

# **Causal Factors Influencing Decision-Making Use Environmentally Friendly Building Materials of Construction Business Operators in Bangkok**

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**Abstract** This study explores the decision-making processes among construction business operators in Bangkok regarding the use of environmentally friendly building materials, within the context of heightened global emphasis on environmental sustainability. In response to increasing consumer awareness of environmental impacts, particularly in the residential housing sector, this research aimed to identify the causal factors influencing these decisions. Employing quantitative methods, the study analyzed responses from 320 legally registered construction contractors who had used eco-friendly materials in at least five housing projects during 2023. Data were gathered via questionnaires and analyzed using a structural equation model. The findings indicate that the primary determinants of material choice were the operators' skills and product trust, with the former showing the most decisive influence. The 4Ps marketing mix and service quality followed these factors in significance. The insights provided by this research are crucial for manufacturers, contractors, and regulatory bodies aiming to promote the adoption of sustainable materials in Thailand's construction industry, thereby enhancing environmental conservation and reducing pollution from building activities.

**Keywords** Building materials; Decision-making; Environmentally friendly

**Received:** April 23, 2024

**Revised:** June 16, 2024

**Accepted:** August 23, 2024

## Introduction

The construction industry is paramount to Thailand's economy, as a hub for diverse professionals, including architects, engineers, and technicians. The primary aim of this sector is to execute projects that adhere strictly to specified conditions and align with the predetermined objectives that collectively drive forward national infrastructure and development goals. To thrive in this volatile sector, stakeholders must navigate myriad challenges: the industry is marked by a highly dynamic operating environment where rapid and extensive changes are commonplace, and intense, overlapping competition further exacerbates the complexity of operations. These factors demand comprehensive management practices, without which, the industry faces potential financial losses or infrastructural collapses. Additionally, clients are increasingly inclined towards environmental sustainability, which has significantly influencing project outcomes and overall quality of life (Maradan, 2011; Mohammed et al., 2018).

There has been a notable shift in consumer demands in recent years, with increasing emphasis on environmental considerations in the construction process. This shift necessitates the selection of construction materials beyond mere durability and functionality to include criteria that support environmental sustainability (Li et al., 2018). Driven by this trend, construction firms are now compelled to carefully choose materials conducive to green building practices, promoting both eco-friendliness and substantial benefits. Utilizing green materials can lead to considerable energy savings, reduced maintenance costs, enhanced productivity, improved health conditions for occupants, and greater architectural design flexibility. These advantages significantly improve the societal quality of life, demonstrating the construction industry's fundamental role in fostering sustainable development across various sectors (Mohammed et al., 2018). The thorough selection of construction materials, therefore, not only responds to increasing environmental awareness but also sets a benchmark for industry practices that harmonize economic development with environmental sustainability.

The escalating emphasis on environmental sustainability within the construction industry indicates a significant shift towards adopting green building practices. This trend is characterized by a concerted effort among building owners to leverage renewable energy sources and to incorporate architectural designs that harmonize with the local climate, environmental conditions, and the inhabitants' lifestyles. Using environmentally friendly construction materials is central to this approach, as it aligns with the broader objectives of reducing ecological footprints and promoting sustainability. The development and utilization of such materials, as evidenced in the work of Li et al. (2014), are instrumental in realizing the vision of green buildings. However, the adoption rate of these sustainable practices in Thailand must catch up to that of other countries, a phenomenon attributed to the high costs and limited availability of green construction materials. The reliance on imports for these materials further accentuates the challenges faced by the Thai construction industry in embracing environmental sustainability, exacerbated by concerns over local standards and the quality of domestically produced materials (Rakkiattiyod, 2021).

Integrating environmentally friendly construction materials into the building process presents a holistic approach to environmental stewardship, spanning the entire lifecycle of these materials from extraction and production to installation, and eventually, to their reuse, recycling, and disposal. Clarke (2006) highlights the intrinsic value and enhanced durability of materials derived from renewable resources, emphasizing their reduced environmental impact. Modern construction practices in small and large firms now frequently incorporate policies that prioritize materials that are benign to the ecosystem, aiming to reduce the environmental footprint of their projects. This paradigm shift is influenced by a growing recognition of the universal impacts of material choices on the environment, affecting all facets of society. Moreover, there is an increasing engagement in advertising campaigns that promote natural resource conservation and environmental protection, which plays a crucial role in shifting societal attitudes towards sustainability (Malahayati et al., 2017).

