

Dominik Zimon¹
Jonah Tyan
Robert Sroufe

DRIVERS OF SUSTAINABLE SUPPLY CHAIN MANAGEMENT: PRACTICES TO ALIGNMENT WITH UN SUSTAINABLE DEVELOPMENT GOALS

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Abstract: *The main objective of the research and thinking presented in this study is to characterize the conditions and barriers related to the implementation of SDGs in supply chains. The explanation of the outlined research problem and the more detailed research issues prompted the authors to formulate the following auxiliary goals: identification and emphasis on the links between SSCM practices and UN SDGs and development of a model supporting the implementation of UN SDGs in SSCM. In summarizing our analysis of information from this field of inquiry, contributions to the literature include a new conceptual model, and a dynamic context for a three phased model for implementation of successful sustainable supply chain management initiatives. We provide a grounded approach for new theoretical insights that map supply chain practices for future research and performance measurement aligned with the United Nation's 17 Sustainable Development Goals.*

Keywords: *Drivers; Practices; Supply Chain Management; Sustainable Development; Theory Development; UN SDGs.*

1. Introduction

The image of a modern supply chain has become inseparably associated with its care for ecological aspects and sustainable development. It can be assumed that the pursuit of sustainable supply chain management results from the needs of the modern world, and efficiency and care for natural resources contribute not only to improving the image, but also to waste reduction, innovation, generating profits and building a competitive advantage. McKinon (2010) agrees with this view, which claims that implementing sustainable solutions in logistics processes will not only help the environment and improve the image of the organization, but it can also give enterprises financial benefits. In turn, García-Arca et al.

(2017) recognize that the globalization of activities and the increase in raw material prices requires the absolute implementation of sustainable solutions in the supply chains. According to researchers, this fact is noticed not only by entrepreneurs but also by external stakeholders up and down the supply chain.

Given the importance of this burgeoning paradigm, researchers and practitioners want to know what drivers, practices and barriers enable an understanding of sustainable supply chain management (SSCM) and where are the linkages to long-term sustainable development goals? When looked at broadly, SSCM links the supply chain to performance goals involving implementation of environmentally and socially focused solutions to meet the needs of current and future generations. These needs vary, yet include moral,

¹ Corresponding author: Dominik Zimon
Email: zdomin@prz.edu.pl

economic, technical, legal, social, and political attributes of performance. A similar view is presented by Sisco et.al. (2011) who define the SSCM that takes into account environmental, economic and social influences and implements friendly manufacturing practices throughout the product life cycle. Sroufe and Melnyk (2017) see these practices as including stakeholder engagement, materiality, product/process design, life cycle assessment (LCA), materials selection and sourcing, manufacturing processes, waste, transportation of final products and services to consumers as well as end-of-life management of products, and closed-loop systems. These definitions reinforce Seuring and Müller (2008a), who, stated that good relations with suppliers will result in minimizing environmental and social risks, and this plays a particularly important role in developing a sustainable supply chain. Similar support for the integration of sustainability within supply chains can be found in the work of Grekova et al. (2016). Dey et al. (2011) suggest that modern supply chains should implement sustainable solutions, not for economic, but moral reasons. Brandenburg et. al. (2014) recognize that the key to building a sustainable supply chain is to find alignment between economic and environmental issues. Other studies indicate the importance sustainable consumption and production (Govindan, 2018, Gualandris & Kalchschmidt, 2014; Zimon & Domingues, 2018), reduce risk (Sajjad et al., 2015), prevention of production problems in developing countries, improved overall supply chain performance and the need to set sustainability criteria for their suppliers (Turker & Altuntas, 2014; Touboulis & Walker, 2015; Beske-Janssen et al., 2015; Fernandes & Bornia, 2019; Tomic & Spasojevic Brkic, 2019).

