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Abstract

Sustainable solid waste management (SSWM) is recently a complicated and ambiguous problem due to urbanization, inequality, and economic growth. Hence, this study aims to propose a SSWM attributes set and identify a causal model through linguistic preferences by using a fuzzy decision-making trial and evaluation laboratory to simultaneously handle the uncertainty and the interrelationships. The analytic network process is used to compose the hierarchical structure to weight the aspects and criteria. Qualitative information is transformed into crisp and comparable values to examine the causal relationships between attributes and confirm the consistency between the theoretical structure and industry phenomenal. The results indicate that policy and regulations, stakeholder participation, and social impacts play essential roles in these causal interrelationships. Political leadership in SSWM is required to drive stakeholder participation and social impacts. Population growth and migration, institutional settings, waste recycling and energy recovery, households, and private contractors are the main criteria to improve SSWM in Vietnam. The theoretical and managerial implications are discussed.

Keywords: sustainable solid waste management; triple bottom line; solid waste management; fuzzy set theory; decision-making trial and evaluation laboratory; analytic network process

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1. Introduction

The failures of solid waste management (SWM) have resulted in resource loss, forcing waste management authorities to adopt an approach that relies on emergency response and confirming that purely technical and economic perspectives on waste management can lead to critical social, ethical and political problems (Galante et al., 2010). The design of the waste management system in Vietnam is also suffering from these hidden problems. SWM currently cannot be considered a sustainable system because it incorporates only economic and environmental perspectives (Heidari et al., 2019). Since SWM is a complicated problem of urban expansion, inequality, economic development, sociocultural issues, political and institutional attributes, and international impacts (Marshall and Farahbakhsh, 2013); the sustainable solid waste management (SSWM) is essential for all waste management stages, from planning to design, operation and discharge. Further investigation is required to not only from the practitioners but also from academician to improve performance and achieve the sustainability.

In the literature, SSWM attributes are assessed mainly from the perspectives of social impact, economic benefits and environmental assessment (the triple bottom line - TBL) (Diaz-Barriga-Fernandez et al., 2018; Mohammadi et al., 2019). Mirdar Harijani et al. (2017) developed SSWM capabilities to balance the TBL perspective toward sustainability. Ng et al. (2019) and Bui et al (2020a) proposed the SSWM assessment should be conducted by using the benefits and effects of the TBL dimensions (triple bottom line, TBL). However, there are fundamental difficulties still tackles the SSWM conflicting substances (Heidari et al., 2019). Under existing arrangements, uncontrolled or unsuitable SWM still results in serious problems that contribute to adverse human health impacts, ecosystem destruction, biodiversity damage, environmental contamination, as well as negative economic and social impacts (Sisto et al., 2017). The SSWM is now a rich variation of interesting and challenging gap that needs to have deep mining. Edalatpour et al. (2018) and Tsai et al. (2020a) suggested that the SSWM is approached using the development of partnerships with other stakeholders to assess to environmental aspects and economic benefits analysis. Bui et al. (2020b) argued that there is need for an integrated approach and explored future trends for SSWM from national regulations and political frameworks, suitable technology, and stakeholders' consciousness and involvement. Thus, the policy and regulations, technical solutions and stakeholder participation are further needed aside from the TBL to improve the SWM process by shifting it toward sustainability.

Prior studies have presented SSWM decision-making problems in various ways. Galante et al. (2010) noted that SSWM entails a high number of decision attributes. Arıkan et al. (2017) stated that SSWM system selection requires the involvement of both qualitative and quantitative attributes. Yadav et al. (2017) claimed that SSWM is a complexity issue related to the practical challenges arising from the high level of uncertainty SSWM attributes association. In all SSWM situations, avoiding the uncertainty inherent in waste management will result in unreliable decision-making (Gambella et al., 2019). However, the aforementioned studies still neglect this gap, addressing the interrelationships between the proposed attributes and linguistic preferences in the decision-making process is required. This study adopts the fuzzy decision-making trial and evaluation laboratory (DEMATEL) method as an approach to SSWM that goes beyond experts' linguistic opinions. This study examines the causal relationships between attributes using decision-makers' linguistic preferences; formerly, the qualitative information is transformed into a quantitative crisp value for visual analysis (Tseng et al., 2017). The analytic network process (ANP) is then employed to shape the hierarchical framework by testing the consistency between the theoretical structure (aspects) and industry phenomenal (criteria) (Bui et al., 2020a). The study objectives are as follows:

- To develop a SSWM attributes set in qualitative information for Vietnam.
- To identify a hierarchical structure using linguistic preferences.
- To present improvement criteria in practice.

This study provides a theoretical insights and practical guidelines for those communities and organizations that want to achieve sustainable goals: (1) the theoretical contribution is to identify and structure a SSWM attributes set and presents a hierarchical model that extends current models and determine appropriate strategies for SWM to achieve operational success; (2) practical guidelines are provided important implications to the society, local communities, and relevant organizations and institutions in terms of promoting diversion of waste management approaches for achieving sustainable goals.

The rest of this study is organized into five sections. The next section addresses the literature, and both measurement attributes and methodological recommendations are proposed. The next two sections present the proposed methods in more detail, followed by the study results. The fourth section presents the implications. Finally, the limitations and recommendations for future research are discussed in the conclusion.

2. Literature Review

This section addresses the SSWM details and the proposed attributes. The proposed methods and measurements are also discussed.

2.1. Sustainable solid waste management

Sustainable consumption and production in connection with SSWM have been subjected to extensive deliberation (Pires, 2011). Prior studies aim to assess SSWM feasibility, considering causal attribution. Zurbrügg et al. (2012) defined SSWM as an integrated management issue that involves the TBL perspective, policy and regulations, and technical assessments to satisfy local demand and help to select the appropriate waste management solution. Marino et al. (2016) discussed advancements in knowledge that can be applied to relevant issues, such as the recovery of degraded areas, contraction, regulation, fundraising via complex processes developed for effective economic sustainability, the availability of landfills, and the logistics of integrating waste separation and storage with social management to control the entire process, thus enhancing SSWM performance. Growing awareness of both the SSWM short- and long-term effects has led responsible authorities to focus significant attention on certain attributes of sustainability (Heidari et al., 2019, Tsai et al, 2020b).

The importance of the SSWM is processed in all stages of generating, collecting, and separating waste as well as in waste transportation, distribution, treatment and disposal (Mohammadi et al., 2019). Pires et al. (2011) emphasize on regulatory factors and the three different TBL perspectives to SSWM growth for better development strategies in conformation to current standards and support future success. Generowicz et al. (2011) proposed a probable scenario based on legal, technical, economic, ecological, and social attributes to ensure that the appropriate attributes are selected for SSWM. Diaz-Barriga-Fernandez et al. (2018) connected SSWM with the stakeholder approach. Fernando (2019) noted that political provision is a prerequisite for achieving a radical revolution in waste management. Heidari et al. (2019) showed how a cohesive utilization of technologies can ensure sustainability. However, these components are still in the early stage of discussion and identifying proper SSWM attributes and their interrelationships is a work in progress (Henry et al., 2006, Fernando, 2019). This study aims to help create an environment favorable to reducing and managing solid waste and support the essential drivers that to achieve an SSWM system.

2.2. Proposed method

Arıkan et al. (2017) determined the appropriate solid waste disposal method using three different multicriteria decision-making methods ranked by similarity to the ideal solution: technique for order of preference by similarity to ideal solution (TOPSIS), the preference ranking organization method for enrichment evaluations, and fuzzy TOPSIS. Ali et al. (2018) used the analytical hierarchy process and TOPSIS to decide among different waste management alternatives. Kharat et al. (2019) applied the fuzzy Delphi method, fuzzy analytical hierarchy process and fuzzy TOPSIS techniques to determine the appropriate municipal solid waste treatment and disposal methods. Still, the interrelationships among the complex SSWM attributes have not been fully clarified. Studies using identification models of causal interrelationships among these attributes are rare and incomprehensive.

This study proposes fuzzy DEMATEL to determine the key SSWM attributes and explore the causal effects and interrelationships among the proposed attributes. Wu et al. (2017) supported the transfer of mathematical computations to solve complex problems among the attributes. Tseng et al. (2018) investigated the distribution of attributes based on the identification of driving and dependent powers, which is a comprehensive technique that can overcome complexity, categorize the attributes into cause-and-effect groups, and offer visual analysis. However, this method has two limitations (1) it is very complex to calculate a numerous comparison, (2) it is not suitable for group valuation practice. Consequently, the evaluation results are not precise, the more attributes involve the more complexity increases.

The study uses fuzzy DEMATEL - ANP method to validate SSWM hierarchical framework. The ANP is employed to clarify the multifaceted interdependencies among the attributes (Tseng et al., 2018). This technique is used to identify the criteria and develop a hierarchical framework that help to this study constructs a consistency framework (Bui et al., 2020a). Hence, by combining the advantages of ANP for handling complex interactions and the virtues of DEMATEL for evaluating the attributes' interrelationships and the consistency among them, the complexity problem is reduced and the link between theory (aspects) and industrial phenomenal (criteria) is verified. Tseng et al. (2019) proposed using a hierarchical structure to form a theoretical paradigm to identify feasible measures for a causal sustainable product-service system. Bui et al. (2020a) apply this combine method to construct the municipal solid waste management capabilities hierarchical framework under uncertainty.

2.3. Proposed attributes

SSWM involves various environmental and socioeconomic aspects, and decision-makers would be justified in using the proposed model to find suitable guidelines (Tsai et al., 2020b). There is growing demand for SSWM approaches that identify the social, cultural, political, and environmental scopes and include an extensive range of stakeholders (Henry et al., 2006; Wilson, 2007; Zarate et al., 2008). However, prior studies observe that waste management practices complicate regional policies and regulations and reconstruct the pattern of worldwide sustainable progress (Pires et al., 2011). Hence, this study proposes a hierarchical model that includes 6 aspects, covering the TBL perspective, policy and regulations, technical solutions and stakeholder participation.

Environmental assessment (A1) is described as a set of interrelated circumstances that convey effective and sustained transformation (Eawag/WSSCC, 2005). Cobbinah et al. (2015) suggested that SWM emphasizes minimizing environmental consequences by prioritizing prevention, reuse, recycling, and recovery over landfill discharge, all of which are necessary to create a favorable environment for the improved management of solid waste. Environmental processes may lead to sustainable utilization. However, the attributes affecting environmental SSWM assessment lack environmental control and evaluation systems in practice (Asase et al., 2009). Zurbrügg et al. (2012) argued that health hazards have occurred, as uncontrolled discharge, impacts on the environment, and the rehabilitation of the former dumping site. Moreover, there is global concern about climate change, which is causing higher temperatures that result in more biowaste degradation, leading to odor-control problems and resulting in pressure and advocacy worldwide (Marshall and Farahbakhsh, 2013). In this complex environment, a favorable solution to SWM is to implement better SSWM (Kharat et al., 2019).

