How Is the Sustainable Consumption Intention Model in Food Industry under Preference Uncertainties? The Consumer Willingness to Pay on Recycled Packaging Material

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Abstract: Food packaging is costly to consumers and generates a huge volume of packaging waste, especially in Indonesia. Prior studies have neglected to construct a causal sustainable consumption intention model in food industry and link to the consumer willingness to pay under preference uncertainties. To address the gaps, this study explores consumer attributes to build a causal sustainable consumption intention model and takes the model to address the consumer willingness to pay under preference uncertainties. This study proposes a causal model that integrates five aspects of sustainable consumption intention model: (1) sustainable consumption knowledge, attitudes, and behaviors; (2) government policy and regulation on sustainable consumption; (3) recycled packaging eco-labeling certification; (4) supply chain innovation and infrastructure; and (5) sustainable product purchasing features. This study uses the fuzzy Delphi method to confirm the reliability and validate the criteria and applies cause and effect model to address the causal model. In addition, this study collects 428 valid responses to address the willingness to pay for causal sustainable consumption intention model and a cognitive best-worst choice experiment to confirm the model in the food industry. The result reveals that recycled packaging eco-labeling certification is the major aspect for enhancing the model, followed by government policy and regulation and supply chain innovation and infrastructure. In practice, consumers incur inconvenience in purchasing sustainable food products but prefer recycled packaging material at a standardized price.

Keywords: sustainable consumption intention; recycled packaging; eco-labeling certification; fuzzy Delphi method; choice experiment; cognitive best-worst method

1. Introduction

Sustainable consumption intention (SCI) involves consumers' intention to consume products with the least harmful impact on the environment without neglecting the needs of future generations. Although the attributes to enhance intention have been explored in the literature, some studies have noted that further exploration is needed due to the continuous impact of unsustainable intention on waste generation [1,2]. Indonesia has become the world's second largest food-waste contributor, and food waste accounts for 39% of the

total waste in landfills; this is due to unsustainable consumption [3–5]. Kahraman and Kazançoğlu [6] argued that the literature tends to focus primarily on individual-level attributes, such as consumer awareness and knowledge. Thus, this study incorporates various attributes based on the triple bottom line (TBL) perspective by involving a variety of stakeholders to explore an SCI pattern, meet consumption desires, and alleviate environmental burdens.

Studies have claimed that the TBL perspective is used to explore what motivates intentions, and commonly, the measures are based on consumer preferences [7,8]. The attributes are mainly discussed regarding consumer purchasing intentions and derive not only from consumption awareness and knowledge but also from unsustainable practices by the government and manufacturers. For instance, Singh et al. [9] posited that the government helps the industry with policies to support innovation in the supply chain and public–private collaborations to reduce waste. However, these policies and regulations often tend to be weak and of poor-quality regarding consumer purchasing intentions [10]. Hoek et al. [11] argued that information provided by manufacturers on product packaging, such as eco-labels, affects sustainable knowledge, attitudes, and behaviors; however, these attributes described with qualitative eco-labels potentially benefit consumers by informing them about the environmental consequences of purchasing a product [12,13]. Despite these advantages, Lago et al. [14] argued that eco-labels do not influence intentions and willingness to purchase and that information on packaging and labels tends to be difficult for consumers to understand, affecting their willingness to pay for premium-priced sustainable products. This study proposes the SCI attributes as follows: sustainable consumption knowledge, attitude and behavior, government policy and regulation on sustainable consumption, recycled packaging eco-labeling certification, supply chain innovation and infrastructure, and sustainable product purchasing features.

SCI is described as consumers' willingness to spend on a product or service [15]. Consumers with SCI are willing to pay premium prices for sustainable products [16]. However, the SCI criteria vary and tend to be inconsistent [17]. For instance, purchase features of sustainable products, such as price and quality, have been found to have both significant and insignificant impacts on purchases [18]. Specifically, Ketelsen et al. [19] indicated that lower prices positively affect SCI based on willingness to pay. In contrast, Aitken et al. [12] found that product quality features appeared to be more appealing for consumers than a lower price. The various SCI attributes need to be elaborated to clarify the inputs for sustainable products under uncertainties. Hence, this study proposes valid SCI model attributes, including sustainable consumption knowledge, attitudes, and behavior; government policies and regulations on sustainable consumption; recycled packaging eco-labeling certification; supply chain innovation and infrastructure; and sustainable product purchasing features.

The SCI attributes are abundant in the literature and thus in qualitative information and are measured by linguistic preferences. While eliminating the extensive attributes, this study applies the fuzzy Delphi method (FDM) to validate the study's model based on experts' opinion and uses the choice experiment (CE) method to capture Indonesian food SCI preferences to reflect consumers' sustainable consumption intention in reality [20]. The cognitive best-worst method (CBWM) is applied to confirm the consistency of the results and identify the importance of SCI attributes. Last, a cause-effect model is drawn in a graph using a decision-making trial and evolution laboratory method to depict and examine the interrelationships among the attributes more clearly. This study aims to develop a sustainable consumption intention model of consumer willingness to pay under preference uncertainties. The objectives of this study are as follows:

- To identify SCI attributes in qualitative information with linguistic preferences;
- To justify the valid causal model under uncertainties; and
- To address SCI with consumer preferences in practice.

In the literature, such related concepts and structures of consumption intention are abundant [1,2], and prior studies have explored the food consumption model [13,21,22].

However, there are few studies on the SCI model in consumer willingness to pay under preference uncertainties. This study makes three main contributions: (1) identifying a valid set of SCI attributes under qualitative information; (2) using a valid model to address the theoretical debates while the attributes involve qualitative information and quantitative data; and (3) providing practical guidance for practitioners. Moreover, this study expands the literature on understanding the impacts of attribute features on the improvement of the SCI model in the Indonesian food industry. Finally, in the context of the rising rates of consumption and waste generation of packaging in Indonesia, the SCI model benefits consumers as the attributes must be clarified to enhance the intention, present manufacturers with criteria to prioritize in action plans, and reduce the waste generated by food product packaging to achieve sustainable consumption.

The rest of the study is organized as follows: Section 2 presents the literature review, including the perspective, definitions, arguments from the literature, proposed measures, and industrial background; Section 3 explains the methodology and data analysis; Section 4 reports the results; Section 5 presents the theoretical discussion based on the results; and Section 6 presents the conclusion including the managerial implications, limitations, and suggestions for future study.

2. Literature Review

This section reviews the literature on SCI model, which is described with attributes such as sustainable knowledge, attitude and behaviors, government policy and regulation on sustainable consumption, recycled packaging and eco-labelling certification, supply chain innovation and infrastructure, and sustainable product purchasing features. In addition, this section presents an explanation on sustainable consumption intentions described with willingness to pay.

