



Exploring the Role of Internal Environmental Locus of Control as a Mediator between Consumer Climate Change Perception and Low-Carbon Product Purchase Intention

Shieh-Liang Chen^{1}, Yi-Hsuan Lee¹, Yu-Sheng Su¹, and Yu-Hsia Ho¹*

¹ Department of Business Administration, Asia University, Taiwan

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Abstract

In recent years, growing global awareness of climate change has heightened public concern about environmental issues, particularly the need to reduce carbon emissions. This shift has prompted businesses to adopt more sustainable practices and design eco-friendly products that align with consumers' increasing preference for environmentally conscious choices. This study investigates the key factors that influence consumers' willingness to purchase low-carbon products, with a focus on the mediating role of internal environmental locus of control in the relationship between climate change perception and purchase intention. By employing questionnaire surveys and Partial Least Squares Structural Equation Modeling (PLS-SEM), the research identifies important behavioral patterns linked to low-carbon consumption. The findings provide valuable insights, enriching our theoretical understanding of how consumers perceive and engage with environmentally sustainable products.

1. Introduction:

In recent years, global climate change has significantly raised public awareness of environmental issues, with extreme weather events, rising sea levels, and ecosystem disruptions becoming urgent concerns. Against this backdrop, concepts such as low-carbon intentions, emissions reduction, and sustainable development have become increasingly important for both businesses and consumers. As climate awareness grows, companies are adopting sustainable practices, including the use of renewable energy, eco-friendly product designs, and efforts to reduce carbon footprints. This shift not only reflects corporate social responsibility but also aligns with the growing consumer demand for low-carbon products.

This study seeks to clarify the factors that influence consumers' decisions to purchase low-carbon products. Imagine a consumer faced with two choices: one labeled "eco-friendly" and the other not. Their decision goes beyond the product's features or appeal; it taps into deeper values

*corresponding author. Email: peterchen@asia.edu.tw

and an internal compass that shapes their actions. This internal mechanism, known as the internal environmental locus of control (ELOC), offers a critical lens for understanding consumer behavior toward sustainability.

Although the literature on climate change perception and consumer behavior regarding low-carbon products is expanding (Bamberg & Moser, 2007; Steg & Vlek, 2009; Sun et al., 2023), important research gaps remain. While many studies have established a direct link between climate change perception and sustainable consumption, few have explored the psychological mechanisms that underlie this relationship. In particular, the role of internal environmental locus of control—the belief that one’s personal actions can influence environmental outcomes—has been largely overlooked. Understanding this concept may illuminate how consumers translate their climate awareness into actionable purchasing decisions.

Furthermore, much of the existing research treats climate change perception as a single construct, often ignoring the complexity of its various dimensions (e.g., severity, personal relevance, efficacy) and how these interact with individual traits like internal environmental locus of control. While some studies have examined the direct effects of environmental attitudes on low-carbon product intentions, they frequently fail to consider how these attitudes may be mediated or moderated by psychological factors. This study addresses these gaps by investigating the mediating role of internal environmental locus of control in the relationship between climate change perception and low-carbon product purchase intentions.

Using questionnaire surveys and Partial Least Squares Structural Equation Modeling (PLS-SEM), this research aims to validate a model of consumer behavior in low-carbon consumption, offering insights into consumers' awareness of environmentally friendly products. The study examines the relationship between climate change perception and willingness to purchase low-carbon products, while introducing a behavioral framework that integrates these variables. Additionally, it highlights the mediating role of internal environmental locus of control, enhancing our understanding of the psychological and behavioral factors influencing low-carbon product choices. The objectives of this study are twofold:

1. To assess whether consumers' willingness to purchase low-carbon products is influenced by their perception of climate change and their internal environmental locus of control.
2. To determine whether the internal environmental locus of control mediates the relationship between climate change perception and consumers' willingness to purchase low-carbon products.

The remainder of this paper is organized as follows: Section 2 reviews the literature on climate change perception, internal environmental locus of control, and low-carbon product purchase intentions; Section 3 describes the methodology; Section 4 presents the results, followed by a discussion; and Section 5 outlines the conclusions.

2. Literature review

This section reviews the relevant literature and proposes hypotheses to guide the validation of this study.

