

1 **Sustainable packaged food and beverage consumption transition in Indonesia: persuasive**  
2 **communication to affect consumer behavior**

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37 **Abstract**

38 Sustainable consumption transition **in relation to consumers' environmental behavior and**  
39 **manufacturers' governance of sustainability** and persuasive communication has not been  
40 adequately addressed by prior studies. This study presents theory on ecological  
41 modernization, transition management and persuasive communication to address  
42 sustainable consumption transition. This study proposes a valid set of four aspects and  
43 fourteen criteria using the Delphi method. The valid attributes are analyzed using fuzzy set  
44 theory and decision-making trial and evaluation together to handle the qualitative  
45 information and interrelationships among the attributes. This procedure converts qualitative  
46 information into numerical data to create a diagram showing the interrelationships among  
47 the attributes. **This study found that persuasive communication is the most effective factor in**  
48 **convincing consumers to transition to sustainable consumption. Other key factors for this**  
49 **transition include educating consumers, augmenting their knowledge and altering their**  
50 **attitudes toward sustainable consumption.** Being environmentally friendly, product labeling,  
51 offering an authenticity argument, and reusing and recycling products are the solutions found  
52 in this study.

53

54 **Keywords:** sustainable consumption transition; ecological modernization theory; transition  
55 management theory; persuasive communication; decision-making trial and evaluation  
56 laboratory

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60

61 **1. Introduction**

62 Sustainable consumption transition (SCT) is a process of transitioning from being  
63 unsustainable to being sustainable that involves a change in views, positions and tactics by  
64 consumers and regulatory authorities while simultaneously focusing on quality of life  
65 (Spaargaren et al., 2012; Lin et al., 2019; Tseng et al., 2020a;b). SCT is complex and remains a  
66 problem in the consumption process due to the nature of consumer behavior, which would  
67 ideally be environmentally friendly (Dong et al., 2020). Nevertheless, SCT is difficult to achieve:  
68 the need for a transition by reducing the negative impacts on the environment from the  
69 postconsumption waste of products has been highlighted. For instance, Notarnicola (2017)  
70 noted that consumption is **showing an ongoing trend toward unsustainability** due to a loss of  
71 focus on attention to consumer behavior. **Prior studies have indicated that changing**  
72 **consumers' behaviors** is key to fostering transitions toward sustainable consumption  
73 practices (Crivits and Paredis, 2013; O'Rourke and Lollo, 2015). However, changing  
74 consumers' behavior is not an easy task. For instance, Vega-Zamora et al. (2019) found that  
75 consumers have a lack of trust in and knowledge about sustainable products. To address this  
76 issue, some manufacturers have developed sustainable products and packaging, and the  
77 government has implemented environmental policies and regulations. Whether sustainable  
78 products and packaging reach consumers depends considerably on the process from buying  
79 the right products to governing their environmental consciousness. Hence, this study  
80 proposes a set of valid attributes to justify SCT.

81 This study focuses on attributes such as consumer behavior, environmental  
82 governance, and the role of persuasive communication (Wu et al., 2016; Janßen and Langen,  
83 2017). For instance, Vittersø and Tangeland (2015) found that the main success attributes  
84 with the transition are related to consumers' perception about the sustainable benefits of  
85 their behavior, manufacturers' actions and the government's policy toward SCT. Ely et al.  
86 (2016) presented SCT as being related to societal activities through behavior, to  
87 manufacturers through their actions and to the government as regulators, where each  
88 stakeholder interacts with one another through the media and social networks. Interaction  
89 with respect to sustainable information among the involved stakeholders is significant for SCT  
90 improvement (Magnier and Schoormans, 2015; Lombardi et al., 2017). Vega-Zamora et al.  
91 (2019) stressed that the failure to deliver sustainable information has a negative impact on  
92 successful transitions. The transition process faces a barrier of the ineffective spread of  
93 information regarding the potential benefits, including financial benefits, from policy makers  
94 to consumers, which affects the confidence level consumers have in these products (Nikolaou  
95 and Kazantzidis, 2016; Mulcahy et al., 2020). Sustainable information and communication  
96 among stakeholders are important components of SCT failure or success.

97 Moreover, SCT attributes, such as firm operations, policy makers and consumers, could be  
98 the main solution to achieve SCT. SCT is an upstream and downstream process in terms of  
99 environmental governance in ecological modernization theory. Manufacturers are  
100 responsible for the upstream process, whereas consumers are involved in the downstream  
101 process (Spaargaren and van Koppen, 2009; Tseng et al., 2020a). In terms of perspectives, the  
102 niche level is for firm activities, the regime level is for government governance, and the  
103 landscape level for society is used to address the dynamics of the transition (Grin, 2012).  
104 Nevertheless, a key issue is located on the niche level. There are interrelationships among the

105 firm, industry and government activities. Environmental dynamics are difficult to solve by  
106 focusing on only current policies but must be addressed by restructuring the societal system,  
107 as explained by transition management theory (Vittersø and Tangeland, 2015). Indeed, the  
108 landscape level is related to consumers' information and confidence, and many people have  
109 never purchased sustainable food due to a lack of knowledge about its benefits. This study  
110 proposes persuasive communication from ecological modernization and transition  
111 management theories to address the barriers to achieving successful SCT at the landscape  
112 level.