2.1. Sustainable Consumption Intention Model

Sustainable consumption consists of a complex process emphasizing how consumption habits impact the natural and social environment and the economy and focuses on how consumption can improve quality of life or resource use efficiency, satisfy consumer needs, or be minimized overall [13,23,24]. These sustainable consumption indicators are accompanied by different perceptions and attitudes toward sustainable consumption [1,25]. Many studies have argued that sustainable consumption considerations are increasingly evident in consumer behavior, especially in regard to SCI [2,12,26]. Apart from consumers, other stakeholders are involved in consumption sustainability. For instance, Grabs et al. [27] argued that while manufacturers provide sustainable products, the government provides relevant policies and regulations, with both roles affecting the dynamics of consumption intentions; still, many studies have identified a lack of in-depth investigation of the negative attributes of intentions [28]. There have not been significant changes in purchasing intentions despite prior efforts to influence the attributes [29]. To develop a deeper understanding of this issue, this study uses SCI to assess the impact of different attributes of intentions.

Prior studies have shown that SCI both influences and is influenced by TBL considerations [8,30]. These perspectives are explored below, incorporating social attributes, environmental practices, and economic considerations. Social attributes have a positive influence on sustainable consumption, resulting in enhanced SCI, including consumer knowledge, attitudes, and behaviors regarding sustainable consumption and government policy and regulation of consumption [13,30]. In practice, the attributes of SCI explored here relate to environmental practices. These attributes include recycled packaging eco-labeling certification and supply chain innovation and infrastructure [13,17]. Economic attributes affecting SCI are included to explore here. Prior studies have long shown that economic considerations, such as purchase features of sustainable products, are a major aspect affecting consumption intentions [31].

2.2. Sustainable Knowledge, Attitudes and Behaviors

Consumer attitudes and behaviors have a profound influence in shaping intentions, which are motivated by perceived knowledge of sustainable consumption [1,6,12]. Shin et al. [32] argued that consumers with these sustainable attributes show a positive intention to select sustainable products on the market. Although great effort is required to understand the exact motivations for sustainable consumption intentions, consumers with positive sustainable knowledge, attitudes, and behaviors show a tendency to have environmentally oriented intentions toward purchasing conditions [2,25]. However, despite the positive evidence of these sustainable attributes affecting intentions, studies have indicated that consumers still suffer from a lack of sustainable knowledge, uncertainty, and confusion surrounding sustainability information [28,33]. Moreover, prior studies have been inconsistent in determining the exact motivations reflected in different levels of knowledge, various expressive attitudes, and behaviors [1,28]. Nevertheless, sustainable knowledge, attitudes, and behaviors are assumed to be significant toward SCI.

2.3. Government Policy and Regulation on Sustainable Consumption

The government's role is to support sustainable consumption through relevant policy and regulation to raise awareness among consumers about the importance of sustainable product purchases [9,34,35]. Tseng et al. [28] found that legitimacy signals from the government affect intentions. Morone et al. [21] noted that government action through educational campaigns and tax incentives becomes an effective policy driver in raising awareness. However, Khan et al. [10] argued that developing countries tend to suffer from weak policy and poor-quality regulation. Moreover, Morone et al. [21] indicated a lack of awareness about appropriate policy strategies that need to be implemented to enhance sustainable consumption intentions. Nevertheless, government support through relevant policies and regulations is assumed to be significant for improving consumer intentions to purchase sustainable products.

2.4. Recycled Packaging Eco-Labeling Certification

Recycled packaging eco-labels are labels issued by certifying organizations on the packaging's environmentally oriented footprint. Prior studies have shown that packaging acts to motivate consumers to make decisions on purchases [14,36]. Specifically, product packaging made of recyclable material positively affects consumer intentions to make sustainable purchases [19,37]. Moreover, Aitken et al. [12] argued that manufacturers play a crucial role in educating consumers through information on product certification displayed on packaging to improve consumers' intention toward sustainable consumption. Although eco-labeling certification positively influences SCI, information on labels tends not to effectively influence intentions [11]. Aitken et al. [12] identified that eco-labeling certification is perceived as a purchasing barrier to sustainable products. Moreover, studies have found that the extensive volume of information and values present on these labels have little influence on consumers' environmental choices in their purchases [14,37]. Nevertheless, recycled packaging eco-labeling certification is assumed to be significant in enhancing the SCI of consumers.

2.5. Supply Chain Innovation and Infrastructure

The literature on the supply chain's impact on consumers' consumption intention is mostly related to how products are distributed and potentially contribute to waste generation. For example, Morone et al. [21] noted that the existing amount of waste is due not only to the consumption and production phases but also to the distribution process. Moreover, traditional packaging techniques are still used for product protection and transportation processes with consequences for waste generation. In addition, Codenori and Perito [13] argued that trust in supply chain members also plays a role in affecting consumers' consumption intention to purchase sustainable products. Lago et al. [14] identified challenges involving supply chain innovation and infrastructure in facilities that potentially generate

waste. Specifically, Morone et al. [21] showed that there is a lack of integration among supply chain partners in matching demand and supply dynamics. Infrastructure issues, such as transport and storage facility design, often encourage waste generation due to poor packaging. Therefore, supply chain innovation and infrastructure are assumed to strengthen consumers' SCI.

2.6. Sustainable Product Purchasing Features

Sustainable product purchasing features relate to product pricing and quality standards. Consumption intentions of consumers are shaped by various purchasing features, including product price and quality [13,38]. In particular, Feil et al. [2] emphasized that product quality acts as a motivator to strengthen consumers' SCI because of the benefit of health improvements. In different studies, other product features, such as availability and variety, have been found to affect consumption intention to purchase the product [7,30]. These works indicate the importance of economic considerations in consumption intentions. However, other studies have identified these features as challenges. For instance, an increase in price potentially reduces consumer consumption intentions despite not necessarily deterring consumers from effectively purchasing a product [14,37]. Nevertheless, sustainable product purchasing features are assumed to enhance the SCI of consumers.

It is assumed that sustainable knowledge, attitudes, and behaviors; government policy and regulation on sustainable consumption; recycled packaging eco-labeling certification; supply chain innovation and infrastructure; and sustainable product purchasing features significantly enhance sustainable consumption intention.

2.7. Sustainable Consumption Intentions and Willingness to Pay

SCI is often used to capture willingness to pay [16,17]. Willingness to pay is defined as the maximum amount of money that consumers are willing to pay to use or purchase a service or a product, and some studies have used willingness to pay as SCI [15]. Moreover, consumers with positive knowledge of and attitudes and behaviors toward sustainability tend to have a positive SCI for sustainable products. However, previous studies have shown that consumers can experience overload of sustainability information, which may be too unfamiliar for consumers to comprehend and thus ineffective in shaping knowledge of and attitudes and SCI behaviors toward sustainable products [39]. SCI is affected by government policy and regulation related to sustainable consumption. For instance, Cantillo et al. [40] argued that consumers are willing to pay more for sustainable products if the government issues a sustainability certification. Benyam et al. [35] found that consumers believe that the government should be responsible for environmental quality improvement and that relevant policy and regulation can affect behaviors. However, consumer perceptions of the role of government are still understudied in relation to SCI for sustainable products.