2.1 Climate Change Perception

Climate change refers to long-term fluctuations in average meteorological conditions over extended periods, ranging from decades to millions of years, and it can occur on both regional and global scales. While the majority of people acknowledge the reality of climate change, their views on human causation vary considerably. Questions about the extent to which climate change is anthropogenic, its potential consequences, and the timing and location of these changes significantly affect public support for climate policies and the willingness to take action for mitigation or adaptation (Lorenzoni et al., 2007).

Climate change perception encompasses an individual's awareness, understanding, and viewpoints about this phenomenon. It reflects the level of knowledge regarding key concepts, such as greenhouse gas emissions, global warming, and extreme weather events. Research by Bostrom et al. (2012) and Heath and Gifford (2006) identified three main factors influencing climate change perception: (1) belief in the reality of climate change, (2) belief in its causes, and (3) belief in its consequences.

Building on construal level theory, McDonald et al. (2006) introduced two additional dimensions of climate change perception: (1) perceived spatial distance and (2) perceived temporal distance. Van Valkengoed et al. (2021) further integrated these dimensions into climate change scales and conducted several validation experiments.

Additionally, Rotter's (1996) concept of locus of control offers a framework for understanding individual responses to climate change. Individuals with an external locus of control believe events are beyond their influence, often attributing outcomes to fate or luck. In contrast, those with an internal locus of control believe they can influence outcomes through their own actions.

The internal environmental locus of control (ELOC) has been widely studied in environmental contexts, especially in relation to attitudes and behaviors toward ecological responsibility (McCarty & Shrum, 2001; Bodur & Sarigöllü, 2005). Numerous studies have explored how climate change perception influences behavior and policy support (Hornsey et al., 2016). These studies suggest that climate change denial and skepticism may be less widespread than previously assumed (Steg, 2018), with most individuals recognizing the reality of climate change. Therefore, it is essential to empower individuals to translate their perceptions into climate action and policy support (Steg & Vlek, 2009).

The Intergovernmental Panel on Climate Change's (IPCC) Fifth Assessment Report (AR5), released in 2013, asserts with 95% certainty that the global warming observed between 1950 and 2010 is caused by human activities that release greenhouse gases. Climate change poses a major threat to life on Earth, affecting agricultural productivity through extreme weather events and causing habitat shifts due to drought and temperature increases. Addressing these challenges is critical to achieving sustainable development goals.

2.2 Internal Environmental Locus of Control (ELOC)

The concept of environmental locus of control is rooted in psychology, sociology, and behavioral science, reflecting how individuals' beliefs, behaviors, and lifestyles influence their environmental responsibility. This study focuses on the role of internal environmental control orientation in shaping business marketing strategies and environmental policies. Understanding how strengthening individuals' internal locus of control can promote sustainable consumer behavior is especially valuable.

Rotter's (1966) Attribution Theory serves as the foundation for this research. According to this theory, individuals possess either an internal or external locus of control. Those with an internal locus believe they can influence the events in their lives, while those with an external locus attribute outcomes to external forces, such as luck or fate. The internal environmental locus of control is shaped by factors such as personality, life experiences, and education. Research shows that individuals with a strong internal control orientation tend to be more proactive and resilient, while those with a strong external orientation may feel helpless in the face of environmental changes.

2.3 Low-Carbon Product Purchase Intention

A carbon (emission) label in Taiwan indicates the carbon emissions associated with a product, from the acquisition of raw materials to manufacturing, distribution, consumer use, and final disposal or recycling. These emissions are expressed as carbon dioxide equivalents.

As global climate anomalies have drawn increasing attention to low-carbon practices, many companies have introduced eco-friendly products designed to save energy and reduce carbon footprints. Carbon labels act as a communication tool between businesses and consumers, helping consumers understand product emissions and recognize companies that prioritize carbon reduction. Products that reduce their carbon footprint by at least 3% within five years are eligible to earn a carbon label after a rigorous review process.

The carbon labeling initiative, which began in Taiwan in 2009, aims to enhance the market competitiveness of low-carbon products and raise consumer awareness. Ultimately, this initiative seeks to foster sustainable consumption and production models that support a low-carbon economy. This study focuses on consumers' willingness to purchase low-carbon products, particularly those bearing a carbon label, signifying a reduction in carbon footprint (National Council for Sustainable Development, 2023).

3. Methodology

3.1 Research Framework

The research framework is illustrated in Figure 1, which outlines the relationships among climate change perception, internal environmental locus of control (ELOC), and the intention to purchase low-carbon products. Their interconnections are discussed below.

