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Toward the closed-loop sustainability development model: a reverse logistics multi-criteria decision-making analysis

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Abstract
More attention has been paid to the circular economy in recent years due to a focus on sustainability. Reverse logistics is an example of this, as it is critical for embracing and implementing the circular economy concept across supply chains. Nowadays, consumers are affecting every aspect of sustainability due to social media's exponential growth. This paper addressed a knowledge gap in sustainability and consumer behavior, which significantly impacts managerial decisions in reverse logistics, leading to reduced waste on returning products. The concept of sustainability is broadened by emphasizing specific aspects, including consumers, profit, the environment, and the company's employees. Additionally, an extended conceptual model of sustainability was proposed, discussed, and analyzed to determine the relationship between reverse logistics performance and sustainability using a brand-new linguistic interval-value hesitant fuzzy DEMATEL technique. The proposed model could be applied to various industries, including food, automotive, and electronics. To this end, the electronics and automotive industries were analyzed and compared. The findings indicated that, in the context of sustainability and to achieve more sustainable reverse logistics, consumers as a new stakeholder, in addition to other stakeholders, play a critical role. The study results could aid managers in governing reverse logistics in a circular economy ecosystem that is sustainable. Additionally, the model proposed in this paper enables policymakers and decision-makers to gain additional insights into developing a more resilient sustainable supply chain.

Keywords Circular economy · Sustainable reverse logistics · Linguistics interval-value fuzzy DEMATEL · Sustainability model

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1 Introduction

With a growing population, mass-production commodities are advancing at a rapid pace, as is global industry. Mass-production industries, such as electronics, vehicles, and airplanes, are moving toward modular design and production in response to environmental concerns, increased product durability, cleaner manufacturing, repairability, and, most importantly, the circular economy's sustainability concerns (de Dios et al., 2020; Vimal et al., 2021). Consumers frequently replace products in specific industries due to new technologies, resulting in shorter product life cycles. On the contrary, some industries have longer product life cycles due to the industries' characteristics, consumer behavior, and the low frequency with which new or disruptive technologies are introduced (Kazmi et al., 2021).

Annual waste generation rates vary by industry, necessitating various decision-making strategies aligned with the sustainability model (Moktadir et al., 2020a, 2020b). As an example, only 5% of waste generated in the cellphone industry is recycled, as there are no mandatory regulatory requirements (Chaudhary & Vrat, 2020). Researchers have stated the importance of implementing circular economy strategies and focusing more on sustainability to resolve this issue. The circular economy aims to reintroduce products that have reached the end of their useful life into the supply chain by managing end-of-life products through various processes, rather than assuming they are waste (Morseletto, 2020). By efficiently managing end-of-life or other product returns, reverse logistics practices contribute to operational efficiency and a sustainable supply chain (Phochanikorn et al., 2020). The reasons for returning products include defects, damage, dissatisfaction, or any other unspecified reason (Moktadir et al., 2020a, 2020b). To make an informed decision about maximizing the value of product returns, manufacturers thoroughly process these products.

It is customary for manufacturers to prioritize economic benefits over environmental and social benefits for product returns. On the other hand, governments made the management of these products mandatory by establishing regulatory requirements (Govindan et al., 2020). Researchers suggest that reverse logistics plays a critical role in managing product returns in achieving any company's sustainability goals (Banihashemi et al., 2019). However, there is a lack of research on reverse logistics consumer returns and disposition decisions in developing sustainable supply chain frameworks or models that incorporate the circular economy (Mangla et al., 2020; Vimal et al., 2021; Yadav et al., 2020).

Sustainability in production and consumption entails making prudent use of natural and human resources, minimizing waste, and extending the life of products. To ensure the sustainability of production and consumption, top executives implement circular economy strategies that maximize the value of available resources (Galvão et al., 2020). Reverse logistics is the process of collecting, investigating, and sorting product returns to classify them and route them back into the supply chain for further processing. The most critical decision in reverse logistics is the disposition of returned products (Rizova et al., 2020), which contributes to the supply chain's resilience and sustainability by improving its focus dimensions (Mangla et al., 2019). To this end, one of the most effective strategies that managers have recently embraced is reverse logistics to bring an open-ended sustainability concept to a close.

Reverse logistics disposition decisions significantly impact sustainability performance, either directly or indirectly, and there is a strong link between reverse logistics and sustainability (Maheswari et al., 2020). Economic performance and operational efficiency of sustainability have a significant impact on disposition decisions, where making the best disposition decision for returned products based on the industry and certain factors, such

as value recovery, product life-cycle, logistics costs, price, and demand forecast, can be influenced by these two factors (Lechner & Reimann, 2020). Alternative disposal methods include reuse, repair, refurbishment, remanufacture, material recovery, and waste management, illustrated in Fig. 1 (Thierry et al., 1995; Tibben-Lembke & Rogers, 2002). These options mostly adhere to the circular economy and sustainability principles, such as moving toward sustainable production and consumption, minimizing waste, and increasing resource efficiency through component and material extraction from returned products.

Managers must align their supply chain with their consumers, and the flow of product returns to make the best disposition decision possible. As a result, increased control over product flow, a digitalized information system, and sharing capabilities among supply chain stakeholders are required (Sarkis et al., 2020). The overall performance of reverse logistics is evaluated using economic and environmental performance metrics and consumer attention (Kazancoglu et al., 2020a, 2020b; Kazmi et al., 2021; Maheswari et al., 2020; Morgan et al., 2018). Gaining a competitive edge in the global market requires implementing a sustainability model in the circular economy era. Recent studies have emphasized the modeling technique used to assess the relationship between sustainability and the implementation, performance, operations of reverse logistics, and the disposition of returned products (Bouzon et al., 2016; Shaharudin et al., 2019).

To the authors' knowledge, few studies have incorporated consumer expectations, needs, and sentiments alongside RL's economic, environmental, and social performance in the circular economy ecosystem to ensure sustainability (Shaik & Abdul-Kader, 2018; Slomski et al., 2018). Therefore, it can be deduced that top managers should make forward and reverse supply chain decisions based on sustainability to achieve circular economy goals (Khan et al., 2021; Rajak et al., 2021).

1.1 Problem description and research gap

Compared to other industries, mass-production industries place a higher premium on consumer satisfaction. To the authors' knowledge, only a few studies on sustainability have been conducted to extend or propose a framework or model of sustainability that considers consumers in addition to economic, environmental, and social sustainability.

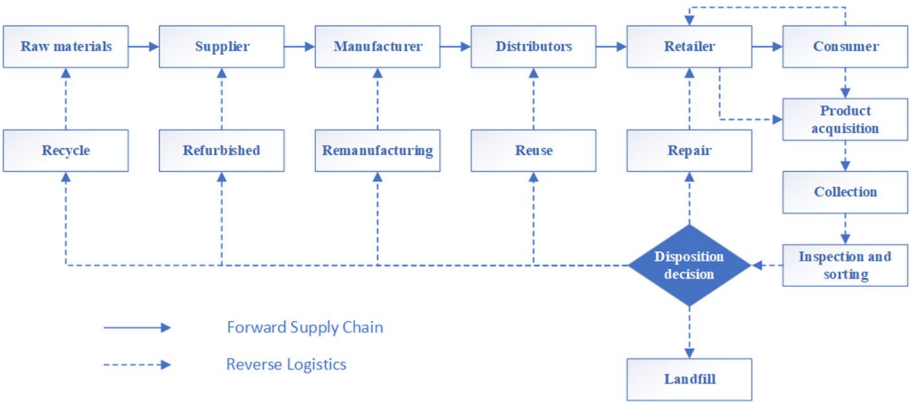


Fig. 1 Disposition decisions in RL to close the circular economy loop (enhancing (Agrawal & Singh, 2019))

Product return disposition decisions are critical for implementing a sustainable supply chain. Consumer factors and their impact on disposition decisions in reverse logistics and sustainability in the context of the circular economy ecosystem, plus the interrelationships between them, have not been examined (Rizova et al., 2020). No single study has been conducted to assess the impact of various disposition options on economic, environmental, and social aspects of sustainability (Banihashemi et al., 2019). Considering that the RL closes an open-end of sustainability and connects it to the circular economy via returned products from satisfied or dissatisfied consumers, a greater emphasis is placed on consumers as an autonomous entity in the sustainability model in this study, resulting in the model's expansion (Rajak et al., 2021).

Despite the growing popularity of social media and its increasing infiltration coefficient in developing and developed countries, the authors are unaware of any sustainability frameworks or models that place a premium on consumers as an effective stakeholder, autonomous entity, and primary production goal. Most importantly, reverse logistics managers do not place a high enough premium on consumer ideas, sentiments, and satisfaction in the context of sustainability and circular economy decision-making (Banihashemi et al., 2019). This study extends and redefines the literature's sustainability model by paying particular attention to consumers' opinions and sentiments to fill a gap in the literature.

Numerous authors have demonstrated that consumer sentiment significantly impacts supply chain managers' decision-making, and its importance is multiplying, particularly in mass-production industries (Shahidzadeh et al., 2020). Before the surge of emerging social media, sustainability models such as the triple bottom line focused on three primary goals: maximizing profit for the company, protecting the planet and green concerns, and supporting human rights. These goals were defined as three pillars: economic, environmental, and social (Omer, 2008; Tseng et al., 2020).

To this end, this study emphasizes the importance of analyzing the impact of disposition decisions on RL performance and achieving sustainability objectives, which managers must do to make informed decisions that minimize waste generation while increasing supply chain, environmental resource, human capital, and consumer behavior efficiencies.

The following questions are addressed in this study:

- *RQ1* How does the sustainability model align with the circular economy's RL performance, and how might incorporating consumers' perspectives improve the sustainability TBL framework in mass-production industries?
- *RQ2* How can consumer perspectives help to extend and strengthen the TBL model's sustainability?
- *RQ3* How could the relationship between various aspects of the TBL model's sustainability and consumer concerns be quantified?

While these questions are addressed, this paper also attempts to accomplish the following research objectives:

- Focusing on cleaner production and consumption while expanding sustainability research and practice to assist businesses and societies in becoming more sustainable in their ecosystems through incorporating consumer perspectives into supply chain decision-making processes.
- Developing strategies for 'resource management,' 'waste minimization,' and 'improving the serviceability of returned products.'

- Identifying internal and external factors affecting the operational performance of reverse logistics' disposition decisions for returned products.
- To address the literature gap, expanding the sustainability framework (TBL) is proposed by placing a greater emphasis on consumers in addition to economic, environmental, and social factors, particularly in mass-production industries, which are more consumer-facing than low-frequency production industries.
- Identifying the relationships between RL disposition decision alternatives and extended sustainability model-related (TBL) aspect attributes.

Consumer satisfaction and dissatisfaction are shown in this study to have the most significant impact on increasing profit, saving the planet, and the benefits of people to businesses' sustainability concerns. Additionally, this study demonstrates that treating a "consumer" as a distinct pillar aids RL's disposition decision, results in more sustainable supply chains in the circular economy.

The remainder of the paper is organized in the following manner: Sect. 2 reviews previous literature on circular economy and RL concepts, sustainability, and reverse flow product disposition decisions. The sustainability concept and multiple bottom lines are also discussed. Following that, the literature is reviewed to apply multi-criteria decision-making models, DEMATEL, fuzzy sets and theory, and interval-valued hesitant fuzzy sets. Section 3 details the research methodology. The methodology framework for the study is defined in three stages. The proposed model for a circular economy ecosystem's sustainable supply chain is introduced, and a novel approach to the linguistic interval-valued hesitant fuzzy (LIVHF) DEMATEL is proposed. The final part of this section discusses expert elicitation. Section 4 applies the framework to the electronics and automotive industries to analyze and validate the proposed sustainability model based on derived results. Following that, a dependence-influence chart is used to make a detailed comparison. Section 5 contains a discussion of the research. Section 6 examines the research implications, including both practical and theoretical. Finally, Sect. 7 discusses concluding remarks, research limitations, and future works.

2 Literature reviews

The primary objective of this research is to assist managers in making the best decisions possible based on the sustainability TBL model and their consumers' preferences for returning products to the RL while also addressing circular economy concerns. To this end, the literature review has been divided into three sections: "circular economy and RL," "sustainability and multiple bottom lines," and "multiple criteria decision-making," which correspond to the three primary building blocks discussed in the introduction and abstract sections. Additionally, each of the following four sections is described: "define the topic and provide context for the literature review," "establish the authors' point of view within the context of the primary research objective," "provide insight into the relationship between the topic and the primary research objective," and "identify significant flaws or gaps in existing knowledge."

Moreover, tables summarize previous works and provide context for the primary topic. For example, in the MCDM section, DEMATEL is discussed relative to other techniques. Following that, prior DEMATEL work is reviewed and discussed and why

LIVHF-DEMATEL was chosen over alternative methods. Finally, the novel idea of incorporating DEMATEL into the research objective is presented.

2.1 Circular economy and reverse logistics

Profitability, environmental, and social aspects are all identified as characteristics of circular economy concepts. However, reverse logistics disregards social concerns, as it is more concerned with profitability and the environment than with consumer concerns (Khor et al., 2020). The circular economy concept encompasses all economic, environmental, and social aspects of sustainability, referred to as the triple bottom line (TBL) approach (Elkington, 1998). Economic considerations ensure increased profits and sufficient cash (Tomić & Schneider, 2020), while environmental concerns safeguard living ecosystem capitals for the future (Asongu et al., 2020). The social component focuses on issues affecting the company and its employees, ranging from job enrichment to health care (Choi et al., 2020).

There are numerous definitions of sustainability in the literature. Nonetheless, one of the most frequently cited is "sustainability can be defined as a state of human activity that preserves the functions of the earth's ecosystems" (ISO 2019). Thus, earning profit for the company, satisfying customers and employees, and minimizing waste to save the planet are three pillars of the sustainability concept (Amirmokhtar Radi & Shokouhyar, 2021; Vimal et al., 2021).

The emergence of social media and the growing influence of consumer opinion illuminated the duality of sustainability, a reasonable price for the consumer, and satisfaction with every aspect of the ecosystem previously overlooked. As an example, a dissatisfied consumer would undermine all three of sustainability's pillars. Initially, dissatisfied customers discourage other customers from purchasing future products by expressing and amplifying negative sentiment on social media, resulting in decreased profits for the company and tarnishing the company's reputation (Koch et al., 2020). Second, dissatisfied consumers may return products to the manufacturer, resulting in additional waste and undermining consumer loyalty. Finally, dissatisfied consumers will refrain from purchasing future products from the manufacturer, and the company will eventually reduce its workforce.

However, an unsatisfactory consumer has a detrimental effect on sustainability, whereas a satisfied consumer has a beneficial impact. The three sustainability dimensions should be ranked according to their contextual relevance to align stakeholders (Galvão et al., 2020).

Sustainability is achieved through the use of an open-ended system. On the other hand, the circular economy eliminates waste and reduces raw material consumption by implementing reverse logistics activities via a circular system. Therefore, the consumer perspective is emphasized in this study, which is often overlooked in discussions of sustainability and circular economy, thereby filling in knowledge gaps. Consumers are added in this paper as a new bottom line to create a holistic sustainability model to close an open-ended sustainability system. Furthermore, reverse logistics practices impact the four pillars of the extended sustainability model and are influenced by various internal and external factors identified in the literature. Sustainability is defined with or without the use of reverse logistics. However, in the circular economy era, sustainability and reverse logistics are inextricably linked.

The authors of (Rogers & Tibben-Lembke 1999) discussed the motivations for implementing reverse logistics in a business for the first time in the literature. When consumers stop using purchased products, reverse logistic activities begin. Thus, consumers

emerged as a new stakeholder in the sustainability and circular economy concepts. The flow of returned products in reverse logistics is depicted in Fig. 1 through dotted lines. As an example, inspection and sorting are required before disposition decisions. Numerous researchers have identified alternative disposition strategies such as repair, reuse, recycling, remanufacture, refurbishment, or landfill. The significance of these alternatives is demonstrated through observed facts (Hazen et al., 2012). Even though recycling and disposal increase economic performance, repair and reuse increase the environmental performance of RL (Sadrnia et al., 2020).

Several additional considerations and factors must be considered to align the sustainability concept with the RL and circular economy. While it is preferable to remanufacture or refurbish high-recovery-value products, it is beneficial to recycle low-recovery-value products (Gobbi, 2011). The quality and quantity of returned products and the extracted value are also critical factors in making the best decision in RL (Sadrnia et al., 2020). Numerous internal and external factors influencing reverse logistics disposition decisions have been identified in the literature. A literature review was conducted by extending the sustainability model, and twelve critical factors influencing RL performance were identified based on input from industry experts (Agrawal & Singh, 2019; Agrawal et al., 2016; Banihashemi et al., 2019). Table 1 summarizes the internal and external factors that influence disposition decisions and RL performance.

As a recent significant work, (Goyal et al., 2021a) assessed the critical success factors to achieve CE. They stated that adopting sustainable consumption and production linked with CE can help in solving the issues of increasing pollution and increased consumption of resources, which ultimately will result in improved quality of life.

2.2 Sustainability and multiple bottom line

The term "triple bottom line (TBL)" was coined in 1998 by John Elkington, a sustainability and corporate responsibility expert (Elkington, 1998). Since then, managers of leading companies have placed a premium on profit, the environment, and people, to the extent that they report their sustainability assessments using a triple bottom line framework. Businesses strive to balance "environmental safety" and "employees' needs" with "financial and commercial profit" to increase their success and gain a competitive edge over their rivals (Hourneaux et al., 2018; Tseng et al., 2020). There are still very few definitions of "multiple bottom lines" in the literature. Several parameters from the literature are introduced in this study to provide a new bottom line for the context.

Regarding the circular economy concept, the proposed extended sustainability model extends the triple bottom line where consumers are added as a new bottom line to the existing components while also considering alternative RL implementation and disposition decisions, plus internal and external factors affecting RL performance. Rather than focusing exclusively on profit, the environment, and people, researchers have extended TBL to include factors that are not only intrinsic to the business but also satisfy values beyond "spirituality" (Inayatullah, 2005; Sawaf & Gabrielle, 2014), "ethics," and "purpose" (Taback & Ramanan, 2013).

2.2.1 Concept of the multiple bottom line

The term "multiple bottom lines" refers to a concept that accurately defines components contributing to the ecosystem's sustainability goals (Taback & Ramanan, 2013).

Table 1 Internal and external factors affecting the RL implementation and disposition decisions

	Internal and external factors	Code	Reference	Description
External	Consumer behavior	EF1	Jack et al. (2010), Julianelli et al. (2020) and Mengistu and Panizzolo (2022)	Reverse logistics performance is influenced by consumer behavior. More quantity of product returns pushes managers to choose to recycle while the quality of returned products forces them to remanufacture. More informed consumers return more products of better quality and more quantity, which leads to waste minimisation
	Business environment	EF2	Li et al. (2018) and Phochanikorn et al. (2020)	To make the best disposition decision, the business environment may facilitate selling remanufactured and refurbished products. Companies are more satisfied if rivals and other stakeholders are involved in reverse logistics activities
	Existing practices	EF3	Chaudhary and Vrat (2018) and Vardopoulos et al. (2020)	Existing practices might act as a facilitator and as a barrier in disposition decisions
	Environmental conditions	EF4	Asees Awan and Ali (2019), Dowlatshahi (2005), and Mengistu and Panizzolo (2022)	Making the best decision in the disposition of the returned products in reverse logistics hugely affects the environmental conditions. Choosing the right disposition, which is compatible with the sustainability aspects, aid in reducing waste generation, and use the most out of returned products
	Supply chain integration	EF5	Goyal et al. (2021a), Hazen et al. (2012) and Jayasinghe et al. (2019)	Implementing supply chain integration is a strategic decision that is made by managers. It is also needed to assess the existing supply chain's infrastructure to integrate reverse logistics activities
	Government rules and regulations	EF6	Chaudhary and Vrat (2020), Kazancoglu et al. (2020a, 2020b), Maheswari et al. (2018) and Mengistu and Panizzolo (2022)	Government rules and regulations shape the business environment and even push companies to make or do not make a specific disposition decision

Table 1 (continued)

	Internal and external factors	Code	Reference	Description
Internal	Product value	IF1	Gobbi (2011), Goyal et al. (2021a), Julianelli et al. (2020), Mengistu and Panizzolo (2022) and Sharma et al. (2016)	Product value is a factor that is important to RL managers. Managers would like to recycle low-value products, while remanufacturers are mostly preferred for high-value ones
	Reverse logistics costs	IF2	Shaik and Abdul-Kader (2018)	RL costs comprise of collection, processing, logistics, and retrieval cost of the activities. The cost–benefit analysis of RL is often used in the decision-making process
	Quantity of retuned products	IF3	Guide and Van Wassenhove (2001) and Sadrnia et al. (2020)	The quantity of returned products plays a vital role in RL managers. In the case of a high quantity of returned products, managers prefer to refurbish and remanufacture
	Quality of returned products	IF4	Ardeshirilajimi and Azadivar (2015), Chaudhary and Vrat (2020) and Sadrnia et al. (2020)	The quality of the returned products is related to the consumers' awareness and intention. Some companies encourage their consumers by changing programs, which leads to attaining a high quality of returned products
	Recapturing value	IF5	Chaudhary and Vrat (2020) and Maheswari et al. (2020)	As recapturing value is related to the company's economic benefit, it is significantly impacting the RL disposition decision. A low value of recapturing from products would make the manufacturer reluctant to remanufacture or refurbish

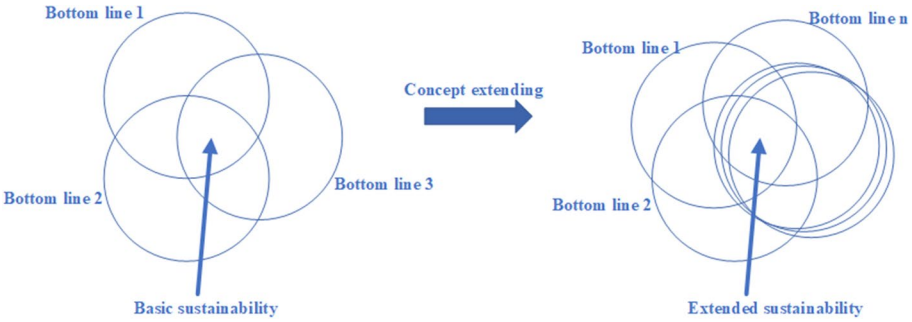


Fig. 2 Concept of extending sustainability model (Cagno et al., 2019)

Table 2 Different perspective of sustainability bottom lines

Point of view	Bottom line 1	Bottom line 2	Bottom line 3	Bottom line 4
Triple bottom line	Economic	Environmental	Social	–
Purpose/Goal	Company's profit	Green planet	Company's people	Consumers' rights and satisfactory
Stakeholder	Shareholders	The planet	People	Consumers
Happiness	Manager and shareholders	The planet	People	Consumers

Consumers are proposed in this study as a new component that contributes to the circular economy ecosystem and the triple bottom line's objectives, taking into account the mass-production ecosystem in the emerging era of social media and more engaged consumers, in addition to the triple bottom line's goals. With the rapid pace of change, monitoring and identifying newborn or emerging purposes that should be satisfied within the ecosystem is critical. The addition of a fourth or extra bottom line complicates business activities and concerns for supply chain strategic decision-making and adds more components to the decision-making process (Sawaf & Gabrielle, 2014). The concept of extending the sustainability model by including multiple bottom lines in the ecosystem is illustrated in Fig. 2.

As Table 2 demonstrates, in addition to the "purpose/goal," "happiness" and "stakeholder" are two distinct points of view. Sustaining supply chains is contingent upon the happiness of all ecosystem stakeholders. In a mass-production ecosystem, the most important stakeholders are the 'managers and shareholders of the company,' the 'planet or the environment,' the 'company's employees,' and the 'consumers or buyers,' whose happiness is dependent on the maximization of their respective benefits, which are 'shareholders profit,' 'mitigate damage to the planet,' 'motivate force labor of the company,' and 'consumers satisfaction.' By incorporating a fourth or additional bottom line, the business improves its resilience and sustainability within the ecosystem (Inayatullah, 2005).

As a significant work, (Mengistu & Panizzolo, 2022) analyzed the indicators used for measuring industrial sustainability in the triple bottom line framework. They identified 1041 factors, 290 for economic, 341 for social, and 410 for environmental. The indicator set was designed to measure the financial performance of industrial sustainability across a number of aspects, including financial benefits, costs, market competitiveness, resources, emissions, wastes, employees, customers, and community. In order to contribute toward

achieving sustainable development goals, the different indicators are linked to organizational goals.

2.2.2 Research gap in sustainability and reverse logistics

While there is a research gap in the literature regarding the addition of multiple bottom lines to the existing sustainability model, particularly the consumer aspect of reverse logistics in the circular economy ecosystem, a framework is proposed in this study for extracting the attributes of each bottom line in order to quantify their impact via added bottom-line analysis. The framework is based on prior research and expert judgment regarding the intended ecosystem's characteristics.

As illustrated in Table 3, only a few studies have been conducted on sustainability, emphasizing the consumer and profit, the environment, and people. However, several studies associate disposition decisions with just three aspects of sustainability to assess and improve a company's performance. The authors of (Shahidzadeh et al., 2020) proposed a framework for extracting consumers' opinions from social media and correlating it to disposition decision-making in real-world situations by measuring consumers' bottom lines. Additionally, they demonstrated that considering consumers' perspectives improves RL's economic performance by maximizing value recapture, its environmental performance by reducing waste, and finally, its consumer performance by reducing consumer complaints.

For the first time in the literature, a framework is proposed in this study for reverse logistics that incorporates all facets of sustainability, including consumer, disposition decision alternatives, and internal and external factors.

2.2.3 Identifying extended sustainability model attributes

Reversing material, financial, and information flows from consumers to manufacturers emphasizes the importance of the fourth pillar. In an optimized circular economy, the fourth purpose of the business is to facilitate the flow of material, money, and information from the point of consumption to the point of origin, as well as to minimize waste through strategic decisions such as increased consumer engagement and tactical activities such as recycling (Amirmokhtar Radi & Shokouhyar, 2021; Kazmi et al., 2021).

The authors of (Agrawal & Singh, 2019; Henri, 2008; Hourneaux Jr et al. 2018) propose distinct metric attributes for reverse logistics and circular economy sustainability components. Furthermore, the researchers examined the impact of aggregate disposition decisions on reverse logistics performance from a triple bottom line sustainability perspective. Table 4 summarizes the extended sustainability model's measurement attributes based on prior research and categorizes them according to four distinct aspects of sustainability. A literature review was conducted to identify multiple bottom-line characteristics, where experts judged the final selection of each bottom-line feature. The experts defined four primary purposes as "profit," "planet," "people," and "consumer," which have the most significant impact on sustainability and disposition decisions in RL. It is worth noting that experts identified additional objectives such as "ethics," "process," "technology," and "culture." They did not, however, collaborate on these objectives within the circular economy ecosystem.

Table 3 The literature gaps amidst existing sustainability model, multiple bottom lines, and reverse logistics theories

Previous study	Disposition decision	Internal and external factors	Profit	Planet	People	Consumer
Rogers and Tibben-Lembke (1999)	✓	✓	✓			
Morseletto (2020) and Rizova et al. (2020)	✓		✓	✓		
Slomski et al. (2018)	✓		✓	✓	✓	
Khor et al. (2020), Maheswari et al. (2020) and Moktadir et al. (2020a, 2020b)			✓	✓	✓	
Koch et al. (2020) and Sadrnia et al. (2020)						✓
Galvão et al. (2020)			✓	✓	✓	✓
Bouzon et al. (2016), Raza (2020), Shaik and Abdul-Kader (2014)		✓	✓	✓		
Gobbi (2011), Govindan and Bouzon (2018) and Phochanikorn et al. (2020)	✓	✓				
Agrawal and Singh (2019), Banihashemi et al. (2019) and Prajapati et al. (2019)		✓	✓	✓	✓	
Shahidzadeh et al. (2020)			✓	✓		✓
The ProposedModel (2021)	✓	✓	✓	✓	✓	✓

Table 4 The measuring attributes of four different aspects of the extended sustainability model

Economics	Code	Related references	Environmental	Code	Related references	Social	Code	Related references	Consumer	Code	Related references
Sustainability performance bottom line and subfactors											
Return on investment (ROI)	ECO1	Banihashemi et al. (2019), Cagno et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)	Minimum energy consumption	ENV1	Henri (2008), Hourneaux Jr et al. (2018), Nikolaou et al. (2019), Omer (2008) and Fan et al. (2020)	Community complaints	SOC1	Cagno et al. (2019)	Price	CON1	Alkitbi et al. (2021)
Recapturing value	ECO2	Chaudhary and Vrat (2020) and Lsaputri et al. (2020)	Minimizing use of raw materials	ENV2	Henri (2008), Hourneaux Jr et al. (2018) and Fan et al. (2020)	People health and safety	SOC2	GRI (2020; Hourneaux Jr et al. (2018) and Lsaputri et al. (2020)	Aftersales services	CON2	Hourneaux Jr et al. (2018)
Logistics cost minimisation	ECO3	Lsaputri et al. (2020)	Transport optimization	ENV3	Banihashemi et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)	Shareholders participation	SOC3	Agrawal and Singh (2019) and Banihashemi et al. (2019)	Promotions	CON3	Fanelli and Romagnoli (2020)
Recycling efficiency	ECO4	Cagno et al. (2019) and Chaudhary and Vrat (2018)	Reduction of packaging	ENV4	Agrawal and Singh (2019)	Employment stability	SOC4	GRI (2020) and Hourneaux Jr et al. (2018)	Friendly features	CON4	Alkitbi et al. (2021)
Annual sales of remanufactured products	ECO5	Agrawal and Singh (2019) and Liu et al. (2018a, 2018b)	Use of recycled material	ENV5	Chaudhary and Vrat (2018, 2020)	Donation to community	SOC5	Agrawal and Singh (2019)	Appearances	CON5	Alkitbi et al. (2021)

Table 4 (continued)

Economics	Code	Related references	Environmental	Code	Related references	Social	Code	Related references	Consumer	Code	Related references
Cost of disposal	ECO6	Cagno et al. (2019)	Waste reduction	ENV6	Cagno et al. (2019), Lsaputri et al. (2020); Nikolaou et al. (2019) and Balali and Stegen (2021)	Employee benefits	SOC6	Cagno et al. (2019)	Reputation of brand	CON6	Lang (2020)
Operating income*		Henri (2008) and Hourneaux Jr et al. (2018)	Materials efficiency variance*		Henri (2008) and Hourneaux Jr et al. (2018)	Employee satisfaction*		Banihashemi et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)	Number of warranty claims*		Alkitbi et al. (2021), Henri (2008) and Hourneaux Jr et al. (2018)
Sales growth*		Banihashemi et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)	Biodiversity*		GRI (2020); Hourneaux Jr et al. (2018) and Østergaard et al. (2020)	Training and education*		GRI (2020) and Henri (2008)	Number of customer complaints*		Banihashemi et al. (2019) and Henri (2008) and Hourneaux Jr et al. (2018)
Return-on-equity (ROE)*		Banihashemi et al. (2019) and Henri (2008)	Emissions, effluents, and waste (*)		Banihashemi et al. (2019), GRI (2020), Hourneaux Jr et al. (2018) and Østergaard et al. (2020)	Diversity and equal opportunity (*)		GRI (2020) and Hourneaux Jr et al. (2018)	On-time delivery (*)		Henri (2008) and Hourneaux Jr et al. (2018)

Table 4 (continued)

Economics	Code	Related references	Environmental	Code	Related references	Social	Code	Related references	Consumer	Code	Related references
Net cash flows*		Banihashemi et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)	Environmental compliance*		GRI (2020) and Hourneaux Jr et al. (2018)	Non-discrimination*		GRI (2020) and Henri (2008)	Customer response time*		Henri (2008) and Hourneaux Jr et al. (2018)
Cost per unit produced*		Henri (2008) and Hourneaux Jr et al. (2018)				Child labour*		GRI (2020) and Hourneaux Jr et al. (2018)	Survey of customer satisfaction*		Banihashemi et al. (2019), Henri (2008) and Hourneaux Jr et al. (2018)
Market share*		Hourneaux Jr et al. (2018)				Forced and compulsory labour*		GRI (2020); Hourneaux Jr et al. (2018)	Customer privacy*		GRI (2020) and Hourneaux Jr et al. (2018)

* These items have not been selected by the experts

2.3 Decision-making trial and evaluation laboratory

Multiple criteria decision making (MCDM) is a technique for analyzing various multivariate situations, ranging from real-world problems to business decisions, using real-valued crisp data. However, it is challenging to obtain crisp data in practice.