In summary, we conclude there are many publications in the literature on the subject of SSCM with a call to look for and improve emerging areas of interest to researchers and practitioners. Our review of the literature

reveals a lack of studies that comprehensively discuss issues that have a significant impact on SSCM and cover broadly the market, workplace, environment and society. Paradoxically, these areas are found within the 17 UN Sustainable Development Goals (SDGs), and will be described in more detail later in this paper. Integrating SSCM practices into the SDGs will enable entrepreneurs to develop advanced and complex supply chain management strategies, which should translate into a more stable, efficient and ethical supply chains. It is worth noting that the goals of sustainable development have been designed to interact with business and stimulate synergistic economic effects (Willis, 2016). While the SDGs do represent a different approach, their potential for transforming the dominant governance approaches to sustainability remains an open question. Global collective action does not end when decisions are reached, but these decisions introduce new practices in a complex political process that can bring in new actors, new ideas, and new action for sustainability (Stevens & Kanie, 2016). It seems, therefore, that the role of SSCM may be decisive in the successful implementation of SDGs, provided that development goals are understood as a process in which all components interact with each other. (Campagnolo et al., 2018). In a similar vein, Sudusinghe et al. (2018) emphasize the key role of the links that co-create supply chains are embedded within the SDGs. In turn, Russell et al., (2018) suggests that SDGs have undoubtedly been successful in broadening the awareness of entities co-creating supply chains, yet their implementation in the supply chain may be problematic due to their very wide scope. It should therefore be emphasized that due to the complexity of SDGs, management decision makers may encounter many barriers and limitations at the stage of implementation of objectives in supply chains. This situation is influenced by the fact that the development of an integrated supply chain management system aligned with the SDGs is a highly

complicated undertaking and requires significant involvement in this process of these particular goals. It is worth noting that in the literature on the subject there is a lack of research and studies addressing the discussed these types of issues. Therefore, we find there is a need for comprehensive research in this area, the results of which will, to some extent, will help to fill this gap in the literature.

Bearing in mind the above considerations the main objective of the research and thinking presented in this study is to characterize the conditions and barriers related to the implementation of SDGs in supply chains. The explanation of the outlined research problem and the more detailed research issues prompted the authors to formulate the following auxiliary goals:

- Identification and emphasis on the links between SSCM practices and UN SDGs.
- Development of a model supporting the implementation of UN SDGs in SSCM.
- To the main areas of interest for our research include:
- A relatively small number of studies regarding the issues under examination.
- The fact that the implementation process of UN SDGs in the supply chain is extremely complex and requires a systematic approach to this issue.

It is therefore necessary to develop models that will support the integration process and make it easier for business decision makers to choose the optimal implementation strategy for UN SDGs in the supply chain. In summarizing our analysis and synthesis of information from this field of inquiry, our contributions to the literature include a new conceptual model, a dynamic context for the implementation of successful SSCM initiatives, and a resilient approach for uncovering new theoretical insights.

2. SSCM Drivers, Implementation Practices and UN SDGs

Sustainable supply chain relationships are formed among a focal company, suppliers, and customers under the influence of government and other stakeholders outside the supply chain (Seuring & Müller, 2008a). These drivers provide an important context for developing and implementing new practices. The core management practices associated with SSCM include sustainable supplier management, sustainable operations and risk management, and corporate social responsibility. Overall supply chain objectives include simultaneously achieving economic, environmental, and social performance. A closer look at implementation reveals three interrelated components considered important by (Nilsen, 2015) and expanded upon in this study:

- Explanatory theory of implementation: it refers to theories and framework developed to provide overarching understanding and/or explanation of aspects of implementation.
- Guiding process model of implementation: the guiding process describes and/or translates implementation into practices.
- Evaluation of implementation: addresses the measurement criteria to determine implementation goals and success.

First, we review and provide a foundation for explanatory theory and implementation through a review of the literature involving sustainable development and supply chain management. Going above and beyond the intertwining goals among economic, environmental, and social aspects, we propose the 17 UN Sustainable Development Goals (SDGs) as an overarching alignment for SSCM implementation. In 2015, the 17 global goals (Fig. 1) and 169 targets were agreed by United Nations General Assembly as the 2030 agenda for sustainable

development to transform our world (UN, 2015). It should be noted that to make the extensive SDG package more easily accessible, different clustering approaches were suggested, aiming to reduce the complexities of the original UN framework. Considering these clusters, SDGs could be grouped according to systems, such as 'Energy and climate' (SDGs 7 and 13), 'Agriculture, food, and terrestrial' (SDGs 2 and 15), or 'Economic development and equity' (SDGs 1, 5, 8, 9, and 11). Other approaches interlink SDGs according to their functions, such as (Körffgen et al., 2018) 'Social objectives' (SDGs 1, 3, 4, 5, and 10),