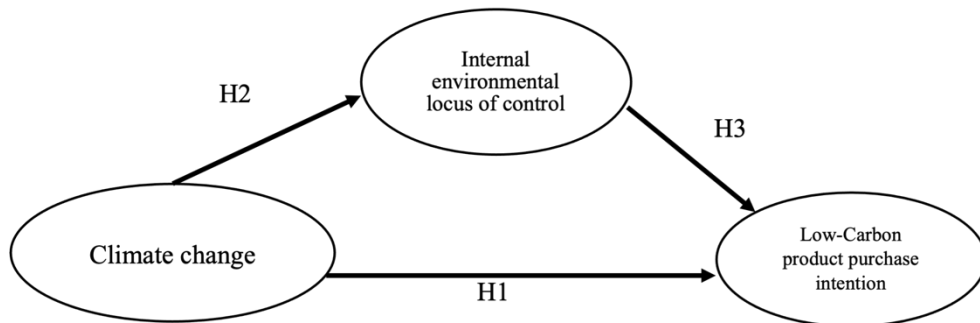


Fig 1. *Research Framework*

3.2 Climate Change Perception and Internal Environmental Locus of Control

Cleveland et al. (2005) examined environmentally friendly behavior through the concept of locus of control, which refers to individuals' beliefs about whether their actions directly influence their environmental circumstances (internal locus) or if outcomes are shaped by external forces. Those with an internal locus of control believe they can affect environmental outcomes through their behavior, while those with an external locus attribute environmental changes to fate or external forces. Cleveland's study identified four dimensions of environmental control: biocentric altruism, corporate suspicion, economic motivation, and personal recycling effort, reflecting varying attitudes toward environmental responsibility.

Environmental internality is the belief that personal actions can positively impact the environment. People with high environmental internality are more likely to engage in environmentally responsible behaviors and experience reduced feelings of guilt over environmental damage. Thus, we propose the following hypotheses:

H1: Climate change perception has a significant positive impact on the willingness to purchase low-carbon products.

H2: Climate change perception has a significant positive influence on internal environmental locus of control.

3.2.1 Internal Environmental Locus of Control and Low-Carbon Product Purchase Intention

MacKerron et al. (2009) studied carbon offset certification, while Oreg and Katz-Gerro (2006) found a positive relationship between consumers' willingness to pay for green products and their internal environmental control orientation. Prakash and Pathak (2017) showed that environmentally conscious consumers in India were less price-sensitive and more willing to pay a premium for eco-friendly products. Based on these insights, we propose:

H3: Internal environmental locus of control has a significant positive impact on the willingness to purchase low-carbon products.

3.3 Sample and data collection

This study employs a questionnaire survey method, designed based on the research framework and the findings from the literature. The survey targets general consumers and uses Google Forms for data collection. Responses are measured using a seven-point Likert scale.

3.3.1 Climate Change Perception Scale

Valkengoed and Perlaviciute (2021) developed a validated scale to measure different types of climate change perceptions, addressing gaps in existing literature. This scale evaluates perceptions regarding the reality, causes, and consequences of climate change, including perceived valence, spatial distance, and temporal distance of its outcomes. It assesses individuals' cognition, knowledge, attitudes, and beliefs about climate change, providing a comprehensive understanding of their perceptions and responses to environmental issues.

3.3.2 Internal environmental locus of control

Internal environmental locus of control involves individual behaviors such as energy conservation, pollution reduction, and the purchase of eco-friendly products. This control can manifest at both personal and collective levels, including organizational, community, or governmental initiatives. Through an internal environmental control orientation, individuals or groups can make significant contributions to sustainability and environmental protection (Yang & Weber, 2019).

3.3.3 Low-Carbon Product Purchase Intention Scale

As businesses increasingly recognize the importance of addressing social and environmental issues alongside profit-making, they understand the synergy between social responsibility and economic success. Consumers expect businesses to go beyond profit maximization, emphasizing the moral responsibility of addressing societal challenges. By engaging in social responsibility, companies not only fulfill ethical obligations but also enhance their performance and competitiveness in the marketplace. This study focuses on consumers' intentions to purchase low-carbon products, particularly those labeled with carbon-reducing attributes, reflecting a broader trend of businesses contributing to societal well-being.