Social impacts (A2) include involving societies and communities in changing their consumption and disposal behavior to minimize solid waste, accompanied by including them in the decision-making process (Al-Khateeb et al., 2017). The attributes presented in social impact analysis include social welfare, public acceptance, social acceptability and equity, cultural or heritage issues, population growth and migration (El-Naqa, 2005). González-Torre and Adenso-Diaz (2005) reported that social impacts can encourage communities to develop strong recycling habits. Sharholy et al. (2008) claimed that the SSWM efficiency relies on the active contribution of both authorities and citizens; therefore, the sociocultural aspects include people developing both community and societal awareness. Ekere et al. (2009) proposed that public involvement in environmental activities is required to develop better operational systems. According to

Marshall and Farahbakhsh (2013), social expectations about waste collection also depend on waste composition and daily habits. Unfortunately, the sociocultural and economic context influences waste composition and generation within populations. Some social groups always dispose of waste in an appropriate manner, while others routinely consider the street to be an appropriate disposal location (Wilson, 2007). Therefore, it is necessary to include these social impacts in any analysis of the multidimensional qualitative and strategic characteristics of SWM.

Economic benefits (A3) have also drawn attention to SSWM systems (Henry et al. 2006; Al-Khateeb et al., 2017; Arıkan et al., 2017). McDougall et al. (2001) suggested that a flexible cohesive system is necessary to reduce environmental impacts and drive costs while also allowing for continuous improvement based on economic advantages. Henry et al. (2006) and Sharholy et al. (2008) noted the role of financial support in recycling improvement, infrastructure, awareness, transportation, buy-back centers and organizations. Financial support from the government, the interest of local authorities in waste management, the involvement of service users and the appropriate management of funds all help modernize sustainable systems (Guerrero et al., 2013). However, SWM fails to be sustainable due to its financial attributes. Pokhrel and Viraraghavan (2005) noted that deficient financial support limits the safety of waste disposal in well-furnished and engineered landfills. Sujauddin et al. (2008) observed that a lack of funding, limited resources, service users' refusal to pay for service and the absence of suitable economic instructions have disadvantaged the delivery of proper SWM services, which require vast expenditures. The rising costs of land in surrounding areas make it increasingly difficult to site landfills, and transportation costs are a major obstacle to placing landfills in distant locations (Memon, 2010). Under financial difficulties, additional problems complicate the conditions of institutional technology and make it more difficult to provide SSWM services at either the national or local levels of government (UN-Habitat, 2010).

Accordingly, SSWM could achieve its expected outcomes through stable policy and regulations (A4) (Khatib, 2011). Visvanathan (2006) emphasized that policy and regulations are essential to ensure the practicable SSWM regulatory enforcement. It is essential to delineate proper SSWM strategy through a forthright, explicit, and legal regulatory outline, with functioning inspections and applicable procedures at both the national and local levels. National and international regulations for SSWM are increasing, and consumers' attitudes toward environmental protection are rapidly changing (Niziolek et al., 2017). Zhang et al. (2014) argued that appropriate policies could moderate the negative effects of natural resource reduction and environmental deterioration toward waste dumping procedures, storage control, and the distribution processes. In addition, institutional features also contribute to existing and upcoming legislation while also extending its enforcement (Zurbrügg, 2012). Still, there is little political and public awareness of environmental concerns, and although this phenomenon is starting to change, the implementation tends to be weak. A lack of attention to a comprehensive national SWM policy has caused major negative environmental consequences (Fernando, 2019). SSWM policies and regulations often require the closure or phasing out of unregulated disposal sites (Wilson, 2007). Successful solid waste policy enforcement relies on the planning ability and management efficiency of public services (Marino et al., 2018).

Waste management is a complex issue that requires appropriate technical solutions, adequate administrative capacity, and cooperation across a wide range of stakeholders (Zarate et al., 2008). To achieve such goals, Diaz et al. (2018) suggested that the technological aspects (A5) should be analyzed because they are interrelated with other attributes and developments that often influence practices and activities. The literature suggests that technical attributes are related to the technical skills among individuals within communities and responsible authorities (Henry et al., 2006). Thus, facilities, infrastructure, waste treatment technologies and reliable information and knowledge, are important. These attributes act as keys to SWM systems and should thus be included in the process of upgrading facilities or services (Zurbrügg et al., 2012). New and existing technologies and administrative strategies have been used to improve waste management quality to meet future sustainability goals (Pires et al., 2011). However, SSWM could be affected by the high complexity of technical, scientific, and managerial characteristics under extreme uncertainty, and conflicting costs, benefits (Marshall and Farahbakhsh, 2013, Bui et al., 2020b). Selecting the appropriate technology for SWM is associated with social and environmental perceptions. Treatment and disposal can help to pursue sustainability (Kharat et al., 2019).

Stakeholder participation (A6) could increase access to related local knowledge that might otherwise be unexploited, and this information could result in practical benefits (Vučijak et al., 2016). Stakeholders are identified as people or organizations interesting in adequate waste management, such as national and local governments, non-governmental organizations (NGOs), households, private service providers, and so on (Sujauddin et al., 2008; Guerrero et al., 2013). Minghua et al. (2009) argued that to increase recycling rates, markets for recycled materials should be encouraged among stakeholders. However, they are likely to express diverse standpoints at different scales, and the range of scenarios could lead to conflicts among stakeholders. Zurbrügg et al. (2012) noted a wide range of involved stakeholders in addition to various elements of waste systems in the interactions among the numerous forces affecting the environment. Hence, appropriate interactions between the stakeholders lead to a better solution for SSWM to advance sustainability by offering the better services required by the population (Pires et al., 2011). Effective administration for solving waste problems and the participation of involved stakeholders, such as the public, in the decision-making process are the main paths to SSWM (Tsai et al., 2020a).

The attributes include 6 aspects and 32 criteria measured in this study are given in Table 1.

Table 1. Aspects and criteria

Aspects		Criteria		References
A1	Environmental assessment	C1	Environmental health hazards	Wilson, 2007; Memon, 2010; UN-HABITAT, 2010; Pires et al., 2011; Marshall and Farahbakhsh, 2013; Zhang et al., 2014; Arıkan et al., 2017; Heidari et al., 2019, Mohammadi et al., 2019.
		C2	Environmental risk	
		C3	Emission limitation	
		C4	Climate change	
		C5	Natural resources consumption	
A2	Social impacts	C6	Social welfare	Hernandez and Martin-Cejas, 2005, El-Naqa, 2005; Henry et al., 2006; Marshall and Farahbakhsh, 2013; Pires et al., 2011; Zurbrügg et al.; 2012; Kharat et al.; 2018. .
		C7	Social acceptability and equity	
		C8	Cultural or heritage issues	
		C9	Population growth and migration	
		C10	Public awareness	
		C11	Social interaction	
A3	Economic benefits	C12	Financial mechanisms	Henry et al., 2006; Marshall et al., 2013; Guerrero et al., 2013; Vučijak et al., 2016; Arıkan et al., 2017.
		C13	Financial resources	
		C14	Equipment availability	
		C15	Operation cost	
A4	Policy and Regulatory	C16	Institutional setting	Wilson, 2007; UN-HABITAT, 2010, Marshall and Farahbakhsh, 2013; Niziolek et al., 2017; Mohammadi et al., 2019.
		C17	National and international regulation	
		C18	Future legislation	
		C19	Existing regulatory framework	
A5	Technical solutions	C20	Generation and separation	Henry et al., 2006; Pires et al., 2011; Guerrero et al., 2013; Zhang et al., 2014; Tsai et al., 2020b; Arıkan et al., 2017; Mohammadi et al., 2019.
		C21	Waste inventory	
		C22	Treatment technologies	
		C23	Waste recycling and energy recovery	
		C24	Collection, transfer and transport	
		C25	Final Disposal	
		C26	Local technical knowledge	
		C27	Local infrastructure and equipment	
A6	Stakeholders' participation	C28	Local authorities	Pires et al., 2011; Sujauddin et al., 2008; Ekere et al.,2009; UN-Habitat, 2010; Tsai et al., 2020a; Guerrero et al., 2013.
		C29	Households	
		C30	National government	
		C31	Non-government organization	
		C32	Private contractors	

3. Method

This section clearly explains the fuzzy DEMATEL and ANP method used in this study. The SWM situation in Vietnam is also discussed.

3.1. Study background

In recent years, the population growth along with socio-economic development has increased the demand for consumption of goods, materials and energy, increased the generation of solid waste. According to the Vietnam Center for Environmental Monitoring Portal (2018), the amount of urban solid waste produced annually in Vietnam is 11.5 million tons, which is reach 30 million tons in 2020 and 40 million tons in 2025. Waste management has become one of the most expensive urban services in this developing country since the cost of waste disposal accounts for 20-50% of the cost of local governments' budget while gaining no profit or value back from the process. The increasing of these complex components has made it difficult for SSWM in Vietnam.

Solid waste in Vietnam is treated in three forms: burning, burying and producing compost. However, both solutions are showing limitations and have not resolved thoroughly the SSWM problem. The current technology is not suitable for solid waste in Vietnam (not yet classified at source, solid waste has low value) causing environmental pollution, consuming a lot of land fund, not taking advantage of solid waste capable of recycling, reuse. Most social organizations have only implemented the contents of propaganda with low awareness of the community, organizing waste collection. There is no policy to support waste management activities yet and environmental service organizations are not capable enough to effectively handle waste management issues. As one of the most discharging waste countries, there is significant for Vietnam to improve its SWM level to become more sustainable.

Hence, by examining the interrelationship among SWM attribute, this study could help the practitioners achieve higher performance in SSWM. A set of attributes is developed from the literature, adhere questionnaire for the linguistic evaluation based on a group of 12 experts included 5 experts from academia, 4 experts from industry and three from government sectors with more than 10 years of extensive SWM experience in Vietnam. The study applied face to face interview to enhance the reliability of the data source and confirmed the expert validity. The experts were questioned to confirm whether the attributes are valid for SSWM in the country then fill in their evaluation questionnaires. Once more than 75% of the expert agree with the attribute, it is considered to be valid and reliable (Chang et al., 2011).

3.2. Fuzzy DEMATEL

The proposed method aggregates the defuzzification of fuzzy numbers to translate human judgments into fuzzy linguistic variables. Based on the application of fuzzy set theory, crisp values are generated from fuzzy numbers using defuzzification. According to Opricovic & Tzeng (2004), the fuzzy minimum and maximum numbers transform the fuzzy data into crisp values to determine the left and right values. Then, the weighted average based on fuzzy membership functions $\tilde{d}_{ij}^{k} = (\tilde{d}_{1ij}^{k}, \tilde{d}_{2ij}^{k}, \tilde{d}_{3ij}^{k})$ is employed to compute the total weighted values. The crisp value is custom in the total direct relation matrix. The

DEMATEL offers a visualized diagram for addressing the analytical results, and the problems are simplified. The attributes are categorized into cause and effect groups to portray their interrelationships and the influential effects among the groups. These groups provide a better assessment that can be used to structure the interrelationship among the attributes. Hence, DEMATEL efficiently solves complicated interrelationship problems (Gabus & Fontela, 1972; Wang & Chuu, 2004).

