

# Electric Vehicle Deployment and Sustainable Corporate Practices: Evaluating the Mediating Effect of Climate Change Awareness

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## ABSTRACT

*The adoption of electric vehicles (EVs) and addressing climate change risks are key factors in achieving corporate sustainability. This study focuses on understanding how EV usage and climate change risks influence sustainability within Micro, Small, and Medium Enterprises (MSMEs) in Bali Province. By examining 180 MSMEs, the research evaluates the direct impact of EV adoption on sustainability and explores the mediating role of climate change risk. The results show that EV usage positively impacts corporate sustainability, highlighting its potential to enhance business practices while reducing environmental impact. However, climate change risk negatively affects sustainability, both directly and indirectly through its interaction with EV usage. These findings underline the dual importance of integrating EVs into business operations and adopting proactive strategies to mitigate climate-related risks. This study provides practical insights for MSMEs by emphasizing the value of EV adoption as a sustainability strategy. It also calls attention to the need for policies and initiatives that help businesses address climate change risks effectively. By clarifying these relationships, the research contributes to the growing literature on sustainable business practices and offers guidance for MSMEs navigating environmental challenges.*

**Keywords:** Bali Province, Climate change risk, Corporate sustainability, Electric vehicles, Micro Small and Medium Enterprises (MSMEs).

## Introduction

The number of motorized vehicles per year keeps increasing [1]. Automobiles are inextricably linked to the human person and cannot be detached. However, automobiles have a negative effect on people as well [2]. Many countries have recently announced the ambition to reach net-zero emissions targets [3]. Indonesia is a country that has a large population and a low global carbon emission rate [4]. Indonesia's green economy development program aimed at supporting the achievement of zero greenhouse gas (GHG) emissions is that the country is committed to sustainable development and mitigating climate change [5]. Electric Vehicles (EVs) have emerged as a promising solution to mitigate the environmental impacts associated with traditional gasoline-powered vehicles. Technology for list-based data entry has advanced since earlier this century [6]. The deployment of EVs presents a significant opportunity for businesses to reduce their carbon footprint and transition towards more sustainable transportation practices. As companies strive to adopt sustainable corporate practices, integrating EVs into their operations has become increasingly common. However, the extent to which EVs deployment contributes to overall corporate sustainability and the mechanisms through which this impact occurs warrant further investigation.

Major past climatic changes and their resulting environmental impacts provide valuable insights into how the Earth system operates under various boundary conditions [7]. Understanding how these fluctuations can impact human health is important [8]. Globalization has become a topic of interest for many countries worldwide, including Indonesia. One possible interpretation of this is that globalization is seen as a serious threat to humankind's environment and way of life [9]. The importance of fostering a thriving green economy is emphasized as a key strategy for mitigating the threats posed by climate change [10]. The increasing frequency of climate-related disruptions requires transformational responses over the lifecycles of interconnected urban systems with short- and long-term change dynamics [11].

One key factor that may influence the relationship between EVs deployment and sustainable corporate practices is climate change awareness. The development of technology and the more pressing environmental issues have led to the rise of the electricity as a popular solution [12]. Climate change awareness refers to individuals' or organizations' understanding of the causes, consequences, and potential solutions to climate change. It encompasses knowledge about greenhouse gas emissions, the role of human activities in driving climate change, and the importance of adopting measures to mitigate its effects. According to research by

[13], using electric vehicle can reduce carbon emissions and be a low-impact solution while using energy in the transportation sector.

The World Economic Forum's 2020 Global Risk Report states that climate change is occurring more quickly than most people realize [14]. Perceptions of climate change can shape attitudes and behaviors towards sustainability, including the adoption of EVs in corporate fleets. Organizations that are more aware of the environmental implications of their operations may be more inclined to invest in EVs as part of their sustainability strategy. Additionally, climate change awareness can influence stakeholders' expectations and preferences, driving demand for businesses to demonstrate environmentally responsible practices, including the use of EVs. Moreover, based on the Pecking Order theory [15], firms have a preferred hierarchy of financing sources, with internal funds being the most preferred, followed by debt, and finally external equity. When applying this theory to the adoption of EVs, companies may prioritize financing options that align with their existing financial structure and objectives. Thus, understanding how financial considerations influence decisions related to EVs deployment is crucial for assessing the feasibility and sustainability of such initiatives.