From an industry point of view, Biondi and Camanzi [17] indicated that manufacturers' strategies for sustainable packaging production and the use of eco-labeling certification tend to influence SCI and consumption intentions. However, Yang et al. [20] showed that there are widespread indicators of low understanding of sustainability labels on products, with negative effects on SCI. Another industry-related aspect that potentially affects SCI is related to supply chain innovation and infrastructure, as efforts must be made during the product storage, loading, and transport stages to ensure waste minimization [19]. Purchase features of sustainable products, such as price and quality, tend to have a positive impact on SCI and consumption intentions, where price is often less relevant than quality. However, better or more features in a product tend to come at a higher price, which is a frequent negative driver of SCI [18,19]. In sum, the results on the SCI attributes are inconsistent across existing studies.

3. Materials and Method

3.1. Proposed Measures

Social attributes are captured by 16 indicators. Purchase frequency (C1) indicates how often a consumer includes sustainable products in their shopping bag when making purchases. The ratio of this number tends to be higher and more relevant for food purchases [2]. Consumer purchases are affected by an awareness of the impact of one's own actions (C2) on the environment, especially regarding creating waste (C3) [31]. Moreover, awareness of consumer responsibility (C4) and willingness to face inconveniences (C5) in taking environmentally friendly actions are among the attributes. Other attributes include proactive consumer behaviors (C6), such as spending resources and time engaging in recycling, purchasing sustainable products and paying attention to making waste, passing sustainable knowledge on to others (C7), and making extra efforts to improve environmental behaviors (C8) [21]. Consumer awareness about the consequences of sustainable food consumption (C9) can motivate more SCI [1]. The perceived image (C10) and characteristics (C11) of sustainable food affect SCI. Beyond these consumer-related attributes, manufacturers and the government play a role. The authenticity of sustainability information from food industry associations representing food manufacturers (C12) has been found to have a positive effect on consumer sustainability behavior [28]. Finally, government food-waste regulations (C13), investments and infrastructure subsidies (C14), small-scale farming incentives (C15), and public–private cooperation (C16) have been argued to limit the production of food waste [21]. In sum, the social attributes encompass criteria capturing the role of consumers and government in enhancing SCI.

Environmental attributes, of which there are seven, are focused on industry-level attributes. Fair trade certification (C17) is a practice used by food manufacturers to present consumers with information on compliance with fair production standards [14]. Other practices relate to packaging. For instance, sustainable packaging practices, such as reductions in excessive packaging (C18), are believed to be effective in protecting the environment by preventing packaging waste after consumption [37]. Traditional packaging techniques (C19) to protect and transport food products have a higher impact on the environment than sustainable techniques [21]. Consumers tend to show positive attitudes toward food products with biodegradable packaging (C20) and packaging made of recycled material (C21) [19]. Last, manufacturers can take actions focusing on efficiencies in the supply chain (C22) and innovation and infrastructure in storage facilities and transportation (C23) to potentially reduce food-waste production [21]. These environmental practices of manufacturers affect SCI because consumers who are more aware of the consequences of their purchases tend to place greater importance on manufacturer behaviors [12]. The focus on industry environmental practices helps clarify the role of this stakeholder in influencing consumption intentions.

Economic attributes with perceived quality, captured through attributes such as product healthiness (C24), freshness (C25) and taste (C26), have been argued to directly affect consumption intentions [32]. Price increases (C27) have been found to reduce sustainable product consumption intentions, potentially driving them toward unsustainable behaviors [14]. Furthermore, past purchases (C28) have an effect on consumption intentions and future purchases because of habit formation [30]. Other attributes include product availability (C29) and product variety (C30); SCI is often irrelevant because sustainable food products are not available or are limited in variety. Last, sustainable product consumption intentions depend on attributes shaping perceived purchase convenience, such as a convenient location (C31) [12]. Overall, economic considerations encompass a variety of attributes, ranging from product features to pricing, that enhance intentions to purchase sustainable products.

In sum, this study incorporates the attributes from social, environmental, and economic perspectives which respectively consist of sets of aspects and criteria, as seen in Table 1.

Table 1. Sustainable consumption intention attributes.

Perspectives	Aspects	Criteria		Description	References
Social influences	Sustainable consumption knowledge, attitude, and behaviors	C1	Purchase frequency	Frequency of including more sustainable products into the shopping	[1,12,13,21,28,31]
		C2	Impact of self-actions	Concern on the environmental impacts from self-actions	
		C3	Concern on making waste	Concern on making waste after consumption	
		C4	Responsible consciousness	Consciousness of being responsible to the environment	
		C5	Willingness for inconvenience	Willing to be inconvenienced to be more environmentally friendly	
		C6	Proactive behaviors	Consumer initiatives to do sustainable activities	
		C7	Extra efforts for improvement	Extra efforts by consumers to improve the environment	
		C8	Passing sustainable knowledge to others	Consumer initiatives to share knowledge to others	
		C9	Consequences of consumption	Consumer motivation by improvement of health and quality of product	
		C10	Image of sustainable food	The image is safer and healthier	
		C11	Characteristics of sustainable food	The characteristics are free of pesticides, better flavor, and free of chemicals	
	Government's policy and regulation on sustainable consumption	C12	Authenticity argument	Sustainable information of products from the firms' association or union	
		C13	Public food-waste rules	Rules focused on waste prevention and reduction	
		C14	Investments and infrastructural subsidies	Donors aimed at installation of plants or waste reduction	
		C15	Small-scale farming incentives	Support programs aimed at small-scale sustainable farming	

Table 1. *Cont.*

Perspectives	Aspects		Criteria	Description	References
		C16	Government-business cooperation	Research and development cooperation between government and businesses	
Environmental practices	Recycled packaging eco-labelling certification	C17	Fair trade certification	Certification to inform the product's fair trade	[13,14,21,28]
		C18	Excessive packaging reduction	Reduction of packaging use	
		C19	Packaging techniques	Traditional packaging techniques cause food waste along the transport	
		C20	Biodegradable packaging	Products are easy to degrade as waste	
		C21	Recycled material for packaging	Packaging made of recycled material	
	Supply chain innovation and infrastructure	C22	Efficiencies in supply chain	All elements of supply chain need to synchronize to reduce waste	
		C23	Innovation and infrastructures in storage facilities and transportation	Effective storage facilities and transport and harvesting techniques	
Economic considerations	Sustainable product purchasing features	C24	Healthy product	Product gives consumers health benefits	[21,30,31,38]
		C25	Fresh product	Product is freshly made	
		C26	Product taste	Food taste determines consumers' choice	
		C27	Price standards	Price affects consumer's purchase intention	
		C28	Past purchase	Past purchases influence future intention or purchases	
		C29	Product availability	The more available the higher frequency of consumer purchase of the product	
		C30	Product variety	The more various the higher frequency for the consumer purchase of the product	
		C31	Convenient locations	Convenience to find influences purchases	

3.2. Industrial Background

Indonesian food consumption is predicted to increase by 40% in 2025 and 82% in 2045 [41]. This trend is expected to trigger faster food-waste generation. Currently, waste from food products dominates 30% of the total waste in landfills [5,42]. This proportion is dominated by waste from private households, at 32.4%, among other sources, such as regional waste disposal facilities (3.86%), institutions (4.45%), public waste disposal facilities (5.19%), shopping malls (5.86%), traditional markets (13.18%) and others (4.53%). Moreover, 46.8% of the total waste is not yet properly managed. This waste problem indicates that SCI has not been successfully achieved. Hence, it is recommended that food-waste generation be reduced by improving SCI [4]. However, currently, the problem entails excessive and unsustainable purchases leading to uncontrolled food-waste generation with influences from food manufacturers' role in providing sustainable food products and the government's role in providing consumers with garbage facilities [22]. By improving the SCI attributes, waste from food products can be minimized in terms of the generation rate.