Adopting environmentally friendly construction materials significantly enhances environmental sustainability and alleviates pollution, while imparting a unique identity to construction projects that distinguishes them from conventional developments. These materials are increasingly favored in current social climates due to their aesthetic appeal, durability, and distinctive characteristics, improving the overall quality and appearance of buildings and contributing to the health and satisfaction of occupants (Luangcharoenrat & Intrachooto, 2013). Moreover, using such materials is cost-effective and augments the investment value of properties by aligning with their locations social and cultural contexts, thereby promoting uniqueness and inclusivity. Contractors prioritizing eco-friendly materials in their projects are positioned as pioneers in the market, gaining a competitive edge over others by leading in sustainability and innovation (Yimprayoon, 2016). This strategic choice fosters market leadership and aligns with growing consumer demands for sustainable and ethically produced infrastructure, marking a shift towards more responsible construction practices.

The researchers are committed studying causal factors influencing the decision-making use environmentally friendly building materials of construction business operators in Bangkok to use environmentally friendly building materials.

## **Literature review**

### **Theoretical concepts related to the decision-making for selecting environmentally friendly construction materials**

Schiffman (2010) articulates that purchasing decisions result from deliberate and rational consumer selection processes. This selection process includes evaluating brands, considering various conditions, and assessing costs. These decisions are a manifestation of the cognitive (thought-based), affective (emotion-based), and conative (action-based) aspects of consumer behavior, which collectively influence and define consumer decision-making dynamics. According to Armstrong and Kotler (2012), decision-making in the consumer purchase process pertains explicitly to the point at which actual product selections are made. This process is generally structured into five phases: Recognizing a need, searching for information, evaluating alternatives, making the purchase decision, and reflecting on post-purchase behavior. Each phase is critical in navigating the consumer's journey from need identification to final purchase and subsequent satisfaction evaluation.

In selecting environmentally friendly construction materials, the purchasing decision process is particularly sophisticated and informed by environmental consciousness and product effectiveness. As outlined by Kotler (2014) and further developed by Kotler and Keller (2016), the decision-making process involves an initial acknowledgment of the need for sustainable materials, followed by a comprehensive search for relevant information and an assessment of alternative options. Subsequently, the purchase decision integrates these evaluations, culminating in the consumer's choice of materials, which is reflected during the post-purchase phase to assess satisfaction and environmental impact Auno (2016). This theoretical framework is corroborated by Pogorelova et al. (2016), who emphasize the alignment of these decision-making stages with broader marketing theories. These stages reflect a structured approach to consumer behavior analysis and highlight the importance of understanding the multifaceted influences on purchasing decisions, especially in increasing environmental awareness and sustainability in construction choices.

### **Theoretical concepts related to the marketing mix**

This literature review intricately examines the marketing mix, with a specific focus on the 4Ps model - Product, Price, Place, and Promotion - and its focal role within the marketing strategy domain, as substantiated by seminal and contemporary theoretical contributions from Russo and Paul (2002); Kotler (2003); Reid and Bojanic (2009); Lauterborn and Kurz (2010). It further extends this analysis to explore applying these principles in the context of environmentally friendly construction materials,

a sector increasingly gaining prominence due to growing environmental concerns. Moreover, recent scholarly efforts by Pogorelova et al. (2016); and Lovelock and Wirtz (2018) reiterate the foundational elements of the 4Ps and emphasize the importance of maintaining coherence and consistency across these dimensions. This comprehensive review thus bridges traditional marketing frameworks with modern sustainable practices, highlighting the adaptability and enduring relevance of the 4Ps concept in navigating the complexities of current market dynamics, particularly within sustainable construction materials.

### **Theoretical concepts related to service quality**

Service quality is fundamentally defined by a service provider's capacity to meet customer needs effectively, distinguishing a business from its competitors through the caliber of its offerings. Essential to competitive differentiation, high service quality ensures that customer expectations are met and exceeded, fostering customer satisfaction. This level of satisfaction is achieved when the service is delivered to the customer's expectations, at the desired location, and in the preferred manner, encapsulating the essence of exceptional service as one that adeptly fulfills the customer's specifications and aspirations (Nanthapaiboon, 2008). Service quality encompasses several facets including the service's excellence and ability to satisfy and surpass customer desires culminating in complete customer satisfaction and perceived value. When customers regard the service as extraordinary and of good value for money, it enhances their satisfaction. It engenders loyalty, thus highlighting the critical role of perceived quality and value in developing customer loyalty (Chaoprasert, 2009).