113 In addition, Vittersø and Tangeland (2015) identified a need for consumer information and  
114 confidence in persuasive communication and suggested a reconstruction of the societal  
115 system to achieve SCT. Moreover, Vega-Zamora et al. (2019) noted that persuasive  
116 communication in SCT impacts consumers' level of knowledge about, confidence in, and trust  
117 in sustainable products. The considered attributes are taken from transition management  
118 theory and ecological modernization theory and include consumer behavior and upstream  
119 and downstream processes of environmental governance. Consumer behavior includes  
120 sustainable knowledge, confidence and attitude, and the downstream processes of  
121 environmental governance focus on consumers' decisions to buy, recycle and reuse products.  
122 In addition, information from external stakeholders affects consumer knowledge, confidence,  
123 attitudes and decisions to act.

124 The SCT attributes are judged in terms of consumer preferences, and the preferences  
125 provide a measure of qualitative information. Hence, this study proposes applying the fuzzy  
126 Delphi method (FDM) to obtain a set of valid attributes. Consumer preferences must be  
127 transformed into crisp values for comparison, and fuzzy set theory is proposed to transform  
128 linguistic preferences into crisp values. Moreover, complicated interrelationships exist among  
129 manufacturers, industries and government; hence, this study uses the decision-making trial  
130 and evaluation laboratory (DEMATEL) method to handle qualitative attributes and  
131 interrelationships and to investigate complex and intertwined groups (Fontela and Gabus,  
132 1976; Tseng et al., 2017; Yeh et al., 2020). The DEMATEL method translates the causal  
133 interrelationships among the attributes into a visual interrelationship map; in addition, the  
134 improvement criteria are justified in practice. Hence, the objectives of this study to assess  
135 attributes are as follows:

- 136 ● To develop a set of valid SCT attributes in terms of qualitative information.
- 137 ● To identify the causal interrelationships among the attributes with linguistic  
138 preferences.
- 139 ● To justify the practical improvement criteria under uncertainty.

140 This study contributes to both the theory and the industry of SCT. The contributions  
141 include (1) providing a set of valid SCT attributes, (2) addressing the causal interrelationships  
142 among the attributes, and (3) providing practical means of improvement for the packaged  
143 food and beverage industry in Indonesia. This study enables stakeholders to identify the  
144 causes of issues in the transition process and to eliminate problems to improve SCT.

145 This study is organized as follows. Section 1 discusses the gaps and study objectives.  
146 Section 2 reviews the literature on SCT, including theories and attributes. Section 3 explains  
147 the method and data analysis. Section 4 discusses the results and presents figures for the  
148 analyzed attributes. Section 5 presents the contributions of the study for both theory and  
149 practice. Finally, Section 6 presents a conclusion and the study's limitations.

150

## 151 **2. Literature Review**

152 This section reviews the theoretical perspectives on SCT, including the proposed  
153 method and measures.

154

### 155 2.1 *Theoretical framework*

156 Ecological modernization theory (EMT) offers governing processes for the  
157 environment, including upstream processes and downstream processes (Spaargaren and van  
158 Koppen, 2009). The upstream processes include the practices of manufacturers such as  
159 processing, storing, transporting, and distributing. Meanwhile, downstream processes  
160 include the activities performed by consumers, such as buying, reusing, and recycling. EMT is  
161 based on the assumption that the government, through its policies, provides solutions for  
162 problems in the environment, economy and society at large (Spaargaren et al., 2012; Lin et  
163 al., 2019). The problem with such an assumption is that the policies are not the best  
164 representation of reality in terms of the effectiveness of communicating these policies to the  
165 involved stakeholders and the understanding of consumer behavior. Moreover, Vittersø and  
166 Tangeland (2015) argued that there is a lack of direct correlation between the policies  
167 implemented by the manufacturers and consumers' motivation to consume products.  
168 Consumers need more motivation or encouragement than just policies in order to decide to  
169 act toward SCT.

170 Transition management theory (TMT) provides an explanation for the evolution of the  
171 economy, culture, technology, environment and institutions taking place at different levels  
172 (Rotmans and Loorbach, 2009). Grin (2012) categorizes the different levels as the niche level,  
173 regime level, and landscape level, which correspond to innovative practices by the firm or  
174 industry, structural changes by the regulatory authorities, and long-term consumer trends,  
175 respectively. Overall, the problem in SCT is often at the landscape level, where there is a  
176 failure of the societal system that cannot be solved simply by the reinforcement of policies  
177 (Vittersø and Tangeland, 2015; Yeh et al., 2020). Specifically, the problem at the landscape  
178 level is with consumer behavior, including using products in an environmentally friendly way  
179 (Dong et al., 2020). The role of the consumers in the transition process is ineffective and  
180 unsuccessfully implemented at the landscape level due to the manufacturers' policies and the  
181 government. To fill these gaps, this study integrates these theories into SCT. This study  
182 assesses the transitional gap, which is the imbalance between what manufacturers want and  
183 how consumers act, which depends on the policies and activities of manufacturers to provide  
184 and facilitate sustainable products for consumers.