A decision-maker must weigh both tangible and intangible criteria when determining the best alternatives. In the process of selecting options, a multi-criteria decision-making (MCDM) tool is frequently used. Numerous MCDM techniques have been proposed, including the analytic hierarchy process (AHP), the analytic network process (ANP), and techniques for ordering preferences according to their similarity to the ideal solution (TOPSIS). Each method has its own set of applications due to its inherent limitations and disadvantages (Goyal et al., 2021b; Liu, Cheng et al., 2018a; Liu, Deng et al., 2018b).

DEMATEL was used in this study to effectively assess the total relationships and construct a cause-and-effect map between system components classified by type and severity, as scoring the interrelationships between identified attributes was sought while maintaining a graphical representation of the features. DEMATEL has been successfully used to solve MCDM problems in a wide variety of fields. Thus, DEMATEL was used in this study to calculate the prominence of various attributes while illustrating decision-makers maps. Numerous researchers have attempted to solve the problem of selection in an uncertain environment. Several methods are proposed, including fuzzy theory, a highly efficient tool for dealing with incomplete data (Liu, Cheng et al., 2018a; Liu, Deng et al., 2018b; Shaik & Abdul-Kader, 2018).

As (Si et al., 2018) analyzed and reviewed more than 300 papers published in the literature, we benefit from extracted insight into selecting fuzzy DEMATEL for the research method which is best fitted to the paper scope.

The DEMATEL method was used to decipher the complex structure of causal relationships among the criteria. The DEMATEL method is illustrated in Fig. 3. The analysis of the factors' interrelationships results in a cause-and-effect diagram and an assessment of the factors' importance. The findings shed additional light on the study's structure and problem (Li & Tzeng, 2009; Wu & Tsai, 2011). Due to its compatibility with various real-world problems, the fuzzy extension of the DEMATEL method has been more widely used. Among these fuzzy extensions, hesitant fuzzy sets have garnered considerable attention for their superior treatment of uncertainty caused by the membership of an element's uncertainty degree in a fuzzy set (Si et al., 2018).

Numerous extensions to DEMATEL have been developed and implemented by researchers. Fuzzy sets, such as Type-1, Type-2, triangular, trapezoidal, intuitive, and t-norm, can deal with data uncertainty more effectively than crisp numbers (Goyal et al., 2021b; Si et al., 2018). The decision-makers would instead express their opinions in linguistic terms than quantify them precisely with a crisp number. A novel version of the hesitant fuzzy set is proposed in this study by incorporating linguistic terms into the interval-valued hesitant fuzzy DEMATEL technique, which allows experts to select multiple options in linguistic

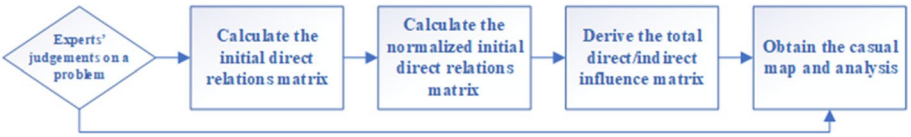


Fig. 3 The steps of the DEMATEL method

terms to add more consistency and integrity to real-world situations. The methods for dealing with uncertainty, as well as the DEMATEL, are summarized in Table 5.

As a significant research on DEMATEL review, (Si et al., 2018) analyzed a total of 346 papers published in the international journals between 2006 and 2016, and the papers were categorized into five categories: classical DEMATEL, fuzzy DEMATEL, grey DEMATEL, and ANP-DEMATEL (analytical network process-DEMATEL). Researchers benefit from their review of DEMATEL as it provides useful insight into possible directions for future research.

The relationship between the proposed sustainability TBL model, consumer concerns, and RL alternatives for returning products was quantified, ranked, and visualized. The DEMATEL could ensure that all limitations and considerations identified as attributes are met, and managers would make the best decision regarding product returns. This novel idea would reassure managers that other TBL pillars of sustainability would be satisfied by addressing consumers' concerns and that ultimately the best RL disposition decision would be made.

3 Materials and methods

This section is divided into two distinct parts. Initially, an overall view of the study is presented, beginning with a literature review on four major topics: sustainability, RL, and circular economy, as well as multi-criteria decision-making methods. Following that, the attributes that comprise both the TBL model and the consumers' perspective are identified. Afterward, the proposed model is applied to two significant mass-production industries: electronics and automotive. Finally, a discussion regarding the findings and conclusion is compiled.

In the following section, a model is proposed to assist managers in selecting the best option for product return based on the sustainability of the TBL model and circular economy theory and consumer factors that are significant in mass-production industries. Section 3.3 details how LIVHF-DEMATEL ensured that the TBL and consumer attributes were satisfied simultaneously and recommended the best return policy in RL. Section 3.4 discusses the process by which experts select industries. Finally, Fig. 6 illustrates the detailed structure of the proposed novel framework, which can aid managers in selecting the optimal return options for products in RL.

3.1 Methodology framework of the research

The proposed study framework is depicted in Fig. 4, which is divided into four phases. The first phase involves examining related literature on the 'circular economy, reverse logistics, and sustainability, as well as the 'Decision making trial and evaluation laboratory (DEMATEL)' topics. The second phase of the study identified and classified the critical factors affecting reverse logistics performance and decision making through a literature review and expert judgment. Following that, sustainability factors and measuring subfactors/attributes were identified and classified for managers to consider during decision-making processes, where experts selected the most significant subfactors and features.

A novel Linguistics Interval-Value Hesitant Fuzzy DEMATEL framework for accounting for expert opinion hesitancy has been proposed. The third phase evaluated the circular economy's sustainable supply chain. It addressed a knowledge gap by plotting and

Table 5 Comparison of DEMATEL combining with theories regarding their capabilities to deal with uncertainty

Theories	References	Manages intra- and inter-personal hesitancy	Needs any assumptions	Handles incomplete assessments and total ignorance	Manages additional information from experts	Flexibility in representing data	Compatibility with linguistics terms
Stochastics	Tamura et al. (2006) and Tamura and Akazawa (2005)	No	Yes	No	Yes	No	No
Ordinary Fuzzy Sets	Hiete et al. (2012), Suo et al. (2012) and Suzan and Yavuzer (2020)	No	Yes	No	No	No	Yes
Intuitionistic Fuzzy Sets	Abdullah et al. (2019), Govindan et al. (2015) and Ocampo and Yamagishi (2020)	Implicitly	Yes	No	Yes	No	Yes
Interval Type-2 Fuzzy Sets	Asan et al. (2018); Dinçer et al. (2019) and Pourmand et al. (2020)	Implicitly	Yes	Yes	Yes	Yes	Yes
Evidence Theory	Zhou et al. (2017)	No	Yes	Yes	Yes	Yes	No
Grey Theory	de Campos et al. (2020), Haleem et al. (2019), Rajesh and Ravi (2015), Tian et al. (2019) and Xia et al. (2015)	No	Yes	No	No	No	No
2-Tuple Fuzzy Linguistic	Goyal et al. (2021b), Liu et al. (2015), Quader et al. (2016) and Zhang et al. (2020)	No	Partly	No	No	No	Yes

Table 5 (continued)

Theories	References	Manages intra- and inter-personal hesitancy	Needs any assumptions	Handles incomplete assessments and total ignorance	Manages additional information from experts	Flexibility in representing data	Compatibility with linguistics terms
Linguistics Interval-Valued Hesitant Fuzzy Sets (Proposed)	Zeng et al. (2019) This paper with a new approach	Yes	No	Yes	No	Yes	Yes

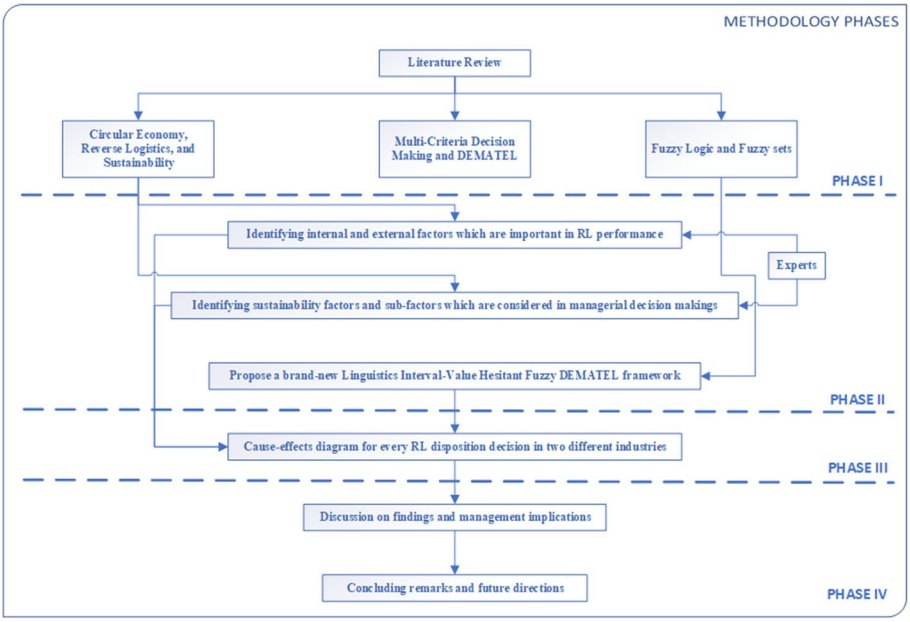


Fig. 4 Proposed research methodology framework

analyzing the interrelationship graphs for two distinct industries—electronics and transportation—and the various disposition decisions using the proposed linguistics interval-value fuzzy DEMATEL method. This analysis could provide guidance and insights to assist the manager in aligning their decision with the proposed sustainability model. By implementing the proposed framework, a multi-aspect disposition decision in reverse logistics was described for the electronics and vehicle industries to assist managers in developing a circular economy that is sustainable and compatible with all economic, environmental, social, and consumer goals.

The final phase includes the suggestion and discussion of theoretical and practical implications based on the study's findings. Furthermore, concluding remarks, future work, and several limitations are discussed.

3.2 Proposed model for the sustainable supply chain in the circular economy ecosystem

This sub-section will discuss developing a sustainable supply chain by establishing a sustainable RL model that adheres to the concept of "Multiple Bottom Lines" to achieve the circular economy's overall sustainability goals. A business must demonstrate a solid commitment to the resource, determined motivation from top management, consideration of environmental conditions in supply chain activities, and a comprehensive understanding of the challenges to implementing sustainability in a supply chain. The proposed extended sustainability model (Fig. 5) is composed of the following components: (1) various factors affecting RL disposition decisions and implementation (Agrawal & Singh, 2019; Morgan et al., 2018), (2) alternative disposition decisions (Singh & Agrawal, 2018), (3) a definition

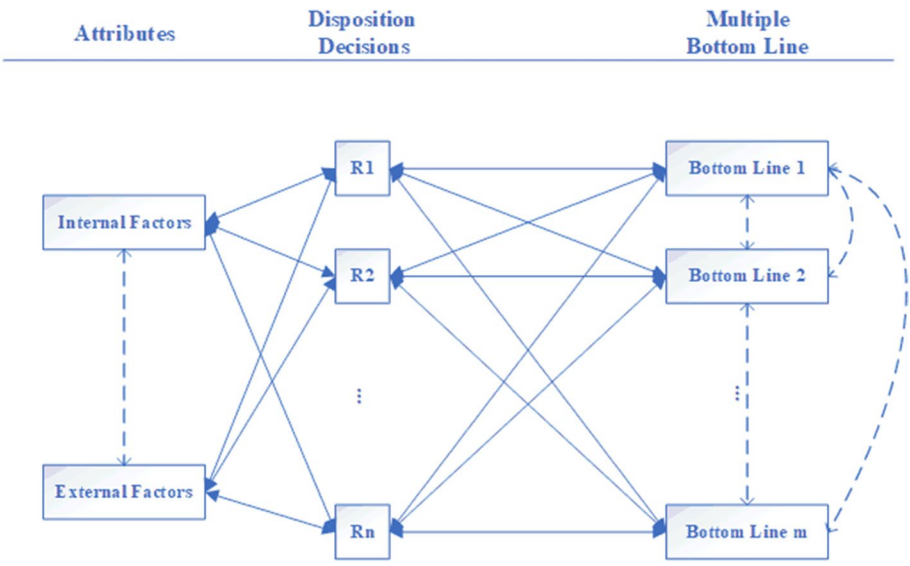


Fig. 5 The concept of the extended sustainability model concerning the disposition decisions and identified internal and external factors that are affecting different disposition decisions (combining Agrawal & Singh, 2019; Cagno et al., 2019; Tseng et al., 2020))

of sustainability with multiple bottom lines, and (4) the mutual interrelationships between 1,2,3, extracted from the experts' survey.

1. RL disposition decisions are influenced by a variety of factors (Agrawal & Singh, 2019). These factors and measuring attributes were identified through a literature review and were chosen based on expert opinion from various industries, with internal and external factors classified as shown in Table 1. These variables affect the performance and decision-making of RLs (Shaik & Abdul-Kader, 2018). It is worth noting that the magnitude of the effect varies according to industry. For example, the effect of 'government regulations and laws' on 'reverse logistics costs' is more significant in the electronic industry than in the footwear industry, owing to "more regulations imposed on the company by the government," "a greater volume of goods," and "a greater amount of pollution and generated wastes." In general, the degree to which internal and external factors interact depends on and varies by "industry." Thus, an assessment of the factors affecting industry and disposition decisions should be conducted to gain a complete picture.
2. Numerous authors in the literature have discussed various RL alternatives, as illustrated in Fig. 1, in addition to the discussion of RL disposition decision alternatives in Sect. 2.1.
3. Having a sustainable supply chain is critical for the expanding sustainability model, but managers consider various internal and external factors when making decisions. Identifying sustainable supply chain and reverse logistics purposes reveals "multiple bottom lines" that must be satisfied if managers make the best disposition decision in the context of the circular economy ecosystem's sustainable supply chain. As mentioned in Sect. 2.2.1, each bottom line serves a purpose, such as maximizing profit, minimizing waste, minimizing the risk associated with capital resources, among others, and a

discussion was made regarding the concept and theories of multiple bottom lines and sustainability being expanded.
4. Certain attributes of 'identified factors' and 'multiple bottom lines' are used as measurements. A novel LIVHF-DEMATEL based on human opinion hesitancy was proposed to denote the mutual interrelationship between the attributes of "internal and external factors," "multiple bottom lines," and "disposition decision alternatives."

Each alternative disposition in RL (as discussed in Sect. 2) could be influenced by "multiple bottom lines" with varying weights. Each bottom line has its own set of measuring attributes identified in the previous literature and was carefully selected based on the opinions of industry experts. As with internal and external factors, industry and disposition decisions should be evaluated by examining the attributes of the multiple bottom lines and their interrelationship. Expert opinions on various industries could be used to determine the degree of interrelationship between the factors surveyed. According to experts, managers, and policymakers in any industry can make the best decision regarding sustainable resource management and supply chain management in the circular economy.

Figure 5 illustrates the proposed model's concept and the mutual interrelationships between identified factors, disposition decisions, and multiple bottom lines based on the preceding discussion. Section 4 discusses a detailed comparison of two distinct industries.

3.3 The new approach, linguistic interval-valued hesitant fuzzy (LIVHF) DEMATEL

By systematically accounting for the uncertainty and hesitation induced by experts, the new linguistic interval-valued hesitant fuzzy (LIVHF) approach has been extended to the classical DEMATEL technique (via modifications of (Asan et al., 2018)). The new approach, which is based on the classic DEMATEL, consists of the following steps:

1. Defining the decision objectives and assembling an expert committee.
2. Identifying the relevant attributes based on expert opinion and relevant literature review.
3. Obtaining expert opinions regarding the two-pair comparison of attributes using a predefined linguistic term.
4. Converting the LIVHF matrix to the initial direct-relation IVHF matrix (A). This matrix contains IVHF elements in the form of $\tilde{a}_{ijk} = [\,\tilde{\gamma}^{L}_{ijk}, \tilde{\gamma}^{U}_{ijk}]$, where i, j, and k denote the rows, columns, and experts, respectively. These interval values quantify the effect of attributes on [0,1] membership degrees.
5. Calculating the IVHF matrix for direct group relationships (B). The following equation combines the membership degree assessments of experts into a single IVHF element:

$$\overset{\sim}{\beta}_{ij}^{\,L} = min_{1\le k\le K}\left(\overset{\sim}{\gamma}_{ijk}^{\,L}\right) and \overset{\sim}{\beta}_{ij}^{\,U} = min_{1\le k\le K}\left(\overset{\sim}{\gamma}_{ijk}^{\,U}\right), i = 1,2,\ldots,n; j = 1,2,\ldots,n \quad (1)$$

6. Calculation of the normalized group hesitant fuzzy matrices X^L and X^U. The group direct-relation IVHF matrix is subdivided into two sections: "lower bound" (X^L) and "upper bound" (X^U). Two different hesitant fuzzy matrices define hesitant fuzzy values. Both matrices are normalized as follows:

$$\tilde{x}_{ij}^{L} = \frac{\overset{\sim}{\beta}_{ij}^{L}}{max_{1\le i\le n}\left(\sum_{j=1}^{n}\overset{\sim}{\beta}_{ij}^{U}\right)} and \tilde{x}_{ij}^{U} = \frac{\overset{\sim}{\beta}_{ij}^{U}}{max_{1\le i\le n}\left(\sum_{j=1}^{n}\overset{\sim}{\beta}_{ij}^{U}\right)} \tag{2}$$

7. Calculating the hesitant fuzzy matrices for total relationships (T^L, T^U). These matrices capture all direct and indirect relationships between each pair of attributes using hesitant fuzzy values for the lower and upper bounds. The T^L and T^U matrices can be calculated using the crisp DEMATEL method as follows:

   (Lin & Wu, 2008) proof of *equation (3)*.

$$T = \lim_{w\to\infty}\left(X + X^2 + \cdots + X^w\right) = X(I - X)^{-1} \tag{3}$$

   where $T = [T^L, T^U]$, and I denote the identity matrix, then:

$$T^L = X^L\left(I - X^L\right)^{-1} and T^U = X^U\left(I - X^U\right)^{-1} \tag{4}$$

8. Calculating the sum of the rows D_i and columns R_i of the total relation, hesitant fuzzy matrix T. Equation (5) is used for this purpose. Following that, the mean value for each resulting interval is calculated. D_i denotes the sum of influence applied by variable i to the other variables, whereas R_i denotes the sum of influence received by variable i from the other variables.

$$\tilde{h}_1 \oplus \tilde{h}_2 = \left\{ \begin{bmatrix} \overset{\sim}{\gamma}_1^{L} + \overset{\sim}{\gamma}_2^{L} - \overset{\sim}{\gamma}_1^{L} \times \overset{\sim}{\gamma}_2^{L}, \overset{\sim}{\gamma}_1^{U} + \overset{\sim}{\gamma}_2^{U} - \overset{\sim}{\gamma}_1^{U} \times \overset{\sim}{\gamma}_2^{U} \end{bmatrix} | \overset{\sim}{\gamma}_1 \in \tilde{h}_1, \overset{\sim}{\gamma}_2 \in \tilde{h}_2 \right\} \tag{5}$$

9. The causal graph is illustrated using the $D_i + R_i$ as the horizontal axis and the $D_i - R_i$ as the vertical axis. If $D_i - R_i > 0$, the attribute belongs to the cause group, and if $D_i - R_i < 0$, the attribute belongs to the effect group. The value of $D_i + R_i$ denotes the relative importance of the attributes and can be used to rank them.

3.4 The expert elicitation

The experts in the RL's field, sustainable supply chains, and circular economy were contacted to provide technical opinions on the internal and external factors, multiple bottom-line attributes, and alternative disposition decisions, as detailed in Table 13 of Appendix A (Expert Questionnaire). Decision-makers (experts) were asked to weigh the interrelationships between identified attributes and disposition decision alternatives using the nine-level linguistic terms from Table 6. Notably, multiple choices were also permitted in cases of hesitancy, e.g., MH, H, and VH.

Additionally, experts were asked to enter a zero value if they believed no correlation between the two attributes.

The decision-makers were experts from the electronics and automotive industries with at least five years of supply chain management experience and employed by a company with more than 1000 employees. Each industry's experts were top managers, where three were chosen from a pool of ten nominees.

The profiles of the experts in the electronics and automotive industries are shown in Table 7. It should be noted that, due to a large number of two-pair comparisons, these comparisons were segmented with the help of experts to improve accuracy.

Table 6 Nine-level linguistic terms

Linguistic terms (the attribute values)	Linguistic terms (weights)	Symbols
Absolutely-poor (AP)	Absolutely-Low (AL)	s_1
Very-poor (VP)	Very-low (VL)	s_2
Poor (P)	Low (L)	s_3
Medium-poor (MP)	Medium–low (ML)	s_4
Medium (F)	Medium (M)	s_5
Medium-good (MG)	Medium–high (MH)	s_6
Good (G)	High (H)	s_7
Very-good (VG)	Very-high (VH)	s_8
Absolutely-good (AG)	Absolutely-high (AH)	s_9

The "research methodology" framework is illustrated in Fig. 6, along with the "proposed extended sustainability model" and the LIVHF-DEMATEL method, enabling more informed decision-making regarding sustainable RL.

A holistic examination of the proposed model revealed the proposed model's innovation and its scientific contributions. As discussed in the literature review, most of the research on sustainability focuses on the TBL model and the challenges associated with its implementation. However, consumer perspectives and TBL pillars were combined in this study by identifying each of their attributes in the literature. Before implementing this model, managers made decisions solely based on sustainable TBL considerations, not addressing consumer concerns.

An innovative framework was proposed to assist managers in selecting the optimal disposition decisions for returned products in RL in a systematic manner in order to reconcile the contradictory benefits of sustainability TBL pillars and consumers. Furthermore, as a scientific contribution, LIVHF-DEMATEL was introduced to address the identified problems' hesitancy and paradoxical nature, where the proposed framework ensures the optimality of decision-making regarding returned products.

4 Case study

By proposing an extended sustainability model, the study's framework was implemented in two industries. The LIVHF-DEMATEL method was used to assess and analyze the results, introduce industry benchmarks, and provide policymakers and managers with RL practices. This section examined whether or not the relationships between factors and measuring attributes vary by industry. Additionally, we examined the relationships between attributes by making the best long-term strategic decision possible in RL while considering the degree to which industry-specific interrelationships vary. Furthermore, using the proposed LIVHF-DEMATEL method, a diagram and an analytical table for the electronics and automotive industries were created to understand cause-and-effect relationships better. Finally, all attributes were classified as "Critical," "Influential," "Dependent," or "Excluded" on the dependence-influence chart (Asan et al., 2018).

Expert data were analyzed to show the applicability and efficiency of the proposed extended sustainability model and linguistic interval-valued hesitant fuzzy approach in dealing with uncertainty caused by hesitation and the industry-specific nature of disposition

Table 7 Experts' profile

Experts	Industry	Scale of industry	Years of experience	Position	Firms details in 2020
1	Electronics/Smartphone	Large	9	Top Manager/Logistics	Employees: 5500 Annual sales turnover in USD: $5 billion
2	Electronics/Laptop	Small	12	Top Manager/Reverse Logistics	Employees: 1200 Annual sales turnover in USD: $1 billion
3	Electronics/Laptop and smartphone	Medium	15	Top Manager/supply chain	Employees: 2100 Annual sales turnover in USD: $3 billion
4	Vehicle/Sedan only	Large	10	Top Manager / supply chain	Employees: 4400 Annual sales turnover in USD: $6 billion
5	Vehicle/Sedan and SUV	Large	7	Top Manager/Logistics	Employees: 5000 Annual sales turnover in USD: $9 billion
6	Vehicle/Sedan and SUV	Medium	15	Top Manager/COO	Employees: 3300 Annual sales turnover in USD: $5 billion

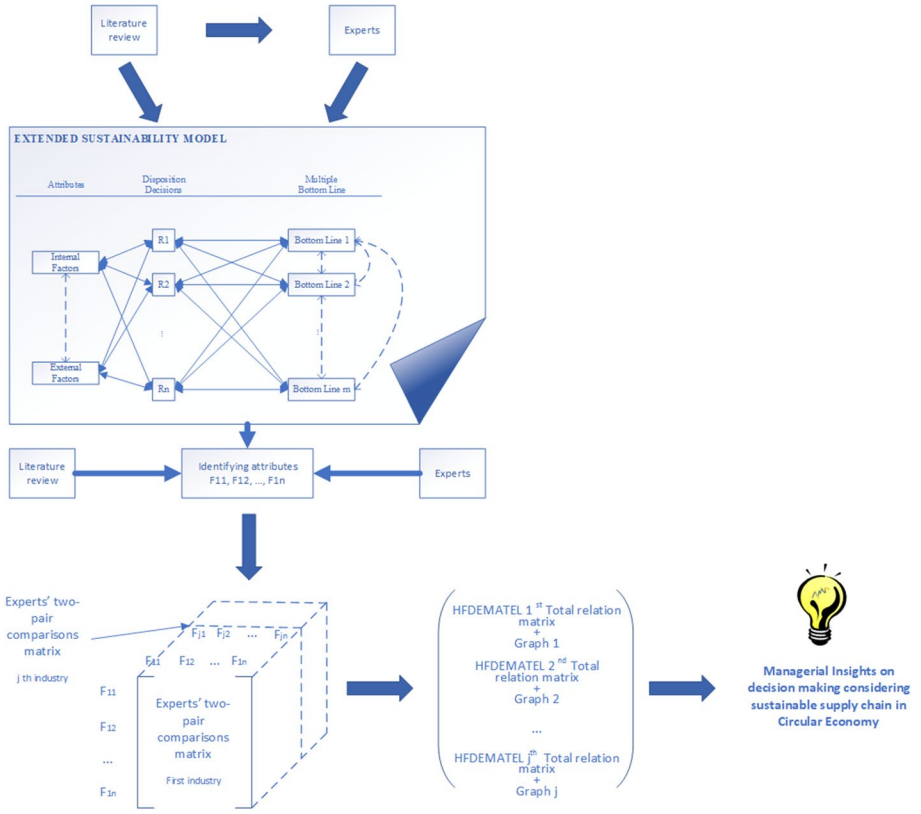


Fig. 6 The concept of research methodology and the proposed extended sustainability framework, along with the LIVHF-DEMATEL method, leads to better decision making on sustainable RL

decisions. Table 16 for the electronics industry and Table 17 for the automotive industry are included in Appendix B as supporting evidence. The primary objective was to identify the pertinent measurement attributes and factors and their direct relationships, calculate the "total-relation hesitant fuzzy matrix," and analyze the corresponding causal diagram.

This section analyzes 41 critical attributes in the electronics and automotive industries. Three experts organized the evaluations for each sector using "linguistic interval-valued hesitant fuzzy elements." The "initial direct-relation LIVHF matrix" illustrating the direct relationships can be found in Appendix B, Table 14 for the electronics industry, and Table 15 for the automotive industry.

Where D_i and R_j, T_{ij} denote the sum of the i^{th} row and the j^{th} column of the total influence matrix T, respectively; D_i denotes the sum of the direct and indirect influences of attribute i on the other attributes, and R_j denotes the sum of the direct and indirect influences of attribute j on the other attributes. The cause-effect graph is created using MATLAB by mapping the data set of the $D_i + R_i, D_i - R_i$.

The horizontal axis $D_i + R$ indicates the attribute's importance. Similarly, the vertical axis $D_i - R_i$ depicts the attributes' influence. When $D_i - R_i$ is positive, the attribute belongs to a cause group; otherwise, it belongs to an effect group (Zeng et al., 2019).

The results of the proposed approach, derived from Eqs. (1) and (4), were analyzed and compared in the electronics and automotive industries, using hesitant values. The resulting graph of cause-and-effect relationships is depicted in Figs. 7 and 8, while Tables 8 and 9 detail the $D_i, R_i, D_i + R_i, D_i - R_i$, importance ranking, and causality results for the attributes in the electronics and automotive industries, respectively.

The graphs depict the causal relationship between disposition decisions and measuring attributes, providing a visual analysis that enables policymakers and managers to pinpoint the core issues and driving attributes.

4.1 The electronics industry

The EF1, EF2, EF3, EF5, EF6, IF1, IF3, IF4, SOC2, SOC3, SOC5, CON1, CON2, CON3, CON4, and CON5 attributes all belong to the cause group in the electronics industry. Additionally, the ranking column of Table 8 indicated that IF1, EF3, EF2, EF4, ECO2, and CON6 were the attributes that had the most significant impact on the system. The group of affected attributes is then listed in the opposite range. The EF4, IF2, IF5, ECO1, ECO2, ECO3, ECO4, ECO5, ECO6, ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, SOC1, SOC4, and SOC6 attributes all fall under the effect group that requires the sustainability manager's attention and improvement. Furthermore, the ranking column of Table 8 indicates that SOC6, SOC5, SOC4, ENV4, SOC1, and ECO6 were the least important attributes. The top-twenty strongest correlations between attributes and disposition decisions are depicted in Fig. 8 with arrows and are highlighted in Table 15 in Appendix B.