Extending these concepts to environmentally friendly construction materials, the analysis reveals that service quality within this sector is structured around five principal components: Tangibles, reliability, assurance, responsiveness, and empathy. These dimensions are thoroughly aligned with the theoretical frameworks proposed by Zeithaml et al. (1990), which emphasize the multifaceted nature of service quality and its critical impact on consumer perception and business performance. Further corroborated by the works of Vahid (2009), and more recent studies by James et al. (2017) and Jang et al. (2016), these components collectively shape the foundation of service quality evaluation. Each element plays a crucial role in how service quality is perceived by consumers, particularly in sectors like sustainable construction, where the assurance of quality and reliability meets environmental standards and reflects a company's commitment to responsiveness and customer empathy, thereby reinforcing customer trust and loyalty in eco-friendly products.

### **Theoretical concepts related to trust in products**

Trust fundamentally underpins consumer decisions in the marketplace. It is as a critical determinant in the choice to purchase or engage with services and is primarily contingent upon the consumer's confidence in the seller or their expertise. This confidence is constructed on three pillars: Competence, benevolence, and integrity, as identified by Morgan and Hunt (1994). Competence refers to the seller's ability, to encapsulate their skills, knowledge, and the efficacy of their systems to meet customer expectations. Benevolence denotes the seller's commitment to prioritize the consumer's interests over their own, ensuring that the benefits to the consumer are placed at the forefront of service delivery. Integrity involves the seller's adherence to ethical standards, including honesty and trustworthiness, and commitment to fulfill promises without deceiving the consumer. These components are essential for fostering a reliable relationship between consumers and sellers, significantly influencing consumer behavior and decision-making processes.

The dynamics of trust are particularly essential in sectors involving environmentally friendly construction materials, where transparency regarding product attributes and the authenticity of environmental claims critically affect consumer trust. Studies by Jarvenpaa et al. (2000) and McKnight

and Chervany (2006) reinforce that trust emerges from the belief in the seller's competence, integrity, and benevolence. Trust spans beyond conventional elements in environmentally conscious construction materials to embrace product-specific qualities like honesty in environmental assertions, proficiency in sustainable manufacturing, dependability in product performance, and alignment with consumer values and requirements. Consequently, trust within this domain intertwines intricately with businesses' ethical and operational standards, showcasing a comprehensive dedication to sustainability that mirrors consumer values and anticipations.

### **Theoretical concepts related to entrepreneurial skills**

A comprehensive review of literature about entrepreneurial skills within the context of environmentally friendly construction materials, shows that these skills encompass expertise, management, and training. These fundamental components are consistently supported by the theoretical frameworks advanced by scholars such as Kotler (2003), who emphasizes the breadth of knowledge necessary to navigate market complexities, and Hu and Juwaheer (2009), alongside Roberts-Lombard (2009), who highlight the critical roles of strategic management and continuous professional training. Further endorsement of these components is provided by Chiu et al. (2016); Pham and Ahammad (2017), whose research emphasizes the necessity of integrating these skills to foster innovation and sustain competitive advantage in the sector effectively. This synthesis of academic perspectives confirms that proficiency in these areas is central to entrepreneurial success in green construction and important in advancing sustainable practices that meet evolving environmental and market demands.

### **Research methodology**

This study utilized quantitative methods to examine the population of construction business operators in Bangkok, categorized into four distinct business groups as recorded in 2023: construction site preparation (643 cases), construction and civil engineering (115,247 cases), building installation (11,549 cases), and building decoration work (3,585 cases), culminating in a total of 131,024 cases registered as legal entities (Department of Business Development, 2023). The sample size was meticulously calculated based on Kelloway's (1998) guideline, which recommends a minimum of 20 times the number of observed variables; thus, with 16 variables, a sample size of 320 was deemed sufficient. A stratified sampling technique enhanced the sample's representativeness across the varied groups. Data were collected through questionnaires that achieved content validity, confirmed by an Item Objective Congruence (IOC) index ranging from 0.80 to 1.00, indicating robust question alignment with the research objectives. The reliability of the measurements was high, with Cronbach's alpha values spanning from 0.70 (Zikmund, et al., 2010) for individual variables to 0.954 for the overall scale, suggesting excellent internal consistency. A structural equation modeling approach was adopted for data analysis to explore the interrelations among the defined variables.