The interrelationships between cause and effect attributes are converted by the DEMATEL. If a system is collected to a set of attributes, $F = \{f1, f2, f3, \cdots, fn\}$, particular pairwise interrelations are used to model the mathematical relationships. The analytical procedures are as follow:

Step 1: Obtaining the crisp values and aggregating these values

The comparison scale is designed using five linguistic preferences: 1 (no influence), 2 (very low influence), 3 (low influence), 4 (high influence) and 5 (very high influence) (see Table 2) to calculate the fuzzy direct relation matrix between attributes. Assume that there are k members in the decision group. Then, make the assessment $\tilde{d}_{ij}^{k}$, which denotes the fuzzy weight of the i^{th}attribute affecting the j^{th} attribute assessed by the k^{th} evaluator.

Table 2. Triangular fuzzy numbers (TFNs) linguistic scale

Scale	Linguistic variable	Corresponding TFNs
1	No influence	(0.0, 0.1, 0.3)
2	Very low influence	(0.1, 0.3, 0.5)
3	Low influence	(0.3, 0.5, 0.7)
4	High influence	(0.5, 0.7, 0.9)
5	Very high influence	(0.7, 0.9, 1.0)

Normalizing the corresponding fuzzy numbers,

$$F = \left(f\tilde{d}_{1ij}^{k}, f\tilde{d}_{2ij}^{k}, f\tilde{d}_{3ij}^{k}\right) = \left[\frac{(d_{1ij}^{k} - mind_{1ij}^{k})}{\Delta}, \frac{(d_{2ij}^{k} - mind_{2ij}^{k})}{\Delta}, \frac{(d_{3ij}^{k} - mind_{3ij}^{k})}{\Delta}\right] \quad (1)$$

where $\Delta = maxd_{3ij}^{k} - mind_{1ij}^{k}$

Computing the left (lv) and right (rv) normalized values,

$$\left(lv_{ij}^{n}, rv_{ij}^{n}\right) = \left[\frac{(fd_{2ij}^{k}}{\left(1 + fd_{2ij}^{k} - fd_{1ij}^{k}\right)}, \frac{fd_{3ij}^{k}}{\left(1 + fd_{3ij}^{k} - fd_{2ij}^{k}\right)}\right] \quad (2)$$

Gathering the total normalized crisp value (cv),

$$cv_{ij}^{k} = \frac{[lv_{ij}^{k}\left(1 - lv_{ij}^{k}\right) + (rv_{ij}^{k})^{2}]}{(1 - lv_{ij}^{k} + rv_{ij}^{k})} \quad (3)$$

The synthetic value notation $\tilde{d}_{ij}^{k}$ was adopted to aggregate the subjective judgment for k evaluators.

$$\tilde{d}_{ij}^{k} = \frac{(cv_{ij}^{1} + cv_{ij}^{2} + cv_{ij}^{3} + \cdots + cv_{ij}^{3})}{k} \quad (4)$$

Step 2: Arranging the pairwise comparisons into the initial direct relation matrix

The initial direct relation matrix (IM) is a $n \times n$ matrix acquired by pairwise comparisons. In this matrix, $\tilde{d}_{ij}^{k}$ is signified as the level at which attribute i affects attribute j, which can be modified as $IM = [\tilde{d}_{ij}^{k}]_{n \times n}$.

Step 3: Generating the normalized direct relation matrix

The normalized direct relation matrix (U) is created using the following equations.

$$U = \tau \otimes IM$$

$$\tau = \frac{1}{\max\limits_{1 \le i \le k} \sum_{j=1}^{k} \tilde{d}_{ij}^{k}} \quad (5)$$

Step 4: Attaining the total interrelationship matrix

From the normalized direct relation matrix, the total interrelationship matrix (W) is obtained with the equation below.

$$W = U(I - U)^{-1} \quad (6)$$

where W refers to $[w_{ij}]_{n \times n}$ $i, j = 1,2, \cdots n$

Step 5: Mapping the causal interrelationships diagram

The driving power (α) and dependence power (β) are gathered from the total value of the rows and columns in the total relation matrix by applying the following equations.

$$\alpha = [\sum_{i-1}^{n} w_{ij}]_{n \times n} \ = [w_i]_{n \times 1} \quad (7)$$

$$\beta = [\sum_{j-1}^{n} w_{ij}]_{n \times n} \ = [w_j]_{1 \times n} \quad (8)$$

Subsequently, the diagram of causal interrelationships can be drawn by positioning the attributes adopting the organization of $(\alpha + \beta), (\alpha - \beta)$. By plotting $[(\alpha + \beta), (\alpha - \beta)]$ on the horizontal and vertical axes, a cause and effect diagram is mapped. $(\alpha + \beta)$ represents the importance of attributes, indicating that the higher the value of $(\alpha + \beta)$ is, the more important the attribute function. $(\alpha - \beta)$ helps organize the attributes into cause and effect groups based on whether it is positive or negative.

3.3. Analytic network process

The ANP integrates the interrelationships between aspects and criteria into a hierarchical supermatrix to calculate the attributes' convergent weights that illustrating the interdependence among the framework (Saaty, 2001). Unlimited supermatrix P is developed from the DEMATEL, and the limited weighted supermatrix P^* is assimilated by adopting the following equation:

$$P^* = \lim_{n \to \infty} P^n \quad (9)$$

4. Empirical Results

This section presents the data analysis process and results.

4.1. Fuzzy DEMATEL results

The experts' assessments of the interrelationships among the various aspects are obtainable in linguistic scales ranging from "no influence" to "very high influence", as shown in Table 2. The empirical data are translated into triangular fuzzy numbers; an example is specified in Appendix A.

The triangular fuzzy numbers are then normalized into crisp values, which retain incomparable and incomputable characteristics using equations (1)-(4). The proposed processes are required to handle these vague denotations as specific crisp values (shown in Appendix B).

Once the crisp values are obtained, these values are placed into an interrelationship matrix and aspect grouping of equation (5)-(6). The DEMATEL is used to inspect the interrelationships and the driving and dependent powers through a cause and effect diagram. The interrelationship matrix has 6 aspects: environmental assessment (A1), social impacts (A2), economic benefits (A3), policy and regulations (A4), technical solutions (A5) and stakeholder participation (A6). This matrix is transformed into causal interrelationships, as shown in Table 3. α is the total value of rows, and β presents the total value of columns. If $\alpha - \beta$ is a positive value, aspects are classified as cause groups; otherwise, they belong to effect groups. A cause and effect diagram is then generated by mapping the dataset on $[(\alpha + \beta), (\alpha - \beta)]$.

Table 3. Inter-relationship matrix and cause-and-effect inter-relationship among aspects.

	A1	A2	A3	A4	A5	A6	α	β	$\alpha + \beta$	$\alpha - \beta$
A1	3.816	3.996	3.773	3.948	3.715	3.931	23.180	22.288	45.468	0.892
A2	3.846	4.132	3.881	4.057	3.780	4.056	23.752	23.657	47.409	0.095
A3	3.493	3.717	3.590	3.681	3.480	3.642	21.603	22.439	44.042	(0.835)
A4	3.890	4.127	3.896	4.122	3.850	4.036	23.921	23.459	47.380	0.462
A5	3.424	3.620	3.451	3.633	3.482	3.606	21.217	22.060	43.276	(0.843)
A6	3.819	4.065	3.847	4.017	3.752	4.036	23.536	23.308	46.844	0.229

The cause and effect diagram is mapped. Figure 1 shows that (A1), (A2), (A4) and (A6) belong to the cause group, whereas the effect group includes (A3) and (A5). Specifically, the 3 aspects of social impacts (A2), policy and regulations (A4) and stakeholder participation (A6) are the main aspects influencing SSWM. The interrelationships between these 3 aspects have the strongest impact on each other. Policy and regulations and stakeholder participation have a strong effect on social impacts, and policy and regulations have a moderate effect on stakeholder participation. Although the environment has a moderate effect on social impacts and a weak effect on policy and regulations and stakeholder participation, this aspect is still an important SSWM attribute due to the highest moderate effect value in the model. Furthermore, policy and regulations are the cause of economic benefits and technical solutions, while social impacts have a weak effect on economic benefits.

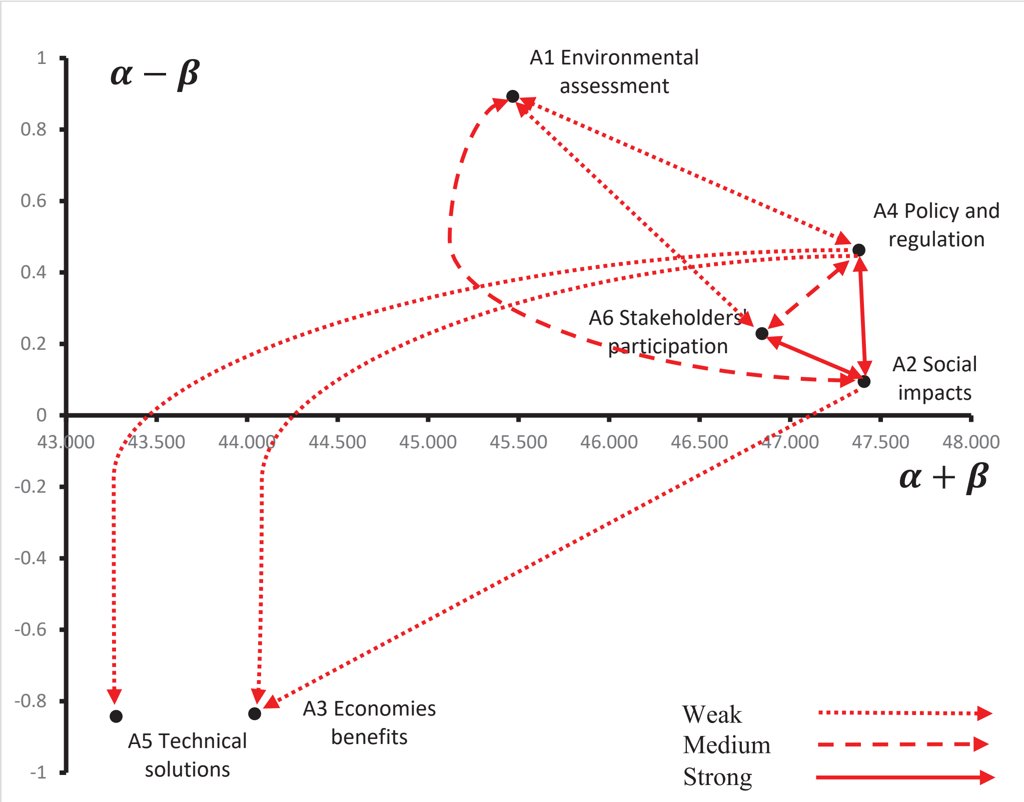

Figure 1. Cause-and-effect diagram for aspects

Repeating the above process, the crisp values and the total interrelationship matrix for the criteria are obtained in Appendix C and Appendix D. Table 4 presents the cause and effect interrelationships among the criteria. The cause and effect diagram is generated in Figure 2. The results show that C1, C3, C7, C9, C16, C17, C20, C23, C26, C27, C28, C29, C30, C31, and C31 are the cause criteria and that C2, C4, C5, C6, C9, C10, C11, C12, C13, C14, C15, C18, C19, C21, C22, C24, and C25 belong to the affected group. Population growth and migration (C9), institutional setting (C16), waste recycling and energy recovery (C23), household (C29), and private contractors (32) have the highest importance in the cause group.