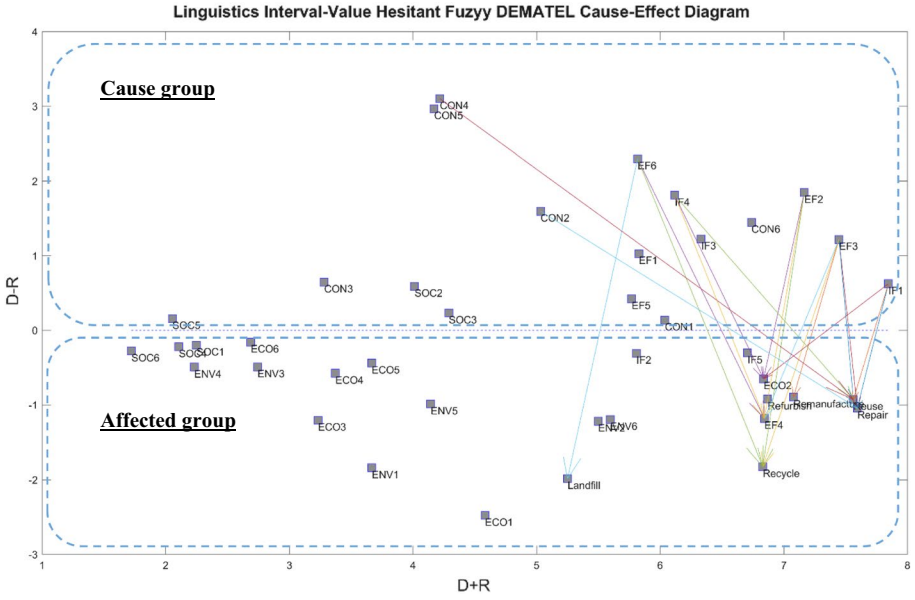


Fig. 7 Attributes causality effects in the electronics industry—twenty most powerful interrelationship arrow plotted

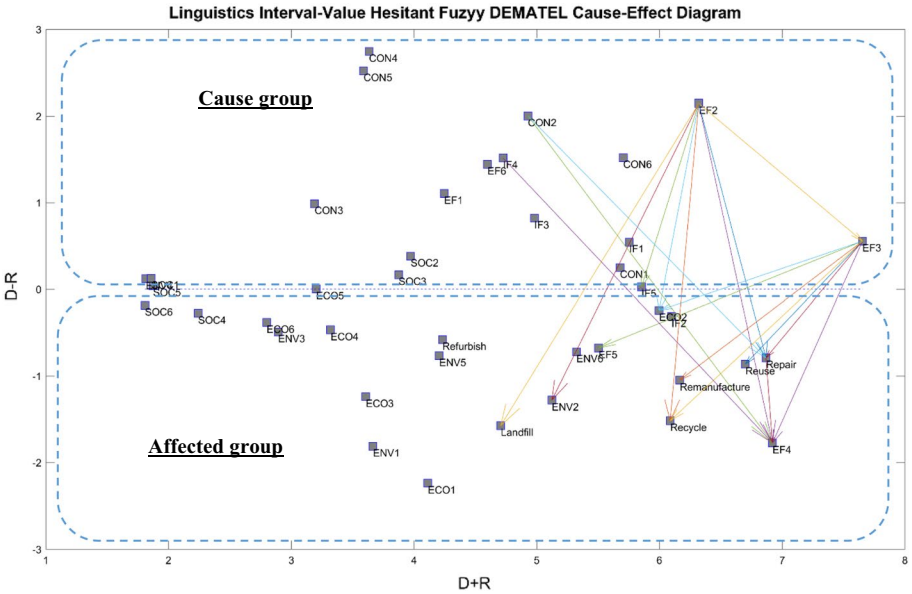


Fig. 8 Attributes causality effects in the automotive industry—twenty most powerful interrelationship arrow plotted

4.2 The automotive industry

The EF1, EF2, EF3, EF5, EF6, IF1, IF3, IF4, SOC2, SOC3, SOC5, CON1, CON2, CON3, CON4, and CON5 attributes all belong to the cause group in the automotive industry. Additionally, the ranking column of Table 9 indicates that EF3, EF4, EF2, IF2, ECO2, IF5, IF1, and CON6 were the attributes that had the most significant impact on the system. The group of affected attributes is then listed in the opposite range. The EF4, IF2, IF5, ECO1, ECO2, ECO3, ECO4, ECO5, ECO6, ENV1, ENV2, ENV3, ENV4, ENV5, ENV6, SOC4, and SOC6 attributes all fall under the effect group that requires the sustainability manager's attention and improvement. Furthermore, the ranking column of Table 9 indicates that SOC6, SOC5, SOC4, ENV4, SOC1, ECO6, and ENV3 were the least important attributes. The top-twenty most significant interrelationships between attributes and disposition decisions are plotted in Fig. 8 with arrows and are highlighted in Table 15 in Appendix B.

4.3 The electronics industry versus automotive industry

Regarding the attributes analyzed in the proposed extended sustainability model, the electronics and automotive industries share some similarities and differences. The cause group attributes are those that policymakers and RL managers should address first to improve the affected group's other attributes. It is critical to note that all consumer attributes belong to the cause group in the automotive and electronics industries, emphasizing the importance of the consumers' bottom line concerning other bottom lines. As a result, no attribute of a consumer belongs to the effect group. It is also worth noting that all economic and environmental attributes fall under the effect group in the automotive and electronics industries.

Table 8 Attribute cause and effect interrelationships in the electronics industry

	Attributes	D_i	R_i	$D_i + R_i$	$D_i - R_i$	Rank	Cause/Effect
1	EF1	3.43	2.40	5.83	1.03	16	Cause
2	EF2	4.51	2.66	7.16	1.85	5	Cause
3	EF3	4.33	3.11	7.45	1.22	4	Cause
4	EF4	2.83	4.01	6.84	− 1.18	8	Effect
5	EF5	3.10	2.67	5.77	0.42	19	Cause
6	EF6	4.06	1.76	5.82	2.30	17	Cause
7	IF1	4.23	3.61	7.85	0.62	1	Cause
8	IF2	2.75	3.06	5.81	− 0.31	18	Effect
9	IF3	3.78	2.55	6.33	1.22	13	Cause
10	IF4	3.96	2.15	6.12	1.81	14	Cause
11	IF5	3.20	3.50	6.70	− 0.30	12	Effect
12	ECO1	1.05	3.53	4.58	− 2.48	24	Effect
13	ECO2	3.09	3.74	6.84	− 0.65	9	Effect
14	ECO3	1.01	2.22	3.23	− 1.21	34	Effect
15	ECO4	1.40	1.97	3.37	− 0.58	32	Effect
16	ECO5	1.61	2.05	3.67	− 0.44	31	Effect
17	ECO6	1.26	1.42	2.69	− 0.16	36	Effect
18	ENV1	0.91	2.75	3.67	− 1.84	30	Effect
19	ENV2	2.14	3.36	5.50	− 1.22	21	Effect
20	ENV3	1.13	1.62	2.74	− 0.49	35	Effect
21	ENV4	0.87	1.36	2.23	− 0.49	38	Effect
22	ENV5	1.58	2.56	4.14	− 0.99	28	Effect
23	ENV6	2.20	3.40	5.59	− 1.20	20	Effect
24	SOC1	1.02	1.22	2.25	− 0.20	37	Effect
25	SOC2	2.30	1.71	4.01	0.59	29	Cause
26	SOC3	2.26	2.03	4.29	0.23	25	Cause
27	SOC4	0.94	1.16	2.11	− 0.22	39	Effect
28	SOC5	1.11	0.95	2.05	0.16	40	Cause
29	SOC6	0.72	1.00	1.72	− 0.28	41	Effect
30	CON1	3.09	2.95	6.04	0.14	15	Cause
31	CON2	3.31	1.72	5.03	1.60	23	Cause
32	CON3	1.96	1.32	3.28	0.65	33	Cause
33	CON4	3.66	0.56	4.22	3.10	26	Cause
34	CON5	3.57	0.60	4.17	2.97	27	Cause
35	CON6	4.09	2.65	6.74	1.45	11	Cause
36	Repair	3.28	4.32	7.59	− 1.04	2	Effect
37	Reuse	3.32	4.24	7.56	− 0.93	3	Effect
38	Remanufacture	3.09	3.99	7.08	− 0.90	6	Effect
39	Refurbish	2.97	3.89	6.87	− 0.92	7	Effect
40	Recycle	2.50	4.33	6.83	− 1.82	10	Effect
41	Landfill	1.63	3.62	5.25	− 1.98	22	Effect

Table 9 Attribute cause and effect interrelationships in the automotive industry

	Attributes	D_i	R_i	$D_i + R_i$	$D_i - R_i$	Rank	Cause/Effect	Rank Alteration
1	EF1	2.68	1.57	4.25	1.11	22	Cause	− 6
2	EF2	4.23	2.09	6.32	2.15	5	Cause	0
3	EF3	4.10	3.55	7.65	0.56	1	Cause	+3
4	EF4	2.57	4.35	6.92	− 1.77	2	Effect	+6
5	EF5	2.41	3.09	5.50	− 0.68	14	Effect*	+5
6	EF6	3.02	1.58	4.60	1.44	21	Cause	− 4
7	IF1	3.15	2.60	5.75	0.54	11	Cause	− 10
8	IF2	2.89	3.21	6.10	− 0.31	7	Effect	+11
9	IF3	2.90	2.08	4.98	0.82	17	Cause	− 4
10	IF4	3.12	1.60	4.73	1.52	19	Cause	− 5
11	IF5	2.94	2.91	5.85	0.03	10	Cause*	+2
12	ECO1	0.94	3.18	4.11	− 2.24	25	Effect	− 1
13	ECO2	2.88	3.12	6.00	− 0.24	9	Effect	0
14	ECO3	1.18	2.42	3.61	− 1.24	30	Effect	+4
15	ECO4	1.43	1.89	3.32	− 0.47	32	Effect	0
16	ECO5	1.60	1.60	3.20	0.00	33	Cause*	− 2
17	ECO6	1.21	1.59	2.80	− 0.38	36	Effect	0
18	ENV1	0.93	2.74	3.66	− 1.81	28	Effect	+2
19	ENV2	1.92	3.20	5.12	− 1.28	16	Effect	+5
20	ENV3	1.20	1.69	2.89	− 0.49	35	Effect	0
21	ENV4	0.97	0.85	1.81	0.12	40	Cause*	− 2
22	ENV5	1.72	2.49	4.20	− 0.77	24	Effect	+4
23	ENV6	2.30	3.02	5.32	− 0.72	15	Effect	+5
24	SOC1	0.99	0.87	1.86	0.12	39	Cause*	− 2
25	SOC2	2.18	1.80	3.97	0.38	26	Cause	+3
26	SOC3	2.02	1.85	3.87	0.17	27	Cause	− 2
27	SOC4	0.98	1.26	2.24	− 0.28	37	Effect	+2
28	SOC5	0.96	0.92	1.87	0.04	38	Cause	+2
29	SOC6	0.81	1.00	1.81	− 0.18	41	Effect	0
30	CON1	2.96	2.71	5.68	0.25	13	Cause	+2
31	CON2	3.47	1.46	4.93	2.00	18	Cause	+5
32	CON3	2.09	1.10	3.19	0.99	34	Cause	− 1
33	CON4	3.19	0.44	3.63	2.74	29	Cause	− 3
34	CON5	3.05	0.53	3.59	2.52	31	Cause	− 4
35	CON6	3.61	2.09	5.70	1.52	12	Cause	− 1
36	Repair	3.04	3.83	6.87	− 0.79	3	Effect	− 1
37	Reuse	2.92	3.78	6.70	− 0.86	4	Effect	− 1
38	Remanufacture	2.56	3.61	6.16	− 1.05	6	Effect	0
39	Refurbish	1.83	2.41	4.23	-0.58	23	Effect	−16
40	Recycle	2.29	3.80	6.09	-1.52	8	Effect	+2
41	Landfill	1.57	3.14	4.71	-1.57	20	Effect	+2

* This attribute has been changed in comparison with the electronics industry

Due to their affecting nature, all disposal decision alternatives, i.e., repair, reuse, remanufacture, refurbish, recycle, and landfill, belong to the effect group. Because all consumer attributes belong to the cause group, consumer opinions and sentiments heavily influence a manager's decision-making.

As one or two of the "consumer bottom line" measurement attributes have a top-twenty most significant relationship to disposition decisions, satisfying consumers' bottom lines in the extended sustainability model would affect other bottom-line attributes and shape the company's sustainability alignment policy in both industries. These findings demonstrate that the most important characteristics of a sustainability policy, and thus, the best RL performance within the circular economy ecosystem in the electronics and automotive industries, are consumer-related. Moreover, considerable effort is required to manage and implement policies that genuinely improve the circular economy ecosystem's sustainability, rather than being purely environmental, economic, or socially motivated, or for the benefit of individuals/groups.

Furthermore, "reinforce the connection with consumers as the most influential stakeholder," "invest in proper relationship enforcement," and "effective consumer satisfaction programs" were identified as factors that can significantly reduce the risk of sustainability and RL underperformance. In the electronics industry, the most prevalent and consistent disposition decision in terms of the extended sustainability model was "repair," followed by "reuse," "remanufacture," "refurbish," "recycle," and "landfill," respectively. In the automotive industry, "repair" was the optimal disposition option based on the proposed sustainability model; following that, "reuse," "remanufacture," "recycle," "landfill," and "refurbish" were the optimal disposition options based on sustainable RL.

Comparing the electronics and automotive industries uncovered some significant shifts in the ranking of the attributes. In the automotive industry, IF2, EF4, EF5, ENV2, and CON2 were more critical than in the electronics industry.

IF1, EF1, and IF4 were, on the other hand, more critical in the electronics industry than in the automotive industry. Overall, because automotive vehicles are larger in size, volume, and weight than electronic devices, the attributes "Reverse logistics costs," "Environmental conditions," "Supply chain integration," and "Optimal use of raw materials" are more critical to the sustainability and RL performance of automotive vehicles. In comparison with the automotive industry, the electronics industry places a higher premium on "Product

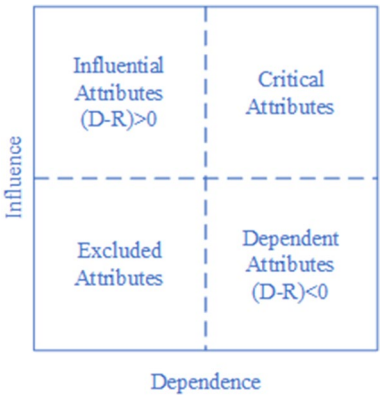


Fig. 9 Influence–Dependence diagram (Asan et al., 2018)

value," "Consumer behavior," and "Quality of returned products" attributes when it comes to RL performance and sustainability.

The influence-dependence diagram was used to provide additional context for managers. The influence-dependence diagram, shown in Fig. 9, is another representation of a two-dimensional cause-and-effect graph. This diagram is divided into four distinct regions that denote the attributes "influential," "critical," "dependent," and "excluded." Each attribute is represented on this diagram, and their function can be deduced from the region to which they belong (Asan et al., 2018).

The I-D diagram is logically linked connected to the DEMATEL causal graph. Figure 9 illustrates which regions of the I-D diagram correspond to the values $D_i + R_i$ and $D_i - R_i$. If an attribute is included in the influential area, it implies that the relevant attribute's $D_i - R_i$ value is positive. If the attribute belongs to the dependence region, its $D_i - R_i$ value is negative.

Finally, a critical factor implies high $D_i + R_i$ values. The cut-off points denoting the four distinct areas are determined by averaging the sums of the rows and columns separately. Table 10 compares the categorization of attributes in the electronics and automotive industries using the influence-dependence chart.

As illustrated in Table 10, "EF2: Business environment," "EF3: Existing practices," "EF6: Government rules & regulations," "IF1: Product value," "IF3: Quantity of returned products," "IF4: Quality of returned products," "CON1: Price," and "CON6: Brand reputation" are classified as critical attributes in both the electronics and automotive industries

Table 10 Comparison of the electronics industry and automotive industry in influence-dependence chart based on the DEMATEL graph

Attributes	Electronics	Automotive	Attributes	Electronics	Automotive
EF1	Critical	Influential	ENV5	Excluded	*Excluded*
EF2	Critical	*Critical*	ENV6	Dependent	*Dependent*
EF3	Critical	*Critical*	SOC1	Excluded	Influential
EF4	Dependent	*Dependent*	SOC2	Influential	*Influential*
EF5	Critical	Dependent	SOC3	Influential	*Influential*
EF6	Critical	*Critical*	SOC4	Excluded	*Excluded*
IF1	Critical	*Critical*	SOC5	Influential	*Influential*
IF2	Dependent	*Dependent*	SOC6	Excluded	*Excluded*
IF3	Critical	*Critical*	CON1	Critical	*Critical*
IF4	Critical	*Critical*	CON2	Influential	Critical
IF5	Dependent	Critical	CON3	Influential	*Influential*
ECO1	Excluded	*Excluded*	CON4	Influential	*Influential*
ECO2	Dependent	*Dependent*	CON5	Influential	*Influential*
ECO3	Excluded	*Excluded*	CON6	Critical	*Critical*
ECO4	Excluded	*Excluded*	Repair	Dependent	*Dependent*
ECO5	Excluded	Influential	Reuse	Dependent	*Dependent*
ECO6	Excluded	*Excluded*	Remanufacture	Dependent	*Dependent*
ENV1	Excluded	*Excluded*	Refurbish	Dependent	Excluded
ENV2	Dependent	*Dependent*	Recycle	Dependent	*Dependent*
ENV3	Excluded	*Excluded*	Landfill	Dependent	*Dependent*
ENV4	Excluded	Influential			

that should be considered the most by a manufacturer. Following that, influential attributes such as "SOC2: People health and safety," "SOC3: Shareholder participation," "SOC5: Community donation," "CON3: Promotions," "CON4: Friendly features," and "CON5: Appearances" are classified in both industries.

Policymakers and managers should pay close attention to these characteristics to ensure the supply chain's sustainability. Additionally, it is noted that "ECO1: Return on investment," "ECO3: Logistics cost minimization," "ECO4: Recycling efficiency," "ECO6: Cost of disposal," "ENV1: Minimum energy consumption," "ENV3: Transport optimization," "ENV5: Use of recycled material," "SOC4: Employment stability," and "SOC6: Employee benefits" all played a minor role in the supply chain's sustainability when compared to other attributes in both industries. The importance of the "EF1: Consumer behavior," "EF5: Supply chain integration," "IF5: Recapturing value," "ECO5: Annual sales of remanufactured products," "ENV4: Packaging reduction," "SOC1: Community complaints," and "CON2: After-sales services" attributes varied between industries, implying that these attributes should be considered separately in the electronic and automotive industry's sustainability decision-making.

4.4 Comparison with other methods and sensitivity analysis

Designing a model is to add the ability of prediction for decision-makers. Validating the model's reliability is crucial which is achievable by sensitivity analysis. The sensitivity analysis in designing models aims to validate the model in case of changing the input(s) and investigate the output. By analyzing the range of changes in input and output, the model would be certified and ready to be used by decision-makers.

Sensitivity analysis can be conducted in various ways, including by adjusting the weights of various attributes or by adjusting the weight of a specific expert. The model's sensitivity was examined by varying the expert's weight independently to determine the model's robustness and bias of any particular expert (Xia et al., 2015). As shown in Table 11, the expert weights were changed in three states, and the total relationship matrices for each state were calculated. Additionally, the root mean square of the desired state relative to state 0 was calculated. Following sensitivity analysis, the cause-and-effect relationship was calculated and analyzed. The findings were consistent with the overall degree of influence in both the electronics and automotive industries. It was concluded that no significant differences in the results were present, the model was robust, and expert opinions were free of bias.

Despite the sensitivity analysis, the proposed method was compared to Fuzzy AHP, Fuzzy VIKOR, and Fuzzy TOPSIS to validate the LIVHF-DEMATEL results.

As shown in Table 12, there was a slight difference between the results obtained by the proposed method and those derived by other methods.

Table 11 Altering weights of experts' opinion in the sensitivity analysis

	State 1	State 2	State 3
Expert 1	2	1	1
Expert 2	1	2	1
Expert 3	1	1	2

Table 12 Comparison of the results in different MCDM Methods

	Attributes	Fuzzy DEMATEL (Proposed Approach)		Fuzzy AHP		Fuzzy VIKOR		Fuzzy TOPSIS	
		RANK							
		Elec*	Auto**	Elec*	Auto**	Elec*	Auto**	Elec*	Auto**
	External factors								
1	EF1	16	22	17	22	17	22	17	22
2	EF2	5	5	6	5	6	5	6	5
3	EF3	4	1	4	1	4	1	4	1
4	EF4	8	2	8	3	9	2	8	3
5	EF5	19	14	18	14	18	14	18	14
6	EF6	17	21	19	20	19	20	19	20
	Internal factors								
7	IF1	1	11	1	12	1	12	1	12
8	IF2	18	7	16	7	16	6	16	7
9	IF3	13	17	13	17	13	18	13	18
10	IF4	14	19	15	19	14	19	15	19
11	IF5	12	10	11	10	11	10	11	10
	Economic								
12	ECO1	24	25	24	26	24	26	24	26
13	ECO2	9	9	10	8	10	8	10	8
14	ECO3	34	30	33	30	33	31	33	30
15	ECO4	32	32	32	32	32	32	32	33
16	ECO5	31	33	31	34	31	34	31	34
17	ECO6	36	36	36	36	36	36	36	36
	Environmental								
18	ENV1	30	28	30	31	30	30	30	31

Table 12 (continued)

	Attributes	Fuzzy DEMATEL (Proposed Approach)		Fuzzy AHP		Fuzzy VIKOR		Fuzzy TOPSIS	
		RANK							
		Elec*	Auto**	Elec*	Auto**	Elec*	Auto**	Elec*	Auto**
19	ENV2	21	16	21	18	21	17	21	17
20	ENV3	35	35	35	35	35	35	35	35
21	ENV4	38	40	38	40	37	41	38	41
22	ENV5	28	24	26	24	26	24	26	24
23	ENV6	20	15	20	15	20	15	20	15
	Social								
24	SOC1	37	39	37	39	38	39	37	38
25	SOC2	29	26	29	25	29	25	29	25
26	SOC3	25	27	25	27	25	27	25	27
27	SOC4	39	37	39	37	39	37	39	37
28	SOC5	40	38	40	38	40	38	40	39
29	SOC6	41	41	41	41	41	40	41	40
	Consumers								
30	CON1	15	13	14	13	15	13	14	13
31	CON2	23	18	23	16	23	16	23	16
32	CON3	33	34	34	33	34	33	34	32
33	CON4	26	29	27	28	28	28	27	28
34	CON5	27	31	28	29	27	29	28	29
35	CON6	11	12	12	11	12	11	12	11
	Disposition decisions								
36	Repair	2	3	2	2	2	3	3	2

Table 12 (continued)

	Attributes	Fuzzy DEMATEL (Proposed Approach)		Fuzzy AHP		Fuzzy VIKOR		Fuzzy TOPSIS	
		RANK							
		Elec*	Auto**	Elec*	Auto**	Elec*	Auto**	Elec*	Auto**
37	Reuse	3	4	3	4	3	4	2	4
38	Remanufacture	6	6	5	6	5	7	5	6
39	Refurbish	7	23	7	23	7	23	9	23
40	Recycle	10	8	9	9	8	9	7	9
41	Landfill	22	20	22	21	22	21	22	21

* Electronics industry

** Automotive industry

5 Results and discussions

With the business ecosystem's increasing competitiveness in the twenty-first century, all businesses have a strong commitment to sustainability, whether for profit, environmental concerns, or even survival (Martins & Pato, 2019; Stojčić et al., 2019). In recent years, environmental concerns, social responsibility, reduced environmental impacts, governmental rules and legislation, and economic competition have pushed managers to adopt green supply chain strategies and sustainability (Kumar et al., 2020; Vimal et al., 2021). By embracing sustainability, businesses can increase profits, safeguard the environment and society, and defend their businesses against competitors, resulting in long-term competitive advantages (Martins & Pato, 2019). As a result, establishing sustainable practices has been critical to businesses' strategic objectives, contributing to long-term competitive advantages (Maheswari et al., 2020; Moktadir et al., 2020a, 2020b).

Manufacturers' executives place a premium on assessing and analyzing their business's social and environmental performance, as well as its economic performance (Tseng et al., 2019). Due to the numerous benefits to supply chain sustainability, reverse logistics as a strategic decision has garnered considerable attention among businesses. The purpose of this paper was to contribute a comprehensive model of sustainability that incorporates RL and the circular economy concept. This model is an extension of the three-dimensional sustainability model developed through research and consultation with experts. The interrelationships between identified attributes were analyzed using a novel causal method based on the hesitant fuzzy DEMATEL model to evaluate real-world and sustainability performance. This study determined the factors influencing disposition decisions and their relationship to the circular economy ecosystem's sustainability model through a literature review and expert consultation.

This study established that a variety of internal and external factors influenced disposition decisions. By connecting people in real-time and allowing them to express their opinions, emerging social media empowered consumers, and this power should be considered more than ever in the supply chain's sustainability and decision-making.

By considering sustainability models and resolving their open-ended nature via RL toward a circular economy, the sustainability model was extended by adding consumers as a new bottom line to existing sustainability models. Additionally, in light of the study's context, the capability of sustainability models to add additional bottom-line value was discussed. The identified attributes were further extracted as indicators of internal and external factors and economic, environmental, social, and consumer bottom lines, where these characteristics aided in the completion of the sustainability model and the evaluation of the proposed extended sustainability model.

By implementing the extended sustainability model, managers gain a comprehensive view of the supply chain's sustainability while making the most informed decisions about the disposition of returned products in the circular economy. Managers and policymakers formulate more robust and practical decisions that are aligned with "maximizing profits," "saving the planet," "social concerns," and, most importantly, "consumer concerns" in the circular economy ecosystem while utilizing the best disposition decision in the RL toward sustainable consumption and cleaner production.

It was suggested that the extended sustainability model raises some questions about the interrelationships of the identified attributes across industries. Thus, to evaluate the extended sustainability model, a novel approach in multi-attribute decision-making methods was proposed for extracting and visualizing the model's attribute interrelationships, which provides a wealth of information to policymakers and managers.

Numerous studies have been conducted in the literature to assess and analyze the effects of economic, environmental (Hazen et al., 2012, 2016), and social (Sarkis et al., 2010) concerns on RL performance and best disposition decisions. To the authors' knowledge, no study has been conducted that considers all economic, environmental, social, and consumer benefits associated with sustainability and RL in a circular economy context.

The linguistic interval-valued hesitant fuzzy approach to DEMATEL was proposed to enable decision-makers and experts to make more consistent judgments by incorporating hesitancy via nine-level linguistic terms and hesitant fuzzy sets. Furthermore, the experts provided a wealth of knowledge regarding the uncertainty that results from hesitation. The LIVHF-DEMATEL approach was used to analyze two distinct industries (electronics and automotive) in order to provide sustainability practice and to evaluate the proposed extended sustainability model, and the following results and findings were obtained:

- In both electronics and manufacturing, decision-making in RL, as well as disposition decisions regarding the sustainability model, are influenced by external factors such as "Business environment," "Existing practices," and "Government rules and regulations," as well as internal factors such as "Product value," "Quantity of Returned Products," and "Quality of Returned Products."
- By incorporating the proposed extended sustainability model into the decision-making process for RL, it was discovered that consumers have a more significant influence on disposition decisions in both studied industries than the newly identified bottom line. Additionally, "Price" and "Brand reputation" had the most significant influence on RL disposition decisions.
- Consumers' inclusion in the sustainability model had a significant impact on the model's economic, environmental, and social attributes. "Return on investment," "Logistics Cost Optimization," "Recycle Efficiency," and "Disposal Costs" as economic attributes, "Minimum Energy Consumption," "Transport Optimization," and "Use of recycled material" as environmental attributes, and "Employment Stability" and "Donations to Community" as social attributes all contributed significantly less to sustainability concerns than they did before the addition of consumer attributes to the sustainability model. As a result, the attributes mentioned above were assigned to the effect group rather than the cause group. These were the attributes that are most influenced by other attributes.
- Due to the nature of the industry, certain model attributes were shifted from the cause group to the effect group and vice versa. The attributes "Supply chain integration," "Recapturing value," "Annual Sales of remanufactured products," "Reduced Packaging," and "Response to Community complaints" were industry-specific.

6 Policy and managerial implications

The purpose of RL implementation is to maintain the engagement of supply chain stakeholders such as consumers, the company's shareholders, the environment, the economy, society, and government (Banihashemi et al., 2019; Kazmi et al., 2021).

Environmental considerations are viewed as a factor that encourages consumer participation in reverse logistics, particularly in product take-back programs, and the benefits to other stakeholders are directly related to the returned products (Govindan & Bouzon, 2018). This study proposed an evolution model of sustainability based on the RL theory

that is consistent with the circular economy and sustainability concepts, considering all stakeholders in the circular economy ecosystem's sustainability concept and consumers' increasing use of social media.

By examining the literature and identifying research gaps, additional bottom lines were proposed for future sustainability and RL implementation studies. This research examined how policymakers and decision-makers at manufacturers and businesses must consider the four sustainability bottom lines of economic, environmental, social, and consumer. Additionally, it discussed how they aligned the extended sustainability bottom lines with the internal and external factors affecting RL performance to create a robust, sustainable supply chain and how the proposed model assists managers in making the best disposition decision in RL. Finally, the proposed extended sustainability model can ensure that the supply chain benefits of all stakeholders align with the RL's optimal disposition decision.

Manufacturers are expected to generate economic benefits, protect the environment, integrate into society, and satisfy consumer needs while maintaining a positive brand reputation. The proposed LIVHF-DEMATEL approach was used to extract the interrelationships between the sustainability model's elements by polling experts in the electronics and automotive industries to ensure and determine the feasibility of the proposed model. The findings indicated that the proposed extended sustainability model complements the previous model, with the added bottom line of consumers having a significant impact on the economic, environmental, and social bottom lines. Consumers' financial well-being also played a significant role in disposition decisions.

The findings of this study indicated that incorporating consumer perspectives into the sustainability TBL model would improve managerial regarding product returns in RL, thereby reducing consumer dissatisfaction, returned products, inventory levels, environmental harms, and wastes while maximizing brand reputation, product recapture value, RL performance, and profits. Thus, as a policy, it is critical to consider consumer needs when attempting to improve the sustainability of the TBL model and RL performance through the lens of circular economy concepts.