4. Data analysis and empirical results

The research model was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), a variance-based approach to structural equation modeling (Hair et al., 2014). PLS-SEM was chosen for this study due to its suitability for reflective measurement models and its ability to handle complex models with multiple independent and dependent variables, as well as both direct and mediating relationships (Richter et al., 2016). Additionally, PLS-SEM is particularly appropriate for datasets with small sample sizes and non-normal distributions, which further justified its use in this research (Hair et al., 2014).

4.1 Descriptive statistics

In the pre-test phase of this study, 84 questionnaires were collected. In terms of education, 44 respondents had completed college or university education, accounting for 52%; 31 respondents had completed graduate studies or above, accounting for 37%; 8 respondents had a high school or vocational education, accounting for 10%, with 1 respondent having missing data, constituting 1%. Regarding age distribution: 3 respondents were below 24 years old, accounting for 4%; 10 respondents were between 25 and 34 years old, accounting for 12%; 29 respondents were between 35 and 44 years old, accounting for 35%; 28 respondents were between 45 and 54 years old, accounting for 33%; 11 respondents were between 55 and 64 years old, accounting for 13%; and 3 respondents were 65 years old or above, accounting for 4%. The study found that 76% of the respondents were willing to pay additional costs to purchase low-carbon products.

4.2 Reliability

This study utilized composite reliability (CR) to assess the internal consistency of variables within each construct. According to recommendations, the composite reliability values should be above 0.6 (Hair et al., 1998). The Cronbach's α values for each construct range from 0.870 to 0.938, and the CR values range from 0.884 to 0.943. These results meet the standard, indicating good internal consistency for each construct.

4.3 Convergent validity

According to the recommendations of Fornell and Larcker (1981), a critical threshold for Average Variance Extracted (AVE) is 0.5, indicating convergent validity when surpassing this value, it can be observed that the AVE values for each construct in this study range from 0.498 to 0.890. All these values exceed the 0.5 threshold, suggesting the presence of convergent validity.

4.4 Hypothesis testing

According to the research model presented in Figure 2, the influence of climate change perception on internal environmental control orientation was examined. The path coefficient for the effect of climate change perception on the willingness to purchase low-carbon products was 0.129 (p-value < 0.01), confirming that H1 was supported in a positive direction. Additionally, a significant influence of climate change perception on internal environmental control orientation was found, with a path coefficient of 0.559 (p-value < 0.01), supporting H2. Furthermore, internal environmental control orientation positively impacted the willingness to purchase low-carbon products, with a path coefficient of 0.650 (p-value < 0.01), supporting H3 and reaching a significant level. which did not reach statistical significance. This suggests that internal environmental control orientation may serve as a mediating factor in this relationship.

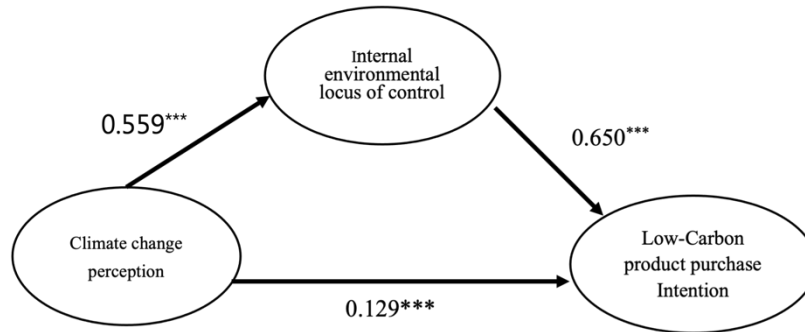


Fig 2. *Path Analysis*
 (***)p-value < 0.01)

From Figure 2, internal environmental control orientation has a positive and statistically significant impact on the willingness to purchase low-carbon products, with a path coefficient of 0.650. Moreover, climate change perception positively affects internal environmental control orientation, with a path coefficient of 0.559. The Variance Accounted For (VAF) values for climate change perception, internal environmental control orientation, and the willingness to purchase low-carbon products are approximately 75%, indicating mediation effects within the study, thereby supporting H4.

4.5 Discussion

This study focuses on consumers' behavior and explores the relationships between climate change perception, internal environmental locus of control, and the willingness to purchase low-carbon products. In this section, we present conclusions drawn from the study results, discuss their managerial implications, provide recommendations for future research, and address the limitations of this study. Additionally, we offer insights for future researchers by highlighting potential avenues for further exploration.