3.3. Methodology and Proposed Model

The purpose of this study is to enhance SCI by clarifying the important and valid attributes. In order to answer the objectives, as explained previously, this study adopts fuzzy Delphi method to select and identify SCI attributes and validate the study's framework, applies choice experiment method to identify consumer preferences on the significant SCI attributes based on the WTP values, justifies a causal and effect model to examine the attributes interrelationship, and lastly employs cognitive best-worst method to determine the best and worst attributes for SCI improvement, as depicted in a graphical model in Figure 1.

3.4. Demographic Profiles and Sampling Method

The following presents the demographic profiles and sampling method of selecting the respondents for fuzzy Delphi method and choice experiment method, respectively.

This study gathered a group of 10 food industry experts from food manufacturing practitioners at the managerial level, such as heads of companies and managers, to academics specializing in consumer behavior studies, as described in Table 2. These experts were consulted to obtain their input on the importance and selection of the criteria.

To implement the CE, the study used 40 different versions of the questionnaire with three different CE and SCI combinations in each. Demographic questions were presented prior to the CE and SCI questions. The sample is concentrated on consumers living in Indonesia, with the demographic data collected encompassing age, gender, monthly income, education level, and food-waste trends. This study has a total sample size of 428 respondents and separately delivered the questionnaires to the respondents who had purchased sustainable products.

The reliability coefficient of the model is 95% with a deviation value of 5% and an assumption that 50% of the respondents have an SCI greater than zero. The equation below is used to derive, based on a binary distribution, the minimum number of respondents required for this study (384), where n represents the total respondents, z is the standard error, p is the estimated population in percentage, q represents $1 - p$, and e is the standard deviation.
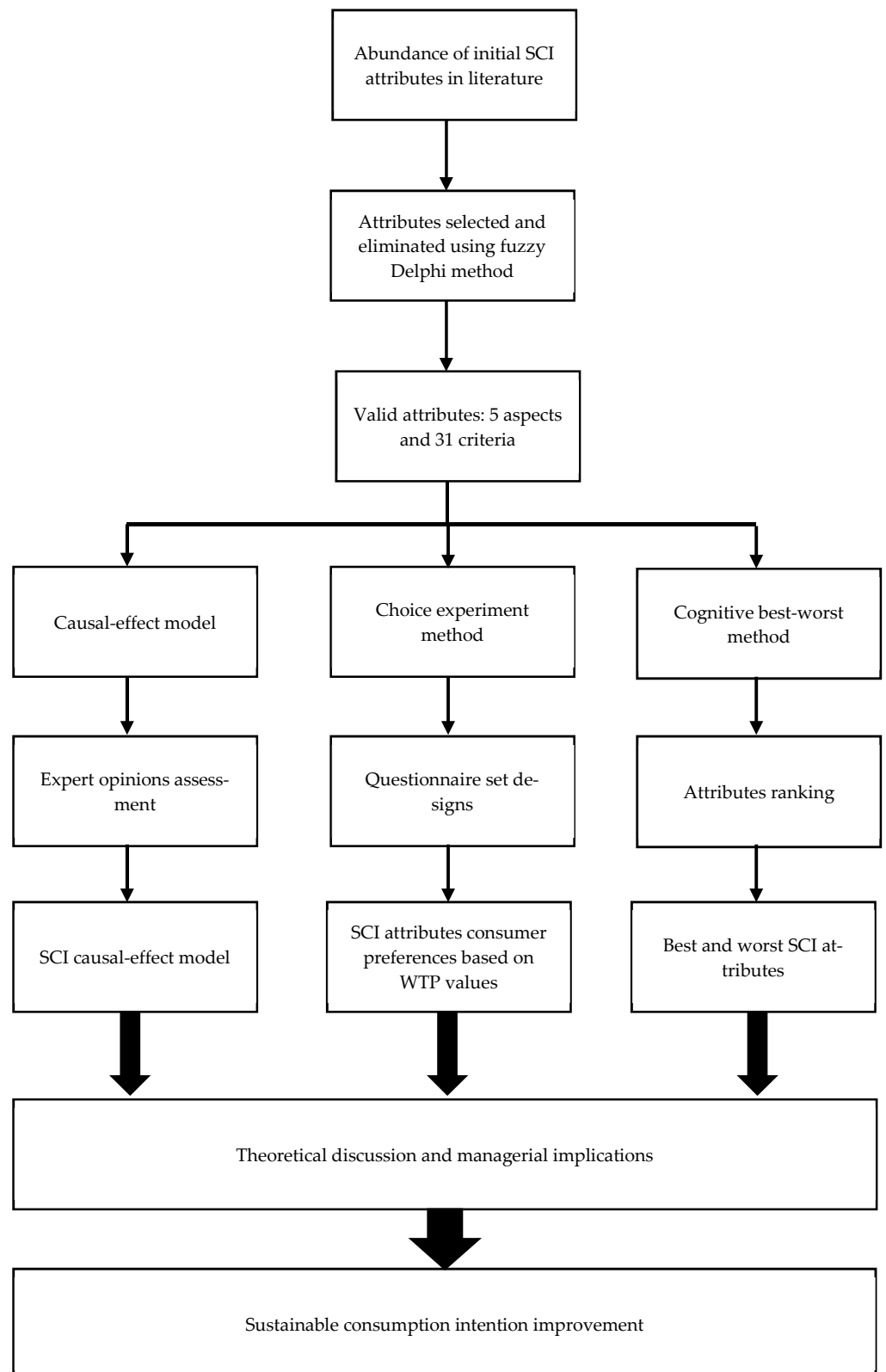
$$n = \frac{z^2(pq)}{e^2} \tag{1}$$

Figure 1. Proposed graphical model.

Table 2. Expert demographics.