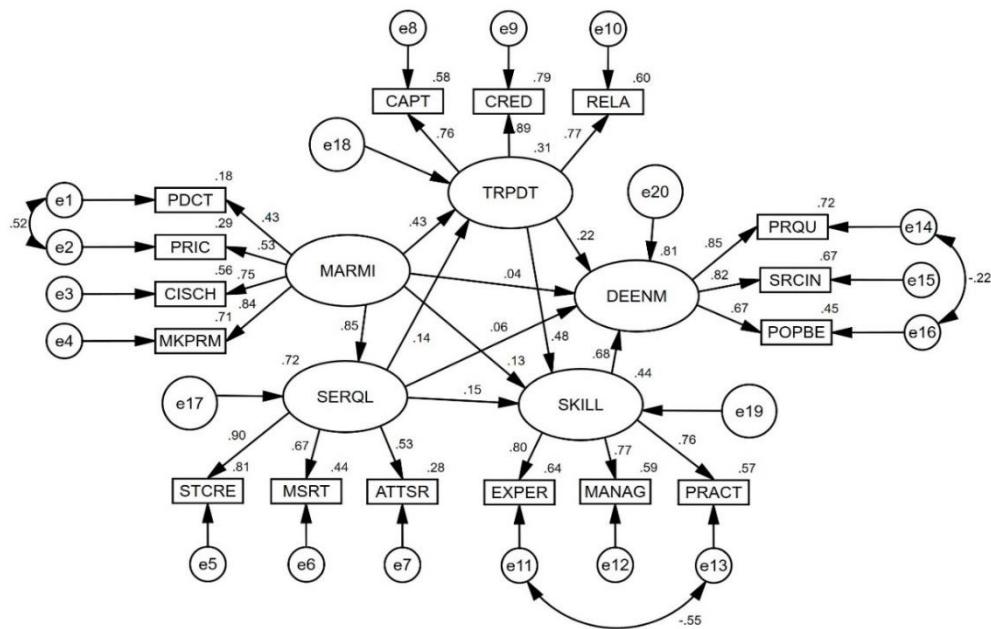
### **Results and discussion**

In this study, researchers refined the model by incorporating adjustments suggested by modification indices to attain an optimal fit with the data. Throughout this model refinement process, the structural equation modeling (SEM) software guided researchers by presenting information derived from modification indices obtained during the analysis, facilitating informed decision-making.

Table 1 displays the outcomes of the model adjustments. Following these adjustments, it became evident that the goodness-of-fit indices align with the established criteria for each respective index, indicating a satisfactory fit of the model (Diamantopoulos & Siguaw, 2000).

**Table 1** Fit indices

Fit indices	Criteria	Before model adjustment	After model adjustment
Chi-square/df	< 2.00	3.089	1.684
RMR	$\leq 0.05$	0.014	0.010
GFI	$\geq 0.90$	0.900	0.944
AGFI	$\geq 0.90$	0.855	0.917
PGFI	$\geq 0.50$	0.622	0.632
CFI	$\geq 0.90$	0.921	0.975
RMSEA	$< 0.05$	0.081	0.046
CN	$\geq 200$	130	238



Chi-square = 153.286, df = 91, Chi-square/df = 1.684, GFI = .944, AGFI = .917, CFI = .975, RMR = .010, PGFI = .632, RMSEA = .046

**Figure 1** The analysis results of the model in the form of t-statistic after model adjustments

### Direct effect, indirect effect, and total effect between variables

Analysis of the data presented in Table 2 elucidates the significant influence of entrepreneurs' skills on the propensity to adopt environmentally friendly building materials, demonstrating a substantial direct effect size of 0.68. In a secondary capacity, Trust in the product emerged as another influential factor, exerting a direct effect with an effect size of 0.22. Intriguingly, when exploring the indirect impacts on decision-making concerning the utilization of environmentally friendly building materials, product trust assumes a predominant role with an effect size of 0.33, surpassing other variables. This is followed by the marketing mix, conceptualized through the framework of the 4Ps (Product, Price, Place, Promotion), which manifests an indirect effect size of 0.16, and service quality, which displays a relatively more modest indirect effect size of 0.08.

Upon a comprehensive evaluation encompassing both direct and indirect influences, it becomes apparent that entrepreneurs' skills exert the most significant total effect on the decision to employ environmentally friendly construction materials, marked by an effect size of 0.68. This finding indicates the critical role of entrepreneurial acumen in steering such sustainable practices. The entrepreneurs' skills in total effect magnitude are product trust, the marketing mix (4Ps), and service quality, with effect sizes of 0.55, 0.16, and 0.08, respectively. This hierarchy of effects highlights the critical importance of entrepreneurs' capabilities sustainable construction. It illustrates how product trust, marketing strategies, and service quality influence eco-friendly material adoption decisions.

