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BEST–WORST METHOD TO PRIORITIZE INDICATORS EFFECTIVE IN MAKING LOGISTICS SYSTEMS MORE SUSTAINABLE IN FAST-MOVING CONSUMER GOODS INDUSTRY IN DEVELOPING COUNTRIES

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Abstract. Logistics systems constitute the backbone of international trade. For developing countries, establishment of sustainable logistics systems reduces costs, and makes supply chains strong to become able to compete. Without setting indicators for sustainable logistics, it is not possible to understand what policies are necessary for success. Logistics systems situations become worse in especial industries such as Fast-Moving Consuming Goods (FMCG) industry that are facing observable challenges such as old-fashioned goods or product corruption. The objective of this paper is to determine a set of indicators, which can be helpful in enhancement of sustainable logistics systems in developing countries. An initial set of indicators is determined through literature review and justified by asking experts' opinions who have experience of management in logistics systems in developing countries such as Iran and Afghanistan, especially in logistics management in FMCG industry. The indicators are prioritized using Best–Worst Method (BWM), which is a newly introduced decision-making model. Results of prioritization of finalized dimensions and indicators by use of BWM show that "Governance" has the highest importance among dimensions and "management commitment to sustainability" is the most important indicator among all indicators. The results are applicably acceptable as we can see in business circumstances that only when managers believe in perusing sustainability principles as an important factor under each type of economic circumstance, an efficient vision will be set. Risk management has gained the least weight in this study. Based on experts' opinions, if policies and procedures are set and performed correctly, risks will be less probable by themselves. The results help mangers in assignment of limited budgets to improvement projects related to each indicator.

Keywords: best–worst method (BWM), developing countries, fast moving consumer goods (FMCG), logistics systems, sustainability, prioritization model.

Notations

AHP – analytic hierarchy process;
BWM – best–worst method;
CI – consistency index;
CoCoSo – combined comprise solution;
CR – consistency rate;
DEA – data envelopment analysis;
DEMATEL – decision-making trial and evaluation laboratory;
EMAS – eco-management and audit system;
FMCG – fast-moving consumer goods;
FPP – fuzzy preferences programming;
ICT – information and communication technology;
IoT – internet of things;
MADM – multiple attribute decision-making;
MAIRCA – multi-attributive ideal real comparative analysis;
MCDM – multi-criteria decision-making;
MULTIMOORA – multiplicative and multi-objective ratio analysis;
OECD – Organisation for Economic Cooperation and Development;
SCM – supply chain management;
TISM – total interpretative structural modelling;
TOPSIS – technique for order of preference by similarity to ideal solution;
VIKOR – multi-criteria optimization and compromise solution (in Serbian: *Višekriterijumska optimizacija I KOmpromisno Rešenje*);
WASPAS – weighted aggregates sum product assessment.

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Introduction

Supply chains define a complicated concept consist of many participants. The main goal of the whole supply chain is to achieve the highest profit from all the members point of view, which is mostly complicated goal (Stević *et al.* 2018; Puška *et al.* 2018; Fazlollahtabar 2018). Since organizations moved from vertically integrated, centralized, single production system to coordinated network of organizations all around the world that work well-arranged to create value for the end user, logistical complexity has increased exponentially. The role of logistics as a part of supply chain is something more than just transportation, playing an important function in the successful implementation of supply chain strategies (Jayal *et al.* 2010; Stević *et al.* 2017; Zavadskas *et al.* 2018). Logistics systems observe considerable amount of energy resources and, as such, are responsible for generating emissions worldwide. Meanwhile, in most nations, approximately from 3 to 5% of the total workforce is working in logistics industry (Rashidi, Cullinane 2019).

The complexity of performance management is not just exclusive to selecting the most efficient routes and costs. Logistics service providers should also satisfy customer's requirements through on-time delivery, excellent responsiveness, good logistics service quality and other intangible sides, which are dependent on issues such as knowledge sharing (Wang *et al.* 2019; Stević *et al.* 2017; Zavadskas *et al.* 2018).

Such complexity becomes fierce in FMCG since speed to market is the key point for clients of this industry especially in the section that is related to fashion. To meet the changing preferences of consumers, logistics systems should be developed with consistent deliveries. New approaches should be developed including real time inventory visibility to allow customers to get the most out of their assets. Scalability and the capacity to meet high demands are essential in a logistics system for the FMCG industry while as e-commerce becomes increasingly important in the direct-to-consumer market, comprehensive services with integrated information technology should be launched. Economic, environmental and social objectives should be balanced in order to make the role of logistics, which is crucial in increasing food security more efficient and become able to feed 9 billion people by 2050 while mitigating impact on climate change (Irigoyen 2014). Previous studies show that although some developing countries are among the top exporting countries of FMCG globally, the concept of sustainable logistics systems is new to many of the supply chain players and the logistics costs are more than global average (Nayak *et al.* 2019; Wang *et al.* 2019).

Sustainability has strongly become a modern concept, which considers the long-term connection of present and future generations (Hansmann *et al.* 2012). Another new concept beside this is "sustainable development", which focuses on supply of the present generation needs considering the future generation's needs (Moldan *et al.* 2012). It is also needed to consider that sustainability should be investigated in the governance context of the society to obtain the cultural gaps and interlinks of sustainability challenges (Bergsten *et al.* 2019).

Decision-making methods have received more attention in recent years as a device of environmental sustainability, but the issues that distinct this study from previous ones and shape its contributions are that indicators that are fruitful in making logistics systems sustainable are determined by considering social, economic, environmental and governance systems of developing countries. It is considered that governance plays especial role in making strategies come true in each domain of economic, environmental and social. There are less evidences of determining the weights of sustainability indicators for developing countries. Indicators are finalized by asking experts' opinions. After that, these indicators are prioritized by use of best–worst MCDM method. BWM asks experts to judge indicators at extremes instead of making discrimination among indicators of middling importance. Besides, experts make choices of indicators and this omits the opportunity for scale use bias. These advantages of BWM makes the gained results of this study more reliable and enhances its quality, which is unprecedented in sustainable logistics studies. This is helpful in understanding new facts of sustainable logistics in developing countries.

The rest of the study is organized as follows. In Section 1, a review of the literature can be found. The research methodology is described in Section 2. Data analysis and discussions of a real world study are reported in Section 3, some managerial insights are presented in Section 4 and at the end, the conclusion and proposals for future studies can be found in last section.

1. Literature review

Globalization makes SCM simultaneously consider economic issues, labor conditions, and green production. Sustainable SCM has become a growing topic for business in all industries (Azadi *et al.* 2015). Academic studies about sustainability of SCM started about 2 decades ago (Klassen *et al.* 1996; Murphy *et al.* 1996; Walton *et al.* 1998) and a considerable amount of studies shaped after that (Quarshie *et al.* 2016; Chung *et al.* 2016). As noted by Dyllick, Hockerts (2002) and Cuthbertson *et al.* (2011), sustainable SCM is the set of sustainability and SCM, seeking to combine environmental, social, and economic issues. All supply chains should become sustainable and it is not possible unless each part of it becomes sustainable and clearly, logistics system is a momentous part of supply chain. Sustainability of transportation even gains more importance nowadays since consumers are becoming more conscious about the products they consume. New ways of communication have facilitated sharing information about a company's activities among customers, and company's image depends on honesty and role in creating a sustainable future.