Expert	Position	Gender	Education Levels	Years of Exp.
1.	Chief of Operations	Male	Ph.D.	26
2.	Director of Marketing	Female	M.B.A.	11
3.	Marketing Manager	Female	M.B.A.	8
4.	Marketing Manager	Female	M.B.A.	6
5.	Academics	Female	Ph.D.	16
6.	Academics	Female	Ph.D.	11
7.	Academics	Male	Ph.D.	12
8.	Academics	Male	Ph.D.	6
9.	Restaurant manager	Female	M.B.A.	13
10.	Restaurant manager	Male	M.B.A.	10

3.5. Fuzzy Delphi Method

The FDM was used for the experts' perceptions to improve the reliability and validate the SCI attributes. The expert's evaluation of the attribute's importance level uses a five-point Likert scale, as shown in Table 3. Quantitative information is in the form of linguistic preferences that are converted to crisp values. This method provides a close representation of experts' perceptions by gathering the evaluation scores, checking if expert consensus is achieved for each of the criteria and revising the attributes based on the consensus level by eliminating the unaccepted attributes.

Table 3. Linguistic terms transformation table.

Linguistic Terms (Performance/Importance)	Corresponding Triangular Fuzzy Numbers
Extreme	(0.75, 1.0, 1.0)
Demonstrated	(0.5, 0.75, 1.0)
Strong	(0.25, 0.5, 0.75)
Moderate	(0, 0.25, 0.5)
Equal	(0, 0, 0.25)

3.6. Cause and Effect Model

This cause and effect analysis is an extension of decision-making trials and evaluation laboratory methods. The value is derived from the FDM and divided into little effect (0, 0.25), some effect (0.26–0.5), moderate effect (0.51–0.75), and strong effect (0.76–1) to aggregate these values into a direct relation matrix.

$$DR = \left(\widetilde{D}_{ij}^{k} \right)_{n \times n} \tag{2}$$

The direct relation matrix needs to be normalized into the normalized direct relation matrix (ND) by employing the following equation:

$$ND = \partial \otimes DR, \ \ \partial = \frac{1}{\max\limits_{1 \le i \le k} \sum_{j=1}^{k} \widetilde{d}_{ij}^{k}} \tag{3}$$

The utilization of the following equation generates the total interrelationship matrix (TI):

$$TI = ND(I - ND)^{-1}, \tag{4}$$

Therefore, TI is rewritten as $\left[ti_{ij} \right]_{n \times n} i, j = 1, 2, \cdots n.$

Driving power (γ) and dependence power (δ) are acquired from the total interrelationship matrix as follows:

$$\gamma_i = \left[\sum_{i=1}^{n} w_{ij} \right]_{n \times n} = [w_i]_{n \times 1} \tag{5}$$

$$\delta_j = \left[\sum_{j=1}^{n} w_{ij} \right]_{n \times n} = \left[w_j \right]_{1 \times n} \tag{6}$$

The cause and effect is based on the $((\gamma_i + \delta_j), (\gamma_i - \delta_j))$. $(\gamma_i + \delta_j)$ denotes attributes' cause and effect level, with a higher value representing a more important attribute. $(\gamma_i - \delta_j)$ categorizes attributes into cause and effect by using $(\gamma_i - \delta_j) > 0$ and $(\gamma_i - \delta_j) < 0$.

3.7. Cognitive Best-Worst Choice Experiment

CBWM determines the best-to-others and others-to-worst vectors for the aspect weights, allowing consistent comparisons and improving reliability [43]. The best (most important) and worst (least important) attributes are determined using the FDM results. The weight of the attributes is defined as follows:

$$D_{bn} = (d_{b1}, \ d_{b2}, d_{b3} \ldots \ldots d_{bn}) \tag{7}$$

where D_{bn} denotes the best-to-others vector, and $d_{bn} = (l_{gh}; m_{gh}; n_{gh})$ represents the preference for aspect b over the nth aspect.

$$E_{NW} = (e_{1W}, \ e_{2W}, e_{3W} \ldots \ldots e_{NW})^T \tag{8}$$

where E_{mW} denotes the others-to-worst vector, and $x_{nW} = (l_{gh}; m_{gh}; n_{gh})$ represents the preference for aspect W over the nth aspect.

A CBWM linear model is adopted, and the maximum absolute difference of all sets of m attributes is minimized, as shown in Equation (9).

$$\text{Maximum absolute difference} = (|\gamma_n - d_{bn}|, \ |\delta_m - e_{NW}|) \tag{9}$$

where $(\gamma_n, \ \delta_m)$ is computed as $\gamma_n = \left(\frac{w_b}{w_n} \right)$, and $\delta_m = \left(\frac{w_N}{w_W} \right)$ and is arranged in a min–max model.

The linear model is as follows [44]:

$$\text{Model} \begin{cases} \text{for} \min \mu \\ |w_b - w_n x_{bn}| \le \varepsilon^L, \ |w_N - w_W x_{NW}| \le \mu^L \\ \sum_{n=0} w_n^* = 1, \ w_n^* \ge 0 \end{cases} \tag{10}$$

Hence, $\left(w_1^*, w_2^*, \ w_3^*, \ w_4^* \ldots \ldots \ldots, w_n^* \right)$ at the optimal weight value of μ^{L*} are obtained; μ^{L*} is $\in (0, 1)$, with a value close to 1 having less consistency and a value close to 0 having more consistency.

In prior studies, the CE has frequently been used with the conditional logit model as a basic evaluation model to set a benchmark and analyze regression estimates [44]. The respondents' assessment parameters are assumed to be fixed. The results estimate respondents' average preference. In addition to conditional logit, this study uses a random parameter logit (RPL) model to explore respondents' preferences and SCI and to change the criterion levels [44].

First, this study used the pretest to obtain several WTP values using an open question by involving experts. Different versions were created with three sets of WTP in each version. Each version was sent to at least 10 respondents. Each different version had a different WTP. In total, 40 questionnaires were created, and 428 respondents were involved in the data collection. In each questionnaire, there were three combinations consisting of the current state, alternative state 1, and alternative state 2, with different combinations of attributes and SCI values in each state.

The CE examines various alternative situations consisting of aspect sets. Based on a random utility model, this method allows respondents to assess various sets of hypothetical alternative situations. The respondents chose an option based on their preferences.

$$V_{ij} = \beta_{ij} X_{ij} + \varepsilon_{ij} \tag{11}$$

The utility function V_{ij} merges the vector X_{ij} with desirable and undesirable attributes in relation to individual i and alternative j. The model represents the observable attributes of the alternatives. β_i is a coefficient related to the change in levels. The error term ε_{ij} captures unobserved attributes.