'Economy' (SDGs 8, 9, 11, and 12), or 'Environment' (SDGs 13, 14, and 15). These divisions can be considered as helpful, however, in the way in which we present summary information we will make a statement of individual objectives with practices realized in the framework of SSCM. Then, extending the framework developed by Seuring and Müller (2008a) and aligning with 17 UN SDGs, we propose a sustainable supply chain framework (figure 1) for a company to implement their own SSCM strategy.

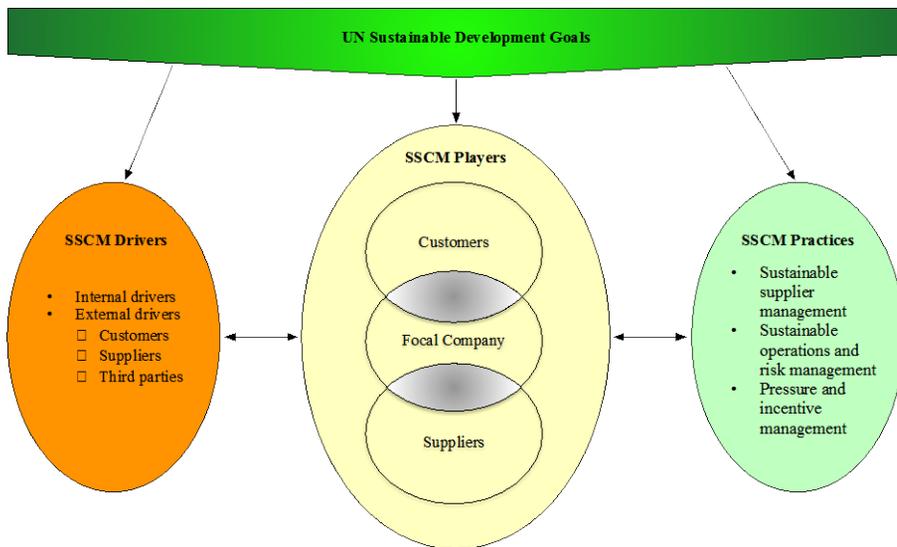


Figure 1. Sustainable supply chain implementation framework

The UN SDGs serve as an overarching goal to align various aspects of SSCM implementation. This implementation framework can be a foundational element to help develop explanatory theory and provide practitioners a blueprint of overseeing of SSCM strategies.

SSCM drivers are one explanatory aspect of implementation, which provide motivational factors for a focal company to adopt SSCM practices. We can view drivers from internal and external angles, where external drivers can further divide into perspectives of

customers, suppliers, and third parties. Internal drivers include management commitment (Ansari & Kant, 2017), organization involvement (Luthra et al., 2014), supportive culture (Walker & Jones, 2012), productivity improvement (Srivastava, 2007), and competitive opportunity (Linton et al., 2007) where top management commitment is normally cited as the most important internal driver. External pressures from customers/suppliers refer to business social compliance (Walker & Jones, 2012), environmental regulation compliance

(Srivastava, 2007; Seuring & Müller, 2008), green product and reverse logistics requirements (Ageron et al., 2012), and customer and supplier involvement (Luthra et al., 2014). The SSCM third parties cover local government, international regulatory institutions, competitors, investors, and general publics; the derived pressures like regulatory pressure (Ansari & Kant, 2017; Chen, 2008; Chiou et al., 2011), institutional pressure (Dubey et al., 2017), international

environment regulation (Srivastava, 2007), competition (Walker & Jones, 2012), reputation (Seuring & Müller, 2008b; Sroufe, 2017), and social responsibility (Luthra et al., 2014; Xia & Li-Ping Tang, 2011; Zailani et al., 2012). Among all internal and external drivers, regulatory pressure is commonly identified as the influential driver for SSCM implementation. Table 1 summarized the drivers of SSCM implementation.