According to many authors the supplier selection, has received too much attention as an important aspect of sustainable SCM. That is why many different methods have been designed for ranking suppliers. Luthra *et al.* (2017) designed an integrated supplier selection approach using AHP and VIKOR methods. They considered 22 criteria for 3 aspects of sustainability. Fallahpour *et al.* (2017) presented a fuzzy combination of the TOPSIS and AHP methods. They used the FPP to calculate the weights of criteria, and ranked the suppliers by a fuzzy-TOPSIS model then validated the model by a case study. The fuzzy-TOPSIS model was also used to assess the sustainable performance of suppliers (Govindan *et al.* 2013). Su *et al.* (2016) presented a model using grey theory in the DEMATEL model for the supplier selection and sustainable SCM assessment. Rezaei *et al.* (2016) demonstrated a combined model consisting of 3 phases to select suppliers, the main phase is the BWM method. The suggested model is useful for companies forwarding to new markets.

Logistics system is the integration of all the activities needed for forward and reverse flow of raw materials, semi-finished goods and finished products to the point of consumption, considering related services and information. Freight transport, storage, inventory management, materials handling and all the related information processing are considered as logistics system activities. The main objective of sustainable logistics system is to line up these activities in a way that meet customer requirements and supply chain requirements at minimum cost while considering environmental and social issues. That is why companies get more involved with costs of logistics associated mainly with climate change, different pollutions, noise, and accidents (Dang, Yeo 2018). Logistics system management is helping organizations to develop their social, economic and environmental performance throughout their supply chains (Lin, Tseng 2016; Genovese *et al.* 2017). Considering sustainability importance, logistics frameworks are directed to these specific domains (e.g., Wong *et al.* 2015; Kaiser *et al.* 2019) from generic frameworks, which Novack (1984) study shapes one of the firsts (Tavasszy *et al.* 2020).

Different scholars have pointed to the indicators related to sustainable logistics and its importance in nowadays SCM (e.g., Speranza 2018). Govindan *et al.* (2019) determined criteria related to sustainable 3rd-party reverse logistics service provider based on the robustness analysis. Narayana *et al.* (2019) took into account the Indian pharmaceuticals industry consuming attention in market dynamics and reverse logistics to see how the companies in this industry are trying to get sustainable. Rashidi and Cullinane (2019) evaluated the sustainability of logistics performance within a sample of OECD nations using DEA. Energy use, greenhouse gas emissions, goods transport, and rate of job creation are the criteria used to do such analysis. Kayikci (2018) discussed about digitization in logistics and its effect on sustainability considering FMCG companies and their logistics systems in Turkey based on qualitative research method. Liu *et al.* (2018c) considered IoT concept for optimization of sustainable reverse logistics based on real time information. Yu and Solvang (2018) also considered sustainability of reverse logistics and 2-stage stochastic bi-objective mixed integer programming model. Liu *et al.* (2018b) considered 42 Asian countries and indicated a significant relation between logistics performance and environment that determines the priorities on environmental sustainability and green SCM. Mohanty and Shankar (2017) classified the key enablers of sustainability of integrated logistics in an uncertain environment considering fuzzy extension of TISM. Abbasi and Nilsson (2016) determined 4 groups of challenges as: (1) customer priorities, (2) managerial complexity, (3) network imbalance, and (4) technological and legislative uncertainties.

According to the important role of innovation in sustainability, Kusi-Sarpong *et al.* (2019) suggested a model based on the BWM for prioritization and selection of the criteria for sustainable innovations in SCM. They validated their model applicability and efficiency in manufacturing companies in India. There are many different applications of BWM as well. Kheybari *et al.* (2019) identified the best location for bioethanol production plant using BWM. They demonstrated an evaluation model based on the 3 dimensions of sustainability ("economic", "environmental" and "social"). The used method is based on only one decision-maker preferences where an average operator can be used to consider the preferences of multiple decision-makers. In another paper, a Bayesian BWM is defined to find amalgamate the aggregated weights of indicators for several decision-makers at once (Mohammadi, Rezaei 2020).

Validi *et al.* (2014) considered the food supply chain sustainability. They used TOPSIS to rank the traffic routes, according to transport total costs and CO_2 emissions. Das and Shaw (2017) also generated a procedure based on the AHP and fuzzy-TOPSIS considering CO_2 emissions and social factors for selecting a sustainable supply chain. The performance assessment of a sustainable supply chain was studied by Erol *et al.* (2011) with regard to 3 aspects of sustainability, economic, social and environmental. The authors combined fuzzy techniques and MCDM as it is very hard to valuate certain criteria. Entezaminia *et al.* (2016), suggested a product evaluation method in the supply chain based on the AHP according to environmental criteria such as biodegradability, recyclability, and product risk and energy consumption. Another field of MCDM application is performance assessment, a study has considered hospital information of evaluation system and proposed a BWM model with hesitant fuzzy linguistic data (Liao *et al.* 2019).

Hashemkhani Zolfani *et al.* (2019b) developed a hybrid BWM–WASPAS model for location selection problem to find the best location for the hotel. They analysed probable locations for a 5-star hotel in Shahrekord city (Iran) and prioritized them from sustainability

perspective. In another research, a hybrid MADM model based on BWM and CoCoSo method is suggested for sustainable supplier selection problem (Hashemkhani Zolfani *et al*. 2019a). Another research has been taken up to explore the criteria for evaluating the green performance of airports. A hybrid model of BWM and VIKOR methods has been generated to calculate the weight of different criteria and rank the airports accordingly. Green policies and regulations are the most important performance criteria for green airports (Kumar *et al*. 2020).

Sustainability assessment systems usually choose measures of economic performance, environmental impact, and social acceptability while considering governance indicators like what is shown in Table 1. Ren *et al*. (2015) and Manzardo *et al*. (2012) are among the scholars who believe some related governance indicators should also be considered to become able to achieve sustainability. Governmental support and guidelines, regulations and standards, and technologies are some of these indicators that have attained attentions. Indicators and their main dimensions based on literature review can be found in Table 1.