Table 4. Cause-and-effect inter-relationship among criteria.

	α	β	$\alpha+\beta$	$\alpha-\beta$
C1	9.443	8.372	17.815	1.071
C2	9.255	9.811	19.066	(0.557)
C3	7.900	7.159	15.059	0.742
C4	7.423	7.642	15.065	(0.219)
C5	7.014	8.113	15.127	(1.100)
C6	9.247	9.727	18.974	(0.480)
C7	7.391	5.896	13.287	1.495
C8	6.971	7.734	14.705	(0.764)
C9	9.408	8.997	18.405	0.411
C10	9.292	9.353	18.645	(0.061)
C11	8.836	9.591	18.426	(0.755)
C12	8.830	9.528	18.358	(0.698)
C13	7.979	8.681	16.659	(0.702)
C14	8.255	8.978	17.233	(0.723)
C15	8.325	8.746	17.071	(0.420)
C16	9.477	9.389	18.867	0.088
C17	9.009	8.304	17.314	0.705
C18	8.984	9.536	18.520	(0.551)
C19	8.059	8.286	16.345	(0.227)
C20	8.547	8.455	17.002	0.092
C21	8.636	8.678	17.314	(0.043)
C22	7.903	9.553	17.456	(1.650)
C23	9.650	9.522	19.172	0.128
C24	8.165	9.833	17.998	(1.668)
C25	8.436	8.602	17.038	(0.166)
C26	8.305	8.178	16.483	0.127
C27	9.040	8.544	17.584	0.496
C28	9.142	8.676	17.818	0.467
C29	9.058	8.915	17.973	0.143
C30	9.357	7.554	16.911	1.803
C31	9.679	6.955	16.634	2.723
C32	9.399	9.109	18.508	0.291

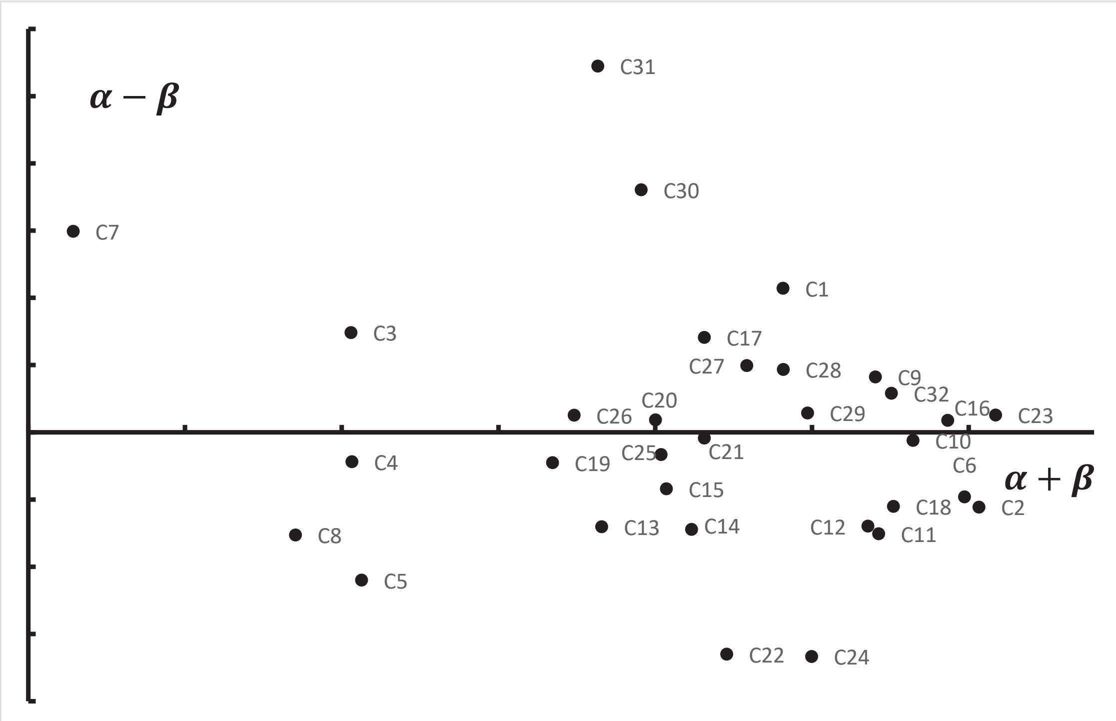

Figure 2. Causal diagram for criteria

4.2. Analytic network process results

The total interrelationship matrix of the aspects and criteria is assimilated into the unlimited supermatrix as the self-feedback relationships in the hierarchical and interdependence supermatrix, presented in Appendix E. The convergent limited supermatrix is generated using Equation (9) to show the aspect and criteria weight ranking, shown in Table 5. The results show that social impacts (A2) is ranked first in terms of priority, followed by environmental assessment (A1), policy and regulation (A4), and stakeholders' participation (A6), which are ranked second, third, and fourth. Technical solution (A5) and economies benefits (A3) rank at the bottom of the framework. This process addressed the consistency of the aspects during the analysis using the DEMATEL method and confirmed the validity and reliability of the hierarchical framework proposed

Table 5. The limited weighted supermatrix.

	A1	A2	A3	A4	A5	A6	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12
A1	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866
A2	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872
A3	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785
A4	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846
A5	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794
A6	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836
C1	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172
C2	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178
C3	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165
C4	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161
C5	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129
C6	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163
C7	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149
C8	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143
C9	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149
C10	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154
C11	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140
C12	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198
C13	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189
C14	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146
C15	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162
C16	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204
C17	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161
C18	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189
C19	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191
C20	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125
C21	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128
C22	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109
C23	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133
C24	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132
C25	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126
C26	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131
C27	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133
C28	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174
C29	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167
C30	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182
C31	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147
C32	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170

C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32	**Ranking**
0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	0.0866	**2**
0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	0.0872	**1**
0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	0.0785	**6**
0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	0.0846	**3**
0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	0.0794	**5**
0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836	**4**
0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	0.0172	9
0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	0.0178	7
0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	0.0165	12
0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	16
0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	0.0129	28
0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	0.0163	13
0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	18
0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	0.0143	22
0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	0.0149	19
0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	0.0154	17
0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	0.0140	23
0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	0.0198	2
0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	4
0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	0.0146	21
0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	0.0162	14
0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	0.0204	1
0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	0.0161	15
0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	0.0189	5
0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	0.0191	3
0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	0.0125	31
0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	0.0128	29
0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	0.0109	32
0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	25
0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	0.0132	26
0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	0.0126	30
0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	0.0131	27
0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	0.0133	24
0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	0.0174	8
0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	0.0167	11
0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	0.0182	6
0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	0.0147	20
0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	0.0170	10

5. Implications

The theoretical and managerial implications are discussed in this section.

5.1. Theoretical implications

This study contributes to the literature by providing theoretical insights into the causal SSWM aspects. The results indicated that policy and regulations (A4), stakeholder participation (A6) and social impacts (A2) are important SSWM aspects. The policy and regulations aspect, in particular, has an effect on the other aspects.

This study found that policy and regulations play a significant role in driving SSWM performance. The aspect is presented as the foundation for managing, processing and disposing of garbage in a civilized manner in any context. This result suggests that policy and regulations are causal aspects because they affect all aspects of the model. This confirmed that political support is a required attribute for achieving the fundamental modification of waste management systems (Fernando, 2019), and contributes to the feasible SSWM regulatory execution (Visvanathan, 2006). Improving the political aspect can foster better performance not only because it encourages stakeholder participation and social impacts but also because it drives the economic and technical aspects, thus improving environmental performance. SSWM requires awareness and implementation to accelerate economic benefits and technical solutions. This finding suggests that awareness and investment in a closed chain should be increased, starting with promoting policy and regulations and moving on to processing waste management. Orientations and solutions as well as mechanisms for implementing the law to achieve sustainable development are proposes.

Stakeholder participation generally refers to citizens who are interested in SSWM. These citizens tend to be responsible for the cleanliness of an area and are residents or households who use SSWM services. This result highlights the interrelationship between multiple stakeholder participation in SSWM and aspects of policies, regulations and social impacts. Stakeholders have different roles and interests in relation to waste management and the need to be identified in the local context as well as according to their interests, which could motivate them to cooperate toward a common purpose and thereby improve waste management performance. This aspect offers rich knowledge for the local system, which in turn offers more pragmatic benefits for implementing plans to improve water quality, people's lives, and education and to share knowledge about environmental protection and sustainability (Vučijak et al., 2016; Tsai et al., 2020a). Stakeholders who share the same social and geographic context may be bound together for reasons other than solid waste. This approach aims to achieve collaboration among stakeholders and provides effective solutions to solve social and environmental problems to develop the economy and build a strong, sustainable community.

Social impact is a SSWM major cause and is interrelated with environmental assessment, policy and regulations, stakeholder participation and economic benefits. The results also confirm the involvement of decision-making processes ranging from society-wide to community involvement in consumption and discharge behavior to minimize solid waste volume (Al-Khateeb et al., 2017, Tsai et al., 2020b). SSWM attempts to include social trends in the emergence of lifestyle changes, as the potential to change behavior and attitudes in society is critical. For example, social expectations about waste collection depend on waste composition and on the population's cooking and eating habits (Marshall and Farahbakhsh, 2013). Hence, defining social goals and priorities in the waste management field and mobilizing the public to support SSWM are essential for sustainable development. This study argues that the social impact aspect is important for creating an environmental culture at the local and government levels. Enhancing and improving social impacts is presented as an urgent need for SSWM. Innovative approaches are encouraged for raising community and public awareness, increasing support for developing innovative ideas in waste management, expanding public involvement in planning, applications and operational systems for collecting waste with the goal of raising awareness, changing public behavior, and offering training on waste management for the community to create concrete initiatives and actions toward sustainable development.

Although the environment has moderate effects on social impacts and weak effects on policy and regulations and stakeholder participation, it has moderate value in the model. The results state that environmental assessment is still a low priority in policies and that social aspects and enforcement tend to be weak, although regulations often require closure (Wilson, 2007). This aspect is a vital attribute of SWM systems and serves as a goal and one of the basic attributes of sustainable development. The current environment is similar to a huge landfill that receives large amounts of pollution from daily human life. If there is no timely treatment, this waste source will be the main cause of pollution problems. Hence, environmental assessment is required to enhance performance to keep the environment clean, ensure an ecological balance, prevent and overcome the negative consequences caused by people, and rationally exploit and use natural resources. However, the application of available waste treatment solutions has not reached the advanced level or remains weak. To develop proper SSWM, this aspect needs to be given top priority; it is especially important for the management system to support the adoption of these solutions.