185

### 186 2.2 *Sustainable consumption transition*

187 SCT is a complex process of transitioning from unsustainable consumption to  
188 sustainable consumption to ensure environmental friendliness while maintaining and  
189 enhancing the quality of life for future generations (Ahamad and Ariffin, 2018; Tseng et al.,  
190 2020b). Traditionally, sustainable consumption is the fulfillment of basic human needs  
191 through the use of goods and services without harming the environment with waste and  
192 pollution (Oslo Symposium, 1994). Spaargaren et al. (2012) described SCT as a process of  
193 medium- to long-term change that has effects on the rules of consumption and production.  
194 SCT is a time-consuming process of improving sustainable consumption and production that  
195 involves different groups of stakeholders. Grabs et al. (2016) noted that the stakeholders  
196 involved in the processes range from manufacturers and providers to consumers, with the  
197 government providing infrastructure. Prior studies found a growing role of policies that are  
198 consumer-oriented and a role of consumers themselves in the success of SCT, despite the

199 complexities related to implementing these policies (de Koning et al., 2016; Echegaray, 2016;  
200 Wu et al., 2016).

201         Watkins et al. (2016) linked SCT to the importance of emphasizing the building of a  
202 moral foundation among consumers because it is proven to affect their orientation and desire  
203 for change, especially in regard to sustainable consumption. Li et al. (2016) suggested that  
204 the instruments of transition include the policies, governance, infrastructure, and business  
205 models of manufacturers and consumer motivation. However, policies alone are not the key  
206 to achieving SCT (Vittersø and Tangeland, 2015; Tseng et al., 2020b). The role of consumers  
207 is significant, especially in the process of making consumption decisions. Joerß et al. (2017)  
208 defined sustainably consuming consumers as those who make consumption and purchase  
209 decisions based on these decisions' benefits for and harm to the environment. Additionally,  
210 Quoquab and Mohammad (2017) noted that sustainable consumers take short-term and  
211 long-term consequences into consideration when deciding what to consume or what to  
212 purchase. SCT involves not a single stakeholder but a collaboration among many stakeholders,  
213 including the government through relevant programs, manufacturers through their sense of  
214 responsibility from their activities, and consumers (Ely et al., 2016; Tseng et al., 2020a).

215         Although SCT is complex, the main stakeholders are consumers, manufacturers, and  
216 the government. Vainio et al. (2020) noted that consumers are the key to the success of SCT.  
217 Moreover, the future considerations of each consumer affect the transition. The role of  
218 consumers in the transition is through their sustainable awareness and behavior in  
219 consumption (Echegaray, 2016; Li et al., 2016; Tseng et al., 2019). Spaargaren and van Koppen  
220 (2009) found that the environmental governance by manufacturers in attempting to change  
221 practices toward SCT includes storage, transportation, and distribution activities. Vittersø and  
222 Tangeland (2015) emphasized that the role of the government is significant in terms of  
223 providing policies or regulations related to SCT, although policies or regulations alone are not  
224 sufficient. Nikolaou and Kazantzidis (2016) found that insufficient communication about  
225 sustainable information causes the failure of SCT due to insufficient knowledge. Annunziata  
226 et al. (2019) noted that the communication of sustainable information by manufacturers has  
227 a positive impact on SCT because it augments consumers' knowledge. Moreover, low  
228 confidence and trust are caused by insufficient knowledge due to ineffective communication  
229 or inadequate interaction between manufacturers and the government (Gadema and  
230 Oglethorpe, 2011; Hartikainen et al., 2014; Vega-Zamora et al., 2019).

231         In sum, SCT has problems with respect to consumer communication. Inadequately  
232 communicated information causes the transition to be unsuccessful due to consumers'  
233 misunderstanding of their potential role in sustainable consumption. This study enriches the  
234 literature on SCT by exploring EMT and TMT and persuasive communication.

235

### 236 2.3 *Proposed measures*

237         This study considers TMT and EMT. Despite the adequacy of these two theories to  
238 cover the discussion of SCT, there is room for enhancement by adding additional attributes  
239 from other theories. This study emphasizes attributes that include 4 aspects and 14 criteria.  
240 The aspects consist of consumer behavior (A1), upstream processes of environmental  
241 governance (A2), downstream processes of environmental governance (A3), and persuasive  
242 communication (A4), as shown in Table 1.

243         Consumer confidence (C1) in the claims about a product shows differences with  
244 respect to determination. Consumers with a lack of confidence have different consumption  
245 patterns than those with a high level of confidence in a sustainable product (Vermeir and

246 Verbeke, 2008). Consumer behavior toward SCT includes being efficient in the use of  
247 resources (C2) and having the attitude that being environmentally friendly (C3) helps to  
248 achieve SCT (Wu et al., 2016). Finally, consumer behavior involves consumers' dependence  
249 on the traditional market (C4) with reduced packaging use, which leads to a reduction in  
250 packaging waste (Zhang et al., 2016). Products in traditional markets are sold without  
251 manufactured packaging.

252 Upstream processes in environmental governance consist of manufacturers' activities.  
253 Manufacturers create a product with a certain design (C5) that sends a sustainable message  
254 to consumers. Contextually, the design includes the use of leftover material from production  
255 instead of postconsumer waste (Ordonez and Rahe, 2013; Singh and Ordonez, 2016).  
256 Moreover, Tseng (2017) suggested that the sustainable design of a product potentially  
257 reduces its negative impacts on the environment. Another attribute is the material of the  
258 product packaging (C6), which focuses on the packaging and is not necessarily based on  
259 leftover material but can be any sustainable material that affects the perception of the SCT  
260 (Boesen et al., 2019; Steenis et al., 2019). For instance, product labeling (C7) is a major tool  
261 for communicating the performance of products (Janßen and Langen, 2017; Zhao et al., 2018).  
262 Pancer et al. (2015) found that product labels including verbal and nonverbal features are  
263 effective communication tools.