2. Research methodology

To determine the set of indicators effective in making logistics sustainable in FMCG industry in developing countries the methodology is structured and presented in 4 steps (Figure 1). At 1st, the objective is determined and it has been cleared why such study is useful in FMCG industry and why it is essential to consider the especial situations of developing countries. In the 2nd stage, explorative literature review is done to specify initial set of indicators for logistics sustainability analysis. Since scholars believe that governance of sustainability projects affect the economic, social and environmental performance of the entity (e.g., Turnheim *et al*. 2015; Leal Filho *et al*. 2016; Husted, De Sousa-Filho 2017), indicators are determined in 4 categories of "Governance", "Economic", "Social" and "Environmental". Different techniques used to prioritize them are also investigated in this stage. For finalizing the logistics sustainability indicators, a decision panel is constituted of 13 experts with working experience in FMCG companies for more than 7 years in developing countries. These experts are among managers in companies such as *Kalleh Dairy* in Iran and *Nestle* in Afghanistan. 9 of these experts are men and 4 of them are women who are chosen not only because of their expertise but also for their willingness to cooperate. Meetings are held in person by the authors and brainstorming on-line discussions are done to collect data from experts.

BWM is applied in this study to find out the weights of dimensions and also indicators. BWM is one of the MCDM techniques 1st presented by Rezaei (2015). BWM is the most suitable technique to attain the advantage of less pairwise comparisons and also to attain more consistence results (Brunelli, Rezaei 2019; Malek, Desai 2019). In comparison with other known models of decision-making, BWM is preferred because of 2 main characteristics: 1st it needs less comparison data than other methods, which need full pairwise matrix data, 2nd this method gives more consistent results comparing with other pairwise methods. In other words, this technique needs fewer comparative data and leads to more robust comparisons. The variety of methodologies incorporated in sustainability assessment is high but some related examples, which used BWM as their applied method, are listed in Table 2 to see BWM can be a suitable technique to determine the weights in this study considering its advantages in comparison to other similar techniques.

The BWM is a 5 steps technique. In 1st step we identify the set of appropriate criteria for prioritization. During the 2nd step the most important and least important indicators among all the indicators are called the best and the worst indicators, they are identified by decision-maker. In 3rd step the comparisons of all other indicators are done pairwise with the best indicator and other indicators, giving a score among 1, 2, …, 9, where 1 shows equality and the more score means higher priority of best indicator comparing to other one.

In 4th step the same is done between worst indicator and other indicators in the form of 2 matrices. In the 5th (last) step the optimal weights of indicators should be calculated so that for each $\frac{w_b}{w_j}$ and $\frac{w_j}{w_w}$ the ideal situation, which is $\frac{w_b}{w_j} = a_{Bj}$ and $\frac{w_j}{w_w} = a_{jw}$ occurs (Nawaz *et al*. 2018). To achieve this goal a linear model should be constituted as is depicted in Equation (1). The weights are determined by solving the linear model (BWM 2021).

$$\min \varepsilon$$

subject to:

$$\left|w_b - a_{Bj}.w_j\right| \le \varepsilon;$$

$$\left|w_j - a_{jw}.w_w\right| \le \varepsilon;$$

$$\sum_j w_j = 1,\ w_j \ge j \text{ for all } j. \quad (1)$$

By consideration of the epsilon value and the related value in Table 3, CR can be determined. The closer to 0 (zero), the more consistency of the comparisons has been created, and the closer to one, the comparisons have less consistency and less stability. CI, which is used to determine CR can be reached by applying values shown in Table 3. The CR is specified by use of Equation (2):

$$CR = \frac{\varepsilon}{CI}. \quad (2)$$

3. Discussion

Based on expert's opinions, indicators in Table 2 are finalized. In this regard, experts are asked to choose 9 most important indicators, since when the number of indicators increases, experts can't make distinction between them

Table 1. Components for making FMCG supply chain sustainable

Main dimension	Indicator	Description	Reference(s)
Governance	Management commitment to sustainability	Determination of sustainability vision and its publication while promoting shared values in the field of sustainability in the workplace and encourage employees to advance the principles of sustainability considering green governance principles	Azadi *et al.* (2015); Tseng, Chiu (2013)
	Technology	The capability to adopt innovative and internet based approaches to face the objectives of business partners and increase market penetration and clearance (e-commerce; enterprise resource planning, online status tracking)	Mulky (2013); Dang, Yeo (2018)
	Integration of logistics elements	Stakeholder management considering internal and external accountability, transparency and information sharing, and cooperation with other supply chain parts to enhance sustainability of the whole chain via shared strategies	Mohanty, Shankar (2017); Zhu *et al.* (2008); Vachon (2007); Dang, Yeo (2018)
	Control of collusive behaviour	Misleading behaviour in order to obtain an unfair advantage. Collusion may be seen as a market sharing agreement, price fixing or bid rigging. Collusion should be highly avoided	Shankar *et al.* (2018)
	Risk management strategies	Increasing resiliency and risk management capabilities	Simchi-Levi et al. (2021); Shankar *et al.* (2018)
	Legislations and standards	Alignment to the state and local laws and taxes and standards (ISO 14001:2015, EMAS certification) although their uncertainty can be high	Abbasi, Nilsson (2016); Shankar *et al.* (2018); Narayana *et al.* (2019)
	Service quality	Audition of quality, reliability and tracking of customers critics while having empathy with them; value added activities and other services such as warehouse services considering changes in customers' priorities	Amindoust *et al.* (2012); Ghadimi, Heavey (2014); Mafakheri *et al.* (2011); Punniyamoorthy *et al.* (2011); Yousefi *et al.* (2016); Dang, Yeo (2018)
Economic	Goods transport while better market accessibility	Creation of an effective traceability system to increase the reliability of demand forecasting and to optimize distribution networks to manage any demand–supply gaps	Rashidi, Cullinane (2019); Amindoust *et al.* (2012); Azadi *et al.* (2015)
	Financial capability	Realized revenue less total cost per period of the organization and its reputation to obtain external financial resources	Punniyamoorthy *et al.* (2011); Sueyoshi, Wang (2014); Yousefi *et al.* (2016); Dang, Yeo (2018)
Social	The rights of stakeholders and business ethics	The rise of honesty and ethics in the behaviour of all employees while managing and prioritizing the rights of different groups of stakeholders	Amindoust *et al.* (2012); Yousefi *et al.* (2016); Govindan *et al.* (2019)
	Rate of job creation	the number of organizational position, which is created and the quality of work life	Lin, Chang (2018) Rashidi, Cullinane (2019)
	Decent work	Creating opportunities for productive work with determined career path, job security and the right to transfer opinions, avoidance of gender discrimination and supporting of vulnerable staff	Amindoust *et al.* (2012); Azadi *et al.* (2015); Ghadimi, Heavey (2014); Yousefi *et al.* (2016)
	Support for charity activities, arts and cultural expression	Culture protection ideas in product design and related services to support art and culture expressions in addition to participating in charity activities	Sabah (2017); Wang *et al.* (2019)
Environ-mental	Environmental management system	To systematically ensure that commitment to environmental protection improvement exists in the business organizations in their work towards environmental sustainability	Amindoust *et al.* (2012); Hsu, Hu (2009); Yousefi *et al.* (2016); Kayikci (2018); Suhi *et al.* (2019)
	Green competencies	Gaining updated information about environmental protection and sustainability, and cooperation with other organizations and academic institutes for creating values in the field of ozone depleting chemicals volumes, non-renewable and renewable energy consumption management and waste reduction while enhancement of recycling capabilities	Mafakheri *et al.* (2011); Sueyoshi, Wang (2014); Yousefi *et al.* (2016); Yu, Solvang (2018)
	Green image	Stakeholders' belief about organization's social or ecological responsibility over the environment	Ghadimi, Heavey (2014)