5.2. Managerial implications

This subsection discusses the study's managerial implications for practice. The important causative criteria, including population growth and migration (C9), institutional setting (C16), waste recycling and energy recovery (C23), households (C29), and private contractors (32), provide practical insights into SSWM in Vietnam. The linkage action plans that can help improve the sector are explored.

Population growth and migration (C9) are essential to predicting waste generation and estimating the appropriate capacity of SWM facilities. In the context of urbanization, an increase in population growth and waste are increasingly serious environmental problems worldwide. Natural population growth, the rate of migration and economic development mean that management systems are increasingly overloaded by the amounts of waste they receive. The problem is waste generation and its management challenges causing harmful environmental effects and growing the quantities of trash and sewage and the uncontrolled exploitation of natural resources. This study recommends that environmental instruction be given to the community to educate and create awareness and to help people develop the knowledge, skills, and practices required to protect the environment and follow waste treatment methods. Efficient SSWM requires the ability to properly manage the increasing waste generation that results from urbanization. Good management planning for residential settlements is suggested to contribute to the spread of management facilities and minimize the amount of waste, which would help relieve pressure on waste management systems.

Institutional aspects (C16) refer to the level of regionalization and the circulation of authority, occupations, and responsibilities between the central and local governments. The institutional systems structure accountability for SSWM based on how they communicate with other institutions and their management processes. In this context, the analysis and evaluation of practices are proposed to implement the law on SSWM with regard to waste collection, transportation, waste storage, and treatment. Waste management agencies are encouraged to cooperate with government organizations to determine errors, problems and legal violations, thereby analyzing the causes of and solutions to the situation. Policymakers should develop waste treatment and recycling plans to limit greenhouse gases and enhance solid waste treatment, especially in low-income and populous areas. Imposing tax measures on plastic bags, films, disposable eating utensils, packaging materials and garbage dumps are one way to reduce plastic consumption. Regulations on the control of goods in production and consumption as well as SSWM policies are needed to help the country achieve its sustainable development goals.

Recycling and energy recovery processes (C23) result in improved energy efficiency at waste treatment and disposal facilities. Many areas have been looking to implement effective policies to help reduce waste and consumption. Because waste is recognized as a valued resource that creates self-sustaining production systems in which materials are reused over and over, it is a potential fuel when new technologies are developed to process it into fertilizer, chemicals or energy. The waste also has properties that make it suitable for use as a material source or for energy recovery because it contains materials such as metals for use in the construction industry. In manufacturing, low-end products can be restore the original product itself; these materials can be processed and used as a source of recycling material. Many large urban centers in the country have been zoning to match the higher living standards of their residents, and therefore, the waste treatment systems must also advance. Sustainable waste disposal measures focused on recycling and energy recovery should be identified and applied. This criterion is a problem in Vietnam due to the low level of modern technology, which must be improved. Continued investment is encouraged in the field of waste recycling and recovery, as well as in the development and operation of novel plans and processes in SSWM.

Household (C29) attitudes toward SSWM are affected by active support, and community investment involves public participation and fees for collection services. A prominent problem is that the household production of solid waste has not been matched with the increased local capacity to manage that waste, giving rise to waste problems. The impacts of households' gender, amount of land, location and commitment to environmental actions explain their waste generation and utilization habits. Increasing urbanization in Vietnam, rising living standards and rapid population growth have resulted in the increased generation of solid waste; quantities of household solid waste are on the rise, and may rapidly increase. To solve this problem, more waste collection stations could be established. Citizens should be trained and educated about waste and its separation. Garbage banks, where people are encouraged to bring sorted waste in exchange for living expenses, may also be developed. Measures are necessary to raise people's awareness of the harmful effects of plastic waste and to prevent them from dumping it. For food waste problems, the present study recommends that a campaign be conducted to raise awareness about what to do with leftover food; such changes can help households produce fewer carbon emissions from organic waste. This study proposes using waste prevention strategies and improving households' knowledge about the environment with regard to waste disposal.

Private contractors (32) who provide services, along with the national and local governments, are essential stakeholders in establishing an endowment for SWM systems. The government can achieve significant cost savings and provide better services by taking advantage of the industrial technology, facilities, management skills and capabilities of contractors. Solid waste recycling has been sufficiently adopted by private waste contractors and has been identified as a waste management strategy. Given the experience of private contractors, political views, and desperation resulting from the failure of the public sector, the government is motivated to promote contractual agreements with private waste contractors to improve service delivery. However, cooperating with private contractors may result in increased corruption and embezzlement of the public budget. Increasing transparency and raising the licensing standards for contractors are recommended. Private service providers should educate the public about acceptable waste streams. In this way, the government's financial exposure can be limited even while it pursues sustainable development.

6. Conclusions

Because of an unclear gap of assessing linguistic preferences in the decision-making process and failure in addressing the interrelationships in previous studies, this study employs a hybrid method of Fuzzy DEMATEL and ANP to explore the SSWM structure. A set of 32 valid criteria are categorized into 6 aspects are included in the proposed hierarchical structure, which reflect the critical SSWM attributes in Vietnam. The fuzzy set theory was proposed to offer an effective means to overcome the uncertainty conditions, the DEMATEL method was adopted to determine the causal interrelationships among the attributes, the ANP was employed to construct the hierarchical framework.

This study shows that the environment, policy and regulations, social impacts and stakeholder participation are causal aspects. Specifically, the 3 aspects of social impacts, policy and regulations and stakeholder participation are presented as the main aspects influencing SSWM because their strongest interrelated impacts. Thirty-two criteria were divided into either the cause group or the effect group. The top five causative criteria were identified as (1) Population growth and migration; (2) Institutional setting; (3) Waste recycling and energy recovery; (4) Households; and (5) Private contractors. These attributes enhance SSWM performance.

The findings contribute by examining SSWM performance as well as identifying the causal interrelationships among those attributes. The significant role of social impacts, policy and regulations, and stakeholder participation are clarified in the SSWM model identifying the main attributes can help decision-makers achieve better and more efficient performance. Especially, policy and regulations is recognized to drive stakeholder participation and social impacts for improving SSWM performance because its direct interrelationships with all attributes. Recommendations for achieving SSWM in Vietnam are provided. Population growth and migration, the above top five causative criteria are confirmed to be the foci of practice to guide for action plans that could be used to improve the criteria for practitioners so they can take appropriate action and foster sustainable performance.

This study has some limitations. First, the existing attributes are obtained from the literature and from experts; the present hierarchical model could be limited by this reliance on extant studies. Second, this study adopted a hybrid decision-making method to evaluate the attributes. The method has disadvantages; the knowledge, experience and familiarity with experts' judgments may cause biases that influence the results. Therefore, increasing the sample size could be useful for future studies. Third, this study focuses only on SSWM, which leads this study to have limited generalizability. Perhaps a comparison study or a deeper study of Vietnam could be done in the future. Future studies should also collect data from cities or other countries to focus on specific attributes and enrich the SSWM literature.

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Appendix A. Transferred TFNs for aspects

	A1			A2			A3			A4			A5			A6		
A1	[1.0	1.0	1.0]	[0.5	0.7	0.9]	[0.7	0.9	1.0]	[0.7	0.9	1.0]	[0.7	0.9	1.0]	[0.7	0.9	1.0]
A2	[0.7	0.9	1.0]	[1.0	1.0	1.0]	[0.5	0.7	0.9]	[0.7	0.9	1.0]	[0.3	0.5	0.7]	[0.7	0.9	1.0]
A3	[0.3	0.5	0.7]	[0.5	0.7	0.9]	[1.0	1.0	1.0]	[0.7	0.9	1.0]	[0.7	0.9	1.0]	[0.3	0.5	0.7]
A4	[0.7	0.9	1.0]	[0.3	0.5	0.7]	[0.5	0.7	0.9]	[1.0	1.0	1.0]	[0.7	0.9	1.0]	[0.5	0.7	0.9]
A5	[0.5	0.7	0.9]	[0.3	0.5	0.7]	[0.3	0.5	0.7]	[0.5	0.7	0.9]	[1.0	1.0	1.0]	[0.7	0.9	1.0]
A6	[0.7	0.9	1.0]	[0.3	0.5	0.7]	[0.5	0.7	0.9]	[0.7	0.9	1.0]	[0.3	0.5	0.7]	[1.0	1.0	1.0]

Appendix B. Crisp values for aspects.

	A1	A2	A3	A4	A5	A6
A1	0.707	0.571	0.490	0.521	0.503	0.544
A2	0.513	0.704	0.544	0.571	0.431	0.646
A3	0.459	0.515	0.698	0.493	0.522	0.444
A4	0.572	0.600	0.514	0.695	0.568	0.494
A5	0.429	0.411	0.446	0.541	0.720	0.527
A6	0.535	0.600	0.543	0.556	0.448	0.700