264 In contrast, downstream processes are activities performed by consumers in terms of  
265 environmental governance. Product buying (C8) is influenced by the consumer's level of  
266 information about the product and trust in the product (de Koning et al., 2016). In general, a  
267 consumer's product purchase decision is personal and related to the consumer's level of  
268 knowledge about SCT. After making a purchase, the product is reused or recycled. Product  
269 reuse (C9) and product recycling (C10) are activities related to the governance of the  
270 environment from the individual perspective of each consumer, who must be educated about  
271 how to reuse and recycle used packaging or leftover products (Spaargaren and van Koppen,  
272 2009; Spaargaren, 2016).

273 Sustainability information must be communicated among stakeholders and is vital to  
274 achieving SCT because it affects consumers' confidence and trust in the product or firm  
275 (Magnier and Schoormans, 2015; Lombardi et al., 2017; Tseng et al., 2019). A health argument  
276 (C11) is a statement or information from health experts about the health benefits of a product  
277 (Lopez-Azpiazu et al., 2001; Vega-Zamora, 2019). Additionally, authenticity arguments (C12)  
278 are transmitted by a union or association of manufacturers or the industry (Vega-Zamora,  
279 2019). Janssen and Hamm (2012) explained that when manufacturers provide clear  
280 information about their product through a union or association, more trust is generated  
281 among consumers. Another source of communication is elites (C13). An elitist argument is a  
282 statement by or information from a well-trusted practitioner or expert in the industry, for  
283 example, a famous chef (Vega-Zamora, 2019). Finally, social arguments (C14) are transmitted  
284 by a public authority (Vega-Zamora, 2019; Tseng et al., 2020b), such as a government agency  
285 that has the authority to issue regulations.

286 In conclusion, SCT is explained by several attributes, and prior studies have used  
287 different sets of attributes to explain SCT. To achieve the objectives of this study, a new set  
288 of attributes is proposed by combining EMT and TMT and including additional attributes.

289  
290 **(INSERT TABLE 1 here)**

291  
292 **3. Method**

293 3.1 Industrial background

294 In general, one of the direct effects of unsustainable consumption is the production of  
295 waste. In Indonesia, 64 million tons of waste are produced annually; 60% is biodegradable  
296 organic waste, 14% are plastics, and 9% is paper (Jain, 2017). Purwaningrum (2016) found  
297 that food and beverage packaging contributes to 30.19% of nonbiodegradable waste in  
298 Indonesia. Packaging consumption has outnumbered other types of consumption, including  
299 electronics, automotive and building (Hidayat et al., 2019). More specifically, packaged food  
300 and beverages in Indonesia have contributed substantial amounts of waste to landfills in the  
301 past three years. During the 2016-2019 period, fast-moving consumer goods manufacturers  
302 in the food and beverage industry contributed 75% of all waste to landfills, becoming the  
303 main contributor (Greenpeace Indonesia, 2019). This indicates a failure of SCT because the  
304 volume of waste did not decrease. The problem with the transition is related to  
305 manufacturers and consumers. Despite the communication efforts by manufacturers via  
306 sustainability labeling, consumers are still not well informed about what to do with waste.  
307 The SCT indicates a problem in the disconnectedness between the sustainable messages that  
308 the manufacturers want to deliver and the information consumers receive, perceive and react  
309 to. Manufacturers fail to create accurate perceptions among consumers during the transition  
310 process. Consequently, consumers do not have the knowledge, attitude and behavior that  
311 the manufacturers may expect based on their communication through labeling.

312 Stakeholders at different levels, including the niche and regime levels, have developed  
313 sustainable policies and infrastructure but often fail to communicate information to  
314 consumers. This transitional gap, where consumers respond to sustainable products by  
315 behaving unsustainably, is located at the landscape level. For instance, consumers are not  
316 well informed about and skilled in determining which products are sustainable to purchase  
317 and what is done to give waste another life through reuse and recycling. Achieving SCT affirms  
318 the stakeholders' roles. However, this study highlights the importance of effectively  
319 communicating information about SCT to consumers. Persuasive communication from  
320 industry experts, including health, authenticity, elitist and social perspectives, is considered  
321 to be an attribute. This style of communication is unbiased toward a specific firm or brand;  
322 therefore, it is believed to be more persuasive. This attribute is considered as a  
323 communication strategy by the different levels of stakeholders involved in the transition  
324 process.

325

326 3.2 Analytical method

327

328 1. Delphi method

329 The Delphi method was applied to validate the SCT attributes. This study involved 13  
330 experts with profiles ranging from CEOs of food manufacturers to managers in the retail  
331 industry. The experts evaluated the attributes' importance levels using a five-point Likert  
332 scale. The Delphi procedure involved the following steps: (1) gathering experts' evaluation  
333 scores for the level of importance of each criterion using a Likert scale and calculating the  
334 central tendency and standard deviation of the responses for each criterion; (2) checking if  
335 expert consensus is reached for each criterion by fulfilling the consensus threshold given in  
336 Table 2; and (3) revising the attributes according to the consensus level, considering the  
337 experts' comments, and deleting unaccepted attributes (Tseng et al., 2019).