There is a trend indicating companies' adoption of sustainable practices using the Triple Bottom Line (TBL) measurement as a corporate success indicator of company [16]. The interaction between companies and the natural and social environment is commonly referred to as the Triple Bottom Line [17]. TBL significantly influences the use of sustainability in business practices [17]. Furthermore, the Triple Bottom Line framework emphasizes the importance of balancing economic prosperity (profit), social justice (people), and environmental quality (planet). TBL-based industries can generate business activities that not only have long-term economic benefits but also provide social and environmental benefits [18]. The sustainability of a company's business not only depends on the level of customer satisfaction but also on the partnership relations of the company with related parties, both internal and external to the company [19]. In the context of EVs deployment, the TBL approach encourages businesses to evaluate the financial costs and benefits, social implications, and environmental impacts associated with transitioning to electric transportation. By adopting a holistic perspective that integrates financial, social, and environmental considerations, companies can make more informed decisions that support long-term sustainability objectives.

The Triple Bottom Line framework and the Pecking Order Theory serve as foundational concepts in understanding sustainability strategies, particularly for MSMEs adopting electric vehicles. TBL emphasizes the need for businesses to balance three critical dimensions: economic profitability (profit), social equity (people), and environmental stewardship (planet). For MSMEs, this framework highlights how adopting EVs can reduce operational costs, support eco-friendly practices, and foster stronger community relationships by demonstrating corporate responsibility. On the other hand, the Pecking Order Theory explains how businesses prioritize financing decisions, often starting with internal funds, followed by debt, and lastly external equity. This theory is particularly relevant for MSMEs, which typically face limited access to external capital. The adoption of EVs, therefore, aligns with both frameworks as a strategic decision: it supports TBL by improving environmental and social outcomes, while also adhering to Pecking Order Theory by emphasizing cost-effective and sustainable investment. Together, these frameworks provide a robust basis for guiding MSMEs in integrating sustainability into their core strategies, enabling them to achieve long-term growth while addressing pressing environmental and social challenges.

Understanding the mediating effect of climate change awareness, as well as considering financial and sustainability frameworks such as the Pecking Order theory and the Triple Bottom Line, is essential for elucidating the mechanisms through which EV deployment influences sustainable corporate practices. By examining these interconnected factors, researchers can provide valuable insights into the drivers and implications of EV adoption in the business sector, informing strategic decision-making and policy development aimed at promoting sustainable transportation practices.

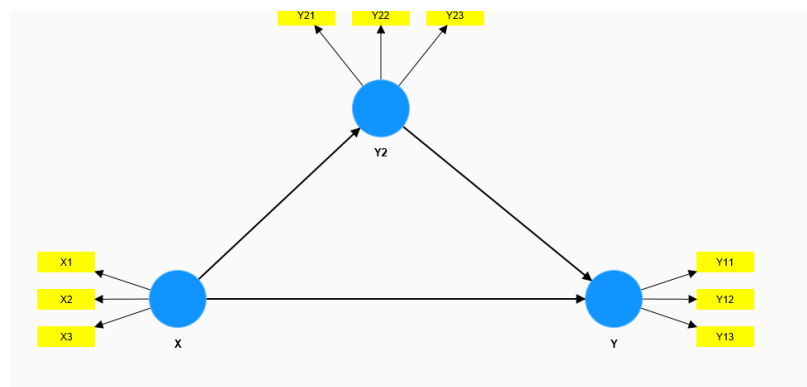


Figure 1. Structural Equation Model

**H1: Electric Vehicles Linked to Corporate Sustainability**

Fill-in: Positive

Justification: The use of electric vehicles, which are more environmentally friendly, can help companies achieve sustainability goals, such as reducing carbon emissions and mitigating negative environmental impacts.

**H2: Electric Vehicles Linked to Climate Change Risk**

Fill-in: Positive

Justification: This hypothesis implies that the use of electric vehicles can help reduce a company's impact on climate change, thus lowering the associated risks of climate change.

**H3: Climate Change Risk Linked to Corporate Sustainability**

Fill-in: Negative

Justification: Climate change risks can lead to financial and reputational losses for companies, disrupting their sustainability efforts.

**H4: Climate Change Risk as a Mediator between Electric Vehicles and Corporate Sustainability**

Fill-in: Negative

Justification: While the use of electric vehicles can reduce climate change risks, the mediating influence of these risks on corporate sustainability may not always be positive. Climate change risks can still cause uncertainty and challenges for company operations, even if the use of electric vehicles has reduced their direct impact.

**Research Methods**

This study underscores the critical role of business sustainability within Micro, Small, and Medium Enterprises (MSMEs), particularly in Bali Province, where these businesses contribute significantly to the local economy and employment. The purposive sampling approach targets MSMEs that have obtained legal recognition through the decentralized fund program by the Directorate General of MSMEs, ensuring the selected sample represents businesses actively engaged in formalized operations. From a population of 16,650 MSMEs in Bali, 180 were chosen based on specific criteria, including their utilization of electric vehicles (EVs), demonstrated awareness of climate change, and commitment to sustainability initiatives. The sample size ensures the study's findings are both representative and manageable for in-depth analysis.