Appendix C. Crisp values for criteria.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
C1	0.775	0.556	0.353	0.418	0.405	0.388	0.600	0.433	0.381	0.505	0.517	0.540	0.445	0.525	0.418	0.503	0.426	0.396	0.341	0.463	0.419	0.386	0.430	0.429	0.487	0.481	0.531	0.221	0.176	0.148	0.300	0.307
C2	0.518	0.755	0.414	0.440	0.390	0.407	0.109	0.398	0.487	0.417	0.430	0.504	0.536	0.564	0.489	0.421	0.427	0.404	0.333	0.414	0.305	0.459	0.452	0.501	0.419	0.428	0.241	0.383	0.356	0.330	0.334	0.307
C3	0.388	0.326	0.755	0.204	0.284	0.213	0.255	0.402	0.347	0.367	0.377	0.349	0.409	0.386	0.371	0.421	0.428	0.368	0.365	0.396	0.252	0.392	0.400	0.416	0.419	0.375	0.204	0.366	0.321	0.300	0.300	0.307
C4	0.388	0.216	0.539	0.767	0.570	0.339	0.255	0.347	0.332	0.261	0.325	0.335	0.427	0.512	0.475	0.364	0.368	0.312	0.266	0.393	0.289	0.231	0.203	0.308	0.257	0.393	0.292	0.240	0.211	0.185	0.173	0.341
C5	0.372	0.306	0.325	0.387	0.779	0.444	0.336	0.363	0.367	0.387	0.380	0.419	0.336	0.314	0.316	0.297	0.424	0.348	0.298	0.377	0.413	0.302	0.349	0.256	0.259	0.232	0.206	0.116	0.159	0.136	0.136	0.144
C6	0.319	0.270	0.289	0.296	0.320	0.803	0.191	0.437	0.456	0.455	0.380	0.403	0.373	0.386	0.316	0.494	0.485	0.422	0.361	0.430	0.466	0.467	0.406	0.471	0.457	0.398	0.331	0.494	0.433	0.464	0.500	0.507
C7	0.217	0.359	0.343	0.351	0.374	0.442	0.109	0.291	0.437	0.260	0.434	0.422	0.427	0.464	0.409	0.441	0.340	0.297	0.314	0.200	0.341	0.393	0.332	0.329	0.171	0.415	0.279	0.443	0.322	0.136	0.100	0.507
C8	0.336	0.321	0.284	0.434	0.390	0.356	0.173	0.791	0.333	0.438	0.377	0.401	0.336	0.298	0.282	0.277	0.300	0.347	0.378	0.321	0.359	0.248	0.331	0.433	0.294	0.270	0.260	0.239	0.248	0.166	0.100	0.108
C9	0.393	0.507	0.289	0.296	0.356	0.391	0.255	0.417	0.767	0.425	0.451	0.406	0.427	0.441	0.493	0.423	0.425	0.457	0.380	0.390	0.341	0.497	0.457	0.435	0.490	0.398	0.398	0.332	0.340	0.464	0.500	0.489
C10	0.340	0.487	0.248	0.260	0.356	0.426	0.336	0.310	0.386	0.767	0.434	0.509	0.482	0.402	0.386	0.441	0.521	0.460	0.410	0.393	0.519	0.533	0.491	0.457	0.368	0.358	0.296	0.458	0.449	0.482	0.300	0.307
C11	0.358	0.487	0.269	0.296	0.391	0.445	0.336	0.347	0.461	0.474	0.755	0.473	0.427	0.389	0.373	0.478	0.484	0.495	0.377	0.325	0.324	0.448	0.406	0.347	0.278	0.305	0.350	0.367	0.358	0.373	0.368	0.359
C12	0.271	0.471	0.180	0.312	0.303	0.407	0.336	0.365	0.442	0.438	0.465	0.767	0.445	0.386	0.371	0.492	0.432	0.530	0.344	0.375	0.360	0.394	0.458	0.383	0.350	0.289	0.295	0.478	0.413	0.464	0.336	0.343
C13	0.251	0.435	0.180	0.261	0.232	0.302	0.355	0.167	0.384	0.439	0.362	0.438	1.000	0.391	0.352	0.407	0.376	0.422	0.363	0.380	0.251	0.339	0.387	0.293	0.278	0.343	0.297	0.388	0.376	0.391	0.318	0.343
C14	0.376	0.455	0.196	0.260	0.304	0.319	0.273	0.291	0.405	0.419	0.359	0.315	0.355	0.743	0.439	0.489	0.394	0.440	0.415	0.325	0.305	0.322	0.389	0.420	0.296	0.325	0.387	0.350	0.394	0.427	0.336	0.359
C15	0.538	0.435	0.180	0.190	0.250	0.302	0.600	0.186	0.297	0.292	0.307	0.367	0.245	0.386	0.743	0.541	0.392	0.406	0.364	0.273	0.305	0.357	0.405	0.420	0.313	0.362	0.422	0.388	0.484	0.482	0.371	0.359
C16	0.411	0.566	0.412	0.502	0.459	0.565	0.255	0.347	0.387	0.437	0.380	0.506	0.391	0.386	0.457	0.767	0.360	0.418	0.288	0.431	0.375	0.429	0.512	0.472	0.347	0.323	0.402	0.439	0.446	0.464	0.371	0.343
C17	0.340	0.487	0.284	0.397	0.288	0.497	0.273	0.347	0.387	0.509	0.448	0.331	0.391	0.389	0.336	0.442	0.779	0.438	0.382	0.377	0.430	0.376	0.442	0.366	0.333	0.308	0.460	0.476	0.464	0.464	0.355	0.343
C18	0.391	0.523	0.377	0.365	0.320	0.463	0.345	0.380	0.347	0.403	0.487	0.370	0.373	0.316	0.282	0.369	0.545	0.767	0.434	0.341	0.377	0.375	0.406	0.366	0.315	0.290	0.424	0.478	0.484	0.500	0.355	0.362
C19	0.376	0.180	0.250	0.297	0.359	0.356	0.445	0.309	0.280	0.297	0.416	0.368	0.245	0.264	0.243	0.369	0.318	0.382	0.742	0.393	0.377	0.324	0.460	0.352	0.369	0.326	0.495	0.478	0.398	0.464	0.355	0.362
C20	0.299	0.376	0.411	0.440	0.395	0.514	0.336	0.414	0.489	0.381	0.449	0.473	0.336	0.371	0.434	0.436	0.409	0.402	0.381	0.755	0.379	0.357	0.331	0.242	0.333	0.342	0.333	0.279	0.144	0.300	0.336	0.507
C21	0.376	0.361	0.523	0.514	0.394	0.445	0.273	0.297	0.243	0.351	0.415	0.458	0.227	0.425	0.355	0.364	0.337	0.405	0.399	0.376	0.753	0.394	0.350	0.455	0.420	0.344	0.387	0.366	0.321	0.330	0.355	0.505
C22	0.321	0.507	0.178	0.221	0.266	0.372	0.191	0.275	0.334	0.400	0.362	0.422	0.300	0.300	0.264	0.294	0.196	0.439	0.333	0.396	0.398	0.779	0.387	0.536	0.385	0.361	0.402	0.400	0.392	0.269	0.209	0.505
C23	0.355	0.505	0.388	0.432	0.457	0.563	0.191	0.452	0.557	0.505	0.396	0.453	0.409	0.473	0.418	0.399	0.370	0.455	0.432	0.452	0.399	0.449	0.767	0.423	0.421	0.394	0.401	0.455	0.410	0.342	0.282	0.507
C24	0.321	0.523	0.212	0.239	0.317	0.423	0.191	0.328	0.386	0.439	0.414	0.384	0.227	0.300	0.264	0.296	0.266	0.476	0.386	0.396	0.415	0.498	0.370	0.789	0.405	0.343	0.403	0.420	0.374	0.257	0.189	0.522
C25	0.321	0.507	0.212	0.238	0.247	0.456	0.273	0.310	0.369	0.489	0.503	0.403	0.282	0.298	0.298	0.296	0.178	0.423	0.382	0.380	0.415	0.481	0.441	0.525	0.767	0.418	0.404	0.327	0.597	0.221	0.189	0.505
C26	0.321	0.507	0.178	0.206	0.265	0.336	0.191	0.309	0.389	0.473	0.452	0.402	0.245	0.312	0.386	0.348	0.177	0.387	0.413	0.448	0.398	0.481	0.457	0.440	0.478	0.755	0.454	0.259	0.536	0.257	0.209	0.489
C27	0.537	0.523	0.265	0.239	0.300	0.493	0.109	0.293	0.523	0.489	0.487	0.435	0.373	0.421	0.459	0.369	0.301	0.491	0.392	0.341	0.503	0.531	0.494	0.541	0.476	0.444	0.767	0.242	0.373	0.155	0.189	0.436
C28	0.425	0.409	0.474	0.364	0.335	0.549	0.191	0.275	0.441	0.419	0.463	0.417	0.536	0.441	0.475	0.508	0.264	0.441	0.264	0.234	0.398	0.464	0.441	0.509	0.511	0.305	0.491	0.767	0.483	0.209	0.227	0.436
C29	0.389	0.523	0.406	0.415	0.493	0.551	0.255	0.167	0.389	0.382	0.450	0.402	0.391	0.491	0.473	0.438	0.214	0.441	0.358	0.339	0.396	0.480	0.457	0.576	0.474	0.412	0.351	0.455	0.779	0.166	0.152	0.436
C30	0.321	0.523	0.341	0.238	0.229	0.567	0.109	0.341	0.510	0.401	0.521	0.437	0.282	0.332	0.496	0.547	0.353	0.511	0.362	0.323	0.414	0.480	0.494	0.544	0.458	0.359	0.458	0.458	0.536	0.457	0.516	0.455
C31	0.423	0.270	0.371	0.434	0.527	0.489	0.173	0.413	0.362	0.452	0.458	0.398	0.427	0.434	0.348	0.419	0.230	0.309	0.388	0.394	0.523	0.537	0.494	0.561	0.401	0.412	0.494	0.475	0.503	0.482	0.743	0.615
C32	0.332	0.359	0.359	0.401	0.442	0.388	0.173	0.432	0.309	0.275	0.412	0.419	0.445	0.455	0.455	0.417	0.444	0.380	0.341	0.358	0.357	0.532	0.509	0.556	0.366	0.375	0.441	0.459	0.554	0.524	0.532	0.755