338

339 2. Fuzzy DEMATEL



340 This study applied fuzzy set theory to collect linguistic preferences and transform them  
 341 into triangular fuzzy numbers (TFNs), as shown in Table 2. The normalization, aggregation,  
 342 and defuzzification were conducted by means of the following equations.

343 **(INSERT TABLE 2 here)**

344

345 The decision matrix assumes that there are  $x$  attributes to be assessed against  $y$  attributes.  $n$   
 346 is the number of decision makers; therefore, the decision-maker vector is denoted by  $\tilde{D}_n$   
 347 using linguistic preferences represented as  $(g\tilde{d}_L^n, g\tilde{d}_M^n, g\tilde{d}_U^n)$  (Lan et al., 2019; Tseng et al.,  
 348 2019; Tseng et al., 2020a)

349

$$350 \quad \tilde{D}_n = \begin{bmatrix} \tilde{d}_{L1j}^{1y}, \tilde{d}_{M1j}^{1y}, \tilde{d}_{L1j}^{1y} & \cdots & \tilde{d}_{Li1}^{1y}, \tilde{d}_{Mij}^{1y}, \tilde{d}_{Lij}^{1y} \\ \vdots & \ddots & \vdots \\ \tilde{d}_{L1j}^{xy}, \tilde{d}_{M1j}^{xy}, \tilde{d}_{L1j}^{xy} & \cdots & \tilde{d}_{Lij}^{xy}, \tilde{d}_{Mij}^{xy}, \tilde{d}_{Lij}^{xy} \end{bmatrix}_{xy}, n=1,2,\dots,n \quad (1)$$

351 The fuzzy numbers are then normalized. If a decision group comprises  $n$  members, let  $\tilde{d}_{ij}^n$   
 352 represent the fuzzy weight of the effects of the  $i^{\text{th}}$  attribute on the  $j^{\text{th}}$  attribute as assessed by  
 353  $n$  decision makers.

354

$$355 \quad D = (g\tilde{d}_{Lij}^n, g\tilde{d}_{Mij}^n, g\tilde{d}_{Uij}^n) =$$

$$356 \quad [(\tilde{d}_{Lij}^n - \min\tilde{d}_{Lij}^n)/(\max\tilde{d}_{Lij}^n - \min\tilde{d}_{Lij}^n), (\tilde{d}_{Mij}^n - \min\tilde{d}_{Mij}^n)/(\max\tilde{d}_{Mij}^n - \min\tilde{d}_{Mij}^n), (\tilde{d}_{Uij}^n - \min\tilde{d}_{Uij}^n)/(\max\tilde{d}_{Uij}^n - \min\tilde{d}_{Uij}^n)] \quad (2)$$

357 where  $(g\tilde{d}_{Lij}^n, g\tilde{d}_{Mij}^n, g\tilde{d}_{Uij}^n)$  is represented as a triangular fuzzy number with normalized  
 358 values.

359

360 The left and right normalized values acquired by Equation (2), the total normalized crisp  
 361 values using Equation (3), and crisp values applied Equation (4) are then computed.

$$362 \quad (D\tilde{d}_{LTij}^n, D\tilde{d}_{RTij}^n) = [g\tilde{d}_{Mij}^n / (1 + g\tilde{d}_{Mij}^n - g\tilde{d}_{Lij}^n), g\tilde{d}_{Uij}^n / (1 + g\tilde{d}_{Uij}^n - g\tilde{d}_{Mij}^n)] \quad (3)$$

$$363 \quad D\tilde{d}_{ij}^n = \left[ \frac{(D\tilde{d}_{LTij}^n (1 - D\tilde{d}_{LTij}^n) + (D\tilde{d}_{RTij}^n)^2)}{(1 - D\tilde{d}_{LTij}^n + D\tilde{d}_{RTij}^n)} \right] \quad (4)$$

$$364 \quad d\tilde{w}_{ij}^n = \min g\tilde{d}_{Lij}^n + D\tilde{d}_{ij}^n (\max g\tilde{d}_{Uij}^n - \min g\tilde{d}_{Lij}^n)$$

365 (5)

366

367 An initial direct relation matrix (IDRM) is defined to aggregate the subjective judgments of  $n$   
 368 evaluators; the synthetic value is obtained using Equation (5). In IDRM,  $w_{ij}$  denotes the  
 369 degree to which criterion  $i$  affects criterion  $j$ .

$$370 \quad w_{ij}^n = (\tilde{w}_{ij}^1 + \tilde{w}_{ij}^2 + \tilde{w}_{ij}^3 \dots + \tilde{w}_{ij}^n) / n \quad (6)$$

371

372 The IDRM is standardized to generate the normalized direct relationship matrix (NDM).

$$373 \quad \text{NDM} = s * \text{IDRM} \quad (7)$$

374 where  $s = \max(\sum_{j=1}^n w_{ij}^n)$  for all  $i$  from 1 to  $n$ .

375

376 After obtaining the total relation matrix, NDM is used to calculate the total interrelationship  
 377 matrix  $Y$ .

$$378 \quad \text{TM} = \text{NDM}(\text{I} - \text{NDM})^{-1}$$

379 (8)

380 where  $I$  is an identity matrix.