6.1 Practical implications

The investigation of cause-and-effect relationships between the extended sustainability model's "internal and external factors," "the quadruple bottom line," and "disposition decisions alternatives" attributes provides decision-makers with insightful knowledge by identifying the interrelationships between attributes. Additionally, industry professionals can recommend best practices and strategies for enhancing the supply chain's sustainability based on the following implications:

1. The supply chains for modular design manufacturing products are highly complex, and they should strive for greater sustainability in both the forward and reverse flow of products. By increasing consumer use of social media, sustainability can be achieved by implementing the sustainability model with consumers' new considerations and associated characteristics as a completely new bottom line. As a result of the research findings, a "sustainability benchmark study" was proposed for the electronics and automotive industries to increase the sustainability of forward and reverse supply chains.
2. The findings of this study could assist executives in the electronics, and automotive industries in implementing a sustainable supply chain in their organizations legitimately

and appropriately. Furthermore, several similarities and differences in the implementation of sustainable supply chains across industries have been identified.

3. The study's findings could assist managers in the electronics and automotive industries in identifying the extended sustainability model's cause-and-effect group to make the best supply chain strategic decisions. These are consistent with disposition decisions and the circular economy ecosystem; placing a higher premium on a critical set of attributes can aid in prioritizing the operational actions necessary to achieve excellence in the sustainable supply chain by aligning RL disposition decisions and the sustainable supply chain.
4. By using the study's findings as an "industry benchmark," electronics and automotive companies can improve their supply chain's operational performance. Additionally, the extended sustainability model's inherent causal and influencing characteristics may aid industry experts in developing a holistic benchmark for the sector's sustainable development.

6.2 Theoretical implications

The following are the study's significant theoretical contributions to the circular economy and sustainability contexts:

1. The sustainability model has been expanded by adding a new bottom line: "consumers." Furthermore, based on a review of the literature and expert judgment, a framework for determining RL's optimal disposition of the extended sustainability model and the identified external and internal factors has been proposed.
2. Consumers are emphasized as a new bottom line in the sustainability model for RL's sustainable supply chain practices. The study's central theoretical contribution is an examination of consumers' role in embracing sustainability and other bottom lines by extracting and evaluating their measuring attributes, as well as their interrelations (Kazmi et al., 2021; Mangla et al., 2020; Moktadir et al., 2020a, 2020b).
3. The LIVHF-DEMATEL method was used to analyze the cause-and-effect relationship between "the extended sustainability model," "RL disposition decisions," and "the external and internal factors" affecting RL disposition decisions in the circular economy ecosystem, where a contribution to the LIVHF-DEMATEL theory was made by using linguistic terms and accepting hesitancy. The proposed method aids in assessing attribute relationships and provides a visual insight to the manager via the DEMATEL causal graph. Additionally, four categories were presented as importance ranking systems for attributes, which facilitate classifying the importance of managers' decision-making on the attributes.
4. This research contributes significantly by developing a well-defined new framework for industry assessments to establish a "sustainability benchmark" through a focus on RL disposition decision practices in mass-production manufacturing firms while also filling a gap in the existing literature (Ma et al., 2020; Moktadir et al., 2020a, 2020b).

7 Conclusion

By applying the proposed model to the electronics and automotive industries, we emphasized on the consumer as a new point of view to the previous TBL model. We divided the consumer pillar into six attributes by scrutinizing the literature. Using DEMATEL clarified and illustrated the interrelationship amidst the TBL and consumer. Moreover, it showed

that the consumer aspect has the most powerful effects on all aspects of TBL. We categorized consumer attributes and TBL attributes into cause-and-effect sets. Cause attributes are more important and affect the effect attributes. Hence, we suggested fortifying the corresponding cause attribute(s) to enhance effect attributes.

Sixteen of the study's forty-one attributes were confirmed as cause groups in the electronics and automotive industries. The most critical attributes in the cause group were 'Product value,' 'Existing practices,' 'Business environment,' 'Brand reputation,' 'Quantity of returned products,' 'Quality of Returned Products,' 'Government rules and regulations,' and 'Price.' The attributes 'Donations to the Community,' 'Promotions,' 'Consumer Health and Safety,' 'Stakeholder Participation,' 'Appearance,' and 'Friendly feature' were the least essential cause group attributes and were categorized as influential attributes.

Similarly, the remaining attributes were classified as effect group members. Notably, the attributes of the cause group influence the attributes of the effect group. As a result, prudent management of the cause group attributes during the decision-making process is critical, influencing the effect group attributes. Within the effect group, the dependent attributes 'disposition decisions' were the most critical, followed by 'environmental conditions'; within the effect group, the dependent attributes 'disposition decisions' were the most critical, followed by 'environmental conditions,' 'reverse logistics costs, ' 'recapturing value,' 'waste reduction,' and 'optimal use of raw material.' The attributes 'Employee Benefits,' 'Employment Stability,' 'Disposal Costs,' 'Transport Optimization,' 'Recycle Efficiency,' 'Logistics Cost Optimization,' 'Low Energy Consumption,' 'Use of Recycled Material,' and 'Return on Investment' were the least important and were classified as excluded attributes.

By analyzing cause and effect attributes, we summarized the conclusions as follows:

- Due to the limitation of the natural resources, the importance of the RL is more considered not only in academic researchers but also in manufacturers (Hazen et al., 2012).
    - o The attention to reusing/recycling the returned products converts open-ended sustainability models into closed-loop ones (Rajak et al., 2021).
- The best decision on returning products (disposition decisions) is crucial to the RL performance and minimizing wastes (Brito & Dekker, 2002b; Pokharel & Mutha, 2009; Prahinski & Kocabasoglu, 2006; Thierry et al., 1995).
- Top managers' desires will align to the circular economy by putting attention to the consumers' desires (Dale Rogers & Tibben-Lembke, 1999).
- Consumer satisfaction would result in:
- Top managers' desire
- Increasing profits of the company and saving costs
- Extend the life of products and recoups the value of returned goods while decreasing wastes
- Reduces the amount of time and capital spent on inefficient processes
- Enhancing brand reputation
- Top executives will gain valuable insight into making decisions consistent with sustainability, reverse logistics, and circular economy concepts by addressing these gaps (Aitken & Harrison, 2013; Kazmi et al., 2021).
- Mass-production manufacturer benefits more from consumer idea and satisfaction.
- To overcome the ambiguity and vague nature of consumers' ideas, the fuzzy DEMATEL technique has been identified (Goyal et al., 2021b).

7.1 Unique contributions

- Based on a review of the literature and expert opinion, this study proposed an extended sustainability model and identified all the attributes and factors necessary to quantify the model's interrelationships. Components of the extended sustainability model are critical for sustainable supply chain practices to be implemented.
- A multiple-choice questionnaire for experts to determine the interrelationships between all identified attributes, considering experts' hesitancy.
- The relationship between the proposed extended sustainability model's attributes was analyzed using linguistics's novel fuzzy DEMATEL technique. Additionally, both the electronics and automotive industries have proposed a classification and ranking system for the attributes.
- The paper's extended sustainability model can be applied to the mass-production manufacturing sector, particularly the electronics and automotive industries. The findings could serve as an "industry benchmark" for supply chain decision-makers.
- This study examined a forward and reverse sustainable supply chain in the mass-production industry; it concludes with several practical and theoretical implications that could enable top managers to embrace sustainable supply chain practices and industry benchmarks while also empowering them to address potential problems.

The critical limitation of this research is that, while the results were analyzed in the context of a mass-production manufacturing company, comparable industry benchmarks can be extracted in the future. A further limitation of this study is the "short lead-time nature of consumer communications, which may result in RL disposition decision changes." In the future, an automated systematic approach to prescribing disposition decisions to managers could be developed.

Future research extending the sustainability model would be consistent with the existing research methodology and complete this study. With a better understanding of the interrelationships between the proposed model components, the future researcher may consider other MCDM approaches such as the "best worst method" or "base-criterion" method. Finally, a study area for future work would be a combination of the MCDM and DEMATEL methods. Another interesting future idea would be comparing the model's output with the manufacturer's reports.

Appendix A: Expert questionnaire

Name of the Organization (OPTIONAL): …

Year of Establishment: …

Annual Turnover (US Dollar): …

Number of Employees: …

Please rate the following factors regarding your working company on the scale of 1–9, s_1 for "*Absolutely-Low (AL)*", s_2 for "*Very-low (VL)*", s_3 for "*Low (L)*", s_4 for "*Medium–low (ML)*", s_5 for "*Medium (M)*", s_6 for "*Medium–high (MH)*", s_7 for "*High (H)*", s_8 for "*Very-high (VH)*", and s_9 for "Absolutely-high (AH)".

Note 1. In the case of hesitancy, multiple choices are also accepted. E.g., s_1, s_2, s_3.

Note 2. Please put "zero" if there is not any interrelation between the two factors.

See Table 13.

Table 13 Experts' opinion of the two-pair comparison of all attributes and factors along with RL disposition decisions

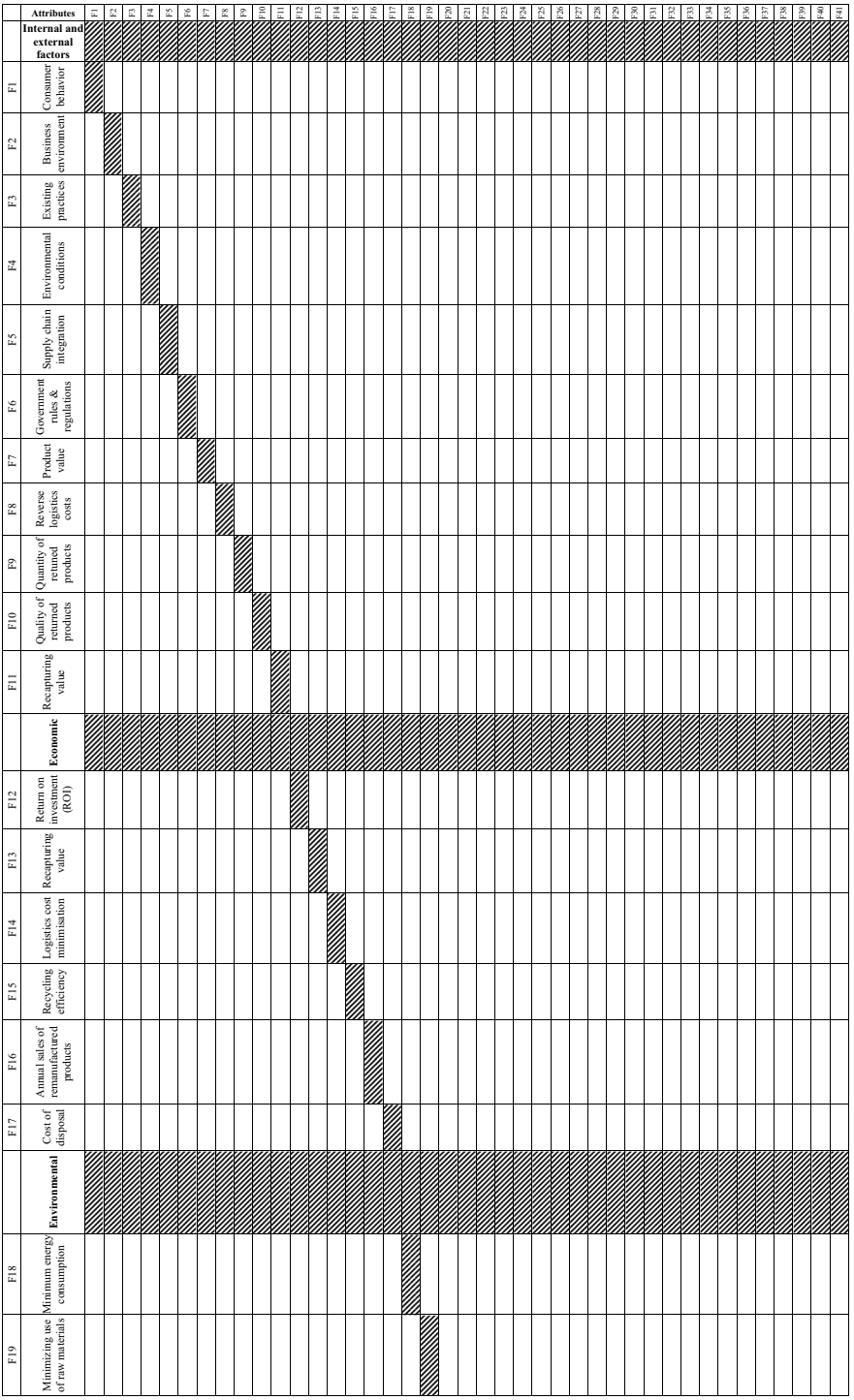
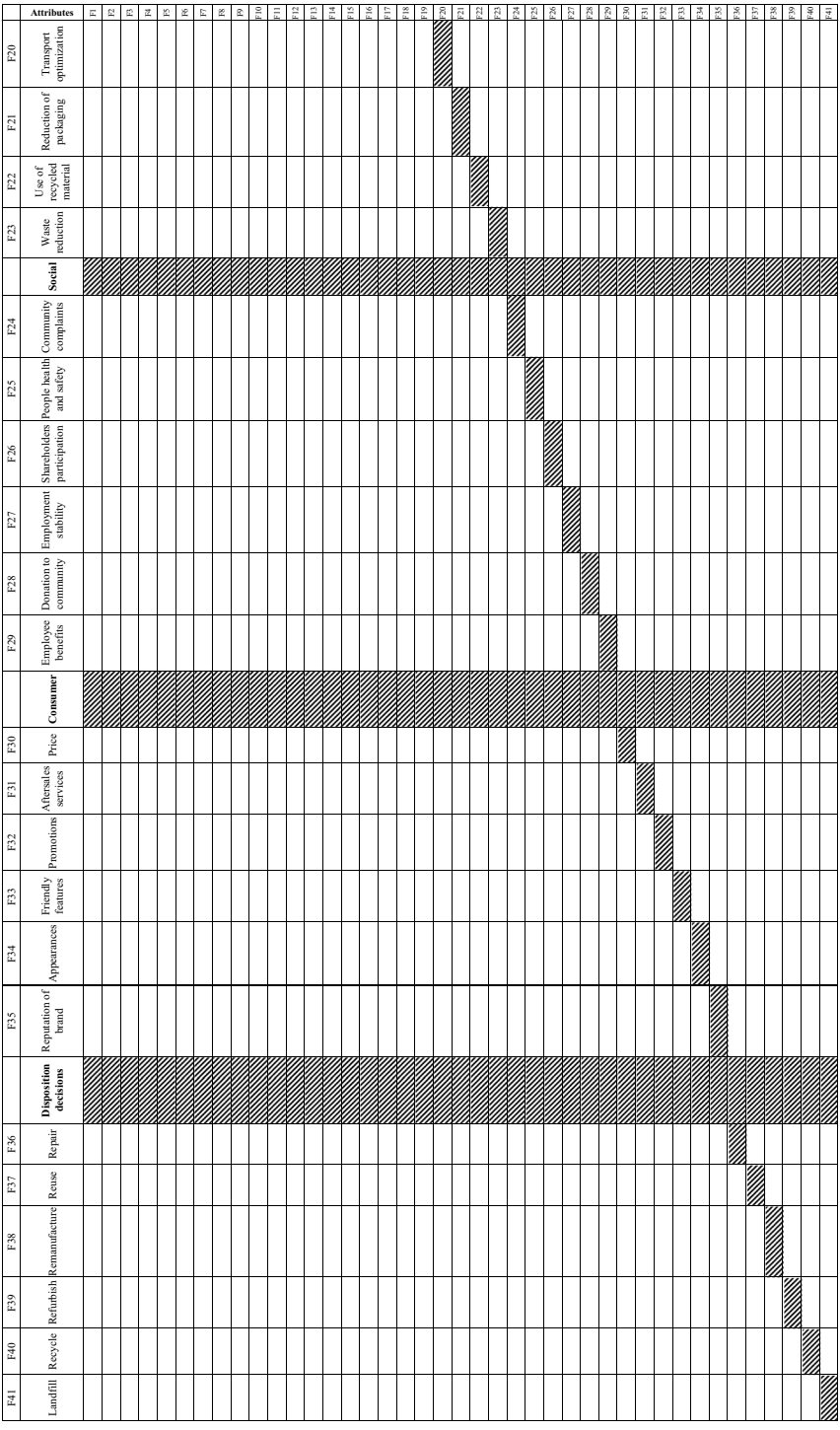


Table 13 (continued)



Respondent Profile

Please provide the following information. All the personal information provided by you would be confidential and will not be shared with anyone. We appreciate your time and efforts in sharing the above information with us. Thanks.

(i) Name (optional).
(ii) Designation.
(iii) Total industry experience.
(iv) Expertise.

Appendix B: Supporting evidence

Experts' respond.

T Matrix for the electronics industry

See Table 14.

Table 14 The total relation hesitant fuzzy matrix T × 1000 for the electronics industry

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6
EF1	23.55	33.05	46.18	87.10	47.50	36.74	47.40	70.76	73.52	62.26	79.89	38.60	81.66	25.95	33.15	40.00	16.28
EF2	36.40	35.82	84.73	**98.97**	62.04	47.84	68.19	85.10	81.06	73.68	95.23	47.97	**98.04**	62.09	39.84	51.36	38.20
EF3	39.83	69.26	42.71	**110.43**	83.17	53.77	62.69	73.45	79.79	44.46	89.20	47.38	92.33	55.86	55.70	38.95	32.27
EF4	24.62	40.83	55.76	39.04	40.75	61.60	53.76	35.34	32.48	28.48	42.63	29.12	44.46	33.26	28.59	16.81	36.53
EF5	25.49	35.74	46.89	78.99	25.00	33.96	79.54	53.31	28.76	23.64	61.46	32.34	64.11	50.42	47.20	29.59	25.78
EF6	72.82	78.31	90.97	**102.20**	86.15	23.74	56.08	76.53	50.65	50.37	63.50	39.69	66.09	48.17	43.74	25.02	31.31
IF1	75.59	68.70	82.38	74.98	77.35	35.84	49.70	66.46	71.46	46.69	95.66	46.59	**98.18**	30.84	49.41	45.37	36.77
IF2	22.10	26.41	52.56	53.95	67.23	20.48	36.03	26.89	30.72	26.75	46.47	29.18	49.13	50.01	45.26	27.94	41.56
IF3	29.64	58.45	77.12	83.28	68.11	33.26	72.30	83.31	30.14	29.06	87.87	63.35	90.88	50.84	51.99	52.33	29.46
IF4	71.78	48.34	73.77	**99.27**	64.86	29.11	86.53	86.21	44.68	24.98	**96.70**	71.29	**100.09**	58.62	59.40	59.81	25.13
IF5	39.62	43.90	76.57	56.24	69.09	35.42	83.57	45.44	66.49	37.74	39.54	62.25	41.36	29.81	26.80	38.09	20.78
ECO1	7.85	20.33	15.88	18.69	32.10	17.73	28.92	9.74	8.33	7.10	11.50	10.25	18.16	12.80	12.03	11.98	10.42
ECO2	38.78	43.01	75.65	53.50	68.63	34.94	82.04	43.86	65.58	36.94	37.86	78.35	39.73	28.26	26.19	37.49	19.95
ECO3	11.95	13.29	20.74	12.29	9.09	5.38	16.95	26.97	8.06	6.12	16.18	40.26	34.81	7.35	11.39	12.07	10.44
ECO4	7.94	22.38	19.31	41.86	23.24	14.12	21.54	13.56	10.37	7.81	24.18	37.62	54.75	16.08	7.59	13.75	12.68
ECO5	22.57	18.12	19.97	31.29	18.12	14.13	23.63	15.09	23.21	27.25	23.41	41.09	24.47	16.50	14.96	10.06	12.35
ECO6	7.45	15.17	15.89	17.68	14.62	11.89	13.54	18.65	8.37	7.29	12.81	20.30	19.57	15.61	12.62	25.17	5.76

Table 14 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6
ENV1	5.81	12.82	14.45	27.78	7.44	5.23	15.91	13.64	6.99	5.54	20.73	15.59	21.41	11.81	10.65	5.13	9.79
ENV2	13.24	27.41	29.11	44.28	21.08	10.85	36.58	20.29	15.21	12.46	35.37	48.00	36.81	14.14	28.34	12.66	8.57
ENV3	6.20	13.52	15.40	18.61	8.62	5.18	17.62	27.32	7.44	5.77	22.51	29.39	23.55	36.97	5.85	5.99	4.94
ENV4	10.95	12.10	13.39	15.77	6.24	4.14	20.23	13.61	6.18	4.86	14.70	14.51	15.26	17.63	4.55	4.56	3.55
ENV5	10.04	24.01	31.86	48.57	12.86	14.92	38.98	32.23	11.50	9.20	21.59	32.19	22.83	22.20	20.59	8.49	7.26
ENV6	12.20	27.28	29.14	49.81	14.68	10.61	34.16	31.30	13.99	11.65	27.86	46.73	29.56	32.87	22.98	23.68	26.88
SOC1	31.52	14.15	15.05	13.18	7.45	11.34	10.63	10.26	14.75	13.87	11.76	10.74	12.14	6.25	6.13	6.66	4.00
SOC2	44.59	29.16	31.18	41.17	17.27	17.61	43.49	22.86	29.29	26.37	32.77	31.58	33.83	15.36	18.33	25.95	9.05
SOC3	21.29	22.84	24.71	33.59	39.46	11.42	54.78	21.71	16.51	13.65	36.16	48.50	37.39	20.56	17.49	13.42	8.92
SOC4	6.61	12.51	12.89	9.19	6.25	4.51	9.12	6.62	6.30	5.38	14.11	9.38	14.73	4.89	15.60	4.52	2.72
SOC5	19.95	26.93	16.55	31.08	9.83	35.90	11.59	10.35	8.80	7.98	11.71	22.10	12.17	7.15	5.98	5.97	4.47
SOC6	5.31	16.82	5.77	7.79	10.74	3.57	13.28	5.85	5.12	4.61	7.26	12.87	7.53	4.13	3.46	3.82	2.51
CON1	46.58	36.78	45.72	41.96	31.18	27.85	49.60	32.38	43.38	45.30	54.31	66.70	55.70	21.71	17.91	21.35	13.14
CON2	52.75	44.31	50.16	70.83	29.17	30.26	55.67	55.43	56.40	57.31	66.82	60.09	69.03	22.67	43.41	33.37	26.03
CON3	48.44	26.93	29.57	47.06	15.68	10.96	38.37	24.05	27.63	25.19	27.62	43.79	28.74	24.33	11.36	29.62	14.10
CON4	49.96	58.55	57.39	59.76	41.71	19.98	72.17	37.45	59.53	60.45	61.28	77.50	63.35	25.74	33.31	48.31	27.59
CON5	61.45	39.85	44.73	50.15	46.75	18.85	71.16	46.36	57.97	59.33	59.22	82.13	61.22	23.64	32.43	47.30	20.23
CON6	65.43	67.37	67.33	58.94	46.27	39.58	69.37	57.97	63.11	63.46	69.77	84.79	71.88	33.87	30.09	49.70	17.56
Repair	34.94	37.34	37.87	77.25	32.24	23.57	75.72	44.86	37.52	32.57	73.47	74.68	75.53	42.74	24.69	30.82	19.92
Reuse	35.25	37.73	38.81	71.70	33.83	23.75	82.30	56.75	38.11	32.66	79.69	80.94	81.70	37.43	24.94	31.27	20.21
Remanufacture	33.01	35.31	35.43	63.27	30.88	21.98	61.46	60.32	35.33	31.08	65.17	72.72	67.07	36.32	23.56	47.33	19.13
Refurbish	32.21	34.50	34.17	62.18	29.80	21.37	60.10	59.45	34.23	30.28	58.42	71.16	60.17	29.82	23.00	34.86	18.68
Recycle	20.79	30.08	28.91	75.07	24.83	19.03	42.47	67.06	22.49	19.85	35.06	47.32	36.66	33.63	20.62	24.81	17.32
Landfill	15.71	23.59	20.47	64.55	17.71	15.09	21.65	25.47	16.91	15.29	21.34	21.07	22.90	45.54	14.79	14.69	30.91

Table 14 (continued)

	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3	CON4	CON5	CON6
EF1	31.45	39.80	18.06	27.71	57.01	68.11	16.65	18.22	22.29	11.24	9.69	14.84	46.80	35.61	25.64	5.60	5.91	31.32
EF2	51.70	83.19	40.49	30.52	64.72	76.26	33.16	28.92	41.50	37.87	24.20	29.85	49.16	39.86	34.65	12.69	13.05	50.14
EF3	52.48	78.84	28.35	20.28	64.45	78.21	26.35	29.33	44.84	14.86	17.96	11.85	49.25	34.46	23.39	7.09	7.43	49.91
EF4	45.54	50.05	31.56	24.40	52.90	66.71	10.09	15.97	20.30	9.65	18.88	7.03	30.83	14.58	11.02	4.80	5.02	32.95
EF5	58.51	63.62	44.48	30.72	53.98	68.23	15.58	16.39	15.10	9.03	7.79	7.09	32.17	20.48	11.90	4.71	4.93	33.66
EF6	43.15	67.57	27.36	29.41	64.42	80.23	37.99	26.72	33.49	42.27	11.59	17.23	57.25	44.18	21.60	12.45	12.87	42.48
IF1	55.67	71.07	20.77	19.22	63.56	76.25	37.65	22.16	34.48	14.21	12.00	11.65	71.96	35.69	35.85	13.35	13.86	56.09
IF2	26.62	54.00	36.72	18.09	33.64	36.24	14.37	14.83	13.62	14.06	18.74	18.28	34.42	19.22	16.13	4.30	4.53	20.16
IF3	45.33	55.21	36.06	22.86	57.79	58.90	23.95	19.67	19.12	18.04	16.29	15.66	38.31	25.48	15.72	5.64	5.90	33.58
IF4	42.56	56.81	43.01	23.94	66.38	67.49	18.11	20.11	19.02	11.93	10.68	9.98	34.15	20.42	16.63	5.65	5.89	28.32
IF5	35.58	60.36	21.31	20.66	26.68	38.26	11.82	17.10	28.31	16.43	14.32	14.31	35.48	29.17	25.26	5.29	5.53	25.69
ECO1	8.26	10.79	4.84	4.17	8.61	11.20	4.52	4.97	18.14	9.58	8.88	8.94	26.98	11.65	10.27	2.21	2.39	20.04
ECO2	33.33	58.43	20.66	19.89	25.28	36.31	11.34	15.99	27.82	15.99	13.96	13.97	34.27	28.33	24.70	4.93	5.16	24.63
ECO3	8.45	11.10	21.91	4.31	7.00	10.17	2.94	10.86	5.26	3.27	2.83	2.85	14.70	5.27	4.36	1.58	1.68	7.14
ECO4	25.14	15.49	6.76	5.67	35.20	32.12	9.82	7.05	6.77	4.26	3.84	3.44	11.06	6.37	5.19	2.00	2.08	9.54
ECO5	19.77	34.25	13.58	12.79	11.91	34.40	5.50	14.48	20.54	11.17	10.20	10.40	25.96	14.04	18.13	2.75	2.92	24.02
ECO6	13.31	32.36	5.56	6.01	27.24	14.54	4.08	8.21	12.30	4.41	3.65	3.56	17.77	6.58	5.46	2.49	2.61	15.99
ENV1	7.71	15.19	10.13	9.50	12.62	14.59	3.04	10.43	16.79	2.81	2.69	2.55	19.50	4.53	3.62	1.66	1.79	18.15
ENV2	66.62	25.28	15.01	16.42	21.44	30.77	6.85	30.95	23.03	7.33	5.91	5.97	32.71	11.69	9.42	3.96	4.18	29.21
ENV3	44.63	17.32	5.40	10.50	13.10	16.33	3.09	11.71	17.19	3.28	2.90	2.95	15.50	5.12	4.23	1.64	1.74	7.81
ENV4	37.39	20.23	27.49	3.49	11.89	13.90	2.54	10.26	4.70	2.37	2.10	2.06	13.14	3.92	3.19	1.35	1.44	11.84
ENV5	42.65	22.31	13.09	11.88	13.73	22.33	5.41	25.44	14.47	4.86	10.33	4.28	25.17	7.17	5.77	2.68	2.85	22.88
ENV6	68.32	58.68	44.83	15.70	32.98	22.56	6.30	30.31	11.47	6.73	5.74	5.59	25.34	10.29	8.40	3.55	3.72	28.07
SOC1	7.62	9.64	4.74	4.06	8.05	22.59	4.82	11.50	19.01	21.81	9.08	9.79	9.59	35.32	16.03	1.99	2.06	32.19
SOC2	26.62	37.61	15.90	22.86	28.59	32.50	14.96	14.22	30.38	25.74	12.42	30.45	34.22	13.25	10.34	4.17	4.40	30.46

Table 14 (continued)

	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3	CON4	CON5	CON6
SOC3	26.15	25.69	21.33	10.24	28.85	37.32	25.66	25.17	12.63	13.65	12.26	23.96	50.90	18.78	15.94	4.58	4.91	30.50
SOC4	6.12	7.69	9.17	3.12	5.93	8.17	39.64	22.61	35.87	3.88	14.74	27.09	25.47	5.60	3.84	1.76	1.92	19.09
SOC5	7.90	10.54	4.91	4.44	9.03	11.77	11.72	11.78	42.48	16.72	3.55	10.18	16.52	6.66	4.67	2.19	2.30	31.89
SOC6	5.17	6.66	2.93	2.74	5.02	7.18	26.79	15.68	28.24	8.99	8.18	2.78	18.32	10.26	3.19	1.45	1.56	12.14
CON1	27.32	41.02	13.49	14.73	41.48	36.60	10.94	18.60	41.58	11.41	20.77	9.32	31.78	36.02	26.25	29.67	35.95	50.65
CON2	33.18	46.63	21.86	19.74	38.07	64.00	12.60	22.96	47.88	22.85	15.53	15.73	47.20	18.22	19.73	11.68	12.03	71.13
CON3	27.34	24.85	20.78	7.82	26.79	37.61	7.37	9.85	29.30	17.91	11.53	17.50	29.43	22.24	8.00	9.24	9.47	38.43
CON4	32.03	52.65	22.63	16.41	34.97	58.97	13.33	20.36	38.66	18.50	16.59	16.47	69.95	38.46	28.37	7.33	19.62	65.23
CON5	29.49	43.92	16.60	27.43	44.83	61.68	13.26	36.92	55.52	17.94	16.32	16.64	80.74	26.17	27.74	13.05	7.68	75.18
CON6	32.86	48.36	24.15	17.31	43.76	44.73	50.43	38.80	65.28	32.64	29.64	30.50	72.57	52.38	35.42	25.04	25.62	33.65
Repair	62.02	78.29	21.65	35.74	29.47	76.64	16.37	44.24	25.16	21.80	14.80	14.84	62.10	50.73	29.99	11.39	11.83	53.55
Reuse	56.41	79.08	21.80	35.84	29.74	76.57	16.68	44.26	25.11	21.87	15.02	15.05	68.39	33.57	30.44	11.52	11.99	53.23
Remanufacture	48.68	76.65	21.04	35.04	27.72	74.40	15.75	43.52	23.71	21.32	14.46	14.63	60.39	32.23	29.33	11.00	11.43	51.46
Refurbish	47.98	75.48	20.50	34.62	27.23	73.49	15.53	43.09	23.10	20.98	14.15	14.33	59.58	31.69	28.79	10.90	11.32	50.84
Recycle	51.41	65.09	18.75	15.51	71.13	69.43	13.18	35.72	19.05	12.98	12.83	12.35	43.32	16.44	14.26	9.56	9.88	29.37
Landfill	53.28	20.90	13.86	12.08	18.05	21.27	10.92	13.13	14.64	10.63	10.26	9.96	18.68	12.91	11.29	8.21	8.37	23.09

	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
EF1	90.56	84.57	74.86	73.87	85.09	65.84
EF2	93.01	93.09	82.73	75.62	**105.35**	95.29
EF3	**101.09**	**101.28**	**97.32**	96.45	**104.55**	93.15
EF4	62.97	63.04	61.11	60.64	78.18	72.28
EF5	55.25	60.95	64.13	69.32	86.74	39.31
EF6	76.83	75.99	72.49	71.79	**103.43**	**98.49**
IF1	**103.31**	**97.06**	86.97	85.94	86.83	87.72
IF2	66.60	60.88	59.43	59.02	81.22	74.34

Table 14 (continued)

	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
IF3	87.04	93.01	83.98	82.94	78.10	58.04
IF4	90.90	**102.80**	81.37	74.34	87.49	84.16
IF5	87.58	92.99	66.90	66.15	70.19	62.94
ECO1	19.34	18.89	18.43	18.24	20.17	17.60
ECO2	74.52	79.96	71.70	70.96	57.16	44.14
ECO3	23.77	23.68	22.99	22.71	23.57	22.11
ECO4	21.56	21.83	20.84	20.56	64.23	43.20
ECO5	31.92	37.52	47.87	29.78	25.63	22.34
ECO6	25.21	25.28	42.49	41.99	50.02	58.56
ENV1	17.62	17.58	16.79	16.63	18.01	16.09
ENV2	64.89	70.59	63.08	62.75	59.23	25.97
ENV3	24.52	24.43	23.48	23.31	24.51	22.40
ENV4	16.36	16.27	15.47	15.33	16.15	14.62
ENV5	25.13	24.82	23.66	23.38	67.10	23.39
ENV6	53.52	53.50	52.40	51.83	54.59	50.48
SOC1	20.26	18.80	17.90	17.66	19.03	16.80
SOC2	68.52	68.33	66.32	65.63	44.85	40.26
SOC3	61.48	60.75	59.09	58.87	72.79	33.13
SOC4	17.07	16.89	16.24	16.09	17.09	14.82
SOC5	20.14	19.90	19.13	18.88	21.59	19.03
SOC6	14.82	14.44	14.00	13.87	14.63	12.74
CON1	92.25	85.66	82.27	81.59	78.49	72.13
CON2	**97.10**	61.77	58.14	57.12	62.27	43.79

Table 14 (continued)

	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
CON3	55.39	31.18	29.51	28.77	31.38	27.37
CON4	94.64	**99.86**	84.61	83.30	81.22	74.44
CON5	88.34	87.87	84.47	83.32	57.84	50.11
CON6	89.19	87.89	83.71	82.32	92.68	89.85
Repair	45.22	49.74	46.19	45.42	47.61	41.29
Reuse	51.82	45.04	47.19	46.42	48.61	42.42
Remanufacture	47.89	47.12	38.23	43.10	45.35	39.38
Refurbish	46.41	45.51	42.63	35.89	44.15	38.35
Recycle	37.87	37.45	35.62	35.03	34.04	33.20
Landfill	25.31	25.01	24.24	23.85	26.57	18.03

** Other data is also available but omitted due to the word limitations

T Matrix for the automotive industry

See Table 15.