Appendix D. Inter-relationship matrix of criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
C1	0.312	0.341	0.244	0.264	0.277	0.325	0.224	0.268	0.303	0.323	0.331	0.331	0.298	0.313	0.298	0.324	0.285	0.320	0.278	0.292	0.296	0.320	0.322	0.331	0.298	0.285	0.300	0.280	0.284	0.241	0.234	0.300
C2	0.289	0.350	0.244	0.261	0.271	0.321	0.185	0.261	0.305	0.311	0.318	0.322	0.300	0.310	0.298	0.312	0.280	0.315	0.272	0.284	0.282	0.319	0.318	0.331	0.288	0.276	0.273	0.288	0.293	0.251	0.233	0.295
C3	0.242	0.275	0.238	0.210	0.228	0.264	0.170	0.227	0.255	0.266	0.273	0.269	0.252	0.257	0.250	0.271	0.244	0.271	0.239	0.245	0.240	0.273	0.273	0.282	0.251	0.236	0.233	0.249	0.251	0.215	0.200	0.255
C4	0.229	0.251	0.211	0.240	0.237	0.257	0.161	0.211	0.240	0.243	0.253	0.253	0.240	0.253	0.245	0.252	0.227	0.251	0.218	0.232	0.229	0.245	0.243	0.258	0.224	0.225	0.226	0.225	0.228	0.195	0.179	0.243
C5	0.217	0.244	0.186	0.202	0.241	0.253	0.159	0.202	0.231	0.241	0.245	0.247	0.221	0.226	0.221	0.234	0.220	0.242	0.210	0.220	0.227	0.238	0.241	0.240	0.213	0.202	0.208	0.204	0.212	0.181	0.167	0.216
C6	0.273	0.313	0.235	0.250	0.266	0.350	0.190	0.264	0.303	0.313	0.315	0.315	0.287	0.296	0.284	0.317	0.284	0.316	0.274	0.285	0.294	0.321	0.315	0.329	0.291	0.274	0.280	0.296	0.299	0.261	0.245	0.310
C7	0.216	0.261	0.196	0.208	0.221	0.265	0.149	0.206	0.247	0.243	0.261	0.259	0.239	0.249	0.239	0.257	0.224	0.250	0.221	0.217	0.232	0.257	0.252	0.259	0.218	0.226	0.225	0.240	0.237	0.191	0.174	0.254
C8	0.213	0.244	0.182	0.204	0.212	0.245	0.146	0.233	0.227	0.243	0.244	0.244	0.220	0.224	0.217	0.231	0.210	0.240	0.215	0.214	0.222	0.233	0.238	0.253	0.215	0.204	0.211	0.212	0.218	0.182	0.163	0.212
C9	0.284	0.336	0.238	0.254	0.273	0.325	0.198	0.266	0.330	0.316	0.325	0.320	0.295	0.305	0.302	0.317	0.284	0.324	0.280	0.286	0.289	0.328	0.324	0.332	0.298	0.278	0.290	0.288	0.297	0.265	0.249	0.313
C10	0.276	0.331	0.233	0.249	0.269	0.324	0.202	0.255	0.299	0.338	0.320	0.324	0.296	0.299	0.291	0.315	0.288	0.321	0.279	0.283	0.299	0.327	0.323	0.329	0.286	0.272	0.278	0.295	0.301	0.263	0.231	0.296
C11	0.265	0.317	0.224	0.240	0.260	0.311	0.193	0.246	0.291	0.302	0.329	0.307	0.280	0.285	0.277	0.304	0.274	0.309	0.264	0.265	0.272	0.306	0.302	0.306	0.266	0.256	0.270	0.275	0.281	0.244	0.226	0.286
C12	0.259	0.315	0.217	0.241	0.254	0.308	0.193	0.247	0.290	0.299	0.308	0.329	0.281	0.285	0.277	0.305	0.269	0.312	0.262	0.269	0.274	0.302	0.306	0.309	0.271	0.254	0.266	0.284	0.285	0.250	0.224	0.285
C13	0.234	0.286	0.197	0.216	0.226	0.273	0.178	0.211	0.261	0.274	0.274	0.278	0.299	0.260	0.252	0.273	0.242	0.277	0.240	0.246	0.242	0.271	0.274	0.275	0.242	0.236	0.242	0.253	0.258	0.224	0.203	0.260
C14	0.251	0.296	0.205	0.223	0.239	0.283	0.178	0.227	0.270	0.281	0.282	0.277	0.258	0.294	0.266	0.287	0.251	0.287	0.252	0.249	0.254	0.279	0.283	0.294	0.251	0.242	0.257	0.258	0.267	0.234	0.211	0.269
C15	0.265	0.297	0.206	0.219	0.236	0.285	0.203	0.221	0.264	0.273	0.281	0.284	0.251	0.270	0.290	0.293	0.252	0.287	0.250	0.247	0.256	0.284	0.287	0.296	0.255	0.247	0.262	0.263	0.276	0.239	0.214	0.272
C16	0.287	0.343	0.250	0.271	0.283	0.340	0.199	0.263	0.304	0.319	0.322	0.329	0.295	0.304	0.302	0.344	0.281	0.323	0.275	0.291	0.293	0.324	0.330	0.336	0.289	0.274	0.291	0.298	0.306	0.266	0.241	0.304
C17	0.269	0.322	0.230	0.252	0.257	0.321	0.192	0.251	0.291	0.310	0.312	0.302	0.282	0.290	0.280	0.306	0.299	0.310	0.269	0.274	0.285	0.306	0.310	0.314	0.275	0.261	0.283	0.288	0.294	0.255	0.229	0.291
C18	0.272	0.324	0.236	0.249	0.259	0.317	0.196	0.253	0.287	0.302	0.315	0.304	0.280	0.284	0.275	0.300	0.282	0.334	0.273	0.271	0.280	0.305	0.307	0.313	0.273	0.259	0.279	0.288	0.295	0.256	0.228	0.291
C19	0.246	0.269	0.205	0.221	0.238	0.280	0.186	0.224	0.255	0.265	0.281	0.275	0.244	0.253	0.246	0.272	0.239	0.277	0.270	0.249	0.254	0.273	0.282	0.282	0.251	0.237	0.260	0.261	0.262	0.230	0.207	0.264
C20	0.253	0.298	0.228	0.244	0.253	0.306	0.188	0.245	0.285	0.286	0.298	0.298	0.265	0.275	0.274	0.292	0.260	0.293	0.257	0.289	0.267	0.290	0.287	0.289	0.262	0.251	0.260	0.260	0.256	0.232	0.218	0.289
C21	0.261	0.300	0.239	0.251	0.256	0.304	0.185	0.238	0.269	0.287	0.298	0.300	0.258	0.282	0.270	0.289	0.257	0.296	0.261	0.264	0.298	0.296	0.291	0.308	0.271	0.253	0.267	0.269	0.272	0.235	0.220	0.292
C22	0.237	0.289	0.195	0.211	0.227	0.276	0.164	0.218	0.255	0.269	0.272	0.275	0.244	0.251	0.243	0.261	0.226	0.276	0.236	0.245	0.251	0.302	0.272	0.291	0.249	0.236	0.248	0.251	0.257	0.213	0.193	0.270
C23	0.287	0.343	0.252	0.270	0.287	0.345	0.198	0.275	0.322	0.329	0.328	0.331	0.301	0.315	0.304	0.322	0.287	0.331	0.290	0.297	0.300	0.331	0.354	0.338	0.300	0.284	0.296	0.304	0.308	0.261	0.238	0.321
C24	0.245	0.298	0.204	0.219	0.237	0.288	0.169	0.228	0.266	0.279	0.284	0.280	0.245	0.259	0.250	0.269	0.239	0.287	0.247	0.252	0.260	0.289	0.279	0.318	0.257	0.241	0.255	0.260	0.263	0.218	0.197	0.279
C25	0.252	0.306	0.210	0.226	0.239	0.299	0.181	0.233	0.273	0.291	0.299	0.290	0.257	0.267	0.260	0.277	0.239	0.292	0.254	0.259	0.267	0.297	0.292	0.308	0.292	0.254	0.263	0.261	0.288	0.222	0.203	0.286
C26	0.248	0.302	0.205	0.220	0.237	0.286	0.172	0.230	0.270	0.286	0.291	0.286	0.250	0.264	0.263	0.277	0.235	0.285	0.253	0.260	0.262	0.293	0.290	0.297	0.267	0.275	0.263	0.252	0.279	0.222	0.202	0.281
C27	0.285	0.326	0.228	0.240	0.259	0.321	0.181	0.247	0.302	0.310	0.316	0.311	0.281	0.293	0.289	0.301	0.265	0.316	0.271	0.273	0.291	0.319	0.315	0.328	0.287	0.272	0.306	0.271	0.288	0.233	0.217	0.299
C28	0.279	0.321	0.246	0.252	0.264	0.328	0.189	0.248	0.298	0.308	0.317	0.312	0.297	0.298	0.294	0.315	0.265	0.315	0.264	0.267	0.286	0.317	0.314	0.329	0.292	0.264	0.289	0.313	0.300	0.239	0.222	0.301
C29	0.274	0.326	0.239	0.254	0.274	0.325	0.192	0.238	0.292	0.302	0.314	0.309	0.283	0.299	0.291	0.307	0.259	0.312	0.269	0.273	0.283	0.315	0.312	0.331	0.287	0.270	0.276	0.288	0.318	0.233	0.214	0.299
C30	0.277	0.336	0.241	0.248	0.262	0.337	0.186	0.259	0.310	0.313	0.329	0.321	0.283	0.296	0.301	0.324	0.277	0.327	0.277	0.280	0.293	0.325	0.325	0.339	0.295	0.274	0.293	0.297	0.310	0.263	0.249	0.310
C31	0.293	0.327	0.251	0.271	0.293	0.341	0.197	0.272	0.308	0.326	0.334	0.328	0.303	0.313	0.299	0.324	0.276	0.321	0.288	0.294	0.311	0.339	0.335	0.350	0.299	0.286	0.304	0.306	0.316	0.272	0.272	0.331
C32	0.279	0.325	0.244	0.262	0.279	0.324	0.192	0.267	0.296	0.304	0.322	0.320	0.296	0.306	0.299	0.316	0.284	0.318	0.277	0.283	0.290	0.330	0.327	0.340	0.289	0.276	0.292	0.298	0.312	0.268	0.251	0.333