If $V_{nk} > V_{ni}$, alternative k is selected over alternative i. Therefore, the alternatives are likely to be preferred over the other. In this case, alternative k is chosen. The Equations (8) and (9) are presented as follows:

$$P_{nk} = \text{Pr ob } (V_{nk} > V_{ni}), \text{for all } i \text{ in } C, \ i \neq k \tag{12}$$

$$P_{nk} = \text{Pr ob } (\beta_{nk} V_{nk} > \beta_{ni} X_{ni}), \text{for all } i \text{ in } C, \ i \neq k \tag{13}$$

where C is the collection of all alternatives, including k, i, and the current situation. The error terms are denoted as Enk and Eni. SCI functions as a measurement of market product valuation [44,45]. This measure is calculated if the coefficient of a TBL-derived aspect in relation to SCI is statistically significant. SCI is expressed as

$$WTP_j = \frac{-\beta_j}{\beta_{dfee}}, \tag{14}$$

where β_j is the TBL-based parameter of j, and β_{dfee} is the SCI. Therefore, the function presents how the valuation of the attributes varies according to different SCI levels.

An RPL model can capture preference heterogeneity and allows a flexible variance-covariance error structure [20]. This model is employed to assess the SCI values for each aspect and obtains the overall valuation of the individual aspect.

4. Results

This section presents the results of the application of the FDM, causal-effect model, CBWM, and CE.

4.1. FDM Results

Initially, this study proposed 61 criteria. The FDM arrived at a set of 31 confirmed criteria, as summarized in Table 4, with the weight and threshold values for the selection and elimination process of the initial criteria. The initial SCI criteria were evaluated based on experience and judgment from the expert panel and were then converted to corresponding triangular fuzzy numbers, as previously shown in Table 1. The FDM refined the important criteria with the threshold $\gamma = 0.2983$. The 31 accepted criteria were subsequently renamed.

Table 4. FDM–criteria screening out.

Initial Criteria	l_b	u_b	D_b	Decisions
C4	(0.2975)	0.7975	0.3244	Accepted
C5	(0.2743)	0.7743	0.3186	Accepted
C6	(0.3377)	0.8377	0.3344	Accepted
C7	(0.3243)	0.8243	0.3311	Accepted
C8	0.0599	0.8151	0.4225	Accepted
C13	(0.2857)	0.7857	0.3214	Accepted
C14	(0.2530)	0.7530	0.3132	Accepted
C16	(0.1996)	0.6996	0.2999	Accepted
C17	(0.3062)	0.8062	0.3265	Accepted

Table 4. *Cont.*

Initial Criteria	l_b	u_b	D_b	Decisions
C18	(0.2857)	0.7857	0.3214	Accepted
C19	(0.2634)	0.7634	0.3159	Accepted
C25	(0.2906)	0.7906	0.3226	Accepted
C27	(0.3243)	0.8243	0.3311	Accepted
C28	0.0173	0.8577	0.4332	Accepted
C29	(0.3243)	0.8243	0.3311	Accepted
C30	(0.3243)	0.8243	0.3311	Accepted
C34	(0.2743)	0.7743	0.3186	Accepted
C36	(0.3026)	0.8026	0.3257	Accepted
C37	(0.2975)	0.7975	0.3244	Accepted
C38	(0.3243)	0.8243	0.3311	Accepted
C39	(0.3476)	0.8476	0.3369	Accepted
C44	(0.3417)	0.8417	0.3354	Accepted
C45	0.0130	0.8620	0.4342	Accepted
C46	0.0274	0.8476	0.4306	Accepted
C52	(0.3770)	0.8770	0.3442	Accepted
C54	(0.3993)	0.8993	0.3498	Accepted
C56	(0.3377)	0.8377	0.3344	Accepted
C57	(0.2823)	0.7823	0.3206	Accepted
C58	(0.3377)	0.8377	0.3344	Accepted
C59	(0.2940)	0.7940	0.3235	Accepted
C61	(0.3189)	0.8189	0.3297	Accepted
Threshold			0.2983	

The FDM allows us to identify the top criteria in each aspect based on the weight value calculated using Equations (1) and (2), as shown in Table 5.

Table 5. FDM–criteria ranked under each aspect.

No.	Weight	Criteria	Aspects	Perspective
C1	0.6267	Willingness for inconvenience		
C2	0.5585	Concern on making waste		
C3	0.5495	Responsible consciousness		
C4	0.5375	Consequences of consumption		
C5	0.5317	Purchase frequency	Sustainable consumption knowledge, attitude, and behaviors	
C6	0.5238	Capability to choose food		
C7	0.5238	Image of sustainable food		Social influences
C8	0.5162	Impact of self-actions		
C9	0.5090	Characteristics of sustainable food		
C10	0.5020	Extra efforts for improvement		
C11	0.4664	Passing the knowledge to others		
C12	0.6552	Subsidies by government		
C13	0.5495	Public food-waste rules by government	Government's policy and regulation on sustainable consumption	
C14	0.5495	Small-scale farming incentives by government		
C15	0.5495	Government-business cooperation		
C16	0.5271	Authenticity argument		
C17	0.5651	Recycled material for packaging		
C18	0.5495	Biodegradable packaging	Recycled packaging eco-labelling certification	
C19	0.5351	Excessive packaging reduction		Environmental practices
C20	0.5317	Packaging techniques		
C21	0.5162	Fair trade certification		
C22	0.6580	Innovation and infrastructure in storage facilities and transport	Supply chain innovation and infrastructure	
C23	0.5612	Efficiencies in supply chain		

Table 5. *Cont.*

No.	Weight	Criteria	Aspects	Perspective
C24	0.6484	Price standards		
C25	0.5995	Fresh product		
C26	0.5846	Healthy product		
C27	0.5585	Product taste	Sustainable product purchasing features	Economic considerations
C28	0.5585	Product availability		
C29	0.5459	Convenient locations		
C30	0.5293	Product variety		
C31	0.5216	Past purchase		

4.2. Cause and Effect Model

Using Equation (3), a direct relation matrix is developed by transforming the fuzzy numbers into precise and crisp values for each of the aspects, as presented in Table 6.

Table 6. Direct relation matrix.

	A1	A2	A3	A4	A5	Row
A1	0.478	0.591	0.438	0.547	0.456	1.576
A2	0.434	0.379	0.548	0.578	0.478	1.505
A3	0.498	0.431	0.452	0.468	0.532	1.351
A4	0.321	0.648	0.389	0.643	0.541	1.680
A5	0.433	0.542	0.564	0.648	0.478	1.754

The matrix is converted into a matrix of causal-effect interrelationships, as shown in Table 7, based on a computation using Equation (6).

Table 7. Cause-effect model.

Aspects	γ_i	δ_j	$\gamma_i+\delta_j$	$\gamma_i-\delta_j$
A1	−3.188	−3.310	−6.498	0.123
A2	−3.256	−3.456	−6.711	0.200
A3	−3.356	−3.841	−7.198	0.485
A4	−3.381	−2.940	−6.320	(0.441)
A5	−3.582	−3.215	−6.797	(0.367)
Average			−6.682	0.092

In Figure 2, the causal group includes sustainable consumption knowledge, attitudes, and behaviors (A1); government policy and regulation on sustainable consumption (A2); and recycled packaging eco-labeling certification (A3), whereas supply chain innovation and infrastructure (A4) and sustainable product purchasing features (A5) belong to the effect group. Three is the highest number of influencing aspects of the SCI model. The interrelationships among the five aspects are also determined. A3 is a major cause aspect, while A4 has a medium impact, and A5 has a weak impact on the aspects of the effect group.