Table 15 The total relation hesitant fuzzy matrix T × 1000 for the automotive industry

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6
EF1	12.5	23.1	42.9	72.77	43.5	30.5	29.5	57.1	55.7	45.3	58.7	27.7	59.85	23	27.1	30.6	15.3
EF2	25.1	28.1	**86.7**	**98.87**	69.9	48.6	57.1	82.2	70.7	63	**87.8**	42.2	**84.77**	61.8	42.6	59.4	38.8
EF3	29.6	53.8	48.8	**109**	**83.9**	54	47	76.8	69.5	41.4	76.6	41.7	**84.76**	61.2	57.1	32.1	33.6
EF4	17.1	33.7	67	39.26	41.3	56.1	47.5	34.1	27.2	22.8	35	24	37.14	33.3	26.4	12.4	40.7
EF5	16.1	26.6	49.8	76.65	23.6	29	62.5	46.7	21.3	16.6	48.7	22.6	45.49	40.8	36.1	22.4	23.7
EF6	50.9	57.4	83.2	**83.42**	78.3	17.6	36.3	60	37.8	32.6	41.3	26.9	48.1	36.9	35.9	15.8	22.8
IF1	47.2	47.8	74.6	69.21	65	28.5	28.1	50.9	55.6	33.1	69.4	31.9	71.05	26.3	41.2	28.4	27.8
IF2	17	23.4	63.3	68.57	69.4	20.3	29.3	30	28.2	23.5	47.7	29.2	50.15	56.4	43.5	24.8	53
IF3	18	45.5	66.3	80.1	72.6	32.5	47.1	73.8	19.9	19.8	60.5	38.4	62.6	46.1	39.6	36.8	27.5
IF4	45.5	36.5	74.6	**94.85**	65.4	23.8	54.9	76.5	38.6	15.5	78.8	57	75.81	48.4	46.5	43.8	18.2
IF5	23.8	35.6	69.5	60.17	71.7	26.2	62.8	47.8	56.7	19.7	30	60.2	31.69	35	29.1	41.6	21.3
ECO1	4.86	17.2	21.6	23.75	36.4	16.1	24.3	14.8	6.58	5.13	9.33	8.26	15.2	12.7	11.3	10.1	10.4
ECO2	29.6	30.1	79.9	64.55	72.1	37.3	51.8	47.4	51.5	30.5	29.7	70.1	31.32	28.5	23.7	36	20.6
ECO3	10.2	12.4	29	21.75	17.3	6.2	15.1	33.4	7.67	5.55	16.1	43.8	33.31	10.1	11.9	11.2	11.7
ECO4	5.13	19.8	27.3	42.96	34.9	13.4	17.3	15.1	8.52	6.09	21.6	34.3	44.49	28.8	8.04	12.1	13.7
ECO5	7.01	15.2	22.3	37.57	24.9	12.8	18.7	15.9	14.4	17.7	19.8	38.4	20.8	17.6	19.5	7.37	13.1
ECO6	4.39	12.8	23.9	23.78	21.8	11.3	9.69	23.9	6.85	5.35	10.5	17.8	22.48	21.9	17.8	22	7.17
ENV1	3.95	11.3	21.6	44.37	14.6	5.59	13.2	24.9	5.89	4.4	13.5	13.9	19.67	18.3	10.8	4.24	10.8
ENV2	7.88	22.4	36.7	54.32	33.4	9.91	27.5	25.4	11.6	8.6	28.7	46.3	30.38	15.3	31.7	8.97	9.88
ENV3	4.56	12.3	23.8	32.52	16.6	5.84	15.2	33.5	6.94	4.95	21.2	27.9	22.46	42.2	6.56	5.41	6.74
ENV4	3.85	11.2	21.2	29.05	8.63	4.69	12.9	20.4	5.59	4.19	13.8	15	14.72	29.5	5.35	4.05	4.87
ENV5	7.47	21.8	40.6	61.1	21.7	14.8	29.5	38.6	10.5	8.12	20.3	31.5	21.83	29.8	25.9	7.45	9.1
ENV6	8.6	24.4	45.6	59.26	25.3	10.9	28.7	45	12.6	9.65	25.6	44	27.84	41	23.4	15.4	33.6

Table 15 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6
SOC1	21.4	12.2	21.8	24.9	14.7	10.8	8.08	11	17.8	11.2	9.92	15	10.18	7.52	6.11	5.11	5.12
SOC2	30.8	24.2	39.2	47.67	24.8	15.9	29.1	23.1	24.2	20.9	27	27.8	27.86	17.4	17.3	15.6	10.7
SOC3	14.3	17.8	32.2	34.01	44.3	9.62	38.7	21.5	12.3	9.18	29.5	47.8	30.56	26.5	15.9	9.48	9.94
SOC4	4.54	11.2	20.4	16.79	14.1	4.54	7.44	7.66	5.74	4.19	18.3	14.5	13.37	12.1	15.3	3.91	9.04
SOC5	10.2	17.3	21.5	33.67	15.1	27	7.94	8.79	6.02	4.94	8.57	24.5	8.9	6.94	5.31	4	4.5
SOC6	3.96	15.7	13.8	15.47	17.9	4.07	12	7.11	5.13	3.98	12.6	18.2	7.349	10.9	4.18	3.6	3.54
CON1	31.3	30.6	54.8	49.76	45.4	25.6	37.9	39.3	37.3	32.6	51.6	70.7	47.92	23.8	17.7	16.4	16.1
CON2	32.6	38.8	61.5	**85.68**	41	28.7	40.7	73	49.8	49.5	65.3	62.6	67.36	27.6	47.6	28.9	34.3
CON3	35.9	23.8	33.5	59.71	25.3	10.7	27.4	41.8	29.2	21	29.8	46.7	25.53	37.3	12.1	26.1	21.4
CON4	31.5	42.3	63	67.18	53.3	16.9	54.8	45.3	43.6	43.7	48.6	71.2	55.76	25.4	35.4	33.4	38.4
CON5	42.3	30.5	45.3	48.09	57	15.4	48.7	48.1	47.4	42.6	46.6	70.5	53.47	23.3	33.9	32.4	25.5
CON6	49.8	50.2	72.4	62.56	57.6	29.5	51.8	64.6	46.7	46	56.9	79	58.46	39.2	32.1	34.9	18.7
Repair	24.6	30.1	50.7	**87.7**	40.2	21.2	51.3	49.7	30.4	25.1	63.3	66.8	65.11	47.9	23.2	25	31.4
Reuse	24.6	29.6	50.3	81.06	40.5	20.9	56.4	59.6	30.5	24.8	68.2	71.3	69.9	42.1	22.7	19.6	25.8
Remanufacture	16.8	21.5	44.8	59.84	30.7	18	41.6	61	26.8	17.2	48.2	62.4	55.27	39.7	20.5	33.5	23.9
Refurbish	13.8	17	36.8	50.9	23.8	14.9	25.3	54.6	17.2	14.2	32	44	32.99	19	16.2	13.9	15.3
Recycle	9.04	24.8	41.7	73.39	32	16.9	28.5	64.1	18.2	15.2	29.4	42.2	31.14	44	19.4	20.3	23.2
Landfill	6.29	20.2	33.2	62.95	24.9	13.9	17.2	31	14.3	12.3	18.2	18.8	20.15	54.8	14.5	12.4	40.8

	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3	CON4	CON5	CON6
EF1	26.1	31.1	14.8	13.3	43.1	54.7	11.7	14.9	18.3	10	8.45	13.3	38.9	29.1	20.5	3.93	4.58	21.4
EF2	50.1	**88.1**	44.9	22.4	60.1	72.8	27.5	28.8	38.8	42.3	23.3	28.9	45.4	40.9	36	10.8	11.7	46.5
EF3	56.6	77.7	28.3	12.2	65.2	79.5	31.9	33.9	47.1	15.8	17.9	12.2	50.6	40.8	25.1	5.71	6.68	46.2
EF4	48	50.4	34.9	18	48.1	58.4	7.45	15	18.2	9.49	23	6.54	27.2	11.7	8.13	3.26	4.11	26.4
EF5	44.7	48.3	34.8	23.1	41.3	50.6	11.6	12.5	11.7	7.62	6.97	6	25.1	16	8.38	2.85	3.59	24.7
EF6	29.4	54.5	22.6	19.3	48	58.4	30.8	22.1	21.3	37.6	9.22	14.5	40.7	30.7	10.3	4.24	10.2	29.9

Table 15 (continued)

	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3	CON4	CON5	CON6
IF1	41.1	56.7	16.6	9.1	52.7	54	24.5	17.2	27.4	11.8	9.68	9.21	53.4	27.2	28.4	4.75	10.9	36
IF2	28.6	63	36	13.4	38.7	34.2	12.4	16.5	15	15.4	29.7	29	45.2	23.5	19.9	9.48	10.1	17.3
IF3	38	39.4	26.5	9.05	44.4	41	13.3	15.5	14.4	15.9	9.19	13.9	29.9	19.6	10.9	3.73	4.47	22.4
IF4	30.2	47	33	15	51.7	43.3	7.93	16.1	15.3	10.4	9.83	8.85	26.3	15.4	12.1	3.71	4.43	17.6
IF5	33.9	64.5	25.7	19.1	28.3	31.7	8.04	16.6	31.3	16.4	18.8	19.3	31.3	35.1	31.8	3.93	4.65	18.8
ECO1	7.81	9.8	5	2.59	8.06	9.62	3.19	4.84	15.9	9.02	2.78	8.2	18.7	10.1	8.83	1.48	1.8	16.7
ECO2	31.9	58.3	19.9	13.6	22.7	31.4	8.08	16	36.6	21.8	18.6	13.8	30.6	35	31.5	3.73	4.44	18.5
ECO3	10.9	13	32.5	8.66	13.9	11.2	2.75	16.8	6.2	4.21	3.61	3.62	20.7	5.78	4.49	1.72	2	6.66
ECO4	36.4	15.3	8.08	3.84	44.2	34.9	14.2	7.54	6.89	4.4	4.04	3.4	10.6	6.08	4.33	1.6	1.86	8.18
ECO5	21	43.4	19.6	15.1	11.8	42.2	3.63	14.7	24.5	11.4	9.65	9.9	29.5	17.5	21.3	2.41	2.76	20.9
ECO6	13.3	29.7	5.96	3.4	25.7	12.7	2.99	7.62	11.3	4.32	3.69	3.4	16.1	5.42	4.01	1.89	2.2	12.5
ENV1	8.4	15.2	10.8	7.98	13	14.1	2.36	10.1	15.5	3.01	3.18	2.67	12.8	4.08	3.12	1.24	1.44	16
ENV2	62.1	21.7	14.4	11.1	20.3	26.1	4.67	27.6	20.4	7.05	5.67	5.5	28	8.67	6.73	2.75	3.29	22.6
ENV3	43.2	18.2	6.69	8.89	13.8	16.4	2.54	12	16.4	3.89	3.62	3.41	15.4	5.16	4.02	1.56	1.81	6.69
ENV4	25.8	31.4	32.3	2.72	12.2	13.9	2.21	10.8	5.01	3.05	2.84	2.55	13.3	4.02	3.09	1.28	1.5	16.1
ENV5	53.3	28.5	19.6	9.78	15.1	21.9	4.72	30.6	14.6	5.8	10.8	5.01	30.3	7.35	5.41	2.54	3.02	31.5
ENV6	72.2	62.1	54.4	11.9	38.3	21.9	5.22	29.7	11.6	7.64	6.6	6.23	30.4	9.46	7.21	3.18	3.73	29.6
SOC1	8.55	9.76	5.71	2.37	8.23	26.4	3.18	11.5	17	15.3	8.39	9.06	8.8	26.3	14.1	1.52	1.6	28.4
SOC2	37.9	39.9	15.7	11.6	37.5	33.9	11.7	14.7	33.2	30.1	11.8	33.8	30.9	10.2	7.57	3.1	3.7	24.5
SOC3	30.9	22.4	20.6	5.61	31.9	42.4	10.5	34.1	10.6	13.1	11.1	16.9	40	14.8	12.5	3.21	3.85	23.7
SOC4	7.61	8.13	14.9	2.09	12.5	8.34	30.2	32.8	33.2	4.09	8.36	30.6	18.2	4.71	3.24	1.27	1.46	16.7
SOC5	7.46	8.94	4.72	2.44	7.8	9.59	3.76	16.8	38.2	26	2.99	9.17	13.7	4.52	3.09	1.28	1.6	22.2
SOC6	6.45	7.52	3.83	1.97	6.16	7.75	18.8	26.4	26.6	14.4	7.86	3.2	17.4	9.33	2.9	1.24	1.44	10.9
CON1	33.3	38.2	14.1	8.18	49.6	32.4	7.39	19.1	33.2	12.7	19.7	9.11	29.8	41.8	27.4	31.9	38.2	47.8
CON2	41.8	53.3	34.5	9.23	43.9	71	9.53	36	51.1	34.8	16.3	22.1	51.6	16.6	17.9	15.8	11.3	63.5

Table 15 (continued)

	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3	CON4	CON5	CON6
CON3	39	30.7	32.7	5.44	31.8	34.8	5.56	16.9	27.7	28.8	11.7	22.8	33.6	14.7	7.01	8.27	8.74	34
CON4	29.7	51.1	26.6	8.69	31	54.3	8.34	23.6	33.5	22.6	9.47	9.41	66.4	32	17.6	5.3	17.1	47.5
CON5	27.4	37.7	15.2	13.7	50.9	56.6	7.84	44.4	43.3	17	14.6	9.64	76.2	15.4	17.3	10.7	6.25	62.4
CON6	31.8	47.9	28.3	9.39	44.9	41.6	31.5	47.3	52.9	35.9	27	28.2	74.3	39.6	29.6	16.6	17.6	23.5
Repair	69.1	78.3	22.1	18.7	28.3	73.8	12.6	47.5	22.9	31.9	19.6	19.8	60.9	34.9	21.2	9.6	10.3	34.9
Reuse	57.2	72.4	21.3	18.5	27.7	67.3	12.3	40.8	21.7	20.6	14.1	14	65.6	24.4	21.5	9.64	10.5	33.8
Remanufacture	48.9	68.6	19.5	17.4	24.4	64	6.06	39.7	19.8	24.8	12.9	13.3	52.4	22.1	19.8	9.04	9.72	31.6
Refurbish	37.1	40.1	10.1	15.5	14.3	42.5	4.52	25.2	15.5	11.7	11.2	11.2	41.6	13.7	17.2	2.86	8.76	27.3
Recycle	53.8	60.5	18.7	6.2	66.1	62.2	10.4	33.5	16.9	12.3	12.3	11.7	44.6	14.5	6.91	8.48	9.06	19.6
Landfill	55.4	20.3	14.1	4.24	17.4	19.1	9.07	18.3	13.3	10.2	9.85	9.41	17	11.3	4.39	7.15	7.48	14.3

	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
EF1	69.7	69.49	56.6	46.5	69.58	52.9
EF2	**83.51**	83.32	75.3	47.7	**94**	**84.4**
EF3	**97.09**	**91.33**	**88.9**	62.7	**93.87**	83.4
EF4	61.24	55.6	54.5	34.7	68.79	63.9
EF5	39.35	44.38	53.5	33.5	61.75	30.3
EF6	58.75	52.92	51	34.4	76.84	74.5
IF1	76.96	71.35	63.6	41	61.6	64.3
IF2	69.48	63.99	63.3	42.1	76.52	70
IF3	71.17	71.03	64.3	42.3	62.32	45.4
IF4	69.67	80.58	67.4	39.1	70.83	63.7
IF5	76.81	81.26	64	42.3	60.53	53.6
ECO1	16.67	16.32	16.2	7.15	17.42	15.3
ECO2	71.38	75.75	69.3	42.4	55.2	37.6
ECO3	29.68	29.59	29.1	13.7	23.98	22
ECO4	20.31	20.53	14.5	9.33	65.09	50.6

Table 15 (continued)

	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
ECO5	29.23	39.61	49.8	16.9	23.57	19.9
ECO6	23.14	23.34	39.4	24.4	46.15	53.9
ENV1	16.85	16.61	16.2	7.18	17.4	15.4
ENV2	52.63	57.83	56.9	39.8	53.4	22.8
ENV3	29.5	29.32	28.7	13.5	23.9	21.6
ENV4	22.09	21.99	16.1	12.3	16.36	14.5
ENV5	25.54	30.46	24.2	17.9	63.94	23.3
ENV6	56.95	56.83	56.2	37.2	52.59	48.3
SOC1	18.18	17.35	16.7	13.1	17.72	15.4
SOC2	66.6	66.64	65.1	42.2	45.68	40.8
SOC3	54.22	53.97	53.1	40.9	64.68	28.3
SOC4	16.63	16.6	10.7	7.4	16.88	14.5
SOC5	16.71	16.38	15.9	12.7	17.58	15.4
SOC6	15.02	14.83	14.5	11.6	14.72	12.7
CON1	83.29	82.63	80.5	59.7	71.18	64.6
CON2	**91.09**	69.44	66.9	37.6	70.18	41.4
CON3	52	30.18	28.9	21	30.36	26.1
CON4	76.36	81.54	74.4	56.9	65.12	58.9
CON5	75.01	75.4	73.4	51.2	48.21	41.3
CON6	76.39	75.78	73.2	54.5	80.55	77.8
Repair	38.81	43.7	41.8	29.2	41.89	35.7
Reuse	43.5	37.66	41	28.8	41.15	35.4
Remanufacture	37.97	37.67	30.9	25.5	36	30.9
Refurbish	28.75	28.19	27.2	14.5	27.82	24.5
Recycle	33.07	33.01	32	22.9	29.06	28.5
Landfill	23.17	22.82	22.7	16.4	24.06	16.2

** Other data is also available but omitted due to the word limitations

Electronics industry: expert

See Table 16.

Table 16 The experts' initial direct-relation LIVHF matrix in the electronics industry

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
EF1	0	[(s1), (0), (s1,s2)]	[(s2), (s2), (s1)]	[(s7,s8), (s7), (s6,s7,s8)]	[(s2), (s3,s4), (s3)]	[(s4), (s3), (s3)]	[(0), (s1), (s1,s2)]	[(s6), (s6), (s7)]	[(s8), (s7), (s8)]	[(s7,s8), (s7), (s6)]	[(s7,s8,s9), (s6), (s6,s7)]
EF2	[(0), (s1,s2), (s1)]	0	[(s7,s8), (s6,s7,s8), (s7,s8)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s3), (s4,s5), (s4)]	[(s2), (s3,s4,s4), (s2)]	[(s6,s7,s8), (s7,s8), (s7,s8)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s8), (s8,s9), (s7,s8,s9)]
EF3	[(s2,s3), (s2), (s1)]	[(s6,s7), (s6,s7), (s5,s6,s7)]	0	[(s9), (s9), (s7,s8,s9)]	[(s7), (s7), (s8,s9,s9)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s2), (s1), (s2,s3)]	[(s3,s4), (s4,s5,s6), (s3)]	[(s8,s9), (s7), (s8)]	[(s2), (s3,s4), (s3)]	[(s6,s7,s8), (s7,s8), (s7)]
EF4	[(0), (0), (s1,s2,s3)]	[(s2), (s3,s4,s4), (s2)]	[(s3,s4,s5), (s4,s5), (s4)]	0	[(s3), (s2), (s3,s4)]	[(s8), (s8), (s7)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	[(s1), (s2), (s1)]	[(s2), (s2), (s3)]	[(s2), (s2), (s2)]	[(s2), (s2), (s3)]
EF5	[(s1,s2), (s1), (0)]	[(s1), (s2,s3), (s2)]	[(s3), (s2), (s3,s4)]	[(s7,s8,s9), (s6,s7), (s6)]	0	[(s3,s4), (s2), (s3)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s2), (s1), (s1)]	[(s1), (s1,s2), (0)]	[(s4,s5,s6), (s3,s4), (s3)]
EF6	[(s8), (s8,s9), (s7,s8,s9)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s9), (s7,s8,s9), (s9)]	[(s7), (s7), (s8,s9,s9)]	[(s9), (s9), (s8)]	0	[(s3), (s2), (s2)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s2), (s3,s4), (s3)]	[(s3), (s4,s5), (s4)]	[(s2), (s3), (s3,s4)]
IF1	[(s7), (s8,s9,s9), (s7)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s7), (s7), (s7)]	[(s3), (s2), (s3,s4)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s2), (s3), (s2)]	0	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s3,s4), (s2), (s3)]	[(s8), (s7), (s8)]
IF2	[(s1), (0), (s1)]	[(s1,s2), (0), (s1)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s2), (s3,s4), (s3)]	[(s7), (s8), (s8)]	[(s1), (s1), (s2)]	[(s1), (s1), (s1)]	0	[(s1), (s2,s3,s3), (s1)]	[(s3), (s2), (s2)]	[(s2), (s3), (s3)]
IF3	[(s2), (s1), (s1)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s6,s7), (s6,s7), (s5,s6,s7)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s2), (s2,s3), (s1)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s8), (s8,s9), (s7,s8,s9)]	0	[(0), (0), (s1,s2,s3)]	[(s7), (s8), (s8)]

Table 16 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
IF4	[(s8,s9), (s8), (s7,s8,s9)]	[(s3), (s2), (s3,s4)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s3), (s4,s5,s6), (s3,s4)]	[(0), (0), (s1,s2,s3)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s7), (s7), (s8,s9,s9)]	[(s1), (s2,s3), (s2)]	0	[(s7,s8,s9), (s9), (s9)]
IF5	[(s3), (s3), (s3)]	[(s2), (s3,s4), (s3)]	[(s8,s9), (s7), (s8)]	[(s3), (s2), (s2)]	[(s7,s8), (s6,s7,s8), (s7,s8)]	[(s3,s4), (s2), (s3)]	[(s8), (s9), (s8)]	[(s2), (s1), (s2,s3)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s2), (s3,s4), (s3)]	0
ECO1	[(0), (0,s1), (0)]	[(s2,s3), (s1), (s2)]	[(0), (s1,s2), (s1)]	[(s1,s2), (s1), (0)]	[(s5), (s4), (s4)]	[(s1), (s2,s3,s3), (s1)]	[(s3), (s4), (s3)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]
ECO2	[(s3), (s3), (s3)]	[(s3), (s3,s4), (s2)]	[(s7), (s7), (s8,s9,s9)]	[(s2), (s2), (s2)]	[(s6,s7,s8), (s7,s8), (s7,s8)]	[(s2), (s3,s4,s4), (s2)]	[(s7), (s8,s9,s9), (s7)]	[(s2), (s2), (s2)]	[(s6), (s6), (s7,s8,s8)]	[(s2), (s3), (s3)]	[(0), (s1), (0)]
ECO3	[(0), (s1), (s1,s2)]	[(s1,s2), (s1), (0)]	[(s2), (s2), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s3,s4), (s2), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (s1,s2)]
ECO4	[(0), (0), (0,s1,s2)]	[(s2,s3), (s1), (s2)]	[(s1), (s1,s2), (0)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	[(s2), (s2), (s3)]	[(0), (s1), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s2), (s3), (s2)]
ECO5	[(s1), (s2,s3), (s2)]	[(s1), (0), (s1,s2)]	[(0), (s1), (s1)]	[(s1), (s2,s3,s3), (s1)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(s2,s3), (s2), (s1)]	[(s3), (s3,s4), (s2)]	[(s1), (0), (s1,s2)]
ECO6	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2,s3), (0)]	[(0), (0,s1,s2), (0)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(s1), (s1,s2), (0)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]
ENV1	[(0,s1), (0), (0)]	[(0), (s1,s2), (s1)]	[(s1,s2), (s1), (0)]	[(s3), (s3), (s3)]	[(0), (0,s1), (0)]	[(s1), (0), (0)]	[(0), (s1,s2), (s1)]	[(s1,s2), (0), (s1)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]	[(s1), (s2), (s2,s3)]
ENV2	[(0), (0), (0)]	[(s1), (s2,s3), (s2)]	[(s3), (s2), (s2)]	[(s3,s4), (s2), (s3)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (0)]	[(s1), (s2,s3,s3), (s1)]	[(0), (s1), (0)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s3), (s2), (s2)]
ENV3	[(0), (0,s1,s2), (0)]	[(s1), (0), (s1,s2)]	[(0), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s1), (0), (s1,s2)]	[(s2), (s3,s4,s4), (s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(s2,s3), (s2), (s1)]

Table 16 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
ENV4	[(s1,s2), (0), (s1)]	[(0), (s1,s2,s3), (0)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s2), (s2), (s2)]	[(s1,s2), (s1), (0)]	[(0), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (s1,s2,s3), (0)]
ENV5	[(0), (s1), (0)]	[(s1), (s2), (s2,s3)]	[(s3), (s3,s4), (s2)]	[(s4,s5,s6), (s3,s4), (s3)]	[(0,s1), (0), (0)]	[(0), (s1), (s1,s2)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s2), (s3,s4), (s3)]	[(0), (0), (0)]	[(0), (0), (s1)]	[(0), (0), (s1,s2,s3)]
ENV6	[(0), (0,s1), (0)]	[(s2), (s2), (s3)]	[(s2), (s2,s3), (s1)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s2), (s3), (s2)]	[(s2), (s2), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2), (s1)]
SOC1	[(s4), (s4,s5), (s3,s4,s5)]	[(0), (s1), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (0,s1), (0)]
SOC2	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s3), (s2), (s2)]	[(s2), (s2), (s2)]	[(s2), (s2,s3), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(s3), (s3), (s3)]	[(0), (0), (0,s1,s2)]	[(s1), (s1), (s2,s3,s3)]	[(s2), (s2), (s2)]	[(s1), (0), (s1,s2)]
SOC3	[(s1,s2), (0), (s1)]	[(s1), (s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]	[(s3), (s3), (s4,s5,s5)]	[(0), (0), (0,s1)]	[(s4), (s4,s5), (s3,s4,s5)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s2), (s3), (s2)]
SOC4	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(s1), (s1), (0)]
SOC5	[(s2), (s1), (s2,s3)]	[(s3), (s3), (s4)]	[(s1), (0), (s1,s2)]	[(s2), (s2), (s3,s4,s4)]	[(0), (0,s1,s2), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC6	[(0), (s1), (0)]	[(s1), (s2,s3), (s2)]	[(0), (0), (0,s1)]	[(0), (s1), (0)]	[(0), (s1,s2), (s1)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1)]	[(0), (0), (0)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]
CON1	[(s3), (s3), (s4,s5,s5)]	[(s2), (s1), (s2,s3)]	[(s3), (s3), (s2)]	[(0), (0,s1), (0)]	[(s1), (s2), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s1), (s2,s3,s3)]	[(0), (0,s1), (0)]	[(s3), (s2), (s3,s4)]	[(s3), (s4), (s4,s5)]	[(s3), (s3), (s4)]
CON2	[(s4,s5), (s4), (s3)]	[(s3), (s3), (s4)]	[(s3), (s2), (s3,s4)]	[(s4,s5,s6), (s3), (s3,s4)]	[(0,s1), (0), (0)]	[(s2), (s3), (s2)]	[(s2), (s2), (s3,s4,s4)]	[(s3), (s4,s5), (s4)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s4,s5,s6), (s3), (s3,s4)]
CON3	[(s5), (s5,s6), (s6,s7,s8)]	[(s2), (s2), (s2)]	[(s1), (s1), (s2,s3,s3)]	[(s3), (s4,s5), (s4)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s2), (s3,s4), (s3)]	[(s1), (s1,s2), (0)]	[(s2), (s2), (s2)]	[(s1), (s2,s3,s3), (s1)]	[(s1,s2), (0), (s1)]