381

382 A causal diagram is then drawn: the sum of rows is denoted by vector  $\alpha$ , and vector  $\beta$   
 383 represents the sum of columns. The horizontal axis ( $\alpha+\beta$ ) is “prominence” and represents the  
 384 importance. The vertical axis ( $\alpha-\beta$ ) is “relation” and denotes the causal attributes. When the  
 385 value of ( $\alpha-\beta$ ) is negative, the aspect or criterion is in the effect group, and when the sum of  
 386 ( $\alpha-\beta$ ) is positive, it falls into the cause group.

$$387 \alpha = \sum_{j=1}^n NDM_{ij}, \text{ for all } j \text{ from } 1 \text{ to } n$$

388 (9)

$$389 \beta = \sum_{j=1}^n NDM_{ij}, \text{ for all } i \text{ from } 1 \text{ to } n$$

390 (10)

391

### 392 3.3 Analytical steps

393 This study implements five analytical steps.

- 394 1. Applying the Delphi method to remove the less important SCT attributes.
- 395 2. The Fuzzy DEMATEL survey instrument was used to collect the experts’ linguistic  
 396 preferences with qualitative information using Equation (1).
- 397 3. Converting linguistic preferences into TFNs according to Equation (2) and transforming  
 398 the TFNs into crisp values via Equations (3)-(5).
- 399 4. The crisp values are integrated into a relationship matrix using Equation (6).
- 400 5. Mapping the cause-effect relationship diagram via Equations (7)-(10).

401

## 402 4. Results

403 1. The Delphi method is used to remove the less important attributes. The valid attributes  
 404 are presented in Table 1.

405

406 2. The respondents follow  $\tilde{D}_n$  to compose the matrix for the linguistic preferences of each  
 407 respondent. The linguistic preference is taken from Table 3 with the scale ranging from  
 408 VLI for very low influence to VHI for very high influence.

409 **(INSERT TABLE 3 here)**

410

411 3. Converting linguistic preferences into TFNs

412 The linguistic preference is referred from Table 2 using TFNs ( $g\tilde{d}_L^n, g\tilde{d}_M^n, g\tilde{d}_U^n$ ) to  
 413 transform the results in matrix D. The TFNs are converted into crisp values ( $w_{ij}^n$ ) using  
 414 Equations (2)-(5). Table 4 presents the computational process.

415 **(INSERT TABLE 4 here)**

416

417 4. The n respondents are integrated via weights into the IDRМ using Equation (6).

418 Table 5 presents the TFNs transformed into crisp values. All the  $d\tilde{w}_{ij}^n$  crisp values from the  
 419 respondents are integrated and averaged into the IDRМ.

420 **(INSERT TABLE 5 here)**

421

422 5. The IDRМ is standardized to the NDM using Equation (7), and the NDM is used to obtain  
 423 the TM via Equation (8).

424 **(INSERT TABLE 6 here)**

425

426 Table 6 presents the TM. The horizontal axis ( $\alpha+\beta$ ) is “prominence”, and the vertical axis  
 427 ( $\alpha-\beta$ ) is “relation”. The cause-effect diagram of the aspects is drawn based on ( $\alpha+\beta$ ) and ( $\alpha-$   
 428  $\beta$ ) using Equations (9) and (10).

429 This analytical step is repeated. Table 7 presents the IDRM obtained from integrating the  
430 crisp values.

431 **(INSERT TABLE 7 here)**

432

433 Table 8 is the TM used to add the raw values into  $\alpha$  and sum the column values into  $\beta$ .

434 **(INSERT TABLE 8 here)**

435

436 Figure 1 shows that the aspects of upstream environmental processes (A2) and persuasive  
437 communication (A4) belong to the cause group, whereas consumer behavior (A1) and  
438 environmental processes (A3) fall into the effect group. The relationships among the  
439 aspects are shown in Figure 1. A2 has a medium effect on A1 and A3. Meanwhile, A4 has  
440 strong effects on A1 and A3, indicating that A4 is an important aspect to focus on. The  
441 results show that A1 and A3 do not affect A2 and A4. However, A1 shows a strong effect  
442 toward A3, whereas A3 to A1 does not have a strong effect.

443 **(INSERT Figure 1 here)**

444

445 Figure 2 shows that the main criteria for providing SCT solutions lie within the cause group,  
446 including health arguments (C11), authenticity arguments (C12), elitist arguments (C13),  
447 product recycling (C10), product reuse (C9), product labeling (C7), and environmentally  
448 friendly attitudes (C3). These criteria are important for the industry in terms of solutions  
449 for sustainable food consumption transition.

450 **(INSERT Figure 2 here)**

451

## 452 **5. Implications**

### 453 *5.1 Theoretical implications*

454 The cause aspects are persuasive communication (A4) and upstream processes of  
455 environmental governance (A2). SCT has problems communicating what the manufacturers  
456 want to achieve with their sustainable products with how consumers react to them. This  
457 disconnect causes an unsuccessful transition due to nonenvironmentally friendly behavior by  
458 consumers. Communication is vital and must be done by the appropriate group of  
459 stakeholders. In addition to communication, the behavior of the manufacturers in governing  
460 the environment also plays a role in achieving SCT. Providing sustainable products and  
461 information are the basic responsibilities to sustain the transition process.