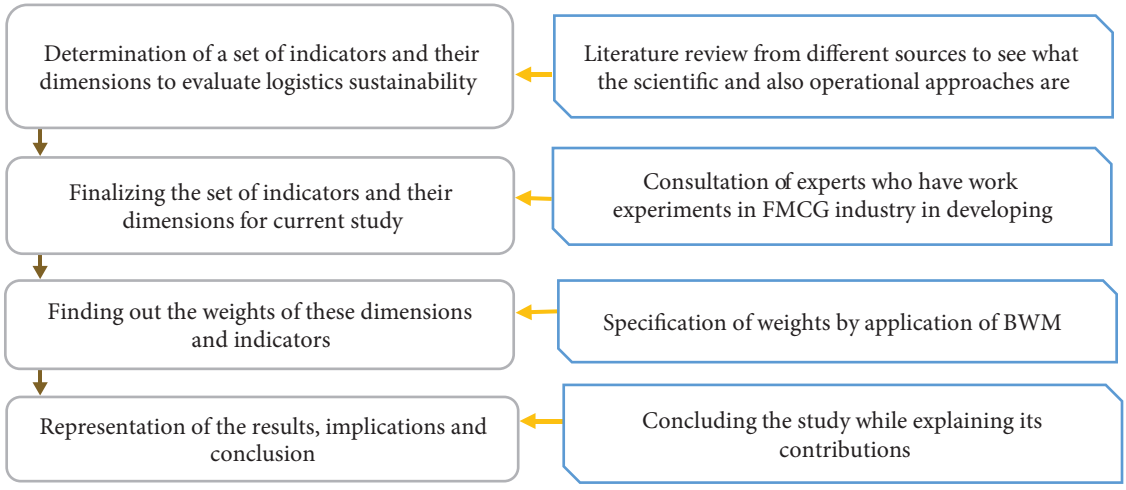

Figure 1. Main steps of this study

Table 2. Sustainability assessment using BWM in literature

Problem description	Method	Reference(s)
Location selection for wind farms	rough BWM; rough MAIRCA	Pamučar *et al.* (2017)
Location selection for roundabout construction	rough BWM; rough WASPAS	Stević *et al.* (2018)
Investigating sustainable supply chains in manufacturing companies	BWM	Kusi-Sarpong *et al.* (2019)
Proposing an innovative 3-phase supplier selection methodology	BWM	Rezaei *et al.* (2016)
Novel 2-stage fuzzy integrated MCDM method for the selection of suitable suppliers	BWM; MULTIMOORA	Liu *et al.* (2018a)
A framework for environmental sustainability assessment in supply chains	BWM	Suhi *et al.* (2019)

Table 3. Consistency index

Number	1	2	3	4	5	6	7	8	9
CI	0	0.44	1	1.63	2.3	3	3.73	4.47	5.23

very well (Rezaei 2015). The indicators that 70% of the experts are agreed on their importance are as such:

- management commitment to sustainability;
- integration of logistics elements;
- control of collusive behaviour;
- risk management strategies;
- legislations and standards;
- service quality;
- financial capability;
- the rights of stakeholders and business ethics;
- environmental management system.

The reasons of why some of the indicators that were initially chosen based on literature review are omitted from the set can be found in the "Results and managerial implications" section. However, main dimensions that contain the indicators – "Governance", "Economic", "Social", and "Environmental"– are prioritized by expert's opinions by use of BWM. As can be seen in Figure 2, "Governance" dimension gets the highest weight among all, while "Economic" receives the 2nd rank. The weight of "Social" dimension is a bit higher than "Environmental" dimension. It also should be added that the CR is about 0.18 and it is a reliable value to consider experts' comparisons of dimensions consistent enough to interpret the results reliable.

Since based on experts' opinions, some of the indicators should be omitted from the initial set of indicators, there is only one indicator in "Environmental" dimension and 6 indicators out of 9 indicators are in "Governance" dimension. This makes it useless to prioritize the indicators in each dimension separately to find their local weights. That is why all the 9 indicators are prioritized in comparison to each other by application of BWM to determine the global weights. Scores to compare the best indicator to others, which are determined by one of the experts can be seen in Table 4 as an example of scoring procedure.

By considering the opinions of all the experts and taking the procedure of BWM, the global weights of indicators can be reached as are shown in Table 5. The CR is 0.25 and good enough to consider the experts' opinions consistent. As can be seen in Table 5, "management commitment to sustainability" receives the highest weight among all while "Risk management strategy" receives the lowest. Achievements are fully described in the "Results and managerial implications" section.

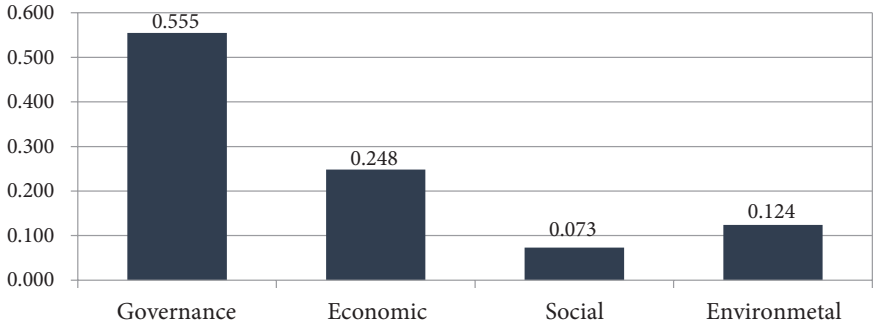

Figure 2. Weights of dimensions

Table 4. Best to others vector by one of the experts

Best to others	Management commitment to sustainability	Integration of logistics elements	Control of collusive behaviour	Risk management strategies	Legislations and standards	Service quality	Financial capability	The rights of stakeholders and business ethics	Environmental management system
Management commitment to sustainability	1	4	7	1	6	8	4	8	6

Table 5. Finalized indicators based on experts' opinions and their weights

Dimension	Finalized indicators based on experts' opinions		Global weights
Governance	1	management commitment to sustainability	0.29
	2	integration of logistics elements	0.14
	3	control of collusive behaviour	0.08
	4	risk management strategies	0.04
	5	legislations and standards	0.09
	6	service quality	0.07
Economic	7	financial capability	0.14
Social	8	the rights of stakeholders and business ethics	0.07
Environmental	9	environmental management system	0.09

4. Results and managerial implications

As experts believe, technology is the fundamental indicator for making communications and doing on-time analysis of data. ICT for instance, can enhance visibility in the total supply chain while reducing costs by obtaining on-time data and making all the groups to be accountable for deficits. That is why there is no need to compare its importance with other indicators, since its importance is obvious. Such can be said about "goods transport while better market accessibility". This issue should be considered while planning for integration of logistics system. 2 other indicators that experts agreed to be omitted from the list are "rate of job creation" and "decent work". Although such indicators are separately under attention in the literature, experts of this study acknowledge that employees are one of the most important groups of stakeholders and their needs should be seen in each organizational decision while setting a career path to them. Therefore, the ninth indicator in Table 5, "the rights of stakeholders and business ethics", must contain employees' issues too. A holistic approach to notify decent work principles and challenges should be addressed for all the employees in the logistics system as like as transport drivers.

