support more on installation of electric vehicles’ charging stations, ii) subsidies on electric vehicles are reduced due to increased usage of electric vehicles, and iii) the government, local governments, and companies need to make active efforts

to increase electric vehicle users. Regarding preparation of better policies, both group of actual and potential customers showed consistent results in terms of agreement on the following: i) it is necessary for the government to prepare better policies related to electric vehicles by considering situation in Korea, ii) the government’s promotion policy is necessary in related to the positive factors of electric vehicles, iii) the government’s regulatory policy is necessary in relation to the negative factors of electric vehicles, and iv) the government should interact with local governments to prepare better electric vehicles’ policies that meet local market condition. Regarding preparation of additional policies to promote electric vehicles, both group of actual and potential customers showed consistent results in terms of agreement on the following: i) installation policy for charging facilities of electric vehicles is necessary, ii) preparation of subsidy support policy is needed when charging facilities for electric vehicles are installed, iii) the government might consider to prepare better policies to support car industries that manufacture environment friendly vehicles, iv) the government might consider to provide economic benefits to customers who make a purchase decision of electric vehicles, and v) overall, proper promotional policies on electric vehicles can be facilitated by the government. Regarding preparation of policies to regulate electric vehicles, both groups of actual and potential customers showed consistent results in terms of agreement that overall proper regulatory policies on electric vehicles need to be prepared by the government.

**Table 3: Perceived Means Differences on Management & Policy Issues based on Electric Vehicle Experiences**

Questions	User	Non-User	t-test (sig)
Electric vehicles’ charging rate policy prepared by the government is not appropriate.	4.14	3.67	***
A policy is needed to impose fines for non-electric vehicles parked in electric vehicle charging areas.	4.47	4.20	*
A policy is needed to impose fines for parking of electric vehicles even after they have finished charging.	4.28	3.98	*
Better policy should be prepared regarding industries that manufacture non-environment friendly vehicles (i.e. internal combustion engine vehicles).	3.42	3.85	**

\*\*\* p < 0.01, \*\* p < 0.05, \* p < 0.1 denotes statistical significance

**5.3. Hypotheses Testing**

This study also conducted Cronbach alpha to check reliability of proposed variables including policy

planning for the management of electric vehicles, prospect of electric vehicles, and socially responsible corporate activities for electric vehicles. The results of Cronbach alpha include the following: 0.622 for policy planning for the management of electric vehicles, 0.90 for prospect of electric vehicles, and 0.95 for socially responsible corporate activities for electric vehicles. As shown in Table 4, this study conducted factor analysis to check validity of constructs. Scale items were extracted by the constructs by applying factor analysis. Principal component analysis was used as the method for extraction with maximum, and factors whose eigenvalue is greater than 1 are extracted. VARIMAX with Kaiser Normalization was applied as the rotation method with maximum iterations for convergence. This study applied the perception of the following questionnaire items in the case of policy planning for the management of electric vehicle: the government’s support on installation of electric vehicles’ charging stations, reduced subsidies on electric vehicles due to increased adoption of electric vehicles, preparations of electric vehicles’ charging rate policy, and efforts to increase users of electric vehicles by central and local government and companies. In the case of the prospect of electric vehicles, this study applied the perception of the following questionnaire items: growth of electric vehicles and development of automobile industry. In the case of socially responsible corporate activities for electric vehicles, this study applied the perception of the following questionnaire items: how corporate activities respond to climate change, resource circulation, and preservation of the natural environment, how corporate activities effort to grow together with the local community, how corporate activities relate to sustainable growth, how corporate activities create customer value, and how corporate ethical management activities comply with laws and regulations.

**Table 4:** Component Matrix for Marketing to the Public, Regulation, and Sustainability of Accommodation Sharing

*	Component		
	1	2	3
PPM4	.79		
PPM3	.78		
PPM2	.65		
PPM1	.60		
PRO1		.92	
PRO3		.91	
PRO2		.89	
COR3			.94
COR5			.93
COR2			.89
COR1			.87
COR7			.85
COR4			.79
COR6			.78

\*PPM: Policy Preparation for Management,

PRO: Prospect of Electric Vehicle,  
COR: Socially Responsible Corporate Activities

This study conducted simple regression analyses using overall attitude as a dependent variable. In the case of policy planning for management of electric vehicles as an independent variable, the results of ANOVA showed that the overall model is significant with  $F = 35.930$  ( $p$ -value < 1%) and  $R$ -square = 0.221. The result of the effect of policy planning for management of electric vehicles on overall attitude showed significant at 1% with beta = 0.470. In the case of the prospect of electric vehicles as an independent variable, the results of ANOVA showed that the overall model is significant with  $F = 21.902$  ( $p$ -value < 1%) and  $R$ -square = 0.149. The result of the effect of the prospect of electric vehicles on overall attitude showed significant at 1% with beta = 0.386. In the case of socially responsible corporate activities as an independent variable, the results of ANOVA showed that the overall model is significant with  $F = 25.921$  ( $p$ -value < 1%) and  $R$ -square = 0.178. The result of the effect of socially responsible corporate activities on overall attitude showed significant at 1% with beta = 0.421. This study conducted multiple regression analysis using policy planning for management of electric vehicles, prospect of electric vehicles, and socially responsible corporate activities as independent variables and overall attitude as a dependent variable. Table 5 summarized the results of multiple regression analysis. This study investigated effects of independent variables including policy planning for management of electric vehicles, prospect of electric vehicles, and corporate activities for electric vehicles on overall attitudes. The results of ANOVA showed that the overall model is significant with  $F = 14.239$  ( $p$ -value < 1%) and  $R$ -square = 0.402. The results of this study found that the effect size of perceived policy planning for management of electric vehicles on the overall attitude was higher followed by corporate activities for electric vehicles and prospect of electric vehicles.