The findings of this study confirm the proposed hypotheses regarding the interactions between consumer climate change perception, internal environmental locus of control, and purchasing intentions for low-carbon products. As consumers become more aware of climate change, they tend to exhibit a greater willingness to buy low-carbon products. This behavior is likely driven by an increased awareness of the environmental impact of their purchasing decisions, which aligns with McCright's (2010) findings. As consumer concern over environmental issues grows, so too does the likelihood of choosing environmentally friendly products.

The results also support the idea that heightened climate change awareness positively influences consumers' internal environmental locus of control. This is consistent with Villacis et al. (2021), who suggest that growing concerns about climate change enhance individuals' sense of control over their environmental impact. As a result, there is a positive relationship between climate change perception and internal environmental locus of control, with consumers perceiving themselves as more capable of influencing environmental outcomes.

Additionally, this study shows that individuals with a stronger internal environmental locus of control are more inclined to purchase eco-friendly products. Those who believe in their ability to effect change through their actions are more likely to consider the environmental impact when

making purchasing decisions. This aligns with Oreg and Katz-Gerro's (2006) research, which found that internal environmental control orientation mediates the relationship between climate change perception and low-carbon product choices.

Our findings suggest that the internal environmental locus of control acts as a bridge, enhancing the connection between consumers' climate change awareness and their actual purchasing behavior. In other words, individuals who perceive themselves as having greater control over environmental outcomes are more likely to translate climate change awareness into concrete actions, such as purchasing low-carbon products.

In summary, this study reveals complex relationships between consumer perceptions, values, and behaviors, contributing to a deeper understanding of how the internal environmental locus of control influences low-carbon product purchasing decisions in the context of climate change awareness. The results offer important implications for businesses and policymakers aiming to promote sustainable consumption.

5. Conclusion

By incorporating the concept of internal environmental locus of control into the research framework, this study offers a fresh perspective on the relationship between consumer psychology and environmentally conscious behavior. It illustrates how climate change perception influences the willingness to purchase low-carbon products by shaping consumers' internal environmental control orientation, ultimately affecting their purchasing behavior.

This research establishes a comprehensive model that integrates climate change perception, internal environmental locus of control, and low-carbon product purchasing behavior. Through the use of structural equation modeling (SEM), the study provides a holistic explanation of the complex interrelationships among these variables. This approach not only enriches theoretical frameworks in the field but also deepens our understanding of how climate change perceptions translate into sustainable consumer behaviors via internal environmental control.

The findings offer practical insights for businesses and policymakers aiming to promote sustainable consumer behavior. By understanding the dynamic interplay between climate change perception, internal environmental control orientation, and the willingness to purchase low-carbon products, companies can craft targeted marketing strategies that encourage more proactive consumer participation in environmental conservation efforts.

In summary, this study builds upon existing research while introducing internal environmental control orientation as a mediating variable, offering a more comprehensive view of consumers' willingness to purchase low-carbon products under the influence of climate change perception. This contribution is significant for both academic research and practical applications, particularly in the context of sustainability.

While previous studies have focused largely on consumer purchasing behavior, this study highlights the importance of consumers' willingness to engage with low-carbon products. By including internal environmental control as a mediating factor, this research broadens the scope of inquiry and provides a more nuanced understanding of the decision-making process.

Despite rigorous methodological efforts, the study faced certain limitations due to constraints in resources such as time, budget, and capacity. Additionally, the sample's geographical and cultural context may limit the generalizability of the findings, suggesting that the results should be interpreted with caution in other contexts. Future research should aim to address these limitations by expanding the sample and exploring the role of internal environmental control across different regions and cultures to provide a more comprehensive understanding of global consumer behavior regarding low-carbon products.

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Shieh-Liang Chen

Department of Business Administration, Asia University, Taiwan, R.O.C.

E-mail address: peterchen@asia.edu.tw

Major area(s): Supply chain management, marketing channel management, marketing research, sustainability management, etc.

Yi-Hsuan Lee

Department of Business Administration, Asia University, Taiwan, R.O.C.

E-mail address: sgipost@msn.com

Major area(s): Business management.

Yu-Sheng Su

Department of Business Administration, Asia University, Taiwan, R.O.C.

E-mail address: peter0963@gmail.com

Major area(s): Business management.

Yu-Hsia Ho

Department of Business Administration, Asia University, Taiwan, R.O.C.

E-mail address: nancy12604@gmail.com

Major area(s): Business management.

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