Participating in charity activities, support of local culture and art are also important issues. Of course, these issues should be considered while setting ethics statement of the organization. If the economic situation of the organization is not good enough, there can be some ways to show empathy and transferring cultural issues to others. One of these ways can be writing quotes on the sides of the transportation vehicles or copying cultural heroes' images. Such activities transfer positive energy and will not cost a lot.

In addition, it should be said that "Environmental management system" refers to setting a plan to the environment preservation activities, which create green competencies as a result and shape the green image of the brand in stakeholders' minds. Therefore, there is no need to consider

"green competency" and "green image" as separate indicators. However, standards and other useful frameworks such as ISO 14001:2015 and EMAS should be taken to set policies about the environmental issues on which managers of logistics systems can put a controlling influence. ISO 14001:2015 has become the international standard while EMAS synchronize European environmental policies and is limited to this area. However, it can still be considered a useful guidance. If do this correctly, company's image and stakeholder satisfaction will be increased.

After finalizing the indicators, weights of 4 dimensions are determined by asking experts' opinions. "Governance" receives the highest weight since based on experts' opinions, strategies in place play an ignorable role in performing sustainability principles. Managers' commitment and consuming needed time and money are essential to take the importance of the social and environmental issues. Setting suitable road maps make it possible to assign budgets. Based on experts' statements, economic bottlenecks cause managers to forget social and environmental issues right away. However, the situation of social issues is a bit better than the environmental ones since older rules exist to preserve social rights while environmental issues have recently been highlighted.

As can be seen in Table 5, "management commitment to sustainability" has gained the highest weight among all, while "risk management strategies" observes the least weight. Based on experts' opinion, the success of any plan towards sustainability always depends on the support and commitment of the top management. If support is not enough or in a good shape, companies will face difficulty in implementation of the sustainability logistics practices. To gain success, it is advised that top managers officially publish a sustainability statement and determine specific vision, which is supported by clear strategic plans. A sustainability vision for a logistics system is like a road map showing the future activities and skills needed to do them.

This is while "risk management" obtains the least weight so if the other indicators go under attention and be managed actively, the risks would become less critical by themselves. However, this does not mean that risk management should be omitted from integrated management plan. Risk related drivers should be recognized continuously or at least in especial occasions when changes happen. To do so, clearly laid strategies should be implemented in order to minimize vulnerability. Continues risk management is crucial since a small disruption may cause huge economic consequences and disturb total supply chain reputation.

Conclusions

Logistics play an especial role in connecting the world and creating an atmosphere that is more useful to reaping the advantages of e-commerce (Liu *et al*. 2018c). However, developing a sustainable logistics system as a task, which is always a matter of interest is quite challenging in developing countries. This study attempts to understand these challenges by considering related indicators and justifying them through expert's opinions in FMCG industry. FMCG logistics systems in developing countries are often faced with various potential disruptions and delays, which are almost higher than what is observable in developed countries. This makes sustainability principles' implementation overwhelming. To create a sustainability map, related indicators should be determined and their priorities be specified. Results of this study show that 9 indicators of "management commitment to sustainability" (with highest priority), "integration of logistics elements", "control of collusive behaviour", "legislations and standards", "service quality", "financial capability", "the rights of stakeholders and business ethics", "environmental management system" and "risk management strategies" (with the least priority) are important to make logistics systems sustainable in developing countries, considering this hypothesis that technology such as ICT is a vital base rock to all.

Management commitment is a key point in most of new concepts that result to a strategic decision or change in a system such as organization or logistics or supply chain, in fact this can speed up any change, as people usually resist in front of changes but will accompany if they feel the management has accepted that changes that's why we see that experts mentions this indicator as the most important one.

Integration is a part of supply chain definition, in fact, a group of organizations can construct a supply chain if they believe in integration and collaboration and this become more important when we discuss about logistics system because it contains relationships of the elements as well. Each of the chosen indicators can be an improvement project in any logistics system, which is looking forward to be a sustainable logistic.

By taking use of these results, it will be possible to see the effects of such indicators on the logistics systems performance via use of techniques such as dynamic systems. In this way, one can see how becoming more sustainable will cause reputation for the whole supply chain in developing countries and how it will enhance the competence capability. Another matter would refer to the role of ICT and internet. Now that based on experts' opinions, technology is vital for the success, IoT can be used to optimize the performance of sustainable logistics. Investigation of related suitable strategies in this regard and then comparison of different logistics system performance by use of techniques such as DEA will be fruitful too.

Author contributions

Mahsa Pishdar and *Fatemeh Ghasemzadeh* conceived the study, designed and developed the methodology, made data collection and analysis, wrote the 1st draft of the paper.

Jurgita Antuchevičienė provided extensive advice throughout the study, assisted with the research design and revised the manuscript.

All of the authors have read and approved the final manuscript.

Disclosure statement

Authors declare that they have no any competing financial, professional, or personal interests from other parties.

References

Abbasi, M.; Nilsson, F. 2016. Developing environmentally sustainable logistics: exploring themes and challenges from a logistics service providers' perspective, *Transportation Research Part D: Transport and Environment* 46: 273–283. https://doi.org/10.1016/j.trd.2016.04.004

Amindoust, A.; Ahmed, S.; Saghafinia, A.; Bahreininejad, A. 2012. Sustainable supplier selection: a ranking model based on fuzzy inference system, *Applied Soft Computing* 12(6): 1668–1677. https://doi.org/10.1016/j.asoc.2012.01.023

Azadi, M.; Jafarian, M.; Saen, R. F.; Mirhedayatian, S. M. 2015. A new fuzzy DEA model for evaluation of efficiency and effectiveness of suppliers in sustainable supply chain management context, *Computers & Operations Research* 54: 274–285. https://doi.org/10.1016/j.cor.2014.03.002

Bergsten, A.; Jiren, T. S.; Leventon, J.; Dorresteijn, I.; Schultner, J.; Fischer, J. 2019. Identifying governance gaps among interlinked sustainability challenges, *Environmental Science & Policy* 91: 27–38. https://doi.org/10.1016/j.envsci.2018.10.007