Table 16 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
CON4	[(s4), (s4,s5), (s3)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s2), (s2), (s2)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (0)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(0), (s1), (0)]	[(s3), (s3), (s4,s5,s5)]	[(s5,s6,s7), (s6,s7), (s6,s7)]	[(s2), (s3), (s3,s4)]
CON5	[(s6), (s7), (s6)]	[(s1), (s2,s3), (s2)]	[(s2), (s3), (s2)]	[(0), (s1,s2), (s1)]	[(s3), (s2), (s3,s4)]	[(0), (0,s1), (0)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s2), (s2,s3), (s1)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s3), (s3,s4), (s2)]
CON6	[(s5,s6,s7), (s6,s7), (s6,s7)]	[(s5), (s6), (s6,s7)]	[(s3), (s4,s5), (s4)]	[(0), (s1), (s1,s2)]	[(s1), (s2,s3), (s2)]	[(s3,s4), (s2), (s3)]	[(s3), (s4), (s4,s5)]	[(s2), (s2), (s3,s4,s4)]	[(s4,s5), (s4), (s3)]	[(s6), (s6,s7), (s5,s6,s7)]	[(s4), (s4,s5), (s3)]
Repair	[(s3), (s2), (s2)]	[(s2,s3), (s1), (s2)]	[(0), (s1,s2), (s1)]	[(s6,s7,s8), (s6,s7,s8), (s6,s7,s8)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s3), (s3), (s2)]	[(s2), (s1), (s2,s3)]	[(s2), (s1), (s2)]	[(s7,s8), (s6,s7,s8), (s7,s8)]
Reuse	[(s1), (s1), (s2,s3,s3)]	[(s2), (s2), (s2)]	[(s1,s2), (s1), (0)]	[(s6), (s6,s7), (s5)]	[(s1,s2), (s1), (0)]	[(s1), (0), (s1,s2)]	[(s8), (s8), (s8)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s3), (s2), (s2)]	[(s2), (s2), (s3)]	[(s7,s8,s9), (s8,s9), (s8)]
Remanufacture	[(s2), (s2), (s3)]	[(s2), (s2), (s2)]	[(s1,s2), (0), (s1)]	[(s4), (s4,s5), (s3)]	[(s1), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s2), (s2), (s2)]	[(s1), (s2,s3,s3), (s1)]	[(s5), (s6,s7,s8), (s5,s6)]
Refurbish	[(s1), (s2,s3,s3), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(0), (0), (s1,s2,s3)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s1), (s1), (s2,s3,s3)]	[(s2), (s2), (s1)]	[(s5), (s4), (s4)]
Recycle	[(s1,s2), (0), (s1)]	[(s2), (s3), (s2)]	[(s1), (s1,s2), (0)]	[(s8,s9), (s8), (s7)]	[(s1,s2), (0), (s1)]	[(s1), (0), (s1)]	[(s3), (s3), (s4)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s1), (s1,s2), (0)]	[(0), (s1,s2), (s1)]	[(s1), (s2,s3), (s2)]
Landfill	[(s1,s2), (0), (s1)]	[(s2), (s1), (s2,s3)]	[(0), (s1), (s1,s2)]	[(s7), (s8), (s8,s9)]	[(0), (s1), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s2,s3), (s2), (s1)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (0)]	[(0), (s1,s2,s3), (0)]

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
EF1	[(0), (0), (0)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s1), (0), (0)]	[(s2), (s2), (s3)]	[(s3), (s2), (s3)]	[(0), (0), (0,s1)]	[(0), (s1), (0)]	[(0), (0), (s1)]	[(0,s1), (0), (0)]	[(s3), (s2), (s2)]	[(s4), (s4), (s3)]	[(s3,s4), (s4,s5,s6), (s3)]

Table 16 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
EF2	[(0), (0,s1,s2), (0)]	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s3), (s2), (s2)]	[(s4), (s4), (s5)]	[(s2), (s3,s4), (s3)]	[(s1), (s1), (s2,s3,s3)]	[(s5), (s5), (s6,s7,s7)]	[(s2), (s3), (s3,s4)]	[(s1), (s2), (s2,s3)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s4,s5,s6), (s3), (s3,s4)]
EF3	[(0), (0), (s1)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s3), (s4,s5), (s4)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s1), (s1), (s2,s3,s3)]	[(s2), (s1), (s2)]	[(s2), (s2), (s1)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s1,s2), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s3,s4), (s4,s5,s6), (s3)]
EF4	[(0), (0), (0,s1,s2)]	[(s1), (s2,s3,s3), (s1)]	[(s2), (s3), (s2)]	[(s2), (s2), (s2)]	[(0), (0,s1,s2), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s2), (s2), (s3,s4,s4)]	[(s2), (s3,s4), (s3)]	[(s3), (s3,s4), (s2)]	[(s1), (s1), (s2,s3,s3)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s6,s7,s8), (s5,s6), (s5)]
EF5	[(0), (0), (0)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s3,s4), (s4,s5,s6), (s3)]	[(s1), (s2), (s2)]	[(s3), (s2), (s2)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s3,s4), (s2), (s3)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s5), (s6,s7,s8), (s5,s6)]
EF6	[(0), (s1), (0)]	[(s3,s4), (s2), (s3)]	[(s2), (s3,s4), (s3)]	[(s3), (s2), (s3,s4)]	[(0,s1), (0), (0)]	[(s2), (s2,s3), (s1)]	[(s1), (s1), (0)]	[(s4), (s4,s5), (s3,s4,s5)]	[(0), (s1,s2,s3), (0)]	[(s2), (s3), (s2)]	[(s3), (s3,s4), (s4,s5,s6)]	[(s6,s7), (s5,s6,s7), (s6,s7)]
IF1	[(0), (0), (s1)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s1), (0), (0)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s2), (s3), (s3,s4)]	[(s2), (s3,s4), (s3)]	[(s3,s4), (s2), (s3)]	[(s4), (s4), (s4)]	[(0), (0), (0,s1)]	[(0), (0), (0)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s4), (s4,s5), (s3,s4,s5)]
IF2	[(0), (0), (0,s1,s2)]	[(s2), (s2), (s3,s4,s4)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s3), (s3,s4), (s4,s5,s6)]	[(s2), (s2), (s3)]	[(s4,s5), (s4), (s3,s4,s5)]	[(0), (0), (0,s1,s2)]	[(s3), (s4,s5), (s4)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (0), (s1,s2,s3)]	[(s2), (s2), (s3)]	[(0), (0), (s1,s2,s3)]
IF3	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s7), (s8,s9), (s8)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s2), (s1), (s2,s3)]	[(s1), (s1), (s2,s3,s3)]	[(s2), (s2), (s3)]	[(s2), (s2), (s3,s4,s4)]	[(s1), (s1), (s2)]	[(s4), (s5), (s4)]	[(s2), (s3,s4), (s3)]
IF4	[(s4), (s5), (s4)]	[(s9), (s7,s8,s9), (s9)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s5,s6), (s5), (s6,s7,s8)]	[(s5), (s6,s7,s8), (s5,s6)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (s1,s2,s3)]	[(s1), (s2,s3,s3), (s1)]	[(s4), (s4,s5), (s3,s4,s5)]	[(0), (0), (s1,s2,s3)]	[(s5,s6,s7), (s5,s6,s7), (s5,s6,s7)]	[(s4,s5), (s3,s4,s5), (s4,s5)]
IF5	[(s4,s5,s6), (s3), (s3,s4)]	[(0), (0), (0)]	[(s2), (s1), (s1)]	[(s1), (s1,s2), (0)]	[(s3), (s4), (s3)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (s2)]	[(s3), (s4), (s4)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]

Table 16 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
ECO1	0	[(s1), (s1,s2), (0)]	[(s1), (s2), (s1)]	[(0), (s1), (s1)]	[(s2), (s1), (s1)]	[(0), (s1,s2), (s1)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]
ECO2	[(s8,s9), (s8,s9), (s7,s8,s9)]	0	[(s1), (s1), (s1)]	[(s1), (s1), (s1)]	[(s2), (s3), (s3)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (s1,s2,s3)]	[(s4), (s3), (s4)]	[(s1), (s1), (s2)]	[(0), (s1), (s1,s2)]	[(0), (s1), (0)]	[(0), (0), (0)]
ECO3	[(s3,s4,s5), (s4,s5), (s4)]	[(s4), (s4), (s3)]	0	[(s1), (s2), (s1)]	[(s1), (s1), (s2)]	[(s1,s2), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(s2), (s3,s4,s4), (s2)]	[(0), (0), (0)]	[(0), (0), (s1)]	[(0), (s1), (0)]
ECO4	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s1,s2), (s1), (0)]	0	[(s1,s2), (s1), (0)]	[(s1), (s1), (s2)]	[(s1), (s2), (s2)]	[(0), (0,s1,s2), (0)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s3), (s2), (s3)]
ECO5	[(s4,s5), (s4), (s3,s4,s5)]	[(s1), (s1), (0)]	[(s1), (s1), (s2)]	[(0), (s1,s2,s3), (0)]	0	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s3,s4), (s3), (s2)]	[(s1,s2), (s1), (0)]	[(s1,s2), (s1), (0)]	[(s1), (0), (0)]	[(s2), (s3,s4), (s3)]
ECO6	[(0), (s1), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (s1)]	[(s1), (0), (s1,s2)]	[(s3,s4), (s2), (s3)]	0	[(0), (0,s1), (0)]	[(s2), (s3,s4), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (0)]	[(s2), (s3), (s3,s4)]	[(0), (0,s1), (0)]
ENV1	[(0), (s1), (s1,s2)]	[(s3), (s2), (s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (s1,s2)]	[(0), (0,s1), (0)]	[(s1,s2), (s1), (0)]	0	[(0), (s1,s2), (s1)]	[(s1), (s2), (s1)]	[(0), (s1), (s1,s2)]	[(s1), (0), (s1)]	[(s1), (s1), (s1)]
ENV2	[(s3), (s4), (s4,s5)]	[(s2), (s2), (s2)]	[(0), (0,s1,s2), (0)]	[(s4), (s3), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(s7,s8,s9), (s8,s9), (s8)]	0	[(s1), (s1), (s1)]	[(s1), (s1), (s2)]	[(s1), (s1), (s1)]	[(s1), (s1,s2), (0)]
ENV3	[(s3), (s3), (s3)]	[(s1), (s2,s3,s3), (s1)]	[(s4,s5,s6), (s3), (s3,s4)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(0), (s1), (0)]	[(s6,s7,s8), (s5,s6), (s5)]	[(0), (0), (s1,s2,s3)]	0	[(s1,s2), (s1), (0)]	[(s1), (s1), (s1)]	[(s1), (s2), (s1)]
ENV4	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2)]	[(s2), (s3), (s2)]	[(0), (s1), (0)]	[(0,s1), (0), (0)]	[(0), (0), (s1)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s2), (s2), (s1)]	[(s4), (s4,s5), (s3,s4,s5)]	0	[(s1), (s1), (s1)]	[(s1), (s1), (s1)]
ENV5	[(s3,s4), (s2), (s3)]	[(s1,s2), (s1), (0)]	[(s2), (s2), (s3)]	[(s2,s3), (s2), (s1)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (s2), (s1)]	0	[(s1,s2), (0), (s1)]

Table 16 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
ENV6	[(s4,s5), (s4), (s3,s4,s5)]	[(s1), (s2), (s1)]	[(s2), (s3,s4), (s3)]	[(s3), (s2), (s2)]	[(s2), (s2), (s1)]	[(s3), (s3,s4), (s2)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s5,s6), (s5), (s6,s7,s8)]	[(s1), (0), (s1,s2)]	[(s3), (s3,s4), (s2)]	0
SOC1	[(s1), (0), (0)]	[(0), (0), (0,s1)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(0,s1), (0), (0)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(s2), (s2,s3), (s1)]
SOC2	[(s1), (s1), (s2)]	[(s1,s2), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(s2), (s3), (s2)]	[(0), (0), (s1)]	[(0), (s1,s2), (s1)]	[(s2), (s1), (s2,s3)]	[(0), (0), (s1,s2,s3)]	[(s2), (s1), (s2)]	[(s2), (s2), (s2)]	[(0), (s1,s2), (s1)]
SOC3	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s2), (s1), (s2)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0,s1,s2), (0)]	[(s2), (s3), (s2)]	[(0), (0,s1,s2), (0)]	[(s3), (s2), (s2)]	[(s1), (s1), (s2,s3,s3)]
SOC4	[(0), (0,s1,s2), (0)]	[(s1), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s2), (s2), (s1)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]	[(s1), (0), (s1,s2)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC5	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (s1)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(0), (0), (0)]	[(0), (0), (s1)]	[(s1), (0), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC6	[(0), (s1,s2), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1), (0)]	[(0), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0,s1), (0)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]
CON1	[(s4,s5), (s4), (s3,s4,s5)]	[(s2), (s2), (s3,s4,s4)]	[(s1), (0), (0)]	[(0), (0,s1), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1)]	[(0), (0,s1,s2), (0)]	[(0), (s1,s2,s3), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(s3,s4), (s3), (s2)]	[(0,s1), (0), (0)]
CON2	[(s3), (s4,s5), (s4)]	[(s4,s5,s6), (s3,s4), (s3)]	[(0), (0,s1,s2), (0)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s2), (s3), (s2)]	[(s1), (s1), (s2,s3,s3)]	[(s1,s2), (0), (s1)]	[(s2), (s1), (s2,s3)]	[(0), (s1), (s1,s2)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(s3), (s4,s5,s5), (s3)]
CON3	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s1), (s2), (s1)]	[(s2), (s2), (s2)]	[(0,s1), (0), (0)]	[(s3), (s3,s4), (s2)]	[(s1), (0), (s1)]	[(s2), (s2), (s2)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (s2,s3,s3)]	[(0), (0,s1,s2), (0)]	[(s2), (s2), (s2)]	[(s3,s4), (s2), (s3)]
CON4	[(s5), (s6), (s6,s7)]	[(s3), (s2), (s3,s4)]	[(0), (s1), (0)]	[(s2), (s1), (s2,s3)]	[(s4,s5), (s3), (s4)]	[(s2), (s2), (s1)]	[(0), (0), (0,s1,s2)]	[(s3), (s2), (s2)]	[(s1), (s2), (s1)]	[(0), (s1), (0)]	[(s1,s2), (0), (s1)]	[(s2), (s3), (s3,s4)]

Table 16 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
CON5	[(s6), (s7,s8,s9), (s6,s7)]	[(s2), (s3,s4), (s3)]	[(0), (0,s1), (0)]	[(s2), (s2), (s3)]	[(s3), (s4,s5), (s4)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (0)]	[(s1), (s2,s3), (s2)]	[(s3,s4), (s2), (s3)]	[(s4,s5), (s3), (s4)]
CON6	[(s6,s7), (s7,s8,s9), (s6)]	[(s3), (s4), (s4,s5)]	[(s1), (0), (s1)]	[(0), (s1,s2), (s1)]	[(s4,s5), (s4), (s3)]	[(s1), (0), (0)]	[(0), (0,s1), (0)]	[(0), (s1,s2), (s1)]	[(s1), (s1,s2), (0)]	[(0,s1), (0), (0)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0,s1), (0)]
Repair	[(s6), (s7,s8,s9), (s6,s7)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s3), (s4,s5), (s4)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (s2,s3,s3)]	[(0), (s1), (s1,s2)]	[(s5), (s6), (s6,s7)]	[(s8,s9), (s8), (s7,s8,s9)]	[(0), (s1), (s1)]	[(s4,s5), (s4), (s3)]	[(0), (s1,s2), (s1)]	[(s7), (s7), (s8,s9,s9)]
Reuse	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s7), (s7), (s8,s9,s9)]	[(s2), (s2), (s3,s4,s4)]	[(s1), (0), (s1,s2)]	[(s2), (s2), (s2)]	[(0), (0), (s1,s2,s3)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s7), (s7), (s8,s9,s9)]	[(0), (0), (s1,s2,s3)]	[(s3), (s4,s5,s5), (s3)]	[(s2), (s1), (s1)]	[(s8,s9), (s7,s8,s9), (s8,s9)]
Remanufacture	[(s7,s8,s9), (s6), (s6,s7)]	[(s6), (s7), (s6)]	[(s3), (s2), (s3,s4)]	[(s1), (s1), (s1)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s2), (s1), (s1)]	[(s3), (s4,s5), (s4)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]	[(s1), (s1,s2), (0)]	[(s3), (s4,s5), (s4)]	[(0), (s1), (s1)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]
Refurbish	[(s7,s8,s9), (s6,s7), (s6)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s3), (s2), (s2)]	[(s1,s2), (0), (s1)]	[(s3), (s2), (s3)]	[(0), (s1), (s1,s2)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s8,s9), (s7), (s8)]	[(0), (s1), (s1)]	[(s4), (s3), (s4,s5)]	[(s1,s2), (0), (s1)]	[(s7), (s7), (s8,s9,s9)]
Recycle	[(s3), (s4,s5), (s4)]	[(s1), (s2,s3), (s2)]	[(s3), (s3), (s4)]	[(s1), (s1), (s2)]	[(s2,s3), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s6,s7,s8), (s7,s8), (s7)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s8,s9), (s8,s9), (s9)]	[(s7), (s7), (s8,s9,s9)]
Landfill	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s5), (s6), (s6)]	[(s1), (0), (s1,s2)]	[(0), (s1,s2), (s1)]	[(s4), (s3), (s4,s5)]	[(s6), (s7,s8,s9), (s6,s7)]	[(0), (s1), (s1,s2)]	[(s1), (s1), (s1)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
EF1	[(0), (s1,s2), (s1)]	[(0), (0,s1), (0)]	[(s1), (s1,s2), (0)]	[(0), (s1), (0)]	[(0,s1), (0), (0)]	[(s1), (0), (s1,s2)]	[(s2), (s3,s4), (s3)]	[(s3), (s2), (s3)]	[(s2), (s2), (s3)]
EF2	[(s3), (s4), (s3)]	[(0), (0), (s1,s2,s3)]	[(s3), (s3,s4), (s2)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s2), (s2), (s1)]	[(s2), (s3), (s3,s4)]	[(s2,s3), (s2), (s1)]	[(s2), (s3), (s3,s4)]	[(s3), (s3,s4), (s2)]

Table 16 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
EF3	[(s1), (s1), (s2,s3,s3)]	[(s1,s2), (s1), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(s1), (s2), (s2)]	[(s2), (s2), (s3)]	[(0), (0), (s1,s2,s3)]
EF4	[(0), (0,s1,s2), (0)]	[(0), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (s1)]	[(s2), (s2), (s3)]	[(0), (0), (s1)]	[(s1,s2), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]
EF5	[(s1,s2), (s1), (0)]	[(0,s1), (0), (0)]	[(s1), (0), (0)]	[(0), (s1), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]
EF6	[(s3), (s4,s5), (s4)]	[(0), (0), (s1,s2,s3)]	[(s2), (s2), (s2)]	[(s4,s5), (s4), (s3,s4,s5)]	[(0), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s3), (s4,s5), (s4)]	[(s1), (s2), (s1)]
IF1	[(s3,s4,s5), (s4,s5), (s4)]	[(0), (s1), (0)]	[(s1), (s1), (s2,s3,s3)]	[(0), (0), (0)]	[(0), (s1), (0)]	[(0), (0), (0,s1)]	[(s5,s6,s7), (s6,s7), (s6)]	[(s1), (s2), (s2)]	[(s3), (s2), (s3,s4)]
IF2	[(0), (0), (s1,s2,s3)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s2), (s3), (s2)]	[(s2), (s2), (s3)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1,s2)]
IF3	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (0)]	[(0), (0), (s1)]	[(s1), (0), (s1)]	[(s2), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(0), (s1,s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (0)]
IF4	[(0), (0), (s1,s2,s3)]	[(0), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]
IF5	[(0), (0), (0)]	[(0), (0), (s1)]	[(s2), (s2,s3), (s1)]	[(0), (s1), (s1,s2)]	[(s1), (s1), (s2)]	[(s1,s2), (0), (s1)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s2), (s2)]
ECO1	[(0), (0,s1), (0)]	[(s1), (0), (0)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s1), (s1)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2)]	[(s3), (s4), (s3)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (s2)]
ECO2	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s2), (s2), (s2)]	[(s1,s2), (s1), (0)]	[(s1), (s2), (s1)]	[(s1), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(s2), (s2), (s2)]	[(s2), (s2), (s3)]
ECO3	[(0), (0,s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2,s3), (0)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]
ECO4	[(s1,s2), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]	[(0), (0), (0)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]

Table 16 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
ECO5	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (s2), (s1)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s1), (0)]	[(s2), (s2), (s1)]
ECO6	[(0), (0), (s1)]	[(0,s1), (0), (0)]	[(s1), (0), (s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(0), (0), (s1)]
ENV1	[(0), (s1), (0)]	[(0), (s1,s2), (s1)]	[(s1), (s2), (s2,s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(s2), (s2), (s3)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]
ENV2	[(0), (0,s1), (0)]	[(s3,s4), (s2), (s3)]	[(s2), (s2), (s2)]	[(0), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1)]	[(s3), (s2), (s2)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]
ENV3	[(0), (0), (0)]	[(0), (0), (s1,s2,s3)]	[(s3), (s2), (s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(0), (0), (s1)]	[(s1), (s1), (s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]
ENV4	[(0), (0,s1,s2), (0)]	[(0), (s1,s2), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0)]	[(s1,s2), (0), (s1)]	[(0), (s1), (0)]	[(0), (0,s1,s2), (0)]
ENV5	[(0), (0), (s1)]	[(s2), (s3), (s3,s4)]	[(s1,s2), (s1), (0)]	[(s1), (0), (0)]	[(s1,s2), (s1), (0)]	[(0,s1), (0), (0)]	[(s2), (s3), (s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]
ENV6	[(0,s1), (0), (0)]	[(s2), (s3,s4), (s3)]	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]	[(0), (s1), (s1,s2)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC1	0	[(0), (s1), (s1)]	[(s3), (s2), (s2)]	[(s3), (s2), (s3,s4)]	[(s1), (s1,s2), (0)]	[(0), (s1), (s1,s2)]	[(0), (0,s1), (0)]	[(s4), (s4), (s4)]	[(s2), (s2), (s3)]
SOC2	[(s1,s2), (s1), (0)]	0	[(s2), (s3), (s3,s4)]	[(s2), (s3,s4), (s3)]	[(s1), (s1,s2), (0)]	[(s4), (s5), (s4)]	[(s1), (s2,s3), (s2)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC3	[(s3), (s3,s4), (s2)]	[(s2), (s2), (s2)]	0	[(s1), (0), (s1,s2)]	[(0), (s1), (s1)]	[(s3,s4), (s2), (s3)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s1), (s1), (s2)]	[(s1), (s1), (s2)]
SOC4	[(s5,s6), (s6,s7,s8), (s5)]	[(s4), (s3), (s3)]	[(s3), (s4,s5,s6), (s3,s4)]	0	[(s1), (s1), (s2,s3,s3)]	[(s3), (s4), (s4,s5)]	[(s3), (s2), (s3,s4)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]

Table 16 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
SOC5	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s2), (s2), (s3)]	0	[(0), (s1), (s1,s2)]	[(s1,s2), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]
SOC6	[(s3,s4,s5), (s4,s5), (s4)]	[(s1), (s2,s3), (s2)]	[(s3), (s4,s5), (s4)]	[(0), (s1), (s1,s2)]	[(s1,s2), (s1), (0)]	0	[(s2,s3), (s2), (s1)]	[(0), (s1), (s1,s2)]	[(0), (0), (0,s1)]
CON1	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s4,s5), (s4), (s3,s4,s5)]	[(0), (0,s1), (0)]	[(s2,s3), (s2), (s1)]	[(0), (0,s1), (0)]	0	[(s2), (s3), (s3,s4)]	[(s2), (s1), (s2,s3)]
CON2	[(0), (0,s1,s2), (0)]	[(0), (s1,s2), (s1)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s2,s3), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s3,s4), (s2), (s3)]	0	[(s1,s2), (s1), (0)]
CON3	[(0), (0), (0)]	[(0), (0), (0)]	[(s2), (s3), (s3)]	[(s2), (s3), (s2)]	[(s1), (s1), (s1)]	[(s2), (s1), (s2,s3)]	[(s2), (s2), (s2)]	[(s1), (s1), (s2,s3,s3)]	0
CON4	[(0), (0,s1,s2), (0)]	[(s1), (0), (0)]	[(s3,s4), (s2), (s3)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1,s2), (0)]	[(s6), (s6,s7), (s5,s6,s7)]	[(s2), (s2), (s3,s4,s4)]	[(s1), (s2), (s2,s3)]
CON5	[(0), (0), (0,s1)]	[(s3,s4), (s3), (s2)]	[(s5), (s6,s7), (s6)]	[(s1,s2), (0), (s1)]	[(0), (s1,s2,s3), (0)]	[(s1), (s1,s2), (0)]	[(s7,s8,s9), (s8,s9), (s8)]	[(0), (s1,s2), (s1)]	[(s2), (s1), (s2)]
CON6	[(s6,s7), (s6), (s5)]	[(s3), (s2), (s3,s4)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s2), (s3,s4,s4), (s2)]	[(s2), (s3,s4), (s3)]	[(s2), (s2), (s3,s4,s4)]	[(s7), (s6), (s6)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s3), (s3,s4), (s2)]
Repair	[(0), (s1), (s1,s2)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(0), (s1,s2), (s1)]	[(s2), (s3), (s2)]	[(s1), (0), (s1,s2)]	[(s1,s2), (s1), (0)]	[(s6), (s5), (s6,s7)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s3), (s3), (s2)]
Reuse	[(s1), (s1,s2), (0)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s1), (s1,s2), (0)]	[(s2), (s2), (s2)]	[(s1,s2), (s1), (0)]	[(0), (s1), (s1,s2)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s2), (s3,s4,s4), (s2)]	[(s3), (s2), (s3,s4)]
Remanufacture	[(0), (0), (s1,s2,s3)]	[(s3,s4), (s3), (s4,s5,s6)]	[(0), (s1), (s1)]	[(s2), (s2), (s3)]	[(0), (s1,s2,s3), (0)]	[(0), (s1), (s1)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s2), (s3,s4), (s3)]	[(s2), (s3,s4), (s3)]
Refurbish	[(s1), (s1,s2), (0)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s1,s2), (0), (s1)]	[(s2,s3), (s2), (s1)]	[(s1), (s1), (s1)]	[(s1), (0), (s1,s2)]	[(s5), (s6,s7), (s6)]	[(s2), (s3), (s3)]	[(s3), (s2), (s3,s4)]

Table 16 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
Recycle	[(s1,s2), (0), (s1)]	[(s3), (s4,s5,s5), (s3)]	[(s1,s2), (s1), (0)]	[(s1,s2), (0), (s1)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (s2)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s1,s2), (0), (s1)]	[(0), (s1,s2,s3), (0)]
Landfill	[(0), (s1,s2,s3), (0)]	[(s1), (s1), (0)]	[(0), (s1,s2), (s1)]	[(s1), (s1), (0)]	[(s1,s2), (0), (s1)]	[(s1,s2), (s1), (0)]	[(0), (s1,s2), (s1)]	[(0), (s1,s2,s3), (0)]	[(s1,s2), (s1), (0)]
	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
EF1	[(0), (0,s1), (0)]	[(0), (0), (0)]	[(0), (0), (s1,s2,s3)]	[(s7), (s7), (s8,s9,s9)]	[(s6), (s6), (s7,s8,s8)]	[(s5), (s6,s7), (s6)]	[(s5,s6,s7), (s6,s7), (s6)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s3), (s4), (s4)]
EF2	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s2), (s3,s4), (s3)]	[(s6), (s6), (s6)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s4), (s4), (s5)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s7), (s7), (s8,s9,s9)]
EF3	[(0), (0), (0)]	[(0), (0), (s1)]	[(s2), (s3,s4,s4), (s2)]	[(s8), (s7), (s8,s9)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s8), (s7), (s8)]	[(s8), (s7), (s8,s9)]	[(s7,s8,s9), (s8,s9), (s8,s9)]
EF4	[(0), (0), (s1)]	[(0), (0), (0,s1)]	[(s2), (s2,s3), (s1)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s3,s4), (s4,s5,s6), (s3)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s3), (s3,s4), (s4,s5,s6)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s7), (s7,s8), (s6,s7,s8)]
EF5	[(0), (0), (0)]	[(0), (s1), (0)]	[(s2), (s2), (s2)]	[(s3), (s4), (s3)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s5,s6,s7), (s6,s7), (s6)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s1), (0), (s1)]
EF6	[(s1), (0), (s1)]	[(s1,s2), (s1), (0)]	[(s2), (s3), (s2)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s3), (s4,s5), (s4)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s7), (s8), (s8)]	[(s9), (s8,s9), (s9)]
IF1	[(s1), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s7), (s8,s9), (s8)]	[(s7,s8), (s7), (s6,s7,s8)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s6,s7), (s6), (s5,s6,s7)]	[(s3), (s3,s4), (s4,s5,s6)]	[(s7), (s7,s8), (s6,s7,s8)]
IF2	[(0), (s1), (0)]	[(0), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s4), (s3), (s4)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s7), (s7), (s8,s9,s9)]