**Table 5:** Effects of Proposed Factors on Overall Attitude Toward Electric Vehicles

Independent Variables => Dependent variable	Standardized Coefficient (t-value/sig)
Policy Planning for Management of Electric Vehicles => Overall Attitude	.410 (4.540 ***)
Prospect of Electric Vehicles => Overall Attitude	.218 (2.569 **)
Socially Responsible Corporate Activities => Overall Attitude	.285 (3.224 ***)

\*\*\* p < 0.01, \*\* p < 0.05 denotes statistical significance

This study also applied regression analyses for the effects of overall attitude on growth of the electric

vehicle industry, contribution to the development of the automobile industry, and growth of electric vehicles. Overall, the results of ANOVA showed that the overall model is significant with  $F = 25.833$  for the effects of overall attitude on growth of the electric vehicle industry, the overall model is significant with  $F = 14.142$  for the effects of overall attitude on contribution to the development of the automobile industry, and the overall model is significant with  $F = 16.856$  for the effects of overall attitude on the continuous growth of the production of electric vehicles.

**Table 6:** Effects of Proposed Factors on Overall Attitude toward Sustainability of Electric Vehicles

Independent Variables => Dependent variable	Standardized Coefficient (t-value/sig)
Overall Attitude => Continuous Growth of the Electric Vehicle Industry	.408 (5.083 ***)
Overall Attitude => Contribution to the Development of the Automobile Industry	.319 (3.761***)
Overall Attitude => Continuous Growth of the Production of Electric Vehicles	.341(4.106***)

\*\*\*  $p < 0.01$  denotes statistical significance

## 6. Conclusion

The purpose of this study is to explore how to foster the development of electric vehicles and improve customer adoption by preparing better policies by the government and facilitating socially responsible corporate management for global sustainability. In particular, this study examined how actual experiences of electric vehicles affect different perceptions on management and policies. This study also investigated how actual and potential electric vehicle customers perceive factors that are related to the attitude toward the electric vehicle differently. This study also hypothesized effects of perceived policy planning for management, prospect of electric vehicles, and socially responsible corporate activities for electric vehicles on overall attitude to electric vehicles and effects of overall attitudes on growth of electric vehicle industry and development of automobile industry.

The results of this study found that both actual and potential customers perceived the level of management and maintenance cost of electric vehicles differently. Mean value on management and lower maintenance cost of electric vehicles than non-electric was higher with actual customers and mean values of economic factor on cost of replacing battery in electric vehicles also showed higher with actual customers of electric vehicles. Actual customers who have experiences with electric vehicles showed higher mean values in the case of the length of

mileage and charging efficiency of electric vehicles, and less concern about battery technology than potential customers. Regarding performance of electric vehicles, mean value was higher with actual customers who have experiences with electric vehicles than potential customers. The results of this study also found that mean values on management and promoting and regulating policy issues related to electric vehicles differ based on the experiences with electric vehicles. Actual customers' expectation on electric vehicles' charging rate policy preparation by the government was higher than potential customers and actual customers' expectation on a policy to impose fines for non-electric vehicles in electric vehicle charging areas was also higher than potential customers. Expectation on the necessity of better policy preparation regarding industries that manufacture non-environmental friendly vehicles showed higher potential customers than actual customers. The results of this study also found that policy planning for management of electric vehicles, prospect of electric vehicles, and corporate activities for electric vehicles positively affect overall attitudes, while the effect size was higher with perceived policy planning for management of electric vehicles on the overall attitude than corporate activities for electric vehicles and prospect of electric vehicles on the overall attitude. The results of this study also found that the overall attitude positively affects the growth of the electric vehicle industry, contribution to the development of the automobile industry, and growth of electric vehicles, while the effect size was higher with perceived growth of the electric vehicle industry than perceived contribution to the development of the automobile industry and production of electric vehicles.

This study provides managerial and policy implications. How customers perceive electric vehicles and have intention to purchase electric vehicles differ based on perceived factors including economic factor, efficiency factor, and product performance factor. Based on experiences using electric vehicles, customers perceived management and policy issues differently particularly with electric vehicles' charging rate policy, fines related to parking, and industries that manufacture non-environment friendly automobiles. Therefore, corporate management should consider developing environmentally-friendly cars by considering social responsibility and global sustainability. The results of the study also implied how to promote perception on electric vehicles in order to improve adoption rate and how to prepare policies to regulate production of non-environment friendly products and services. In particular, this study suggested better installation policy for charging facilities, subsidy policy when installing charging facilities for electric vehicles, supporting policies for automobile industries to manufacture more environmentally-friendly vehicles, economic benefits to



customers who adopt electric vehicles, and other promotional policies to facilitate electric vehicles. This study also suggests policies to persuade business sectors to adopt electric vehicles in the case of commercial usage and prepare other regulatory policies to enhance global sustainability and prospect of electric vehicles. This study has limitations and provides future studies. For future study, sample size should be improved for both groups of actual and potential customers. Future study should consider analyzing perceptions across demographics such as age groups, education, income, and gender.

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