Brunelli, M.; Rezaei, J. 2019. A multiplicative best–worst method for multi-criteria decision making, *Operations Research Letters* 47(1): 12–15. https://doi.org/10.1016/j.orl.2018.11.008

BWM. 2021. *BWM Solvers*. Best Worst Method (BWM) Home. Available from Internet: https://bestworstmethod.com/software

Chung, K. H.; Ko, S. Y.; Lee, C. U.; Ko, C. S. 2016. Sustainable collaboration model with monopoly of service centers in express delivery services based on Shapley value allocation, *International Journal of Industrial Engineering: Theory, Applications, and Practice* 23(3): 166–173. https://doi.org/10.23055/ijietap.2016.23.3.2841

Cuthbertson, R.; Cetinkaya, B.; Ewer, G.; Klaas-Wissing, T.; Piotrowicz, W.; Tyssen, C. 2011. *Sustainable Supply Chain Management: Practical Ideas for Moving Towards Best Practice*. Springer Science. 283 p. https://doi.org/10.1007/978-3-642-12023-7

Dang, V. L.; Yeo, G. T. 2018. Weighing the key factors to improve Vietnam's logistics system, *The Asian Journal of Shipping and Logistics* 34(4): 308–316. https://doi.org/10.1016/j.ajsl.2018.12.004

Das, R.; Shaw, K. 2017. Uncertain supply chain network design considering carbon footprint and social factors using two-stage approach, *Clean Technologies and Environmental Policy* 19(10): 2491–2519. https://doi.org/10.1007/s10098-017-1446-6

Dyllick, T.; Hockerts, K. 2002. Beyond the business case for corporate sustainability, *Business Strategy and the Environment* 11(2): 130–141. https://doi.org/10.1002/bse.323

Entezaminia, A.; Heydari, M.; Rahmani, D. 2016. A multi-objective model for multi-product multi-site aggregate production planning in a green supply chain: considering collection and recycling centers, *Journal of Manufacturing Systems* 40: 63–75. https://doi.org/10.1016/j.jmsy.2016.06.004

Erol, I.; Sencer, S.; Sari, R. 2011. A new fuzzy multi-criteria framework for measuring sustainability performance of a supply chain, *Ecological Economics* 70(6): 1088–1100. https://doi.org/10.1016/j.ecolecon.2011.01.001

Fallahpour, A.; Olugu, E. U.; Musa, S. N.; Wong, K. Y.; Noori, S. 2017. A decision support model for sustainable supplier selection in sustainable supply chain management, *Computers & Industrial Engineering* 105: 391–410. https://doi.org/10.1016/j.cie.2017.01.005

Fazlollahtabar, H. 2018. Operations and inspection cost minimization for a reverse supply chain, *Operational Research in Engineering Sciences: Theory and Applications* 1(1): 91–107.

Genovese, A.; Acquaye, A. A.; Figueroa, A.; Koh, S. C. L. 2017. Sustainable supply chain management and the transition towards a circular economy: evidence and some applications, *Omega* 66: 344–357. https://doi.org/10.1016/j.omega.2015.05.015

Ghadimi, P.; Heavey, C. 2014. Sustainable supplier selection in medical device industry: toward sustainable manufacturing, *Procedia CIRP* 15: 165–170. https://doi.org/10.1016/j.procir.2014.06.096

Govindan, K.; Kadziński, M.; Ehling, R.; Miebs, G. 2019. Selection of a sustainable third-party reverse logistics provider based on the robustness analysis of an outranking graph kernel conducted with ELECTRE I and SMAA, *Omega* 85: 1–15. https://doi.org/10.1016/j.omega.2018.05.007

Govindan, K.; Khodaverdi, R.; Jafarian, A. 2013. A fuzzy multi criteria approach for measuring sustainability performance of a supplier based on triple bottom line approach, *Journal of Cleaner Production* 47: 345–354. https://doi.org/10.1016/j.jclepro.2012.04.014

Hansmann, R.; Mieg, H. A.; Frischknecht, P. 2012. Principal sustainability components: empirical analysis of synergies between the three pillars of sustainability, *International Journal of Sustainable Development & World Ecology* 19(5): 451–459. https://doi.org/10.1080/13504509.2012.696220

Hashemkhani Zolfani, S.; Chatterjee, P.; Yazdani, M. 2019a. A structured framework for sustainable supplier selection using a combined BWM-CoCoSo model, in *International Scientific Conference "Contemporary Issues in Business, Management and Education"*, 9–10 May 2019, Vilnius, Lithuania, 797–804. https://doi.org/10.3846/cibmee.2019.081

Hashemkhani Zolfani, S.; Mosharafiandehkordi, S.; Kutut, V. 2019b. A pre-planning for hotel locating according to the sustainability perspective based on BWM-WASPAS approach, *International Journal of Strategic Property Management* 23(6): 405–419. https://doi.org/10.3846/ijspm.2019.10844

Hsu, C.-W.; Hu, A.-H. 2009. Applying hazardous substance management to supplier selection using analytic network process, *Journal of Cleaner Production* 17(2): 255–264. https://doi.org/10.1016/j.jclepro.2008.05.004

Husted, B. W.; De Sousa-Filho, J. M. 2017. The impact of sustainability governance, country stakeholder orientation, and country risk on environmental, social, and governance performance, *Journal of Cleaner Production* 155: 93–102. https://doi.org/10.1016/j.jclepro.2016.10.025

Irigoyen, J. L. 2014. *To Feed the Future, Let's Make Logistics and Transport Sustainable*. Word Bank Blogs. Available from Internet: https://blogs.worldbank.org/transport/feed-future-lets-make-logistics-and-transport-sustainable

ISO 14001:2015. *Environmental Management Systems – Requirements with Guidance for Use*.

Jayal, A. D.; Badurdeen, F.; Dillon, O. W.; Jawahir, I. S. 2010. Sustainable manufacturing: modeling and optimization challenges at the product, process and system levels, *CIRP Journal of Manufacturing Science and Technology* 2(3): 144–152. https://doi.org/10.1016/j.cirpj.2010.03.006

Kaiser, J.; Urnauer, C.; Metternich, J. 2019. A framework for planning logistical alternatives in value stream design, *Procedia CIRP* 81: 180–185. https://doi.org/10.1016/j.procir.2019.03.032

Kayikci, Y. 2018. Sustainability impact of digitization in logistics, *Procedia Manufacturing* 21: 782–789. https://doi.org/10.1016/j.promfg.2018.02.184

Kheybari, S.; Kazemi, M.; Rezaei, J. 2019. Bioethanol facility location selection using best-worst method, *Applied Energy* 242: 612–623. https://doi.org/10.1016/j.apenergy.2019.03.054