Table 16 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
IF3	[(s1), (0), (0)]	[(0), (0), (0)]	[(0), (s1), (s1,s2)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s2), (s3,s4), (s3)]
IF4	[(0), (0), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s7), (s7), (s8)]	[(s8,s9), (s9), (s9)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s3,s4), (s4,s5,s6), (s3)]	[(s5), (s6,s7,s7), (s5)]	[(s7), (s7,s8), (s6,s7,s8)]
IF5	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(s9), (s8), (s8)]	[(s7,s8,s9), (s9), (s9)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s3), (s3,s4), (s4,s5,s6)]	[(s4,s5,s6), (s3,s4), (s3)]	[(s3), (s3), (s4,s5,s5)]
ECO1	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s2,s3,s3), (s1)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(s2), (s1), (s1)]	[(0), (s1,s2), (s1)]	[(0), (s1,s2,s3), (0)]	[(s1,s2), (s1), (0)]
ECO2	[(s1), (0), (0)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(s6,s7), (s6), (s5,s6,s7)]	[(s6), (s7,s8,s8), (s6)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s2), (s3), (s3,s4)]	[(s1), (s2), (s2)]
ECO3	[(0), (0), (0)]	[(0), (s1), (0)]	[(0), (0), (0)]	[(s1), (s2), (s2)]	[(s2), (s2), (s3)]	[(s2), (s3), (s2)]	[(s2), (s2), (s2)]	[(s2), (s2,s3), (s1)]	[(s2), (s2), (s3)]
ECO4	[(0), (s1), (0)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (s1,s2)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s8), (s8), (s9)]	[(s3,s4,s5), (s4,s5), (s4,s5)]
ECO5	[(0), (0), (s1)]	[(0), (0), (0)]	[(s2,s3), (s2), (s1)]	[(s3), (s2), (s2)]	[(s3,s4), (s3), (s2)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s2), (s1), (s2)]	[(s1,s2), (s1), (0)]	[(s1,s2), (0), (s1)]
ECO6	[(0), (s1), (0)]	[(0), (0), (0)]	[(0), (s1,s2), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s1), (s2,s3,s3)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s5), (s5), (s6,s7,s7)]	[(s7), (s8), (s8,s9)]
ENV1	[(0), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(s3), (s2), (s2)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (0)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2,s3), (0)]

Table 16 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
ENV2	[(0), (0), (0)]	[(0), (s1), (0)]	[(s2,s3), (s1), (s2)]	[(s7,s8), (s6), (s7)]	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s6), (s5), (s6)]	[(0), (s1), (s1,s2)]
ENV3	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(0,s1), (0), (0)]	[(s2), (s1), (s2,s3)]	[(s2), (s2), (s3)]	[(s2), (s2), (s1)]	[(s2), (s2), (s2)]	[(s2), (s3), (s2)]	[(s2,s3), (s1), (s2)]
ENV4	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2), (s1)]	[(s1), (s1,s2), (0)]	[(s1), (0), (s1)]	[(s1,s2), (s1), (0)]	[(0), (s1), (s1)]	[(s1), (s1), (0)]	[(s1), (s1,s2), (0)]
ENV5	[(0), (0), (0)]	[(0), (0), (0)]	[(s2), (s1), (s2,s3)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (s2)]	[(s1,s2), (s1), (0)]	[(s9), (s8), (s8)]	[(0), (s1,s2), (s1)]
ENV6	[(s1), (0), (0)]	[(0,s1), (0), (0)]	[(s1), (s1), (s2,s3,s3)]	[(s3,s4), (s3), (s4,s5,s6)]	[(s4,s5,s6), (s3), (s3,s4)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s3), (s4,s5,s6), (s3,s4)]	[(s3,s4), (s4,s5,s6), (s3)]	[(s4), (s4), (s5)]
SOC1	[(0,s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s3), (s3), (s4,s5,s5)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s1), (s1), (0)]	[(s1), (0), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (s1,s2)]
SOC2	[(0), (0), (0)]	[(0), (0), (s1)]	[(s3), (s2), (s2)]	[(s6), (s7,s8,s8), (s6)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s6,s7,s8), (s7,s8), (s7)]	[(s3), (s3,s4), (s2)]	[(s2), (s3,s4), (s3)]
SOC3	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s2), (s2), (s2)]	[(s6,s7), (s5,s6,s7), (s6,s7)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s6,s7), (s5), (s6)]	[(s8), (s8,s9), (s7)]	[(s2), (s1), (s2,s3)]
SOC4	[(0,s1), (0), (0)]	[(0), (0), (0)]	[(s1), (s2,s3,s3), (s1)]	[(s1,s2), (0), (s1)]	[(s2), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2,s3), (0)]	[(s1,s2), (0), (s1)]
SOC5	[(0), (0), (0)]	[(0), (0), (s1)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s1), (0), (s1,s2)]	[(0), (s1), (s1,s2)]	[(s1), (s1), (s1)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]
SOC6	[(0), (0,s1,s2), (0)]	[(0), (0,s1), (0)]	[(0), (s1,s2), (s1)]	[(s1), (0), (s1,s2)]	[(0), (s1,s2,s3), (0)]	[(s1,s2), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (s1,s2)]	[(0), (s1,s2,s3), (0)]

Table 16 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
CON1	[(s3), (s3), (s4,s5,s5)]	[(s4), (s3), (s4,s5)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s9), (s8,s9), (s8,s9)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s8), (s8,s9), (s7)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s6,s7), (s6), (s7,s8,s9)]
CON2	[(0), (s1), (s1)]	[(0), (s1,s2), (s1)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]	[(s8,s9), (s9), (s8,s9)]	[(s3,s4), (s3), (s2)]	[(s3), (s2), (s3,s4)]	[(s2), (s3,s4), (s3)]	[(s2), (s3), (s3)]	[(0), (s1,s2), (s1)]
CON3	[(s1,s2), (s1), (0)]	[(s1,s2), (s1), (0)]	[(s4,s5), (s4), (s3)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	[(0), (s1), (s1,s2)]	[(0), (s1,s2,s3), (0)]	[(s1), (s1,s2), (0)]	[(s2), (s1), (s1)]	[(s1), (s1,s2), (0)]
CON4	0	[(s1), (s2,s3,s3), (s1)]	[(s5,s6,s7), (s6,s7), (s6,s7)]	[(s7), (s7), (s8,s9,s9)]	[(s9), (s9), (s8,s9)]	[(s7,s8), (s7,s8), (s6,s7,s8)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s6,s7), (s5), (s6)]	[(s6), (s6,s7), (s5,s6,s7)]
CON5	[(s1,s2), (s1), (0)]	0	[(s8,s9), (s8), (s7,s8,s9)]	[(s6), (s7), (s7,s8)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s6), (s7), (s7,s8)]	[(s3), (s2), (s2)]	[(s1), (s2), (s2,s3)]
CON6	[(s3), (s2), (s3,s4)]	[(s3,s4), (s3), (s2)]	0	[(s5), (s5,s6), (s6,s7,s8)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s6), (s6), (s5)]	[(s6,s7), (s6), (s5,s6,s7)]	[(s6), (s7,s8), (s7)]	[(s8), (s7), (s8,s9)]
Repair	[(0), (s1,s2), (s1)]	[(0), (s1), (s1)]	[(s4,s5), (s3), (s4)]	0	[(s1), (s1), (s1)]	[(s1), (s1), (0)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]
Reuse	[(s1), (s1), (s2)]	[(0), (s1,s2), (s1)]	[(s4,s5,s6), (s3), (s3,s4)]	[(0), (s1), (s1,s2)]	0	[(s1), (0), (s1,s2)]	[(s1), (s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (0)]
Remanufacture	[(0), (0), (s1,s2,s3)]	[(0), (0), (s1,s2,s3)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s1), (s1), (0)]	[(s1,s2), (0), (s1)]	0	[(s1), (s1), (s1)]	[(s2), (s1), (s1)]	[(s1), (0), (s1,s2)]
Refurbish	[(s1,s2), (0), (s1)]	[(0), (s1), (s1)]	[(s3), (s4), (s4,s5)]	[(s1), (s1,s2), (0)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (0)]	0	[(0), (s1), (s1,s2)]	[(s1), (s1), (s1)]
Recycle	[(s1), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(s2), (s2), (s2)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (s1)]	[(s1), (s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	0	[(s1), (0), (s1,s2)]
Landfill	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1,s2)]	[(s3), (s2), (s2)]	[(s1), (s1), (0)]	[(0), (s1,s2), (s1)]	[(s2), (s1), (s1)]	[(s1,s2), (0), (s1)]	[(s1), (s1,s2), (0)]	0

** Other data is also available but omitted due to the word limitations

Automotive industry: expert

See Table 17.

Table 17 The experts' initial direct-relation LIVHF matrix in the automotive industry

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
EF1	0	[(s1), (0), (s1,s2)]	[(s2,s3,s3), (s1,s2), (0)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s2,s3,s4), (s2,s3,s4), (s2,s3,s4)]	[(s1,s2), (0), (s3,s4,s5)]	[(0), (s1,s2,s3), (0)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s7,s8), (s7,s8), (s6,s7,s8)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s6,s7,s8), (s5), (s5,s6)]
EF2	[(0), (s1), (s1,s2)]	0	[(s6,s7), (s6), (s7,s8,s9)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s5,s6,s7), (s4,s5), (s4)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s3), (s3), (s4,s5,s5)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s7,s8,s9), (s9), (s9)]
EF3	[(0), (s2,s3,s3), (s1,s2)]	[(s3), (s4,s5), (s5,s6,s7)]	0	[(s8,s9), (s8,s9), (s9)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s2), (s2,s3), (s1)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s6), (s7,s8,s9), (s6,s7)]
EF4	[(s1), (0), (s1,s2)]	[(s3), (s3,s4), (s2,s3,s4)]	[(s6,s7), (s7,s8,s9), (s6)]	0	[(s3,s4,s5), (s2,s3), (s1)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s5,s6,s7), (s4), (s4,s5)]	[(0), (0), (s1,s2,s3)]	[(s3), (s2), (s2)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1,s2,s3), (s2,s3), (s2)]
EF5	[(0), (s1,s2), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(s2), (s3,s4), (s4,s5,s6)]	[(s8,s9), (s8), (s7,s8,s9)]	0	[(s3,s4,s5), (s1,s2), (0)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(0), (s1), (s1,s2)]	[(0), (s1), (s1,s2)]	[(s5,s6,s7), (s4), (s4,s5)]
EF6	[(s7,s8,s9), (s6,s7), (s6)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s7,s8,s9), (s9), (s9)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s9), (s7,s8,s9), (s9)]	0	[(s2), (s2,s3), (s1,s2,s3)]	[(s5,s6,s7), (s4,s5), (s4)]	[(s3,s4,s5), (0), (s1,s2)]	[(0), (s3,s4,s5), (s1,s2)]	[(0), (s1,s2), (s2,s3,s3)]
IF1	[(s5), (s5,s6), (s6,s7,s8)]	[(s4,s5), (s3), (s5,s6,s7)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s3), (s3), (s4,s5,s5)]	[(s5,s6), (s6,s7,s8), (s4)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	0	[(0), (s1,s2), (s3,s4,s5)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s1,s2), (0), (s3,s4,s5)]	[(s7,s8,s9), (s6,s7), (s6)]
IF2	[(0), (s1,s2), (s1)]	[(s1,s2), (0), (s1)]	[(s4), (s5,s6), (s6,s7,s8)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s1)]	0	[(s2,s3), (s2), (s1,s2,s3)]	[(s1,s2), (0), (s2,s3,s3)]	[(s1), (s2,s3), (s4,s5,s6)]
IF3	[(s1), (0), (s1,s2)]	[(s4), (s4,s5), (s5,s6,s7)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s3,s4,s5), (s2,s3), (s1)]	[(s3,s4), (s2), (s4,s5,s6)]	[(s8), (s8,s9), (s7,s8,s9)]	0	[(s1), (s1), (0)]	[(s5,s6), (s6,s7,s8), (s4)]

Table 17 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
IF4	[(s5,s6,s7), (s3), (s4,s5)]	[(s2,s3,s4), (s3,s4), (s3)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s9), (s7,s8,s9), (s9)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s1,s2), (0), (s1)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s3,s4,s5), (s1,s2), (0)]	0	[(s7,s8,s9), (s9), (s9)]
IF5	[(s1), (s1), (s2,s3,s3)]	[(0), (s1,s2), (s3,s4,s5)]	[(s7,s8), (s6,s7,s8), (s7,s8)]	[(s3,s4,s5), (s1), (s2,s3)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s1), (s2,s3), (s3,s4,s5)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s1,s2), (s1), (0)]	0
ECO1	[(0), (0,s1,s2), (0)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s2,s3,s3), (0), (s1,s2)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(s1,s2), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]
ECO2	[(s2), (s3,s4), (s3)]	[(0), (s1,s2), (s2,s3,s3)]	[(s9), (s7,s8,s9), (s9)]	[(s4), (s5), (s4)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s3,s4,s5), (s1), (s2,s3)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s2,s3), (s1), (s3,s4,s5)]	[(0), (0,s1,s2), (0)]
ECO3	[(0), (s1,s2,s3), (0)]	[(0), (s1), (s1,s2)]	[(s3,s4), (s3), (s2,s3,s4)]	[(s1,s2), (s1), (0)]	[(s1), (s2), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(s4), (s4), (s4)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]	[(0), (0), (s1,s2,s3)]
ECO4	[(0), (0,s1,s2), (0)]	[(s2), (s1), (s2)]	[(s1,s2), (0), (s2,s3,s3)]	[(s4), (s3), (s4,s5)]	[(s3,s4), (s2), (s4,s5,s6)]	[(s1), (s1), (0)]	[(s1), (s2), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(s1), (s2,s3), (s2)]
ECO5	[(0), (0,s1,s2), (0)]	[(s1), (s1), (0)]	[(s1), (s1,s2), (0)]	[(s2,s3), (s1), (s3,s4,s5)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (s1,s2), (s1)]	[(s1,s2), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(0), (s1), (s1,s2)]	[(s2), (s2,s3), (s1,s2,s3)]	[(0), (s1), (s1,s2)]
ECO6	[(0), (0,s1,s2), (0)]	[(s1,s2), (s1), (0)]	[(0), (s2,s3,s3), (s1,s2)]	[(0), (s1,s2), (s1)]	[(0), (s1,s2), (s2,s3,s3)]	[(s1), (s1,s2), (0)]	[(0), (0,s1,s2), (0)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]
ENV1	[(0), (s1), (0)]	[(s1,s2), (s1), (0)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s2), (s1), (s1)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (0), (s1)]	[(s2), (s3), (s3,s4)]	[(0), (0), (0)]	[(0), (0,s1), (0)]	[(s1,s2), (s1), (0)]
ENV2	[(0), (0,s1,s2), (0)]	[(s2), (s1), (s2)]	[(s3), (s3,s4), (s2)]	[(s2), (s3,s4), (s4,s5,s6)]	[(s2,s3,s4), (s2,s3,s4), (s2,s3,s4)]	[(0), (0), (0,s1)]	[(s2), (s2), (s1)]	[(s1,s2), (s1), (0)]	[(0,s1), (0), (0)]	[(0,s1), (0), (0)]	[(0), (s2,s3,s3), (s1,s2)]
ENV3	[(0), (0,s1), (0)]	[(0), (s1,s2,s3), (0)]	[(s2,s3,s3), (s1,s2), (0)]	[(s3,s4,s5), (0), (s1,s2)]	[(s1), (s1,s2), (0)]	[(0,s1), (0), (0)]	[(0), (s1,s2), (s1)]	[(s4), (s5), (s4)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s1), (s2), (s2)]

Table 17 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
ENV4	[(0), (0,s1,s2), (0)]	[(s1), (0), (s1,s2)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s3,s4), (s3), (s2,s3,s4)]	[(0), (s1), (0)]	[(0), (0,s1,s2), (0)]	[(s1), (s1), (s2)]	[(s2), (s3), (s2)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s1), (0)]
ENV5	[(0), (0), (0,s1)]	[(0), (s1,s2), (s2,s3,s3)]	[(s3), (s4), (s4,s5)]	[(s6,s7,s8), (s7,s8), (s7)]	[(s2), (s1), (s1)]	[(s1), (0), (s1,s2)]	[(s3), (s3,s4), (s2,s3,s4)]	[(s4,s5), (s4), (s3,s4,s5)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(s1,s2), (s1), (0)]
ENV6	[(0), (0,s1,s2), (0)]	[(s2,s3,s3), (s1,s2), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s4,s5), (s3), (s5,s6,s7)]	[(s1), (s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(s2,s3), (s1), (s2)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (s1,s2), (s1)]
SOC1	[(s2,s3,s4), (s2,s3,s4), (s2,s3,s4)]	[(0), (s1,s2,s3), (0)]	[(0), (s2,s3,s3), (s1,s2)]	[(s1,s2), (0), (s2,s3,s3)]	[(s1), (s1), (0)]	[(0), (s1,s2,s3), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0,s1), (0)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s1), (s1), (s2)]	[(0), (0,s1,s2), (0)]
SOC2	[(s4,s5), (s4), (s3)]	[(s1), (s1), (s2,s3,s3)]	[(s3,s4), (s2,s3,s4), (s3,s4)]	[(s3,s4), (s3), (s2,s3,s4)]	[(s1), (0), (s1,s2)]	[(s2), (s1), (s1)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (0), (0)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (s1,s2), (0)]
SOC3	[(0), (s1,s2,s3), (0)]	[(0), (s1,s2), (s1)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s2), (s1), (s1)]	[(s2), (s3,s4), (s4,s5,s6)]	[(0), (0,s1,s2), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (0,s1), (0)]	[(0), (s1), (0)]	[(s1), (0), (0)]	[(0), (s1,s2), (s2,s3,s3)]
SOC4	[(0), (0,s1,s2), (0)]	[(s1,s2), (0), (s1)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1), (s2), (s1)]	[(0), (s1), (s1,s2)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(s1), (s2,s3,s3), (s1)]
SOC5	[(0), (s1,s2,s3), (0)]	[(s2,s3,s3), (s1,s2), (0)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s4), (s4,s5), (s3)]	[(s1), (0), (s1,s2)]	[(s4,s5), (s4), (s3,s4,s5)]	[(0,s1), (0), (0)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]
SOC6	[(0), (0), (0,s1,s2)]	[(s1), (s2), (s2)]	[(0), (s1,s2), (s1)]	[(0), (s1), (s1,s2)]	[(0), (s2,s3,s3), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(s2), (s1), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (s1,s2)]
CON1	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(s2,s3), (s1), (s2)]	[(s4,s5,s6), (s2,s3), (s1)]	[(0), (s1,s2,s3), (0)]	[(s3), (s3,s4), (s2)]	[(s1), (s2,s3,s3), (s1)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(0), (s3,s4,s5), (s1,s2)]	[(s4,s5), (s4), (s3)]

Table 17 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
CON2	[(s3,s4,s5), (s1,s2), (0)]	[(0), (s3,s4,s5), (s1,s2)]	[(s4), (s4), (s5)]	[(s4), (s5,s6), (s6,s7,s8)]	[(0), (s1,s2,s3), (0)]	[(s2,s3,s3), (0), (s1,s2)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s4,s5), (s5,s6,s7), (s3)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s5), (s6,s7,s8), (s5,s6)]
CON3	[(s4,s5,s6), (s5,s6), (s5,s6)]	[(s2), (s1), (s2,s3)]	[(0), (s2,s3,s3), (s1,s2)]	[(s5,s6), (s6,s7,s8), (s5)]	[(0), (s1), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s3,s4,s5), (s1), (s2,s3)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s1,s2), (0), (s2,s3,s3)]
CON4	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(s1), (s2,s3), (s4,s5,s6)]	[(s3), (s5,s6,s7), (s4,s5)]	[(s4,s5,s6), (s2,s3), (s1)]	[(s4,s5), (s3), (s4)]	[(0), (0,s1,s2), (0)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s1), (s2,s3), (s2)]	[(s1), (s4,s5,s6), (s2,s3)]	[(s4), (s5,s6,s7), (s4,s5)]	[(0), (s3,s4,s5), (s1,s2)]
CON5	[(s4,s5), (s4), (s5,s6,s7)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s5,s6,s7), (s4), (s4,s5)]	[(0), (0,s1,s2), (0)]	[(s1), (s2,s3), (s4,s5,s6)]	[(s3,s4), (s3), (s2)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s2,s3,s4), (s3,s4), (s3)]
CON6	[(s6,s7,s8), (s5,s6), (s4)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s4), (s6,s7,s8), (s5,s6)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s1), (s4,s5,s6), (s2,s3)]	[(s5), (s5,s6), (s4,s5,s6)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s4,s5,s6), (s1), (s2,s3)]
Repair	[(s2,s3,s3), (0), (s1,s2)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(s7,s8,s9), (s9), (s9)]	[(s1), (s2), (s2)]	[(s1), (s1,s2), (0)]	[(s3), (s5,s6,s7), (s4,s5)]	[(s4,s5), (s3), (s4)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s2,s3,s3), (0), (s1,s2)]	[(s7,s8,s9), (s6,s7), (s6)]
Reuse	[(0), (s1,s2), (s2,s3,s3)]	[(s2,s3,s3), (s1,s2), (0)]	[(0), (s3,s4,s5), (s1,s2)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1,s2), (0), (s1)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s8), (s8,s9), (s7,s8,s9)]
Remanufacture	[(0), (s1,s2,s3), (0)]	[(s1), (s1), (s2)]	[(s3,s4,s5), (0), (s1,s2)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s1), (s1), (s2)]	[(s1), (s2), (s1)]	[(s3), (s4), (s4,s5)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s1), (s2,s3,s3), (s1)]	[(0), (s1,s2,s3), (0)]	[(s4), (s4,s5), (s5,s6,s7)]
Refurbish	[(0), (s1,s2), (s1)]	[(s1,s2), (0), (s1)]	[(s2,s3,s4), (s2,s3,s4), (s2,s3,s4)]	[(s5,s6,s7), (s4), (s4,s5)]	[(0), (s1,s2), (s1)]	[(s1), (s1,s2), (0)]	[(s1), (s2), (s2)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s1), (s1), (s2)]	[(0), (s1,s2), (s1)]	[(s2,s3), (s1), (s3,s4,s5)]
Recycle	[(0), (0,s1,s2), (0)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s3,s4,s5), (s1,s2), (0)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s2), (s1), (s2,s3)]	[(s1), (s2), (s1)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (0)]	[(s2,s3), (s1), (s2)]

Table 17 (continued)

	EF1	EF2	EF3	EF4	EF5	EF6	IF1	IF2	IF3	IF4	IF5
Landfill	[(0), (0), (0)]	[(s2), (s1), (s2,s3)]	[(s3,s4,s5), (0), (s1,s2)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]	[(s3,s4,s5), (0), (s1,s2)]	[(s1), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (s2), (s1)]
	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
EF1	[(0), (0,s1,s2), (0)]	[(s5,s6), (s6,s7,s8), (s4)]	[(0), (0), (0,s1,s2)]	[(s1), (s2,s3), (s2)]	[(0), (s1,s2), (s3,s4,s5)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2,s3), (0)]	[(s3), (s4,s5,s5), (s3)]	[(s5,s6,s7), (s4,s5), (s4)]
EF2	[(0), (0), (0,s1)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s1), (s3,s4,s5), (s2,s3)]	[(s7,s8), (s7,s8), (s6,s7,s8)]	[(s3), (s3,s4), (s2)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s2), (s2), (s3)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s4), (s5,s6), (s6,s7,s8)]
EF3	[(0), (0,s1,s2), (0)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s2), (s2), (s2)]	[(s2,s3,s3), (0), (s1,s2)]	[(s3,s4,s5), (0), (s1,s2)]	[(s4), (s5,s6), (s6,s7,s8)]	[(s1), (s2), (s1)]	[(0), (0), (0)]	[(s6,s7,s8), (s4), (s5,s6)]	[(s6,s7), (s7,s8,s9), (s6)]
EF4	[(0), (0,s1), (0)]	[(0), (s1,s2), (s2,s3,s3)]	[(s1,s2), (s2,s3,s3), (0)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (0), (s1)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s4,s5,s6), (s2,s3), (s1)]	[(s3,s4), (s4,s5,s6), (s2)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s6,s7,s8), (s5,s6), (s4)]
EF5	[(0), (0), (s1)]	[(s2,s3), (s4,s5,s6), (s1)]	[(s2,s3), (s1), (s4,s5,s6)]	[(s4,s5,s6), (s3,s4), (s2)]	[(0), (s2,s3,s3), (s1,s2)]	[(s1,s2), (0), (s2,s3,s3)]	[(s4,s5,s6), (s2), (s3,s4)]	[(s4,s5,s6), (s1), (s2,s3)]	[(s2,s3), (s1), (s4,s5,s6)]	[(s3,s4,s5), (s2,s3), (s1)]	[(s1), (s4,s5,s6), (s2,s3)]	[(s4), (s5,s6,s7), (s4,s5)]
EF6	[(0), (0,s1), (0)]	[(s2,s3,s4), (s3,s4), (s3)]	[(s1), (s2,s3,s3), (s1)]	[(s3,s4,s5), (s2,s3), (s1)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(s1), (0), (0)]	[(s2,s3), (s4,s5,s6), (s1)]	[(0), (s1), (s1,s2)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1), (s2,s3), (s4,s5,s6)]	[(s4), (s5,s6,s7), (s4,s5)]
IF1	[(0,s1), (0), (0)]	[(s6,s7), (s7,s8,s9), (s6)]	[(0), (0), (s1)]	[(s2), (s4,s5,s6), (s3,s4)]	[(s2,s3,s3), (s1,s2), (0)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1,s2), (s2,s3,s3), (0)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s4,s5,s6), (s2), (s3,s4)]
IF2	[(s1), (0), (0)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s6,s7), (s7,s8,s9), (s6)]	[(0), (0), (s1)]	[(s6,s7,s8), (s4), (s5,s6)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (0), (s1,s2,s3)]	[(s3), (s3,s4), (s2,s3,s4)]	[(s1), (0), (s1,s2)]
IF3	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s4,s5,s6), (s1), (s2,s3)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s3,s4), (s4,s5,s6), (s2)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1), (0), (s1,s2)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s1), (0), (0)]	[(s2), (s3,s4), (s4,s5,s6)]	[(s1,s2,s3), (s2,s3), (s2)]

Table 17 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
IF4	[(s4), (s5,s6,s7), (s4,s5)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s2), (s4,s5,s6), (s3,s4)]	[(s5,s6,s7), (s4,s5), (s4)]	[(s4), (s5,s6,s7), (s4,s5)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s1,s2), (s1), (0)]	[(s4), (s4,s5), (s5,s6,s7)]	[(s1,s2), (0), (s2,s3,s3)]
IF5	[(s6,s7,s8), (s5,s6), (s5)]	[(0), (0,s1,s2), (0)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(s2,s3,s3), (0), (s1,s2)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s1), (s1,s2), (0)]	[(s2), (s1), (s1)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s1,s2), (s2,s3,s3), (0)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s1), (s2), (s1)]	[(0), (s1), (0)]
ECO1	0	[(s1), (s1), (s1)]	[(s1), (s1), (0)]	[(s1), (s1), (s1)]	[(s1), (s1), (0)]	[(s1), (s1,s2), (0)]	[(s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]
ECO2	[(s8,s9), (s7,s8,s9), (s8,s9)]	0	[(s1), (0), (s1)]	[(s1), (0), (s1)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(s1), (s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s1), (s1), (s2)]	[(0), (s1,s2), (s1)]	[(0), (0), (0)]	[(0), (0,s1), (0)]
ECO3	[(s5,s6,s7), (s3), (s4,s5)]	[(s2,s3), (s1), (s4,s5,s6)]	0	[(s1), (s1), (s1)]	[(s1), (s1), (s2)]	[(0), (s1), (s1,s2)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(s4), (s4,s5), (s5,s6,s7)]	[(0), (s1), (s1,s2)]	[(s1), (s1,s2), (0)]	[(0), (0,s1,s2), (0)]
ECO4	[(s4,s5), (s4), (s3,s4,s5)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s3,s4,s5), (s2,s3), (s1)]	0	[(s1), (0), (s1)]	[(s1), (s1), (0)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(0), (s1), (0)]	[(0,s1), (0), (0)]	[(0), (s1), (0)]	[(s6,s7,s8), (s4), (s5,s6)]	[(s2), (s3,s4), (s4,s5,s6)]
ECO5	[(s4,s5,s6), (s1), (s2,s3)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (s1,s2)]	[(s2,s3), (s1), (s2)]	0	[(s1), (s1), (s1)]	[(s1,s2), (s1), (0)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1), (s2), (s2,s3)]	[(0), (0), (s1)]	[(s5,s6,s7), (s4), (s4,s5)]
ECO6	[(0), (s1,s2), (s1)]	[(s1,s2), (s2,s3,s3), (0)]	[(s2,s3,s3), (s1,s2), (0)]	[(s2,s3,s3), (0), (s1,s2)]	[(s3,s4,s5), (0), (s1,s2)]	0	[(0), (0), (0)]	[(s3), (s3,s4), (s2,s3,s4)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(0), (0), (0,s1,s2)]
ENV1	[(0), (s1,s2), (s1)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s1,s2), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	0	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]	[(s2), (s1), (s1)]	[(0), (s1), (s1,s2)]	[(s1), (0), (s1)]
ENV2	[(s4,s5), (s5,s6,s7), (s3)]	[(0), (s1,s2), (s2,s3,s3)]	[(0), (0), (0,s1,s2)]	[(s4,s5), (s4,s5), (s3,s4,s5)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (0)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	0	[(s1), (s1), (0)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]

Table 17 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
ENV3	[(s2,s3), (s3,s4,s5), (s1)]	[(0), (s2,s3,s3), (s1,s2)]	[(s5,s6,s7), (s4,s5), (s3)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s6,s7,s8), (s4), (s5,s6)]	[(0), (0), (s1,s2,s3)]	0	[(s1), (s1), (s1)]	[(0), (s1), (s1,s2)]	[(0), (s1,s2), (s1)]
ENV4	[(s1), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s3), (s4,s5), (s4)]	[(0), (s1), (0)]	[(0), (0), (0,s1)]	[(0,s1), (0), (0)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s4), (s3), (s4,s5)]	[(s4,s5,s6), (s2), (s3,s4)]	0	[(s1), (0), (s1)]	[(s1), (s1), (0)]
ENV5	[(s3,s4), (s2), (s3)]	[(s1), (0), (s1)]	[(s1), (s2,s3), (s3,s4,s5)]	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s3), (s2), (s2)]	[(s1,s2), (0), (s1)]	0	[(s1), (s1), (s1)]
ENV6	[(s3), (s3), (s4,s5,s5)]	[(s2), (s1), (s1)]	[(s4,s5,s6), (s2), (s3,s4)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0), (s1,s2,s3)]	[(s2), (s3,s4), (s4,s5,s6)]	[(s7,s8,s9), (s9), (s9)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s1), (0), (s1,s2)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	0
SOC1	[(s1), (0), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(0), (0,s1), (0)]	[(0), (0), (0)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1), (0)]	[(0,s1), (0), (0)]	[(0,s1), (0), (0)]	[(0), (0), (0)]	[(s1), (0), (0)]	[(s1), (s3,s4,s5), (s2,s3)]
SOC2	[(s1), (s2), (s1)]	[(s2), (s1), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (s1,s2)]	[(s1,s2), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s2,s3,s4), (s3,s4), (s3)]	[(s1), (s1), (s1)]	[(0), (s1,s2), (s1)]	[(s3,s4), (s2), (s4,s5,s6)]	[(s1), (s2), (s2,s3)]
SOC3	[(s4,s5), (s4), (s5,s6,s7)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(s2,s3,s3), (s1,s2), (0)]	[(0), (s1,s2), (s1)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s1), (s2,s3,s3)]	[(0), (0), (0,s1,s2)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(s3), (s4), (s3)]	[(s4,s5,s6), (s3,s4), (s2)]
SOC4	[(0), (s1,s2,s3), (0)]	[(s1), (s1), (0)]	[(s2), (s1), (s1)]	[(s3), (s2), (s2)]	[(0,s1), (0), (0)]	[(s1,s2), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s1,s2), (0), (s2,s3,s3)]	[(0,s1), (0), (0)]	[(s1), (s1), (s2)]	[(0), (0), (0,s1,s2)]
SOC5	[(s3,s4), (s2,s3,s4), (s3,s4)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(0), (0,s1,s2), (0)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]
SOC6	[(s2), (s1), (s2)]	[(s1), (0), (0)]	[(s1), (s2), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(0,s1), (0), (0)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]