Table 1. Drivers of SSCM implementation

| Company Internal | Customers/Suppliers | SSCM third parties |
|---|--|--|
| <ul style="list-style-type: none"> • Management commitment • Organisational involvement • Supportive culture • Productivity improvement • Waste elimination • Competitive opportunity | <ul style="list-style-type: none"> • Business social compliance • Environmental regulation compliance • Green product requirement • Reverse logistics requirement • Customer and supplier involvement | <ul style="list-style-type: none"> • Regulatory pressure • Institutional pressures • International environmental regulation • Competition • Reputation • Social responsibility |

Next, we review the evaluation of SSCM implementation, which represent the performance measurement of SSCM. From a strategic thinking perspective, it makes business and rational sense to set SSCM goals before determining what SSCM practices to implement. And to make those goals and practices material to the firm. Materiality means important to stakeholders and within the control and alignment of the firm as recommended by the Global Reporting Initiative (GRI). Setting SSCM performance objectives is an integrative process considering internal and external drivers, enablers, resources and constraints. In order to align company SSCM goal with UN SDGs, we divide the SSCM metrics into environmental, economic, and social performance.

Environmental performance starts with maintaining compliance to environment standards (Chiou et al., 2011; Luthra et al., 2014), greenhouse gases emissions (Ramudhin et al., 2009), green-design level (Seman et al., 2012), green purchasing level (Seman et al., 2012; Zhu & Sarkis, 2004), and

energy and hazardous material consumption (Charter & Gray, 2008; Ramudhin et al., 2009).

Economic performance includes total cost (Linton et al., 2007), waste reduction (Azevedo et al., 2011), inventory cost and order fulfillment rate (Tyan & Wee, 2003), sustainable risk mitigation (Sroufe, 2017), green purchasing performance (Seman et al., 2012), green innovation (Charter & Gray, 2008; Chen, 2008), competitive advantage (Chiou et al., 2011; Luthra et al., 2014; Vachon & Klassen, 2006), and long-term profitability (Azevedo et al., 2011).

Social performance measures consider green image and product image (Chen, 2008; Azevedo et al., 2011; Seman et al., 2012), public perception (Luthra et al., 2014), corporate social image (Xia & Li-Ping Tang, 2011), level of partnership (Tyan & Wee, 2003), quality of life of communities, and social responsibility (Sroufe, 2017). This review of SSCM performance measures are summarized in Table 2, and can be used to both guide and evaluate the SSCM implementation process and its success.

Table 2. Performance measurement of SSCM

| Environmental performance | Economic performance | Social performance |
|--|--|---|
| <ul style="list-style-type: none"> • Compliance to environmental standards • Greenhouse gases emissions • Green-design level • Green purchasing level • Energy consumption • Consumption for hazardous/harmful/toxic materials | <ul style="list-style-type: none"> • Total cost • Waste reduction • Inventory cost • Order fulfillment rate • Sustainable risk mitigation • Green purchasing performance • Green innovation • Competitive advantage • Long-term profitability | <ul style="list-style-type: none"> • Green images • Product image • Public perception • Corporate social image • Level of partnership • Quality of life of communities • Social and community responsibility |

Third, we propose a review process model following the sustainable supply chain implementation framework. We next review a three-phased approach to accomplish this: practice identification, alignment with SDGs goals, and implementation process model. There is a wide spectrum of SSCM management practices in the literature. Practices related to upstream suppliers include green purchasing and raw material procurement (Luthra et al., 2014; Zailani et al., 2012), green packaging and transportation (Zhu & Sarkis, 2004), material recycling (Linton et al., 2007), strategic supplier collaboration (Dubey et al., 2017; Tyan and Wee, 2003), and supplier sustainability assessment (Seuring & Müller, 2008).