**Table 2** Direct effect, indirect effect and total effect between variables

Dependent variables	Effect	MARMI	SERQL	TRPDT	SKILL	R <sup>2</sup>
DEENM	DE	-	-	0.22	0.68	0.81
	IE	0.16	0.08	0.33	-	
	TE	0.16	0.08	0.55	0.68	

## Discussion

This research aimed to analyze the causal factors influencing the decision-making of construction business operators in Bangkok regarding using environmentally friendly building materials. Employing quantitative methods, this study targeted operators within the industry throughout 2023, aiming to discern significant determinants in their material selection processes. The findings revealed several key influences worth discussing.

Primarily, the skills of business operators emerged as the most significant factor affecting their decisions to utilize environmentally friendly materials. These skills, which include expertise, management capabilities, and comprehensive training, play a crucial role in fulfilling and exceeding customer expectations and needs. Specifically, such competencies enable operators to efficiently source and provide environmentally friendly materials, while excelling in customer communications regarding product benefits and service provisions, thus enhancing customer satisfaction (Kotler, 2003; Hu & Juwaheer, 2009; Roberts-Lombard, 2009). This expertise not only improves satisfaction levels among business owners but also cultivates a positive reputation for their businesses, as these materials meet the required standards effectively, thereby facilitating the execution of construction tasks as specified. The adept use of these materials can lead to higher returns on investment and robust customer satisfaction, judged against benchmarks of service quality, operational processes, and product excellence (Roberts-Lombard, 2009; Kotler, 2014; Chiu et al., 2016). This comprehensive skill set stresses the critical impact of operator capabilities on sustainable practices within the construction industry.

Secondly, the concept of trust in the product is a crucial determinant in using environmentally friendly construction materials, emerging as the second most influential factor. Trust is integral to the foundational communication between customers and service providers and involves multiple dimensions, such as reliability, integrity, service competence, and the provision of straightforward and beneficial services. Sirdeshmukh et al. (2002) describe how consumer trust is not only placed in the organization but also the abilities of its employees, emphasizing that customers evaluate both the integrity and competence of the organization and its representatives. Bourdeau (2005) further corroborates that trust components are vital for service providers to effectively instill customers' confidence, which includes relying on the organization's integrity, competence in service delivery, and the ability to offer direct and advantageous services. Moreover, the adaptability of the service to meet

future needs also plays a significant role in reinforcing customer trust. This framework is particularly pertinent in decisions related to environmentally friendly construction materials, where trust is heavily predicated on prior interactions and the proven quality of these materials. Given the higher costs associated with these sustainable options, trust in the product brand post-purchase becomes crucial and significantly influences ongoing customer loyalty and future purchasing decisions (Suárez-Eiroa et al., 2019). This trust dynamic underlines the importance of credible, high-quality service and product assurance in fostering long-term customer relationships in the environmentally conscious construction market.

Thirdly, the 4Ps marketing mix - Product, Price, Place, Promotion - plays a significant, albeit indirect, role in influencing the decision to use environmentally friendly construction materials. Price, as a component of the 4Ps, is particularly pivotal due to the typically higher costs associated with eco-friendly products, which can deter construction business operators from opting for these materials. This hesitation often stems from a mismatch between the operators' positive environmental inclinations and the economic feasibility of purchasing higher-priced options. Economic conditions of consumers and cost considerations for construction business operators frequently dictate these decisions, leading to a reluctance to invest in pricier, albeit environmentally beneficial, materials. Hence, the escalation in product prices directly under the purview of the marketing mix can significantly sway operators' decisions towards or away from environmentally friendly products.

However, effective implementation of the marketing mix strategies necessitates a strong emphasis on service quality. High service quality, which justifies the money spent, is a critical motivator for customers when using a particular service (Nanthapaiboon, 2008). According to Maša et al. (2022), adopting green marketing strategies within the construction industry involves refining the traditional marketing components to align with green principles. This adjustment includes cultivating trust and a robust understanding with the community through comprehensive stakeholder engagement, enhancing consumer confidence in the quality of the service provided. The synthesis of top-tier materials with strategic marketing can significantly elevate service quality, a sentiment echoed by Kotler (2003), Auno (2016), and Ooi and Tan (2016), who assert that the marketing mix is crucial in steering business operations. A holistic focus on all aspects of the marketing mix clarifies service directives. It ensures consistency in quality across products, pricing strategies, distribution channels, promotional activities, workforce management, physical evidence, and operational processes.