Klassen, R. D.; McLaughlin, C. P. 1996. The impact of environmental management on firm performance, *Management Science* 42(8): 1199–1214. https://doi.org/10.1287/mnsc.42.8.1199

Kumar, A.; Aswin, A.; Gupta, H. 2020. Evaluating green performance of the airports using hybrid BWM and VIKOR methodology, *Tourism Management* 76: 103941. https://doi.org/10.1016/j.tourman.2019.06.016

Kusi-Sarpong, S.; Gupta, H.; Sarkis, J. 2019. A supply chain sustainability innovation framework and evaluation methodology, *International Journal of Production Research* 57(7): 1990–2008. https://doi.org/10.1080/00207543.2018.1518607

Leal Filho, W.; Platje, J.; Gerstlberger, W.; Ciegis, R.; Kääriä, J.; Klavins, M.; Kliucininkas, L. 2016. The role of governance in realising the transition towards sustainable societies, *Journal of Cleaner Production* 113: 755–766. https://doi.org/10.1016/j.jclepro.2015.11.060

Liao, H.; Mi, X.; Yu, Q.; Luo, L. 2019. Hospital performance evaluation by a hesitant fuzzy linguistic best worst method with inconsistency repairing, *Journal of Cleaner Production* 232: 657–671. https://doi.org/10.1016/j.jclepro.2019.05.308

Lin, C.-C.; Chang, C.-H. 2018. Evaluating skill requirement for logistics operation practitioners: based on the perceptions of logistics service providers and academics in Taiwan, *The Asian Journal of Shipping and Logistics* 34(4): 328–336. https://doi.org/10.1016/j.ajsl.2018.12.006

Lin, Y.-H.; Tseng, M.-L. 2016. Assessing the competitive priorities within sustainable supply chain management under uncertainty, *Journal of Cleaner Production* 112: 2133–2144. https://doi.org/10.1016/j.jclepro.2014.07.012

Liu, A.; Xiao, Y.; Ji, X.; Wang, K.; Tsai, S.-B.; Lu, H.; Cheng, J.; Lai, X.; Wang, J. 2018a. A novel two-stage integrated model for supplier selection of green fresh product, *Sustainability* 10(7): 2371. https://doi.org/10.3390/su10072371

Liu, J.; Yuan, C.; Hafeez, M.; Yuan, Q. 2018b. The relationship between environment and logistics performance: evidence from Asian countries, *Journal of Cleaner Production* 204: 282–291. https://doi.org/10.1016/j.jclepro.2018.08.310

Liu, S.; Zhang, G.; Wang, L. 2018c. IoT-enabled dynamic optimisation for sustainable reverse logistics, *Procedia CIRP* 69: 662–667. https://doi.org/10.1016/j.procir.2017.11.088

Luthra, S.; Govindan, K.; Kannan, D.; Mangla, S. K.; Garg, C. P. 2017. An integrated framework for sustainable supplier selection and evaluation in supply chains, *Journal of Cleaner Production* 140: 1686–1698. https://doi.org/10.1016/j.jclepro.2016.09.078

Mafakheri, F.; Breton, M.; Ghoniem, A. 2011. Supplier selection-order allocation: A two-stage multiple criteria dynamic programming approach, *International Journal of Production Economics* 132(1): 52–57. https://doi.org/10.1016/j.ijpe.2011.03.005

Malek, J.; Desai, T. N. 2019. Prioritization of sustainable manufacturing barriers using best worst method, *Journal of Cleaner Production* 226: 589–600. https://doi.org/10.1016/j.jclepro.2019.04.056

Manzardo, A.; Ren, J.; Mazzi, A.; Scipioni, A. 2012. A grey-based group decision-making methodology for the selection of hydrogen technologies in life cycle sustainability perspective, *International Journal of Hydrogen Energy* 37(23): 17663–17670. https://doi.org/10.1016/j.ijhydene.2012.08.137

Mohammadi, M.; Rezaei, J. 2020. Bayesian best-worst method: a probabilistic group decision making model, *Omega* 96: 102075. https://doi.org/10.1016/j.omega.2019.06.001

Mohanty, M.; Shankar, R. 2017. Modelling uncertainty in sustainable integrated logistics using fuzzy-TISM, *Transportation Research Part D: Transport and Environment* 53: 471–491. https://doi.org/10.1016/j.trd.2017.04.034

Moldan, B.; Janoušková, S.; Hák, T. 2012. How to understand and measure environmental sustainability: Indicators and targets, *Ecological Indicators* 17: 4–13. https://doi.org/10.1016/j.ecolind.2011.04.033

Mulky, A. G. 2013. Distribution challenges and workable solutions, *IIMB Management Review* 25(3): 136. https://doi.org/10.1016/j.iimb.2013.06.010

Murphy, P. R.; Poist, R. F.; Braunschweig, C. D. 1996. Green logistics: comparative views of environmental progressives, moderates, and conservatives, *Journal of Business Logistics* 17(1): 191–212.

Narayana, S. A.; Pati, R. K.; Padhi, S. S. 2019. Market dynamics and reverse logistics for sustainability in the Indian pharmaceuticals industry, *Journal of Cleaner Production* 208: 968–987. https://doi.org/10.1016/j.jclepro.2018.10.171

Nawaz, F.; Asadabadi, M. R.; Janjua, N. K.; Hussain, O. K.; Chang, E.; Saberi, M. 2018. An MCDM method for cloud service selection using a Markov chain and the best-worst method, *Knowledge-Based Systems* 159: 120–131. https://doi.org/10.1016/j.knosys.2018.06.010

Nayak, R.; Akbari, M.; Maleki Far, S. 2019. Recent sustainable trends in Vietnam's fashion supply chain, *Journal of Cleaner Production* 225: 291–303. https://doi.org/10.1016/j.jclepro.2019.03.239

Novack, R. A. 1984. Transportation standard cost budgeting, in *NCPDM: National Council of Physical Distribution Management – Fall Meeting: 22 Annual Conference*, 16–19 September 1984, Dallas, TX, US, 309–320.

Pamučar, D.; Gigović, L.; Bajić, Z.; Janošević, M. 2017. Location selection for wind farms using GIS multi-criteria hybrid model: an approach based on fuzzy and rough numbers, *Sustainability* 9(8): 1315. https://doi.org/10.3390/su9081315

Punniyamoorthy, M.; Mathiyalagan, P.; Parthiban, P. 2011. A strategic model using structural equation modeling and fuzzy logic in supplier selection, *Expert Systems with Applications* 38(1): 458–474. https://doi.org/10.1016/j.eswa.2010.06.086

Puška, A.; Maksimović, A.; Stojanović, I. 2018. Improving organizational learning by sharing information through innovative supply chain in agro-food companies from Bosnia and Herzegovina, *Operational Research in Engineering Sciences: Theory and Applications* 1(1):76–90.