Internal, focal company adoption of sustainable operations can come about in many ways. Operations include but are not limited to green product design (Chiou et al., 2011), green process design and planning (Luthra et al., 2014), green manufacturing and remanufacturing (Srivastava, 2007), waste management (Azevedo et al., 2011; Ramudhin et al., 2009), emission reduction (Charter & Gray, 2008), and green packaging (Seman et al., 2012). These operational practices should be linked together through the use of environmental management systems (Sroufe, 2003) to help measure and

manage performance.

Practices related to managing pressure and incentive cover collaborative inventory management (Tyan & Wee, 2003), green warehousing (Zailani et al., 2012), green shipping and distribution (Luthra et al., 2014), product recycling and reverse logistics (Seman et al., 2012; Srivastava, 2007), and corporate green image management (Seman et al., 2012). Some practices across the whole supply chain consist of green product innovation and design (Chiou et al., 2012), supply chain integration system (Vachon & Klassen, 2006), collaborative supply chain planning (Tyan & Wee, 2003), strategic supply chain collaboration (Lambert et al., 1998; Tyan & Wee, 2003), ISO 14001 environmental management system (Azevedo et al., 2011; Zimon, 2017), and corporate social responsibility (Ageron et al., 2012; Ramudhin et al., 2009). We summarize and organize these SSCM practices in Table 3 by dimensions of sustainable supplier management, sustainable operations and risk management, and pressure and incentive, which are equivalent to supply chain setting of upstream, focal company, and downstream perspectives. Most SSCM practices can be placed into a specific category, while some practices overlap with multiple dimensions and are placed in the bottom of Table 3.

Table 3. Summary of SSCM practices

| Sustainable supplier management (upstream) | Sustainable operations and risk management (focal company) | Pressure & incentive management (downstream) |
|---|---|--|
| <ul style="list-style-type: none"> Green purchasing Green raw material procurement Green packaging Green transportation Material recycling Strategic supplier collaboration Supplier sustainability assessment | <ul style="list-style-type: none"> Green product design Green process design and planning Green manufacturing Product recovery and remanufacturing Waste, water, and air management Energy consumption and emissions reduction Green packaging | <ul style="list-style-type: none"> Collaborative inventory management Green warehousing Green shipping and distribution Reverse logistics Product recycling Corporate green image management |
| | <ul style="list-style-type: none"> Green product innovation and design Supply chain integration system (technological and physical level) Collaborative supply chain planning Strategic supply chain collaboration ISO 140001 environmental management system Corporate social responsibility | |

Next, in an attempt to align SSCM practices with UN SDGs, we build on the methodology developed by Costanza et al. (2016) to aggregate 17 UN SDGs into 3 clusters: efficient allocation to build a living economy (i.e. economic aspect), fair distribution to protect capability for flourishing (i.e. social aspect), and sustainable scale to stay within planetary boundaries (i.e. environmental aspect). This procedure results in mapping the SDGs into three focal areas: economic

goals (SDG 7-9, 11-12), social goals (SDG 1-5, 10, 16-17), and environmental goals (SDG 6, 13-15). Following a deliberating and recursive mapping process, the SDGs link with relevant SSCM practices according to their scope and objectives.

Taking all together, Figure 2 presents the SSCM practices alignment with UN SDGs and sustainable aspects.