Additionally, trust in the product is a crucial variable that connects the marketing mix to the decision to use environmentally friendly construction materials. When consumers trust the quality and benefits of a product, they are more likely to choose it. Therefore, building trust in the product lays a solid foundation for using environmentally friendly construction materials. This is consistent with Singtrangarn and Ramanust (2023) on the influence of marketing mix, trust, and satisfaction on online fashion goods who purchase decision-making, which found that the marketing mix indirectly influences purchasing decisions through the trust variable. It also aligns with Chanwan (2016) on the subject of factors influencing the decision to purchase gift shop items via Instagram among high school students in Bangkok, who found that trust is a mediating variable linking the marketing mix to purchasing decisions.

Lastly, service quality exerts an indirect but notable influence on the decision to utilize environmentally friendly construction materials among business operators. This influence is manifested not directly through the physical attributes of the services provided, such as store appearance or credibility, but rather through the intangible aspects of service delivery that build customer trust and confidence. These aspects include the intent to serve promptly, attentiveness to customer care, and the overall customer service experience, which, when executed effectively, foster customer satisfaction and trust post-transaction. In essence, exceptional service quality is imperative for establishing trust, which encourages the adoption of environmentally friendly materials. Trust

develops when customers perceive that the service, they receive surpasses their expectations and is consistently delivered (Rotchanakitumnuai, 2021). This relationship between service quality and customer trust is supported by the findings of Bin et al. (2022), who assert that high product quality enhances customer assurance.

Furthermore, research by Parasuraman et al. (2013) correlates the skills of business operators - specifically their reliability and assurance - with high service quality. These skills are reflected in the operators' ability to adhere to agreed-upon service standards, maintain customer data securely, utilize this data to optimize service delivery, and conduct operations without errors. Additionally, regular maintenance of equipment and adequate staffing are crucial for sustaining service reliability and assuring quality. Regular feedback mechanisms and quality assessments with customers also play a vital role in continual service improvement efforts aimed at solidifying trust. Thus, the interplay between comprehensive service quality and robust customer relationships is essential for fostering a favorable environment for choosing environmentally friendly construction materials.

## **Recommendations**

This study examines the causal factors that influence the decision-making process of construction business operators in Bangkok regarding using environmentally friendly building materials. It offers a range of suggestions aimed at policy development, administrative strategy, and further research.

### **Policy recommendations**

It is imperative for governmental bodies, including the Pollution Control Department, the Environmental Quality Promotion Department, and the Ministry of Natural Resources and Environment, to align their development plans and public policies with the 20-Year National Strategic Plan for Environmental Conservation. A focal point of these efforts should be to enhance the construction business operators' comprehension of their pivotal role in environmental preservation. This entails disseminating information on certified resources, and eco-friendly product categories, ensuring quality assurance, and guiding product selection, thereby equipping operators with the knowledge necessary for informed operations.

Construction business operators are encouraged to prioritize addressing environmental issues over focusing on sales and profits. This includes developing eco-friendly products that surpass the quality of conventional alternatives and improving distribution channels to increase accessibility for the public. Moreover, the government should incentivize private sector investment to enhance production and service processes, emphasizing waste reduction, reuse, recycling initiatives, and the efficient utilization of resources.

### **Administrative suggestions**

Promoting consumer awareness of eco-friendly products necessitates consistent and clear communication from government and private sectors, through sustained Integrated Marketing Communication (IMC) strategies. Companies within the construction material sector should focus on developing and regularly enhancing the quality of eco-friendly products to foster consumer trust. Ensuring these materials meet customer needs will boost confidence in eco-conscious purchasing decisions. Establishing a robust customer service framework that promptly addresses and resolves issues will be critical for private sector entities, reinforcing customer trust, particularly eco-friendly material usage.

Construction business operators can derive valuable insights by examining real-world applications of eco-friendly materials across various projects. This can identify successes and areas for improvement and thus enable a comprehensive evaluation of the benefits and challenges of such

materials. To make eco-friendly construction materials more accessible, the government should explore mechanisms for making them more affordable through incentives or cost reductions, encouraging their adoption among operators and consumers alike.

### Future research directions

Investigating the causal factors that influence the choice of eco-friendly construction materials among non-business operators will provide a broader understanding of the varying informational needs across different consumer demographics. Expanding research to cover various regions and provinces will enrich the data pool, facilitating comparative analysis and uncovering common and unique factors influencing eco-friendly material adoption.

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