Quarshie, A. M.; Salmi, A.; Leuschner, R. 2016. Sustainability and corporate social responsibility in supply chains: the state of research in supply chain management and business ethics journals, *Journal of Purchasing and Supply Management* 22(2): 82–97. https://doi.org/10.1016/j.pursup.2015.11.001

Rashidi, K.; Cullinane, K. 2019. Evaluating the sustainability of national logistics performance using data envelopment analysis, *Transport Policy* 74: 35–46. https://doi.org/10.1016/j.tranpol.2018.11.014

Ren, J.; Tan, S.; Goodsite, M. E.; Sovacool, B. K.; Dong, L. 2015. Sustainability, shale gas, and energy transition in China: Assessing barriers and prioritizing strategic measures, *Energy* 84: 551–562. https://doi.org/10.1016/j.energy.2015.03.020

Rezaei, J. 2015. Best-worst multi-criteria decision-making method, *Omega* 53: 49–57. https://doi.org/10.1016/j.omega.2014.11.009

Rezaei, J.; Nispeling, T.; Sarkis, J.; Tavasszy, L. 2016. A supplier selection life cycle approach integrating traditional and environmental criteria using the best worst method, *Journal of Cleaner Production* 135: 577–588. https://doi.org/10.1016/j.jclepro.2016.06.125

Sabah, S. 2017. The impact of self-construal and self-concept clarity on socially motivated consumption: The moderating role of materialism, *Journal of Global Scholars of Marketing Science* 27(1): 31–45. https://doi.org/10.1080/21639159.2016.1265321

Shankar, R.; Gupta, R.; Pathak, D.K. 2018. Modeling critical success factors of traceability for food logistics system, *Transportation Research Part E: Logistics and Transportation Review* 119: 205–222. https://doi.org/10.1016/j.tre.2018.03.006

Simchi-Levi, D.; Kaminsky, P.; Simchi-Levi, E. R. 2021. *Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies*. 4th edition. McGraw-Hill Higher Education. 1101 p.

Speranza, M. G. 2018. Trends in transportation and logistics, *European Journal of Operational Research* 264(3): 830–836. https://doi.org/10.1016/j.ejor.2016.08.032

Stević, Ž.; Pamučar, D.; Subotić, M.; Antuchevičienė, J.; Zavadskas, E. K. 2018. The location selection for roundabout construction using rough BWM-rough WASPAS approach based on a new rough hamy aggregator, *Sustainability* 10(8): 2817. https://doi.org/10.3390/su10082817

Stević, Ž.; Pamučar, D.; Zavadskas, E. K.; Ćirović, G.; Prentkovskis, O. 2017. The selection of wagons for the internal transport of a logistics company: a novel approach based on rough BWM and rough SAW methods, *Symmetry* 9(11): 264. https://doi.org/10.3390/sym9110264

Su, C.-M.; Horng, D.-J.; Tseng, M.-L.; Chiu, A. S. F.; Wu, K.-J.; Chen, H.-P. 2016. Improving sustainable supply chain management using a novel hierarchical grey-DEMATEL approach, *Journal of Cleaner Production* 134: 469–481. https://doi.org/10.1016/j.jclepro.2015.05.080

Sueyoshi, T.; Wang, D. 2014. Sustainability development for supply chain management in U.S. petroleum industry by DEA environmental assessment, *Energy Economics* 46: 360–374. https://doi.org/10.1016/j.eneco.2014.09.022

Suhi, S. A.; Enayet, R.; Haque, T.; Ali, S. M.; Moktadir, M. A.; Paul, S. K. 2019. Environmental sustainability assessment in supply chain: an emerging economy context, *Environmental Impact Assessment Review* 79: 106306. https://doi.org/10.1016/j.eiar.2019.106306

Tavasszy, L.; De Bok, M.; Alimoradi, Z.; Rezaei, J. 2020. Logistics decisions in descriptive freight transportation models: a review, *Journal of Supply Chain Management Science* 1(3–4): 74–86. https://doi.org/10.18757/jscms.2020.1992

Tseng, M.-L.; Chiu, A. S. F. 2013. Evaluating firm's green supply chain management in linguistic preferences, *Journal of Cleaner Production* 40: 22–31. https://doi.org/10.1016/j.jclepro.2010.08.007

Turnheim, B.; Berkhout, F.; Geels, F.; Hof, A.; McMeekin, A.; Nykvist, B.; Van Vuuren, D. 2015. Evaluating sustainability transitions pathways: Bridging analytical approaches to address governance challenges, *Global Environmental Change* 35: 239–253. https://doi.org/10.1016/j.gloenvcha.2015.08.010

Vachon, S. 2007. Green supply chain practices and the selection of environmental technologies, *International Journal of Production Research* 45(18–19): 4357–4379. https://doi.org/10.1080/00207540701440303

Validi, S.; Bhattacharya, A.; Byrne, P. J. 2014. A case analysis of a sustainable food supply chain distribution system – a multi-objective approach, *International Journal of Production Economics* 152: 71–87. https://doi.org/10.1016/j.ijpe.2014.02.003

Walton, S. V.; Handfield, R. B.; Melnyk, S. A. 1998. The green supply chain: integrating suppliers into environmental management processes, *International Journal of Purchasing and Materials Management* 34(1): 2–11. https://doi.org/10.1111/j.1745-493X.1998.tb00042.x

Wang, H.; Liu, H.; Kim, S. J.; Kim, K. H. 2019. Sustainable fashion index model and its implication, *Journal of Business Research* 99: 430–437. https://doi.org/10.1016/j.jbusres.2017.12.027

Wong, C. Y.; Wong, C. W.; Boon-Itt, S. 2015. Integrating environmental management into supply chains: a systematic literature review and theoretical framework, *International Journal of Physical Distribution & Logistics Management* 45(1/2): 43–68. https://doi.org/10.1108/IJPDLM-05-2013-0110

Yousefi, S.; Shabanpour, H.; Fisher, R.; Saen, R. F. 2016. Evaluating and ranking sustainable suppliers by robust dynamic data envelopment analysis, *Measurement* 83: 72–85. https://doi.org/10.1016/j.measurement.2016.01.032

Yu, H.; Solvang, W. D. 2018. Incorporating flexible capacity in the planning of a multi-product multi-echelon sustainable reverse logistics network under uncertainty, *Journal of Cleaner Production* 198: 285–303. https://doi.org/10.1016/j.jclepro.2018.07.019

Zavadskas, E. K.; Stević, Ž.; Tanackov, I.; Prentkovskis, O. 2018. A novel multicriteria approach – rough step-wise weight assessment ratio analysis method (R-SWARA) and its application in logistics, *Studies in Informatics and Control* 27(1): 97–106. https://doi.org/10.24846/v27i1y201810

Zhu, Q.; Sarkis, J.; Lai, K.-H. 2008. Confirmation of a measurement model for green supply chain management practices implementation, *International Journal of Production Economics* 111(2): 261–273. https://doi.org/10.1016/j.ijpe.2006.11.029