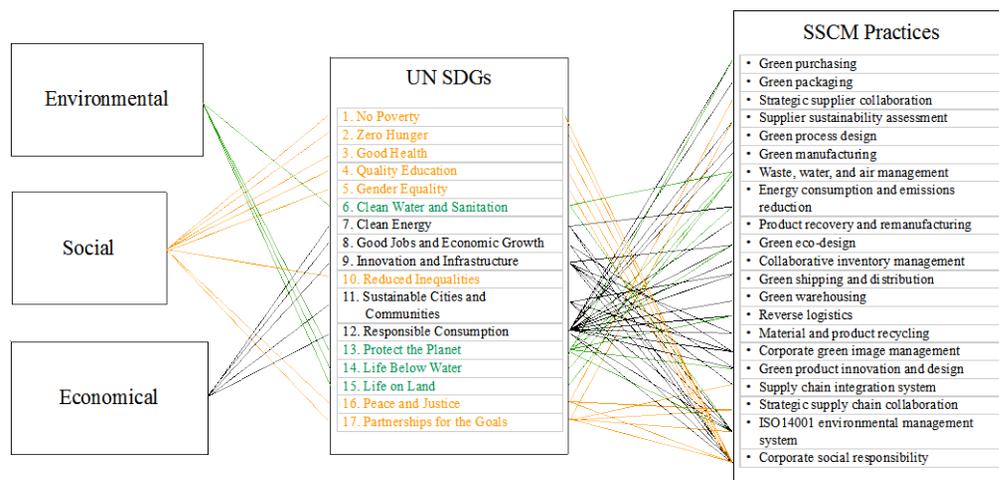


Figure 2. SSCM practices alignment with UN SDGs

The same process can apply to align SSCM performance measures with UN SDGs and is depicted in Figure 3. Going through this process to first identify potential SSCM practices available to a firm and then mapping them to the SDGs provides new insights as to the alignment of existing operations, tactics, and strategies; gaps between current practices and lack of integration with long-term goals; along with opportunities for improved future

alignment.

Given all of these options, it can be challenging for the focal company to make a selection as to what to implement and when. Therefore, three incremental implementation models are proposed to help understand the mindset, focus, management philosophy, and complexity involved in the selection of SSCM practices as summarized in figure 4.

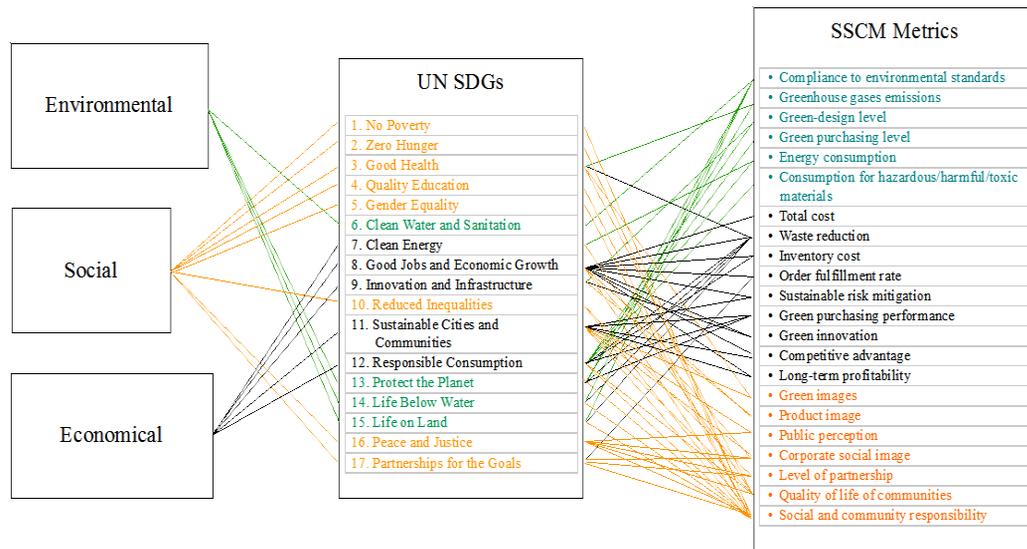


Figure 3. SSCM performance measurement alignment with UN SDGs

| Perspective | Reactive model | Cooperative model | Dynamic model |
|-------------------------|-----------------------|------------------------|--|
| Mindset | Risk avoidance | Capability enhancement | Value creation |
| Focus | Economic | Environmental | Social |
| Management philosophy | Regulatory compliance | Business collaboration | Business opportunity |
| Supply chain complexity | Low | Medium | High |
| UN SDG alignment | Limited | Mostly environmental | Environmental, social, & financial alignment |

Figure 4. Implementation process model of SSCM practices

In selecting SSCM implementation practices, a focal company is primarily considering two competing forces: external push pressures and internal pull constraints. The external push pressures can be interpreted as SSCM drivers such as regularly requirement from

local government, business social compliance requirement from customers, and environmental conservation pressure from society as shown in Table 1. The internal push constrains come from competing business resources such as financial, technical

and human resources. After a deliberated process in balancing between pressures and constraints, the focal company accesses implementation perspectives and then select a best-fit implementation model to achieve its SSCM goals and contribute to the broader UN SDGs.