1 Appendix E. Unlimited super matrix e Hierarchical and interdependence relations

	A1	A2	A3	A4	A5	A6	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
A1	3.816	3.996	3.773	3.948	3.715	3.931	0.826	0.633	0.500	0.673	0.436	0.320	0.440	0.513	0.515	0.673	0.593	0.475	0.593	0.473	0.516	0.556	0.477	0.540	0.495	0.513	0.475	0.593	0.473	0.516	0.556	0.475	0.593	0.473	0.516	0.556	0.475	0.593
A2	3.846	4.132	3.881	4.057	3.780	4.056	0.575	0.919	0.535	0.673	0.513	0.473	0.434	0.509	0.476	0.557	0.555	0.436	0.593	0.435	0.476	0.572	0.593	0.580	0.460	0.503	0.436	0.593	0.435	0.476	0.572	0.436	0.593	0.435	0.476	0.572	0.436	0.593
A3	3.493	3.717	3.590	3.681	3.480	3.642	0.500	0.595	0.759	0.635	0.475	0.320	0.435	0.477	0.520	0.516	0.516	0.360	0.440	0.435	0.477	0.480	0.440	0.500	0.495	0.498	0.360	0.440	0.435	0.477	0.480	0.360	0.440	0.435	0.477	0.480	0.360	0.440
A4	3.890	4.127	3.896	4.122	3.850	4.036	0.650	0.595	0.535	0.908	0.513	0.473	0.593	0.513	0.488	0.596	0.593	0.360	0.440	0.357	0.400	0.633	0.516	0.615	0.460	0.475	0.360	0.440	0.357	0.400	0.633	0.360	0.440	0.357	0.400	0.633	0.360	0.440
A5	3.424	3.620	3.451	3.633	3.482	3.606	0.500	0.633	0.535	0.673	0.796	0.396	0.593	0.475	0.553	0.520	0.593	0.360	0.516	0.320	0.400	0.595	0.593	0.580	0.495	0.475	0.360	0.516	0.320	0.400	0.595	0.360	0.516	0.320	0.400	0.595	0.360	0.516
A6	3.819	4.065	3.847	4.017	3.752	4.036	0.919	0.759	0.635	0.475	0.615	0.460	0.475	0.320	0.435	0.477	0.520	0.516	0.520	0.516	0.360	0.440	0.435	0.477	0.480	0.440	0.460	0.503	0.436	0.580	0.495	0.475	0.357	0.400	0.360	0.440	0.435	0.477
C1	0.477	0.000	0.000	0.000	0.000	0.000	0.312	0.341	0.244	0.264	0.277	0.325	0.224	0.268	0.303	0.323	0.331	0.331	0.298	0.313	0.298	0.324	0.285	0.320	0.278	0.292	0.296	0.320	0.322	0.331	0.298	0.285	0.300	0.280	0.284	0.241	0.234	0.300
C2	0.520	0.000	0.000	0.000	0.000	0.000	0.289	0.350	0.244	0.261	0.271	0.321	0.185	0.261	0.305	0.311	0.318	0.322	0.300	0.310	0.298	0.312	0.280	0.315	0.272	0.284	0.282	0.319	0.318	0.331	0.288	0.276	0.273	0.288	0.293	0.251	0.233	0.295
C3	0.516	0.000	0.000	0.000	0.000	0.000	0.242	0.275	0.238	0.210	0.228	0.264	0.170	0.227	0.255	0.266	0.273	0.269	0.252	0.257	0.250	0.271	0.244	0.271	0.239	0.245	0.240	0.273	0.273	0.282	0.251	0.236	0.233	0.249	0.251	0.215	0.200	0.255
C4	0.516	0.000	0.000	0.000	0.000	0.000	0.229	0.251	0.211	0.240	0.237	0.257	0.161	0.211	0.240	0.243	0.253	0.253	0.240	0.253	0.245	0.252	0.227	0.251	0.218	0.232	0.229	0.245	0.243	0.258	0.224	0.225	0.226	0.225	0.228	0.195	0.179	0.243
C5	0.360	0.000	0.000	0.000	0.000	0.000	0.217	0.244	0.186	0.202	0.241	0.253	0.159	0.202	0.231	0.241	0.245	0.247	0.221	0.226	0.221	0.234	0.220	0.242	0.210	0.220	0.227	0.238	0.241	0.240	0.213	0.202	0.208	0.204	0.212	0.181	0.167	0.216
C6	0.000	0.572	0.000	0.000	0.000	0.000	0.273	0.313	0.235	0.250	0.266	0.350	0.190	0.264	0.303	0.313	0.315	0.315	0.287	0.296	0.284	0.317	0.284	0.316	0.274	0.285	0.294	0.321	0.315	0.329	0.291	0.274	0.280	0.296	0.299	0.261	0.245	0.310
C7	0.000	0.593	0.000	0.000	0.000	0.000	0.216	0.261	0.196	0.208	0.221	0.265	0.149	0.206	0.247	0.243	0.261	0.259	0.239	0.249	0.239	0.257	0.224	0.250	0.221	0.217	0.232	0.257	0.252	0.259	0.218	0.226	0.225	0.240	0.237	0.191	0.174	0.254
C8	0.000	0.580	0.000	0.000	0.000	0.000	0.213	0.244	0.182	0.204	0.212	0.245	0.146	0.233	0.227	0.243	0.244	0.244	0.220	0.224	0.217	0.231	0.210	0.240	0.215	0.214	0.222	0.233	0.238	0.253	0.215	0.204	0.211	0.212	0.218	0.182	0.163	0.212
C9	0.000	0.460	0.000	0.000	0.000	0.000	0.284	0.336	0.238	0.254	0.273	0.325	0.198	0.266	0.330	0.316	0.325	0.320	0.295	0.305	0.302	0.317	0.284	0.324	0.280	0.286	0.289	0.328	0.324	0.332	0.298	0.278	0.290	0.288	0.297	0.265	0.249	0.313
C10	0.000	0.503	0.000	0.000	0.000	0.000	0.276	0.331	0.233	0.249	0.269	0.324	0.202	0.255	0.299	0.338	0.320	0.324	0.296	0.299	0.291	0.315	0.288	0.321	0.279	0.283	0.299	0.327	0.323	0.329	0.286	0.272	0.278	0.295	0.301	0.263	0.231	0.296
C11	0.000	0.436	0.000	0.000	0.000	0.000	0.265	0.317	0.224	0.240	0.260	0.311	0.193	0.246	0.291	0.302	0.329	0.307	0.280	0.285	0.277	0.304	0.274	0.309	0.264	0.265	0.272	0.306	0.302	0.306	0.266	0.256	0.270	0.275	0.281	0.244	0.226	0.286
C12	0.000	0.000	0.596	0.000	0.000	0.000	0.259	0.315	0.217	0.241	0.254	0.308	0.193	0.247	0.290	0.299	0.308	0.329	0.281	0.285	0.277	0.305	0.269	0.312	0.262	0.269	0.274	0.302	0.306	0.309	0.271	0.254	0.266	0.284	0.285	0.250	0.224	0.285
C13	0.000	0.000	0.593	0.000	0.000	0.000	0.234	0.286	0.197	0.216	0.226	0.273	0.178	0.211	0.261	0.274	0.274	0.278	0.299	0.260	0.252	0.273	0.242	0.277	0.240	0.246	0.242	0.271	0.274	0.275	0.242	0.236	0.242	0.253	0.258	0.224	0.203	0.260
C14	0.000	0.000	0.360	0.000	0.000	0.000	0.251	0.296	0.205	0.223	0.239	0.283	0.178	0.227	0.270	0.281	0.282	0.277	0.258	0.294	0.266	0.287	0.251	0.287	0.252	0.249	0.254	0.279	0.283	0.294	0.251	0.242	0.257	0.258	0.267	0.234	0.211	0.269
C15	0.000	0.000	0.440	0.000	0.000	0.000	0.265	0.297	0.206	0.219	0.236	0.285	0.203	0.221	0.264	0.273	0.281	0.284	0.251	0.270	0.290	0.293	0.252	0.287	0.250	0.247	0.256	0.284	0.287	0.296	0.255	0.247	0.262	0.263	0.276	0.239	0.214	0.272
C16	0.000	0.000	0.000	0.475	0.000	0.000	0.287	0.343	0.250	0.271	0.283	0.340	0.199	0.263	0.304	0.319	0.322	0.329	0.295	0.304	0.302	0.344	0.281	0.323	0.275	0.291	0.293	0.324	0.330	0.336	0.289	0.274	0.291	0.298	0.306	0.266	0.241	0.304
C17	0.000	0.000	0.000	0.320	0.000	0.000	0.269	0.322	0.230	0.252	0.257	0.321	0.192	0.251	0.291	0.310	0.312	0.302	0.282	0.290	0.280	0.306	0.299	0.310	0.269	0.274	0.285	0.306	0.310	0.314	0.275	0.261	0.283	0.288	0.294	0.255	0.229	0.291
C18	0.000	0.000	0.000	0.435	0.000	0.000	0.272	0.324	0.236	0.249	0.259	0.317	0.196	0.253	0.287	0.302	0.315	0.304	0.280	0.284	0.275	0.300	0.282	0.334	0.273	0.271	0.280	0.305	0.307	0.313	0.273	0.259	0.279	0.288	0.295	0.256	0.228	0.291
C19	0.000	0.000	0.000	0.477	0.000	0.000	0.246	0.269	0.205	0.221	0.238	0.280	0.186	0.224	0.255	0.265	0.281	0.275	0.244	0.253	0.246	0.272	0.239	0.277	0.270	0.249	0.254	0.273	0.282	0.282	0.251	0.237	0.260	0.261	0.262	0.230	0.207	0.264
C20	0.000	0.000	0.000	0.000	0.460	0.000	0.253	0.298	0.228	0.244	0.253	0.306	0.188	0.245	0.285	0.286	0.298	0.298	0.265	0.275	0.274	0.292	0.260	0.293	0.257	0.289	0.267	0.290	0.287	0.289	0.262	0.251	0.260	0.260	0.256	0.232	0.218	0.289
C21	0.000	0.000	0.000	0.000	0.475	0.000	0.261	0.300	0.239	0.251	0.256	0.304	0.185	0.238	0.269	0.287	0.298	0.300	0.258	0.282	0.270	0.289	0.257	0.296	0.261	0.264	0.298	0.296	0.291	0.308	0.271	0.253	0.267	0.269	0.272	0.235	0.220	0.292
C22	0.000	0.000	0.000	0.000	0.360	0.000	0.237	0.289	0.195	0.211	0.227	0.276	0.164	0.218	0.255	0.269	0.272	0.275	0.244	0.251	0.243	0.261	0.226	0.276	0.236	0.245	0.251	0.302	0.272	0.291	0.249	0.236	0.248	0.251	0.257	0.213	0.193	0.270
C23	0.000	0.000	0.000	0.000	0.440	0.000	0.287	0.343	0.252	0.270	0.287	0.345	0.198	0.275	0.322	0.329	0.328	0.331	0.301	0.315	0.304	0.322	0.287	0.331	0.290	0.297	0.300	0.331	0.354	0.338	0.300	0.284	0.296	0.304	0.308	0.261	0.238	0.321
C24	0.000	0.000	0.000	0.000	0.556	0.000	0.245	0.298	0.204	0.219	0.237	0.288	0.169	0.228	0.266	0.279	0.284	0.280	0.245	0.259	0.250	0.269	0.239	0.287	0.247	0.252	0.260	0.289	0.279	0.318	0.257	0.241	0.255	0.260	0.263	0.218	0.197	0.279
C25	0.000	0.000	0.000	0.000	0.477	0.000	0.252	0.306	0.210	0.226	0.239	0.299	0.181	0.233	0.273	0.291	0.299	0.290	0.257	0.267	0.260	0.277	0.239	0.292	0.254	0.259	0.267	0.297	0.292	0.308	0.292	0.254	0.263	0.261	0.288	0.222	0.203	0.286
C26	0.000	0.000	0.000	0.000	0.540	0.000	0.248	0.302	0.205	0.220	0.237	0.286	0.172	0.230	0.270	0.286	0.291	0.286	0.250	0.264	0.263	0.277	0.235	0.285	0.253	0.260	0.262	0.293	0.290	0.297	0.267	0.275	0.263	0.252	0.279	0.222	0.202	0.281
C27	0.000	0.000	0.000	0.000	0.495	0.000	0.285	0.326	0.228	0.240	0.259	0.321	0.181	0.247	0.302	0.310	0.316	0.311	0.281	0.293	0.289	0.301	0.265	0.316	0.271	0.273	0.291	0.319	0.315	0.328	0.287	0.272	0.306	0.271	0.288	0.233	0.217	0.299
C28	0.000	0.000	0.000	0.000	0.000	0.553	0.279	0.321	0.246	0.252	0.264	0.328	0.189	0.248	0.298	0.308	0.317	0.312	0.297	0.298	0.294	0.315	0.265	0.315	0.264	0.267	0.286	0.317	0.314	0.329	0.292	0.264	0.289	0.313	0.300	0.239	0.222	0.301

C29	0.000	0.000	0.000	0.000	0.000	0.520	0.274	0.326	0.239	0.254	0.274	0.325	0.192	0.238	0.292	0.302	0.314	0.309
C30	0.000	0.000	0.000	0.000	0.000	0.593	0.277	0.336	0.241	0.248	0.262	0.337	0.186	0.259	0.310	0.313	0.329	0.321
C31	0.000	0.000	0.000	0.000	0.000	0.360	0.293	0.327	0.251	0.271	0.293	0.341	0.197	0.272	0.308	0.326	0.334	0.328
C32	0.000	0.000	0.000	0.000	0.000	0.516	0.279	0.325	0.244	0.262	0.279	0.324	0.192	0.267	0.296	0.304	0.322	0.320

C29	0.283	0.299	0.291	0.307	0.259	0.312	0.269	0.273	0.283	0.315	0.312	0.331	0.287	0.270	0.276	0.288	0.318	0.233	0.214	0.299
C30	0.283	0.296	0.301	0.324	0.277	0.327	0.277	0.280	0.293	0.325	0.325	0.339	0.295	0.274	0.293	0.297	0.310	0.263	0.249	0.310
C31	0.303	0.313	0.299	0.324	0.276	0.321	0.288	0.294	0.311	0.339	0.335	0.350	0.299	0.286	0.304	0.306	0.316	0.272	0.272	0.331
C32	0.296	0.306	0.299	0.316	0.284	0.318	0.277	0.283	0.290	0.330	0.327	0.340	0.289	0.276	0.292	0.298	0.312	0.268	0.251	0.333