The questionnaire is structured to capture comprehensive data on the three core variables: EV usage, climate awareness, and business sustainability. It employs a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), enabling the measurement of attitudes, perceptions, and practices. The questions are organized into three sections:

1. Electric Vehicle Usage: Questions assess the extent of EV adoption, including its operational benefits, challenges, and alignment with sustainability goals.
2. Climate Awareness: Items explore respondents' understanding of climate change risks, their perceptions of its impact on business, and their commitment to mitigating these risks.
3. Business Sustainability: This section evaluates practices related to economic, social, and environmental sustainability, aligning with the Triple Bottom Line framework.

The questionnaire design incorporates insights from existing literature and local MSME contexts to ensure relevance and clarity. This structure allows for an integrated analysis of how EV usage and climate awareness influence business sustainability among MSMEs in Bali Province.

**Results and Discussion**

**Reliability and Validity Test**

Table 1. Construct Reliability and Validity.

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
X	0.690	0.812	0.807	0.598
Y	0.830	0.849	0.898	0.747
Y2	0.943	0.950	0.964	0.899

The AVE values for each variable in the output above are greater than 0.5, meaning that all indicators legitimately converge to form their corresponding variables. Furthermore, values for Cronbach's Alpha and CR were found, both of which were greater than 0.6 for every variable. The study's variables and items all satisfy the validity and reliability requirements for measuring the variables, it can be said.

**Goodness of Fit**

Table 2. R-Square

	R-square	R-square adjusted
Y	0.312	0.298

The R-squared value EV on Corporate Sustainability is 0.312, with an adjusted R-squared of 0.298. This suggests that approximately 29.8% of the variance in corporate sustainability can be explained by the exogenous factors of EV. With an adjusted R-squared lower than 33%, the impact of risk perception on financial management is deemed low.

**Direct Effects Analysis**

Table 3. Path Coefficients

	X	Y	Y2
X	-	0.665	0.558
Y	-	-	-
Y2	-	-0.283	-

1. The direct effect of EV on corporate sustainability is 0.665, meaning that if EV increases by one-unit, corporate sustainability can increase by 66.5%. This effect is positive.
2. The direct effect of EV on Climate change risk is 0.558, signifying that if EV increases by one unit, Climate change risk can increase by 55.8%. This effect is positive.
3. The direct effect Climate change risk on corporate sustainability is -0.283, signifying that if Climate change risk increases by one-unit, corporate sustainability can decrease by 28.3%. This effect is negative.

**Hypothesis Test**

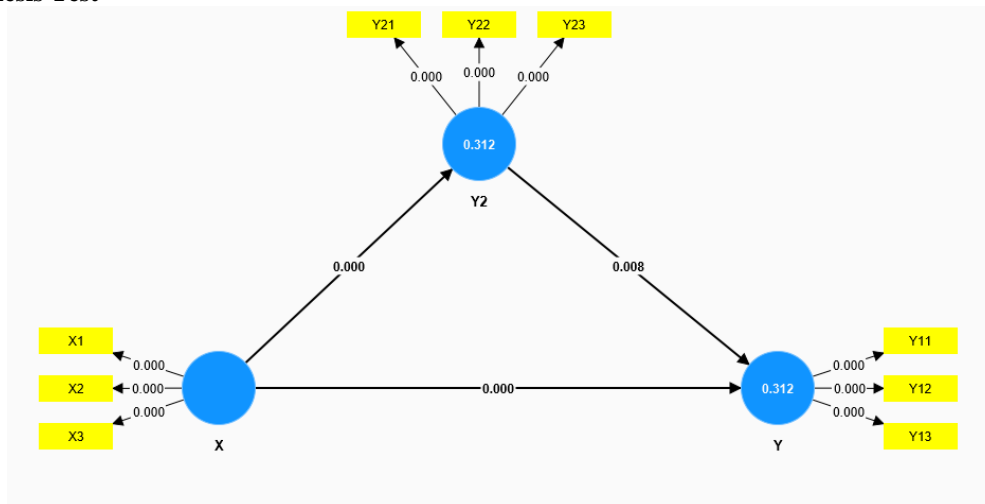


Fig 2. Structural Equation Model Testing

Table 4. Regression Weight Structural Equational Model.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values
X1 -> Y	0.665	0.670	0.082	8.074	0.000
X1 -> Y2	0.558	0.561	0.060	9.334	0.000
Y2 -> Y	-0.283	-0.291	0.107	2.654	0.008

1. The relationship between EV and corporate sustainability (0.000):  
 EV has a positive and significant influence on corporate sustainability with an effect of 0.665. Thus, an increase in EV will increase corporate sustainability, and vice versa. H1 is accepted.
2. The relationship between EV and Climate change risk (0.000):  
 EV has a positive and significant influence on Climate change risk with an effect of 0.558. Thus, an increase in EV will enhance Climate change risk. H2 is accepted.
3. The relationship between Climate change risk and corporate sustainability (0.000):  
 Scepticism has a positive and significant influence on financial management with an effect of - 0.283. Thus, an increase in Climate change risk will increase corporate sustainability. H3 is accepted.