462 Prior studies highlighted the importance of communication, where the role of persuasive  
463 communication involves building awareness and increasing knowledge by stressing who  
464 delivers the message (Annunziata et al., 2019; Vega-Zamora et al., 2019). Unsuccessful  
465 communication results in insufficient information or knowledge about SCT received by  
466 consumers, which affects behavior. Consumer behavior is the main indicator of the  
467 effectiveness of communication. Well-communicated information enhances SCT knowledge  
468 (Nikolaou and Kazantzidis, 2016). Persuasive communication has a strong effect on how  
469 consumers govern their environment and behave sustainably. Persuasiveness is achieved  
470 through the right choice of communicator, that is, who delivers the information. In regard to  
471 choosing the communicator, it is not about sending the person who has the main position in  
472 the firm or institution to the front but selecting the best person to deliver the information.  
473 The level of awareness and knowledge is effectively increased through the right choice of  
474 communicator. Increased knowledge correlates with sustainable consumer behavior.

475 Upstream processes of environmental governance affect the downstream processes  
476 and sustainable behavior of consumers. Contextually, the upstream processes include  
477 activities by the firm, such as designing products, using sustainable material for packaging,  
478 and labeling, in an attempt to reduce the negative environmental impact (Spaargaren and van  
479 Koppen, 2009). Manufacturers have the responsibility to ensure that products are sustainably  
480 processed in terms of production and marketing in order to convince consumers. The  
481 sustainable activities by the manufacturers, especially in the production and marketing  
482 processes of products, affect how consumers govern their environment and behave  
483 sustainably, which begins from the purchasing decision and ends at reusing or recycling waste  
484 in the postconsumption stage. High awareness among consumers is key to the success of SCT  
485 (Echegaray, 2016; Li et al., 2016; Dong et al., 2020). For instance, the effects of higher  
486 awareness and better knowledge on consumer attitudes and behavior improve SCT by  
487 reducing waste production and making littered waste safer for the environment.

488

### 489 *5.2 Industrial implications*

490 This study provides practical solutions for the food and beverage industry in Indonesia to  
491 improve the process of achieving SCT. *Environmentally friendly attitude* (C3) plays a role in  
492 achieving SCT in terms of how consumers in general act sustainably in all their activities, not  
493 only when consuming products but also managing waste in the postconsumption stage and  
494 taking care of the environment around them. Manufacturers should focus their sustainability  
495 programs on how to change consumers' attitudes because sustainable policies and products  
496 alone are not sufficient to achieve SCT if consumers do not maintain an environmentally  
497 friendly attitude. For instance, social marketing programs should be effective because they  
498 involve direct and physical participation by consumers, even though such programs may take  
499 a long time and involve considerable effort. The effect of such an approach is persistent in  
500 the memory of the participants because they have been personally in touch with the  
501 activities. By means of a combination of physical activities with the consumers or community  
502 and advertising campaigns, manufacturers should eventually be able to change consumer  
503 attitudes toward being more environmentally friendly.

504 *Product labeling* (C7) is a proactive action by manufacturers to improve SCT by  
505 informing consumers about the products that they choose to consume. Consumers'  
506 understanding of what they consume plays a role in the transition process. For instance, a  
507 product that does not come with sustainability labeling may cause consumers to act  
508 unsustainably due to a lack of information about the product. The information on the  
509 packaging helps consumers to know what they are about to buy or use and whether their  
510 decision to consume the product has a positive or negative impact on the environment.  
511 Moreover, a niche community of consumers chooses to buy and use only the products that  
512 are the least harmful to the environment. This group represents an opportunity for  
513 manufacturers to take action to educate consumers while simultaneously appearing to be  
514 responsible for the environment. Sustainability labeling is presented in the form of either  
515 verbal or nonverbal information. The former includes a textual description, while the latter  
516 includes logos, images, and use of color associated with sustainability. Such labeling must be  
517 easy to read and to understand.

518 *Authenticity arguments* (C12) increase consumers' trust in sustainable products. An  
519 authenticity argument is a statement from an association or union representing the industry.  
520 This type of argument is used as part of a communication strategy to convince consumers  
521 about SCT. The choice of communicator should be based on the expected effect of the

522 communication process. An association or union of an industry or manufacturers is an  
523 effective means of persuading consumers because it is not biased toward a specific firm,  
524 brand or product but rather focuses on the whole industry. In other words, the argument is  
525 not attached to promoting a specific firm but to responding to an issue affecting the entire  
526 industry. Such an unbiased argument is persuasive because it is free from commercial  
527 purposes or causes. If a firm publicly communicates about its sustainable products, it will be  
528 considered an advertisement or biased promotion, which is unlikely to occur when an  
529 association or union that represents the industry does the communication.

530 *Product reuse (C9)* is a downstream process of governing the environment by  
531 consumers. Reusing a product after consumption means not having to perform any kind of  
532 treatment to transform the product, in contrast to product recycling. Thus, consumers'  
533 product reuse appears to be more sustainable than recycling because it indicates that  
534 consumers understand the effect of not producing waste. Less waste goes unused; thus, less  
535 harm is done to the environment. The problem in industry is that considerable waste has  
536 been produced and left unused. Stakeholders, including manufacturers, government and  
537 communities concerned about social and environmental issues, must take actions to  
538 encourage consumers who do not yet know how to properly handle their waste. Product  
539 reuse can also be encouraged through participatory programs initiated by manufacturers. For  
540 instance, a product that has been used by a consumer is returned to the firm via a special box  
541 placed in a public space or returned directly to the store, and in exchange, a reward is given.  
542 SCT is more effective because the used product does not go to waste but is reused for either  
543 refilling or other purposes.