4.3. Cognitive Best-Worst Method Results

The CBWM confirms and ranks the SCI attributes. These rankings indicate the importance level for the dependent criterion. This study obtains the priority weight for each aspect using Equations (7)–(10). Based on the consistency values, Table 8 presents the CBWM results, with recycled packaging eco-labeling certification ranking first with a consistency value of 0.041, followed by the sociodemographic attributes including education at 0.048, monthly income at 0.051, and interest in food-waste reduction at 0.078. Government policy and regulation on sustainable consumption ranks fifth at 0.073, followed by supply chain innovation and infrastructure at 0.066; sustainable consumption knowledge, attitudes, and behaviors at 0.060; and sustainable product purchasing features at 0.052.
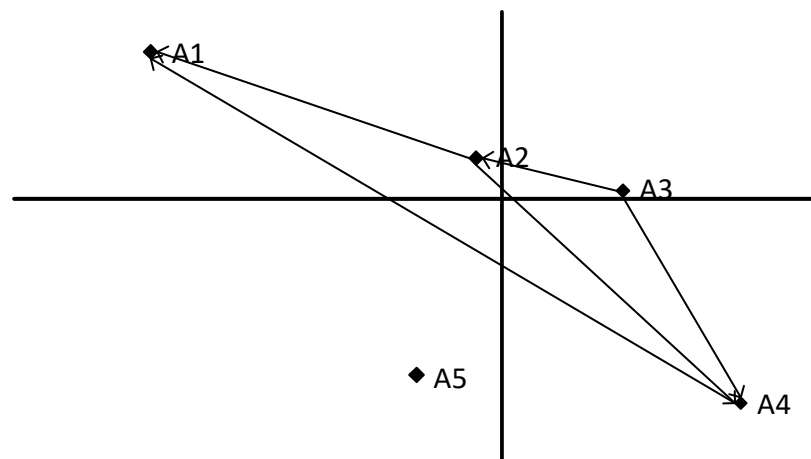
Figure 2. SCI cause-effect model.

Table 8. CBWM sustainable consumption intentions weights and ranking.

	Coefficient	Weight	Rank	Consistency
Sustainable consumption knowledge, attitude, and behaviors (A1)	0.062	0.0725	7	0.060
Government's policy and regulation on sustainable consumption (A2)	0.095	0.0738	5	0.073
Recycled packaging eco-labelling certification (A3)	0.521	0.0505	1	0.041
Supply chain in innovation and infrastructure (A4)	0.078	0.0466	6	0.066
Sustainable product purchasing features(A5)	0.025	0.0722	8	0.052
Consumer monthly income	0.152	0.1851D-06	3	0.051
Consumer education	0.410	0.2096D-06	2	0.048
Food-waste reduction trend	0.108	0.2051D-06	4	0.078

4.4. Choice Experiment Results

This study assesses the economic value of food-loss and -waste policy in Indonesia. Four SCI valuations were set based on 20 pretest interviews with food industry experts, including practitioners and academics. These valuations are 150,000 rupiahs (Rp) (10 USD), 360,000 Rp (25 USD), 500,000 Rp (35 USD), and 1,500,000 Rp (100 USD) per person per year. These SCI values are used in the CE questionnaires. All the attributes and their levels are presented in Table 9.

Table 9. Attributes and levels of sustainable consumption intentions.

Aspects		Levels
	1	Consumers' lack of concern on waste production, responsible consciousness, and willingness for convenience
A1	2	Consumers have concern for waste production, responsible consciousness, and willingness for convenience through NGO's information
	3	Consumers have concern for waste production, responsible consciousness, and willingness for convenience through government's information

Table 9. *Cont.*

Aspects		Levels
A2	1	The government has not set up any food-waste rules, business subsidies, or research and development in cooperation with the industry
	2	The government has developed a cooperation with the industry
	3	The government has set up multiple food-waste rules, business subsidies, and research and development in cooperation with the industry
A3	1	Packaging consists of non-recycled material or eco-labelling certification
	2	Packaging is made of recycled material and contains eco-labelling certification
A4	1.	Traditional supply chain processes in storage facilities and transport
	2.	Innovative supply chain processes in storage facilities and transport
A5	1.	Consumers care more about price than health benefits and freshness
	2.	Consumers purchase products based on the health benefits
	3.	Consumers purchase products based on health benefits and freshness
Donation/ person/year	1	0 USD
	2.	10 USD
	3.	25 USD
	4.	35 USD
	5.	100 USD

Using Equations (11)–(14), this study fits responses from 428 respondents to an RPL model. The analysis tools include statistical analyses, used to generate the number of survey responses required, and NLOGIT 5 software, used to obtain the estimated SCI values, as shown in Table 10. This model shows a statistically good fit according to the log-likelihood value of 167.0717, which is higher than the chi-square value of 21.064.

This study considers sociodemographic attributes, including respondents' monthly income, education, and interest in the issue of food-waste reduction. These attributes are found to be significant and positive at 1%.

The RPL model allows for SCI assessment of each of the five aspects. The results reveal that sustainable consumption knowledge, attitudes, and behaviors are significant at the 1% level, with an SCI value of 122,140.42 IDR (8.53 USD). Government policy and regulation on sustainable consumption are significant at 1%, with an SCI value of 112,403.13 IDR (7.85 USD). Recycled packaging eco-labeling certification is significant at 1%, with an SCI value of 202,355.85 IDR (14.13 USD). Supply chain innovation and infrastructure are significant at 1%, with an SCI value of 102,340.35 IDR (7.14 USD). Sustainable product purchasing features are significant at 10%, with an SCI value of 50,573.46 IDR (3.53 USD). Finally, the dependent SCI criterion is significant at 1%, with an SCI value of 589,813.23 IDR (41.19 USD).

Table 10. Estimated results of the random parameter logit of sustainable consumption intentions.

Aspects and Levels	Random Parameter Logit Model			
	Coefficient	Coefficient Std.	T-Value	MWTP
Current state	−0.4492 ***	0.1290	−3.48 ***	
A1	0.3152 ***	0.0945	3.33 ***	122,140.4216
A2	0.2900 ***	0.0923	3.14 ***	112,403.1308
A3	0.5222 ***	0.0871	5.99 ***	202,355.8586
A4	0.2641 ***	0.0589	4.48 ***	102,340.3596
A5	0.1305 *	0.0677	1.93 *	50,573.4655
Monthly income	0.58908D-06 ***	0.1851D-06	3.18 ***	
Education	0.81945D-06 ***	0.2096D-06	3.91 ***	
Followed the food-waste reduction trend	0.61037D-06 ***	0.2051D-06	2.98 ***	
Sustainable consumption intentions	−0.25808D-06 ***	−0.2246D-06	−3.27 ***	589,813.2362
Number of choice sets	1284			
Log-likelihood ratio	167.0717			
Chi Square	21.064			

*** significance at the 1% level; * significance at the 10% level.

5. Discussion

Recycled packaging eco-labeling certification stood out as a major causal aspect to enhance SCI, which indicates that improvement is largely needed in certification. In lieu of this, prior studies have emphasized that sustainable certification has convinced consumers during the decision-making process to purchase sustainable products [12,17]. However, challenges exist; for instance, sustainable information on recycled packaging certification has not been sufficiently clear for consumers to understand and thus negatively impacts their sustainable consumption intentions. Furthermore, recycled packaging eco-labeling certification comes in many types, making it challenging for consumers with inadequate knowledge to differentiate among and understand the different labels [6,11]. Therefore, it is suggested that measures be taken to increase consumers' knowledge of and familiarity with the various certification types to potentially intensify their consumption intentions toward products that use recycled packaging. Consumers appear eager to contribute to reducing waste by choosing products that use recycled packaging material.