Table 5. Indirect Effect.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics ( O/STDEV )	P values
Risk Perception -> Scepticism -> Financial Management	-0.158	-0.163	0.063	2.505	0.012

Climate change risk to relationship between EV and corporate sustainability (0.012). Climate change risk has a negative and significant influence between EV and corporate sustainability with an effect of 0.158. H4 is accepted.

The findings emphasize the complex dynamics between EV adoption, climate change risks, and corporate sustainability. The positive impact of EVs on sustainability reflects their role in reducing carbon emissions and aligning businesses with environmental standards. This makes EV adoption a vital strategy for companies aiming to enhance their sustainability credentials and meet global environmental expectations. However, the results also reveal that EV adoption can introduce or amplify certain climate change risks, such as resource constraints, increased reliance on specific energy sources, and infrastructural challenges. These risks, if unaddressed, may undermine the sustainability benefits of EVs. Furthermore, the negative effect of climate change risk on corporate sustainability highlights the broader vulnerability of businesses to environmental disruptions and underscores the importance of proactive risk management.

The moderating role of climate change risk in the relationship between EV adoption and sustainability indicates that the effectiveness of EVs in promoting sustainability is contingent upon a company's ability to mitigate associated risks. Companies must adopt a holistic approach that not only incorporates green technologies like EVs but also actively addresses climate-related risks through strategic planning, policy alignment, and technological innovation. This interpretation highlights the need for businesses to view EV adoption not just as an isolated sustainability initiative but as part of a broader strategy to manage environmental risks and ensure long-term resilience.

## Conclusion

The findings of this study reveal that the use of electric vehicles (EVs) has a positive impact on corporate sustainability, while climate change risk negatively affects corporate sustainability both directly and indirectly. These results highlight the strategic importance of EV adoption as a means to enhance sustainability while addressing environmental challenges. From a managerial perspective, companies should prioritize EV integration as part of their sustainability strategies to reduce carbon emissions and strengthen their commitment to environmental stewardship. Additionally, proactive measures to mitigate climate change risks, such as adopting green technologies and implementing risk management frameworks, can further support long-term corporate sustainability.

Adoption of EVs: Companies may consider adopting EVs as part of their sustainability strategy, as this can help reduce carbon emissions and achieve sustainability goals. Climate Change Risk Management: The findings emphasize the importance for companies to seriously manage climate change risks. Proactive measures such as reducing dependence on fossil fuels and integrating climate change adaptation strategies can enhance company resilience.

This study has several limitations that should be acknowledged. First, the findings are specific to companies in Bali Province, which may limit the generalizability of the results to other regions with different economic, social, and environmental conditions. The characteristics of businesses in Bali, often influenced by the tourism sector, may also impact the outcomes. Second, the use of questionnaires as the sole data

collection method poses potential biases, such as respondents providing subjective answers that may not accurately reflect actual conditions. Finally, the study focuses solely on the relationship between electric vehicle (EV) adoption, climate change risk, and corporate sustainability. Other factors that may influence sustainability, such as government policies, market incentives, and infrastructure readiness, were not included in the analysis.

Future studies can address these limitations and expand the scope of this research. To improve external validity, researchers should include companies from other regions or industries, providing broader insights into how EV adoption impacts sustainability in diverse settings. Incorporating a mixed-methods approach, such as qualitative interviews or case studies, can offer deeper insights into managerial perspectives and the complexities of EV implementation. Additionally, future research could explore additional variables, such as the role of government policies, tax incentives, and market dynamics in influencing EV adoption and corporate sustainability. Investigating the readiness of technology and infrastructure for EV use across various regions could further enhance understanding. Furthermore, linking findings to global trends, such as decarbonization efforts or renewable energy policies, could provide a broader context. Challenges in EV adoption, such as high costs, infrastructure limitations, and market acceptance, should also be addressed to offer more practical insights. Lastly, adopting a longitudinal research design to track the long-term impact of EV adoption and evolving environmental policies on corporate sustainability could provide a more comprehensive perspective. By addressing these gaps and incorporating additional dimensions, future research can contribute more significantly to the understanding of corporate sustainability and climate change mitigation strategies.

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