The reactive model is the lightest implementation approach when the external pressures are small and internal resources are limited. In this model, the mindset toward SSCM is risk avoidance to compile with regulatory requirement. A minimum set of SSCM practices is recommended, and suggested candidates include green purchasing, green raw material procurement, green manufacturing, waste, water, and air management, green shipping and distribution, etc. (see Table 3). Corresponding to the selected SSCM practices, the performance measures of reactive model can include compliance to environmental standards, green purchasing level, green manufacturing level, and waste reduction (see Table 2).

The cooperative model represents a mindset shift from reactive to proactive, which the focal company views the SSCM as a capability enhancement instead of mere external requirements. Therefore, SSCM is treated as a strategic business collaboration and then necessary resources are allocated to integrate SSCM practices into business processes. Apart from the previous minimum set of practices, the focal company can expand its practices from upstream, focal company, and downstream categories in Table 2. In addition, the adoption of SSCM infrastructure such as supply chain integration system, ISO 14001 environmental management system, and strategic supply chain collaboration are recommended to enhance the overall SSCM effectiveness. Similarly, additional performance measures matched with expanded SSCM practices can be found in Table 2.

A dynamic model further extends the scope of capability enhancement to value creation, in which the focal company views SSCM as a

new business opportunity. As a result, the focal company actively collaborates with its' upstream suppliers and downstream customers on value creation processes. The new possible SSCM practices include green product innovation and design, corporate social responsibility, and corporate green image management. Consequently, the new performance metrics are green-design level, relations with community stakeholders, and green images and marketing. With the focus on social aspect of sustainability and innovative green design, the dynamic model can turn SSCM into competitive advantage for focal company.

As the theoretical model in Figure 2 is applied to current and future practices, we see these three models as starting points. We would also propose an integrated, hybrid approach going beyond reactive models of the past to a future where sustainability is both a cooperative and dynamic model. Much like the quality movement decades ago, the growing importance of the sustainability paradigm and its implementation in the future will have many benefits. The opportunity provided by the integration of mindsets, focus, and management philosophy is of fundamental importance to any organization because it connects the need for both vertical and horizontal alignment of sustainability initiatives within a supply chain. To better align sustainability within business, society, and global SDGs, organizations can enable sustainability activities as a catalyst for change in their supply chains. Managers can implement an integrated understanding and vision of the future of supply chain management (Sroufe, 2016) so that it has both strategic and competitive outcomes.

It should be stated that the necessary foundation to implement the majority of SDGs in the supply chain is to develop strategic objectives equal to the level presented in the dynamic model. Less complex models, due to their simplicity, provide the basis only for the implementation of some of the 17 SDGs (which also seems to be a good solution for supply chains wishing

to develop narrower areas of sustainable development). The dynamic model aligns with large mature enterprises with an established position for which environmental and social issues play a key role. The assumptions of the model in many aspects coincides with elements of the SDGs and requires only minor adjustments.

3. Proposed Characteristics of a Dynamic SSCM SDG Model

Understanding and developing the role of business in implementing the SDGs is necessary and goes well beyond this study. Without the involvement of the largest corporations and smaller organizations, the success of SDGs will not be possible. However, it should be noted that the involvement of business representatives in the integration of SDGs is complicated, as each industry has a different specifics, challenges, and each can needs to be customized for integrating individual SDGs. For example, the food sector for which SDGs 2, 8 and 12 will have priority verses the energy sector that can focus on achieving Objective 7 and 11. Bearing this in mind, we propose the field needs a more robust SSCM model, which takes into account SDGs and will be generic enough to be implemented by the majority of supply chains. The proposed model creates an alternative to the current style of running business, because the objectives contained therein have been formulated transparently. They can be a signpost for supply chains that are looking for ecological, and social sustainability and useful in that they simultaneously support economic solutions. This model (modified for the specificity of a particular industry or external environment) will be a dynamic starting point for developing a strategic SSCM strategy. The model proposed in Figure 5 is based on dynamic assumptions and the integration of the 17 SDGs.