Table 17 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
CON1	[(s4), (s6,s7,s8), (s5,s6)]	[(s1), (s2,s3), (s3,s4,s5)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(s1), (s1,s2), (0)]	[(s2), (s1), (s1)]	[(0), (0), (s1)]	[(0,s1), (0), (0)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s1), (0), (0)]
CON2	[(s5,s6,s7), (s4), (s4,s5)]	[(s6,s7,s8), (s5,s6), (s5)]	[(0), (0), (0,s1,s2)]	[(s4,s5), (s5,s6,s7), (s3)]	[(s2,s3), (s2), (s1)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s3), (s2), (s2)]	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(s1,s2), (s3,s4,s5), (0)]	[(0), (s1), (0)]	[(s3), (s3,s4), (s2,s3,s4)]	[(s7,s8,s9), (s6), (s6,s7)]
CON3	[(s4,s5), (s4), (s5,s6,s7)]	[(0), (s1,s2,s3), (0)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(0), (s1), (0)]	[(s3,s4,s5), (s1), (s2,s3)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s3), (s4), (s4,s5)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s1), (s4,s5,s6), (s2,s3)]	[(0), (0,s1), (0)]	[(s1,s2), (s3,s4,s5), (0)]	[(s3,s4,s5), (s2,s3), (s1)]
CON4	[(s6,s7), (s6), (s7,s8,s9)]	[(s3,s4,s5), (s4,s5), (s4)]	[(0), (0,s1,s2), (0)]	[(s1,s2), (s3,s4,s5), (0)]	[(s3,s4,s5), (0), (s1,s2)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(0), (0,s1,s2), (0)]	[(0), (s3,s4,s5), (s1,s2)]	[(s2,s3), (s2), (s1,s2,s3)]	[(0), (s1), (0)]	[(s1), (s1,s2), (0)]	[(s3), (s3), (s4,s5,s5)]
CON5	[(s6), (s6,s7), (s7,s8,s9)]	[(s4,s5,s6), (s2,s3), (s1)]	[(0), (0,s1,s2), (0)]	[(s3,s4,s5), (s1), (s2,s3)]	[(s3,s4,s5), (s1,s2), (0)]	[(s1,s2,s3), (s2,s3), (s2)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (s1,s2)]	[(0), (s1), (0)]	[(s1), (s1), (s2)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s4), (s5,s6,s7), (s4,s5)]
CON6	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s3), (s3), (s4,s5,s5)]	[(s2), (s1), (s2,s3)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s3,s4), (s3), (s2,s3,s4)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]	[(s2), (s2,s3), (s1,s2,s3)]	[(0), (s2,s3,s3), (s1,s2)]	[(0), (0), (s1)]	[(s2,s3,s4), (s3,s4), (s3)]	[(0), (0), (s1,s2,s3)]
Repair	[(s6), (s6,s7), (s7,s8,s9)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s5,s6,s7), (s4), (s4,s5)]	[(0), (0), (s1,s2,s3)]	[(s2), (s1), (s2)]	[(s3), (s4), (s3)]	[(s7,s8,s9), (s7,s8,s9), (s7,s8,s9)]	[(s9), (s7,s8,s9), (s9)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (s2,s3,s3)]	[(s1), (0), (s1,s2)]	[(s9), (s7,s8,s9), (s9)]
Reuse	[(s7,s8,s9), (s8,s9), (s8)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(0), (s1,s2), (s1)]	[(s2), (s1), (s1)]	[(s1,s2), (0), (s2,s3,s3)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s1), (s1), (s2)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1), (s1), (0)]	[(s8), (s8,s9), (s7,s8,s9)]
Remanufacture	[(s6,s7), (s6), (s7,s8,s9)]	[(s5,s6), (s6,s7,s8), (s5)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s1), (0), (s1,s2)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s8), (s8,s9), (s7,s8,s9)]	[(0), (0), (s1,s2,s3)]	[(s2,s3,s3), (s1,s2), (0)]	[(0), (s1), (s1,s2)]	[(s7,s8,s9), (s8,s9), (s8)]
Refurbish	[(s4), (s5,s6,s7), (s4,s5)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s1), (s1,s2), (0)]	[(s1), (0), (s1)]	[(0), (s1,s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(s3,s4), (s4,s5,s6), (s2)]	[(s4,s5,s6), (s1), (s2,s3)]	[(0), (0), (0)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(0), (0,s1), (0)]	[(s4), (s5,s6,s7), (s4,s5)]

Table 17 (continued)

	ECO1	ECO2	ECO3	ECO4	ECO5	ECO6	ENV1	ENV2	ENV3	ENV4	ENV5	ENV6
Recycle	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s1), (s2), (s2)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s1), (0), (s1,s2)]	[(s2), (s2,s3), (s1)]	[(s1,s2), (0), (s2,s3,s3)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s7,s8,s9), (s6), (s6,s7)]	[(s1,s2), (0), (s1)]	[(0), (0,s1,s2), (0)]	[(s7,s8,s9), (s9), (s9)]	[(s8,s9), (s8,s9), (s7,s8,s9)]
Landfill	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s1), (s1), (s2)]	[(0), (0), (s1,s2,s3)]	[(s6,s7,s8), (s5,s6), (s4)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (s2)]	[(0), (0,s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
EF1	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(s1), (s1,s2), (0)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s3,s4,s5)]	[(s1), (s2,s3), (s3,s4,s5)]	[(s2), (s2), (s1)]
EF2	[(0), (s1,s2), (s3,s4,s5)]	[(s1), (s1), (s2)]	[(s2), (s3,s4,s4), (s2)]	[(s3), (s4,s5), (s5,s6,s7)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s1), (s3,s4,s5), (s2,s3)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s4,s5,s6), (s1), (s2,s3)]	[(s3,s4,s5), (s4,s5), (s4)]
EF3	[(s4,s5), (s4), (s3,s4,s5)]	[(s1,s2), (0), (s2,s3,s3)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s1), (0), (0)]	[(s1), (0), (s1,s2)]	[(0), (0), (s1)]	[(s3,s4,s5), (s2,s3), (s1)]	[(s3,s4), (s2), (s4,s5,s6)]	[(0), (s1,s2), (s2,s3,s3)]
EF4	[(0), (0), (0)]	[(s1), (0), (0)]	[(0), (s1), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(s3,s4), (s3), (s2,s3,s4)]	[(0), (0,s1,s2), (0)]	[(s1), (s1,s2), (0)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]
EF5	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2), (s1)]	[(0), (s1), (s1,s2)]	[(0), (0), (0,s1,s2)]
EF6	[(s2), (s3,s4), (s4,s5,s6)]	[(s1), (s1,s2), (0)]	[(s1), (s2), (s1)]	[(s5,s6,s7), (s4,s5), (s4)]	[(0), (0), (0,s1)]	[(0), (s1), (s1,s2)]	[(s3,s4,s5), (0), (s1,s2)]	[(s3,s4,s5), (s1), (s2,s3)]	[(0), (0), (0,s1)]
IF1	[(s1,s2), (s3,s4,s5), (0)]	[(s1), (0), (0)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s2,s3,s3), (s1,s2), (0)]	[(s2,s3,s4), (s3,s4), (s3)]
IF2	[(0), (s1,s2), (s1)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s1,s2), (0)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s4,s5,s6), (s1), (s2,s3)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1,s2,s3), (s2,s3), (s2)]
IF3	[(0), (s1), (s1,s2)]	[(0,s1), (0), (0)]	[(0), (s1), (0)]	[(s1), (s2), (s1)]	[(0,s1), (0), (0)]	[(s1), (0), (s1,s2)]	[(s1), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (s1)]
IF4	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0), (0,s1)]

Table 17 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
IF5	[(0), (0,s1), (0)]	[(0), (0,s1), (0)]	[(0), (s3,s4,s5), (s1,s2)]	[(s1,s2), (s1), (0)]	[(s2,s3), (s1), (s2)]	[(s2,s3,s3), (s1,s2), (0)]	[(s1,s2), (s1), (0)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s4,s5,s6), (s3,s4), (s2)]
ECO1	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1)]	[(s1), (s1), (s2,s3,s3)]	[(s1,s2), (s1), (0)]	[(0), (0), (s1)]	[(0), (s1,s2), (s1)]	[(s2), (s2), (s2)]	[(0), (s1,s2), (s1)]	[(0), (0), (s1,s2,s3)]
ECO2	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(s2), (s4,s5,s6), (s3,s4)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(0), (s1,s2), (s2,s3,s3)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1,s2)]	[(s3,s4,s5), (s3,s4,s5), (s3,s4,s5)]	[(s4,s5,s6), (s2,s3), (s1)]
ECO3	[(0), (0), (0)]	[(s2,s3), (s2), (s1,s2,s3)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(0), (0,s1,s2), (0)]	[(s2), (s1), (s2)]	[(0), (0), (0)]	[(0), (0), (0,s1,s2)]
ECO4	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]
ECO5	[(0), (0), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s3,s4,s5), (s1,s2)]	[(s1,s2), (s1), (0)]	[(s2), (s1), (s1)]	[(0), (0), (s1,s2,s3)]	[(s3,s4), (s3), (s2,s3,s4)]	[(s1), (s2), (s2)]	[(s3,s4,s5), (s1), (s2,s3)]
ECO6	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s1), (s1,s2), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s1,s2), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]
ENV1	[(0), (0), (0,s1,s2)]	[(s1), (s2), (s1)]	[(s1), (s2,s3,s3), (s1)]	[(0), (0,s1,s2), (0)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1)]	[(0), (0), (s1)]
ENV2	[(0), (s1), (0)]	[(s2,s3,s4), (s2,s3,s4), (s2,s3,s4)]	[(s2,s3,s3), (0), (s1,s2)]	[(0), (0), (s1)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s1), (s2), (s2,s3)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]
ENV3	[(0), (0,s1), (0)]	[(s1,s2), (0), (s1)]	[(s2), (s1), (s2)]	[(0,s1), (0), (0)]	[(0), (0), (0,s1)]	[(0), (0,s1,s2), (0)]	[(0), (s1,s2,s3), (0)]	[(0), (s1), (0)]	[(0), (0,s1), (0)]
ENV4	[(0), (0), (s1)]	[(0), (s1), (s1,s2)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(s2), (s1), (s1)]	[(0,s1), (0), (0)]	[(0), (0), (s1)]
ENV5	[(0,s1), (0), (0)]	[(s3), (s4,s5), (s4)]	[(0), (s1,s2,s3), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0,s1,s2)]	[(s3), (s3,s4), (s2,s3,s4)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1), (0)]

Table 17 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
ENV6	[(0), (0), (0,s1,s2)]	[(s1), (s3,s4,s5), (s2,s3)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s2,s3), (s1), (s2)]	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]
SOC1	0	[(0), (0), (s1,s2,s3)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (s2)]	[(0), (0), (0,s1,s2)]	[(s4,s5), (s3), (s4)]	[(s2), (s3), (s2)]
SOC2	[(s1,s2), (0), (s1)]	0	[(s3,s4), (s4,s5,s6), (s2)]	[(s4,s5,s6), (s3,s4), (s2)]	[(s1,s2), (0), (s1)]	[(s3), (s5,s6,s7), (s4,s5)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]
SOC3	[(0), (0), (s1,s2,s3)]	[(s2), (s4,s5,s6), (s3,s4)]	0	[(s1), (s1), (0)]	[(s1), (s1), (s1)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s3,s4,s5), (s4,s5), (s4)]	[(0), (0), (s1,s2,s3)]	[(s1,s2), (0), (s1)]
SOC4	[(s5,s6,s7), (s4,s5), (s3)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s4,s5), (s4), (s5,s6,s7)]	0	[(s1,s2), (s1), (0)]	[(s5,s6,s7), (s4,s5), (s3)]	[(s2,s3), (s2), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]
SOC5	[(s1), (0), (0)]	[(s2,s3,s3), (0), (s1,s2)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s4,s5,s6), (s2,s3), (s1)]	0	[(s1), (s1), (0)]	[(0), (s1,s2,s3), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]
SOC6	[(s2,s3,s4), (s3,s4), (s3)]	[(s1), (s2,s3), (s4,s5,s6)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s1,s2,s3), (s1,s2,s3), (s1,s2,s3)]	[(0), (0), (s1,s2,s3)]	0	[(s2), (s2,s3), (s1,s2,s3)]	[(s1), (s1), (s1)]	[(0), (0), (s1)]
CON1	[(0), (0,s1,s2), (0)]	[(0), (0), (s1)]	[(s3,s4,s5), (s1), (s2,s3)]	[(0), (0), (0,s1,s2)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s1), (0), (0)]	0	[(s4,s5), (s5,s6,s7), (s4)]	[(s3), (s3,s4), (s2,s3,s4)]
CON2	[(0), (s1), (0)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s2), (s3,s4), (s4,s5,s6)]	[(s1), (0), (s1,s2)]	[(s2,s3), (s2), (s1)]	[(s4,s5,s6), (s1), (s2,s3)]	0	[(s1), (0), (s1,s2)]
CON3	[(0), (0), (0,s1)]	[(s1), (0), (s1,s2)]	[(0), (s3,s4,s5), (s1,s2)]	[(s2,s3), (s1), (s4,s5,s6)]	[(0), (s1,s2), (s1)]	[(s1,s2), (s3,s4,s5), (0)]	[(s1), (s2,s3), (s3,s4,s5)]	[(s1), (s1,s2), (0)]	0

Table 17 (continued)

	SOC1	SOC2	SOC3	SOC4	SOC5	SOC6	CON1	CON2	CON3
CON4	[(0), (0), (0)]	[(s1,s2), (s1), (0)]	[(s3,s4), (s3), (s2,s3,s4)]	[(s2), (s2,s3), (s1)]	[(0,s1), (0), (0)]	[(0), (0,s1), (0)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s3), (s3), (s3)]	[(s1), (s1), (s1)]
CON5	[(0), (0), (0,s1)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s4,s5), (s3), (s5,s6,s7)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1,s2)]	[(0), (0), (0,s1,s2)]	[(s8,s9), (s9), (s8,s9)]	[(0,s1), (0), (0)]	[(0), (0), (s1,s2,s3)]
CON6	[(s4,s5), (s4), (s3,s4,s5)]	[(s4,s5,s6), (s2), (s3,s4)]	[(s4,s5), (s5,s6,s7), (s3)]	[(s4), (s3), (s4,s5)]	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(s3,s4,s5), (s2,s3), (s1)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s3,s4), (s4,s5,s6), (s2)]	[(s2,s3,s4), (s3,s4), (s3)]
Repair	[(0), (s1,s2), (s1)]	[(s6,s7,s8), (s4), (s5,s6)]	[(0), (0), (s1,s2,s3)]	[(s2), (s4,s5,s6), (s3,s4)]	[(0), (s2,s3,s3), (s1,s2)]	[(s2), (s2,s3), (s1)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s3,s4,s5), (s4,s5), (s4)]	[(s2), (s1), (s2)]
Reuse	[(s1), (s1,s2), (0)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s1), (s2), (s1)]	[(s2), (s3), (s2)]	[(s1,s2), (0), (s1)]	[(s1), (s1), (0)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s2,s3,s3), (0), (s1,s2)]
Remanufacture	[(s1), (0), (0)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s1), (s1,s2), (0)]	[(s2,s3), (s3,s4,s5), (s1)]	[(0), (s1,s2), (s1)]	[(0), (s1), (s1,s2)]	[(s4), (s6,s7,s8), (s5,s6)]	[(s1,s2,s3), (s2,s3), (s2)]	[(0), (s2,s3,s3), (s1,s2)]
Refurbish	[(0), (0), (0,s1,s2)]	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(s1), (s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (s1), (0)]	[(0), (s1,s2), (s1)]	[(s5,s6,s7), (s4,s5), (s3)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (s2,s3,s3)]
Recycle	[(s2), (s1), (s1)]	[(s4,s5,s6), (s3,s4), (s2)]	[(0), (s1), (s1,s2)]	[(s1), (0), (s1)]	[(s1,s2), (0), (s1)]	[(s2), (s1), (s1)]	[(s4), (s4,s5), (s5,s6,s7)]	[(s1), (0), (s1)]	[(0), (0), (0,s1)]
Landfill	[(s1), (s1), (s2)]	[(s1), (s2), (s2)]	[(s2), (s1), (s1)]	[(s1), (s1), (s2)]	[(s1), (s1), (s2)]	[(s1), (s2), (s1)]	[(s1), (0), (s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (0), (0)]
	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
EF1	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s2), (s1), (s1)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s7,s8), (s6,s7,s8), (s7,s8)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s6,s7,s8), (s7,s8), (s7,s8)]	[(s4,s5), (s3), (s5,s6,s7)]

Table 17 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
EF2	[(s1,s2), (s1), (0)]	[(s1), (s2), (s1)]	[(s3), (s4,s5,s5), (s3)]	[(s4), (s5,s6), (s6,s7,s8)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s2), (s3,s4), (s3)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s8,s9), (s8), (s7,s8,s9)]
EF3	[(s1), (0), (0)]	[(0), (0), (0)]	[(s3,s4), (s2), (s4,s5,s6)]	[(s7,s8,s9), (s9), (s9)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s7), (s8,s9,s9), (s7)]
EF4	[(0), (0,s1), (0)]	[(0), (0), (0,s1)]	[(s2), (s2), (s3)]	[(s5,s6), (s5), (s6,s7,s8)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s1,s2), (s3,s4,s5), (0)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s6,s7,s8), (s7,s8), (s7,s8)]
EF5	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s2,s3,s3), (0), (s1,s2)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s2,s3), (s3,s4,s5), (s1)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s1,s2), (0), (s3,s4,s5)]	[(s5,s6), (s5), (s6,s7,s8)]	[(s1,s2), (s1), (0)]
EF6	[(0,s1), (0), (0)]	[(s1), (s1,s2), (0)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s4,s5), (s4), (s3,s4,s5)]	[(s3,s4,s5), (0), (s1,s2)]	[(s1,s2), (0), (s3,s4,s5)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s7), (s7,s8), (s6,s7,s8)]	[(s7,s8,s9), (s8,s9), (s8)]
IF1	[(0), (0), (s1)]	[(s1), (s2), (s1)]	[(s1), (s3,s4,s5), (s2,s3)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s1), (s2,s3), (s3,s4,s5)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s5,s6), (s6,s7,s8), (s4)]
IF2	[(0), (s1,s2), (s1)]	[(0), (s1), (s1,s2)]	[(s1), (0), (0)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s5,s6), (s5), (s6,s7,s8)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s4,s5), (s3,s4,s5), (s4,s5)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s8,s9), (s8), (s7,s8,s9)]
IF3	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s1,s2), (s1), (0)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s2,s3), (s4,s5,s6), (s1)]	[(s5,s6,s7), (s4,s5), (s4)]	[(s3), (s2), (s3)]
IF4	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1)]	[(s1), (0), (0)]	[(s5,s6,s7), (s3), (s4,s5)]	[(s8,s9), (s7,s8,s9), (s8,s9)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s1,s2), (s3,s4,s5), (0)]	[(s6,s7,s8), (s5), (s5,s6)]	[(s5,s6), (s5), (s6,s7,s8)]
IF5	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s7,s8,s9), (s9), (s9)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s4), (s5,s6,s7), (s4,s5)]

Table 17 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
ECO1	[(0), (0), (0,s1,s2)]	[(s1), (0), (0)]	[(s2,s3), (s2,s3), (s1,s2,s3)]	[(s1,s2), (s1), (0)]	[(s1), (s2), (s1)]	[(s1), (0), (s1,s2)]	[(0), (0), (0)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]
ECO2	[(0,s1), (0), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s8,s9), (s8), (s7,s8,s9)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s3), (s3), (s4,s5,s5)]	[(s4), (s4,s5), (s3,s4,s5)]	[(s2), (s2), (s1)]
ECO3	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(s3), (s2), (s3,s4)]	[(s1,s2), (0), (s3,s4,s5)]	[(s1), (s3,s4,s5), (s2,s3)]	[(s1), (s2), (s1)]	[(s2), (s2), (s3)]	[(s1,s2), (s2,s3,s3), (0)]
ECO4	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (s2)]	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(s8,s9), (s9), (s8,s9)]	[(s7,s8), (s7), (s6,s7,s8)]
ECO5	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(s2,s3), (s2), (s1,s2,s3)]	[(s2,s3,s3), (s1,s2), (0)]	[(s3), (s4,s5,s5), (s3)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s1), (0), (s1,s2)]	[(s2), (s1), (s1)]	[(0), (s1,s2,s3), (0)]
ECO6	[(0), (0,s1), (0)]	[(0), (0,s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(s1,s2,s3), (s2,s3), (s2,s3)]	[(s1,s2), (0), (s2,s3,s3)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s3), (s2), (s3)]	[(s5,s6,s7), (s4,s5), (s3)]	[(s7), (s7), (s8,s9,s9)]
ENV1	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s2,s3), (s1), (s2)]	[(0), (s1,s2,s3), (0)]	[(s1), (0), (s1)]	[(0), (s1), (s1,s2)]	[(0), (s1), (0)]	[(0), (0), (s1,s2,s3)]	[(s2), (s1), (s1)]
ENV2	[(0), (0,s1), (0)]	[(0,s1), (0), (0)]	[(s1,s2), (0), (s2,s3,s3)]	[(s4), (s6,s7,s8), (s5,s6)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s6,s7), (s7,s8,s9), (s6)]	[(s5,s6), (s4,s5,s6), (s5,s6)]	[(s6,s7,s8), (s4), (s5,s6)]	[(s1,s2), (s1), (0)]
ENV3	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(0), (0), (0,s1,s2)]	[(s1,s2), (0), (s3,s4,s5)]	[(s3,s4), (s2,s3,s4), (s3,s4)]	[(s3,s4,s5), (s1), (s2,s3)]	[(0), (s1,s2), (s1)]	[(0), (s1,s2), (s2,s3,s3)]	[(s1), (s2,s3), (s2)]
ENV4	[(0,s1), (0), (0)]	[(0), (0,s1), (0)]	[(0), (s1,s2), (s2,s3,s3)]	[(s1), (s2), (s2)]	[(s1,s2), (s2,s3,s3), (0)]	[(s1,s2), (0), (s1)]	[(s1), (0), (s1)]	[(0), (s1,s2,s3), (0)]	[(s2), (s1), (s1)]

Table 17 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
ENV5	[(0), (0), (0,s1,s2)]	[(0), (0), (s1)]	[(s3), (s3), (s4,s5,s5)]	[(0), (0), (s1,s2,s3)]	[(s2), (s2,s3), (s1,s2,s3)]	[(s1), (s1), (s2)]	[(s1,s2), (0), (s1)]	[(s7), (s7), (s8,s9,s9)]	[(0), (s1), (s1,s2)]
ENV6	[(0), (s1), (0)]	[(0), (0,s1), (0)]	[(s2,s3,s4), (s3,s4), (s3,s4)]	[(s4), (s6,s7,s8), (s5,s6)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s5), (s5,s6), (s6,s7,s8)]	[(s5), (s4), (s4)]	[(s5,s6,s7), (s4), (s4,s5)]	[(s4,s5), (s5,s6,s7), (s4)]
SOC1	[(0), (0), (0,s1,s2)]	[(0), (0,s1,s2), (0)]	[(s3), (s4,s5), (s4)]	[(s1,s2), (0), (s1)]	[(s1), (s2), (s1)]	[(s1,s2), (s1), (0)]	[(s1), (s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(0), (s1), (s1,s2)]
SOC2	[(0), (0), (0,s1)]	[(0), (0), (0,s1,s2)]	[(s1), (s1), (s2,s3,s3)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s7,s8,s9), (s8,s9), (s8)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s3), (s5,s6,s7), (s4,s5)]	[(s4,s5,s6), (s2), (s3,s4)]	[(s3,s4), (s4,s5,s6), (s2)]
SOC3	[(0), (0), (s1)]	[(0), (0), (0,s1,s2)]	[(s2,s3,s3), (s1,s2), (0)]	[(s6,s7,s8), (s4), (s5,s6)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s8,s9), (s8,s9), (s7,s8,s9)]	[(s2,s3), (s2), (s1)]
SOC4	[(0,s1), (0), (0)]	[(0), (0,s1), (0)]	[(s1,s2,s3), (s2,s3), (s2)]	[(s1,s2), (s1), (0)]	[(s1,s2), (0), (s1)]	[(0), (s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (s1,s2), (s1)]	[(0), (0), (s1,s2,s3)]
SOC5	[(0), (0), (0,s1,s2)]	[(0,s1), (0), (0)]	[(s3,s4), (s3,s4), (s2,s3,s4)]	[(s1,s2), (0), (s1)]	[(s1), (0), (s1)]	[(s1), (s1), (s1)]	[(s1), (s1), (s2)]	[(s1), (s2), (s1)]	[(s1), (s1), (s2)]
SOC6	[(0), (0,s1), (0)]	[(0), (0), (0,s1,s2)]	[(0), (0), (s1,s2,s3)]	[(0), (s1,s2), (s1)]	[(s1), (0), (s1)]	[(s1), (s1,s2), (0)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1)]	[(s1,s2), (0), (s1)]
CON1	[(s4,s5,s6), (s5,s6), (s5,s6)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s4,s5), (s5,s6,s7), (s4)]	[(s9), (s7,s8,s9), (s9)]	[(s7,s8,s9), (s9), (s9)]	[(s8,s9), (s9), (s8,s9)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s7,s8,s9), (s6,s7), (s6)]
CON2	[(s2,s3), (s1,s2,s3), (s2,s3)]	[(s1), (0), (s1,s2)]	[(s7,s8,s9), (s8,s9), (s8,s9)]	[(s7,s8,s9), (s9), (s9)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s1), (s2,s3), (s2)]	[(s5,s6,s7), (s4,s5), (s3)]	[(s1), (s1), (s2)]
CON3	[(s1), (s1), (0)]	[(s1), (s1), (s2)]	[(s3,s4,s5), (s4,s5), (s4,s5)]	[(s5,s6,s7), (s4), (s4,s5)]	[(0), (s1,s2,s3), (0)]	[(0), (s1), (s1,s2)]	[(s1), (s2), (s1)]	[(s1), (s1,s2), (0)]	[(s2), (s1), (s1)]

Table 17 (continued)

	CON4	CON5	CON6	Repair	Reuse	Remanufacture	Refurbish	Recycle	Landfill
CON4	0	[(s1,s2,s3), (s2,s3), (s2)]	[(s4), (s4,s5), (s5,s6,s7)]	[(s6), (s7,s8,s9), (s6,s7)]	[(s8), (s8,s9), (s7,s8,s9)]	[(s5,s6), (s4), (s6,s7,s8)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s4,s5), (s4), (s5,s6,s7)]	[(s4), (s4,s5), (s5,s6,s7)]
CON5	[(s1), (s1), (s2)]	0	[(s8,s9), (s8), (s7,s8,s9)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s7,s8,s9), (s6,s7), (s6)]	[(s6), (s6,s7), (s7,s8,s9)]	[(s5), (s5,s6), (s4,s5,s6)]	[(s2), (s1), (s2)]	[(0), (s2,s3,s3), (s1,s2)]
CON6	[(s2), (s1), (s2,s3)]	[(0), (s2,s3,s3), (s1,s2)]	0	[(s6,s7,s8), (s5,s6), (s4)]	[(s5), (s6,s7,s8), (s5,s6)]	[(s6,s7,s8), (s5,s6), (s5)]	[(s4), (s5,s6,s7), (s4,s5)]	[(s6,s7), (s6), (s7,s8,s9)]	[(s8,s9), (s8,s9), (s7,s8,s9)]
Repair	[(0), (s1,s2), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (s2,s3), (s3,s4,s5)]	0	[(s1), (s1), (s1)]	[(s1), (s1,s2), (0)]	[(s2), (s1), (s1)]	[(s1), (s1), (s1)]	[(s1), (s1), (s1)]
Reuse	[(s1,s2), (s1), (0)]	[(s1), (0), (s1)]	[(s3,s4,s5), (0), (s1,s2)]	[(s1), (s1), (0)]	0	[(s1), (s1), (0)]	[(s1), (s1), (s1)]	[(s1,s2), (0), (s1)]	[(s2), (s1), (s1)]
Remanufacture	[(s2), (s1), (s1)]	[(0), (s1,s2), (s1)]	[(s3,s4,s5), (s2,s3), (s1)]	[(s1), (s1), (s1)]	[(s1), (s1), (0)]	0	[(s1), (s1,s2), (0)]	[(s1), (0), (s1)]	[(s1), (s1,s2), (0)]
Refurbish	[(0), (0,s1,s2), (0)]	[(s1,s2), (0), (s1)]	[(s1,s2), (s3,s4,s5), (0)]	[(s1), (0), (s1)]	[(s1,s2), (s1), (0)]	[(s1), (s1), (s1)]	0	[(s1), (s1), (0)]	[(s1), (s1), (s1)]
Recycle	[(s1,s2), (s1), (0)]	[(s2), (s1), (s1)]	[(s1), (0), (s1)]	[(s2), (s1), (s1)]	[(s1), (s1), (s1)]	[(0), (0), (s1,s2,s3)]	[(s1), (0), (s1)]	0	[(s1), (s1), (0)]
Landfill	[(s1), (0), (s1,s2)]	[(s1), (0), (s1)]	[(s1), (s1), (s2)]	[(s1), (s1), (s1)]	[(s1), (0), (s1)]	[(s1), (s1,s2), (0)]	[(s1), (s1), (s1)]	[(s1), (s1), (0)]	0

** Other data is also available but omitted due to the word limitations

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