544 *Product recycling (C10)* is initiated by consumers. Recycling a product is relatively less  
545 sustainable than reusing one since it requires more energy and resources to transform the  
546 product into a raw material for future use. One indicator of success is low waste production.  
547 By means of product recycling, waste is reduced, and the use of first-use raw material is  
548 suppressed. However, consumers' acquisition of the knowledge and skills required to  
549 participate in recycling may represent their own problem, although product recycling  
550 contributes to SCT. Relevant stakeholders should play active roles. For instance, social  
551 marketing programs should be initiated by manufacturers in collaboration with the  
552 government and environment-focused community. A series of workshops could be  
553 implemented to change how consumers interact with waste in their daily lives. Some  
554 communities in Indonesia have set a working example by collectively recycling plastic  
555 packaging into useful and commercial items, such as shopping bags and purses. This phase of  
556 transition works even better when the recycled products are valuable and thus benefit the  
557 community through sales profits.

558 Five solutions are presented to solve the problems often found in SCT. Manufacturers  
559 in the packaged food and beverage industry should consider these solutions as part of their  
560 long-term sustainability strategy. Achieving a successful SCT is not the responsibility of a  
561 single stakeholder but of all stakeholders. Consumers play a role in the transition process  
562 because there is a continuation of sustainable vision delivery from upstream to downstream.  
563 The successful implementation of this set of solutions should eliminate the problems related  
564 to SCT, especially in the packaged food and beverage industry in Indonesia.

565

## 566 **6. Conclusions**

567 The transition from unsustainable consumption to sustainable consumption is the focal  
568 point of SCT. Problems in achieving a successful transition are found not only at the niche and

569 regime levels but also often at the landscape level. To explore the transition process and find  
570 solutions to these problems, this study assesses a set of attributes that include consumer  
571 behavior, upstream and downstream processes of environmental governance, and  
572 persuasive communication. From a theoretical perspective, EMT and TMT are used to solve  
573 problems found in the transition process. In return, the findings of this study contribute to  
574 theory and practice in the form of knowledge and practical suggestions. The DEMATEL  
575 method is used to determine the interrelationships among the attributes. This method is used  
576 because it enables qualitative information to be assessed by transforming it into quantitative  
577 data. The qualitative information is obtained from experts. The interrelationships of the  
578 attributes represent the contribution of this study to the theory and practice focused on  
579 determining and finding solutions to SCT, especially in Indonesia.

580         Manufacturers are responsible not only for producing sustainable products but also for  
581 educating consumers to be environmentally friendly, which has long-lasting effects on SCT.  
582 Manufacturers inform consumers via product sustainability labeling to augment consumers'  
583 awareness of the sustainability of the products they buy and consume. Another way to  
584 educate consumers about SCT is through authenticity arguments, which are not solely the  
585 responsibility of the firm but rather that of an association or union of the industry. This  
586 approach to communication is considered persuasive because it is unbiased to a certain firm  
587 or brand, in contrast to advertisements or advertorials. Consumers can perform product  
588 reuse and product recycling to reduce waste. Manufacturers, government and social  
589 organizations are responsible for educating consumers about these strategies. Regular  
590 workshops should be conducted. Recycling is relatively less responsible than reusing due to  
591 the use of energy and resources to transform the waste back into raw materials. If  
592 strategically implemented, this set of solutions should improve the SCT in the food and  
593 beverage industry in Indonesia.

594         The interrelationships of the aspects in this study enrich SCT from a theoretical  
595 perspective. These aspects include persuasive communication, upstream and downstream  
596 processes in governing the environment, and consumer behavior. Problems with SCT are  
597 related to how consumers do not behave sustainably in their consumption. This study found  
598 that persuasive communication, especially from a union or association of manufacturers or  
599 industry, improves consumer behavior and governance of the environment. Arguments from  
600 experts other than manufacturers are also persuasive to educate or convince consumers  
601 about the importance of being sustainable. The upstream processes of environmental  
602 governance also impact the affected aspects. For instance, manufacturers should improve the  
603 sustainability labeling of packaging. Labels are sometimes either unnoticeable or difficult to  
604 understand by consumers with low knowledge of the differences in sustainability labels and  
605 logos. The use of sustainable terms or designs should also consider consumers' ease of  
606 understanding. When consumers find it easy to understand sustainable information on a  
607 product, SCT improves.

608         The limitations of this study include the number of attributes, the scope of industry,  
609 and the number of respondents included. The number of aspects is limited to five, and there  
610 are fourteen criteria. This study considered 13 experts in the packaged food and beverage  
611 industry in Indonesia; therefore, the results may not be generalizable to other industries and  
612 countries. Future studies may consider a larger number of attributes to obtain more detailed  
613 interrelationships among the aspects and a set of main criteria. Future studies may involve  
614 more experts from the industry. Future studies exploring SCT should enrich the theory and  
615 provide better solutions to the problems in the industry.

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