Government policy and regulation on sustainable consumption are shown to have significance, emphasizing the need for government involvement in amplifying SCI. Similarly, other studies have suggested that the government should raise awareness about the importance of SCI by issuing and implementing relevant policies and regulations to strictly monitor the system [10,27,35]. Policy and regulation are not limited to communication efforts to persuade consumers but also need to involve regulations on the market and product development [28,33,40]. A lack of government support leading to inadequate sustainable market and product development potentially weakens consumer consumption intentions of sustainable products. Therefore, government policy and regulation on sustainable consumption must be synchronized with improving the overall system to tackle the problems related to product availability on the market, sustainable storage and distribution systems, and lack of knowledge and trust among consumers.

According to the results, supply chain innovation and infrastructure rank third in boosting SCI, confirming the need for improvement of the supply system for sustainable products. For example, improved supply chain innovation and infrastructure consist of fair support for local farmers and the use of local resources to reduce the distribution distances.

However, supply chain challenges exist, especially due to poor storage and transportation processes, which shorten products' life span, leading to losses. Therefore, in line with other studies, improving supply chain innovation and infrastructure should be emphasized in constant efforts to develop more sustainable facilities to reduce the waste-generation rate at all stages [14,21]. Simultaneously, SCI among consumers tends to increase for products produced by manufacturers that apply fair and sustainable practices at all supply chain stages, creating a high demand for such products. Furthermore, matching the demand and supply dynamics requires integration among the various supply chain partners.

In addition, the results show that sociodemographic attributes have the potential to increase SCI. The results underscore education as a sociodemographic attribute worth considering. Moreover, consumers' monthly income is a determinant of consumption intentions toward sustainable products. Other studies have also recognized these demographic attributes as key to SCI improvement [2,18]. Moreover, the results show that having an interest in the food-waste reduction trend potentially enhances consumption intentions. The results indicate that consumers who follow this trend are willing to pay more for sustainable products.

6. Conclusions

This study defined a new sustainable consumption intention model based on TBL-oriented attributes in the packaged food industry. A set of attributes was developed to explore the attributes' significance in enhancing SCI, involving sustainable knowledge, attitudes, and behaviors; government policy and regulation on sustainable consumption; recycled packaging eco-labeling certification; supply chain innovation and infrastructure; and sustainable product purchasing features. Interviews with 10 experts were conducted using the fuzzy Delphi method to screen out the initial attributes. Questionnaires were used, employing a choice experiment to collect relevant insights from a total of 428 Indonesian consumers. The cognitive best-worst method was employed to check the consistency using a ranking system of the aspects based on their significance in strengthening SCI. The results reveal that all the aspects are significant to enhance consumption intention. The CE results show that recycled packaging eco-labeling certification is among the significant aspects. Finally, the CBWM results prove consistency, as recycled packaging eco-labeling certification ranks first in significance to enhance SCI.

From a managerial perspective, the results provide practical insights on the main criteria for SCI in Indonesia, including willingness to be inconvenienced, recycled packaging material, and price standards.

Willingness to be inconvenienced comprises consumers' willingness to pay a premium price for sustainable products. However, such willingness to incur inconvenience is often hampered by product unavailability on the market in the location where consumers reside. The unavailability of sustainable products often prevents consumers from implementing sustainable purchases despite acknowledging SCI. Therefore, shortening consumers' distance to a market that offers sustainable products can have a positive impact on enhancing SCI. Regulations to mandate sustainable product availability in most retailers can be devised and implemented by the authorizing agency in the local region. Simultaneously, retailers must advertise product availability to raise awareness among consumers by using social media and street banners. Moreover, promotional programs during a certain period of time, such as discounts and buy-one-get-one-free programs for sustainable products, can be focused on raising the interest of first-time buyers who have never made a sustainable product purchase.

Recycled packaging material for food products, such as plastic, paper, aluminum, and glass, enhances SCI because reducing waste generation in landfills lessens the environmental impact. However, these materials tend to end up mixed at disposal with other waste, making separating and recycling more difficult. Using recycled material is important to eliminate the use of new base material. Therefore, creating the habit of separating waste needs to be encouraged by educating consumers about proper waste

handling at the disposal stage by, for example, using various social media platforms for social marketing. In practice, waste from food products can be handled by dividing it into two types: leftover food and packaging waste. Packaging waste can then be divided into designated disposal bins depending on the material types. Packaging waste that has been divided can be returned to manufacturers via a waste collection agency. Simultaneously, it is suggested that the waste collection agency reject waste from consumers that has not been separated based on the type and material.

Price standards for sustainable products on the market have the potential to enhance SCI by addressing price competitiveness with cheaper traditional products. Due to implementing the required environmentally friendly procedures in the manufacturing and production processes, such as using costlier organic materials and obtaining reputable eco-friendly certifications, sustainable products tend to come at higher prices than traditional products. Another reason for these higher prices is low consumer demand. Therefore, building interest and preference among consumers should increase their demand and ability to purchase sustainable products. This can be done by promoting the tangible benefits and impacts on the environment from purchasing the products. Increased demand can lower the price standards for sustainable products so that they can compete with traditional products. Simultaneously, price standards for sustainable products should be regulated and monitored by the authorizing government agencies to avoid inconsistencies and facilitate fair competition in the market at all locations.

In sum, SCI in Indonesia needs to be enhanced by taking advantage of consumers' willingness to experience inconvenience, innovating product packaging using recycled materials, and standardizing market prices for sustainable products. These criteria will potentially intensify SCI and require great attention to achieve sustainable consumption.

Several limitations are recognized in this study. The initial attributes were selected from the literature and are limited to the traditional TBL perspective. The future study can expand the attributes and extend the perspective by including technology as an additional perspective to TBL. This study uses FDM for selecting the attributes; however, the method bases the selection and validation process on the industrial experts' opinion, which is subject to biases. Thus, it is suggested that the future study uses an additional validating method. This study is limited to packaged food industry in Indonesia and recommends the future study to expand the industry for the literature enrichment.

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