The model tries to take into account the multidimensionality of supply chain management processes and its

interdisciplinary relationships. It shows the main directions of flows and interactions taking into account SDGs throughout the entire supply chain. Due to the complexity of the model, its characteristics focus on innovative solutions resulting from the implementation of SDGs described and generally available in the SSCM literature (Wolf, 2011; Pagell et al., 2010; Touboulie & Walker, 2015; Foerstl et al., 2015), and helps to ensure meeting a principled framework for strategic sustainable development as outlined by Broman and Robert (2017). The following characterize the actions that should be taken by the organizations co-creating supply chains within the goals of sustainable development:

- Goal 1 No Poverty: under the first objective, supply chains can focus on extending the offer with products and services addressed to BoP customers and implementing new business models that take into account the needs of social organizations. These activities have marketing advantages, and also allow you to acquire new customers, new markets and establish cooperation with previously overlooked business partners.
- Goal 2 Zero Hunger: activities in this aspect should include, limiting the negative impact on the environment (which may exacerbate climate change and unfavorable tendencies in agriculture), support for local programs of feeding children and cooperation with local food suppliers.
- Goal 3 Good Health and Well-Being: as part of the third objective, initiatives promoting a healthy lifestyle among employees and their families should be developed, awareness and training in this aspect should be organized, and solutions in the field of worker safety should be implemented (especially in the area of production and transport).

- Goal 4 Quality Education: recommend promoting training and self-improvement courses, investment in k-12 school systems, and continuing education for employees.
- Goal 5 Gender Equality: special efforts should be directed toward ethical conduct in the field of fair remuneration and promotions.
- Goal 6 Clean Water and Sanitation: in this aspect, policy makers need to pay attention to the implementation of production technologies that minimize water consumption (in each of the links that co-create the supply chains), increasing the importance of water efficiency, no contamination, and making employees aware of the rationale for water management.
- Goal 7 Affordable and Clean Energy: this goal can be achieved by choosing to replace or modernize energy-intensive machines and means of transport, improve the efficiency of distribution processes and invest in new technologies and renewable energy generation.
- Goal 8 Decent Work and Economic Growth: this objective raises issues extremely important for SSCM, namely streamlining the process of monitoring unethical behavior in supply chains (illegal child labor, the use of emigrants etc.), developing forms of social protection and promoting entrepreneurial culture and establishing cooperation with small developing enterprises.
- Goal 9 Industry, Innovation and Infrastructure: accomplishing this goal requires investing in technology and in particular striving to raise the level of its innovation and developing the ability to eliminate the negative effects associated with its improvement. It is also important to promote innovation and openness to ideas reported by external stakeholders.
- Goal 10 Reduced Inequality: implementing this objective in supply chains includes solutions aimed at developing and maintaining a transparent remuneration system, counteracting discriminatory practices and social investments.
- Goal 11 Sustainable Cities and Communities: projects in this area should focus on reducing the harmful impact of supply chain activities on the environment, air quality and the local community, as well as investments in sustainable and energy-saving infrastructure that reduce the impact of operational activities in urban areas.
- Goal 12 Responsible Consumption and Production: this goal is very consistent with the idea of SSCM and is based on many practices commonly used in supply chains such as eco-design, use of recycling, stakeholder education, but also less frequently applied projects that fit into the broadly understood idea of a closed-circuit economy.
- Goal 13 Climate Action: within this objective, we recommend the use a wide range of solutions aimed at measuring and managing GHG emissions, with particular focus on sustainable development as it relates to transport, logistics and production.
- Goal 14 Life Below Water & Goal 15 Life On Land: managers should implement solutions in the links that co-create supply chains to prevent inefficient or harmful waste management and to monitor the impact of the supply chain on ecosystems.
- Goal 16 Peace And Justice Strong Institutions: compliance with the law, ethical standards and

international standards within the supply chain and in cooperation with external stakeholders.

- Goal 17 Partnerships To Achieve The Goals: it is necessary to make well-thought-out investments and

support the partners by transferring knowledge, technologies and integrate their needs and aspirations into strategies implemented within the most efficient and effective global supply chains.

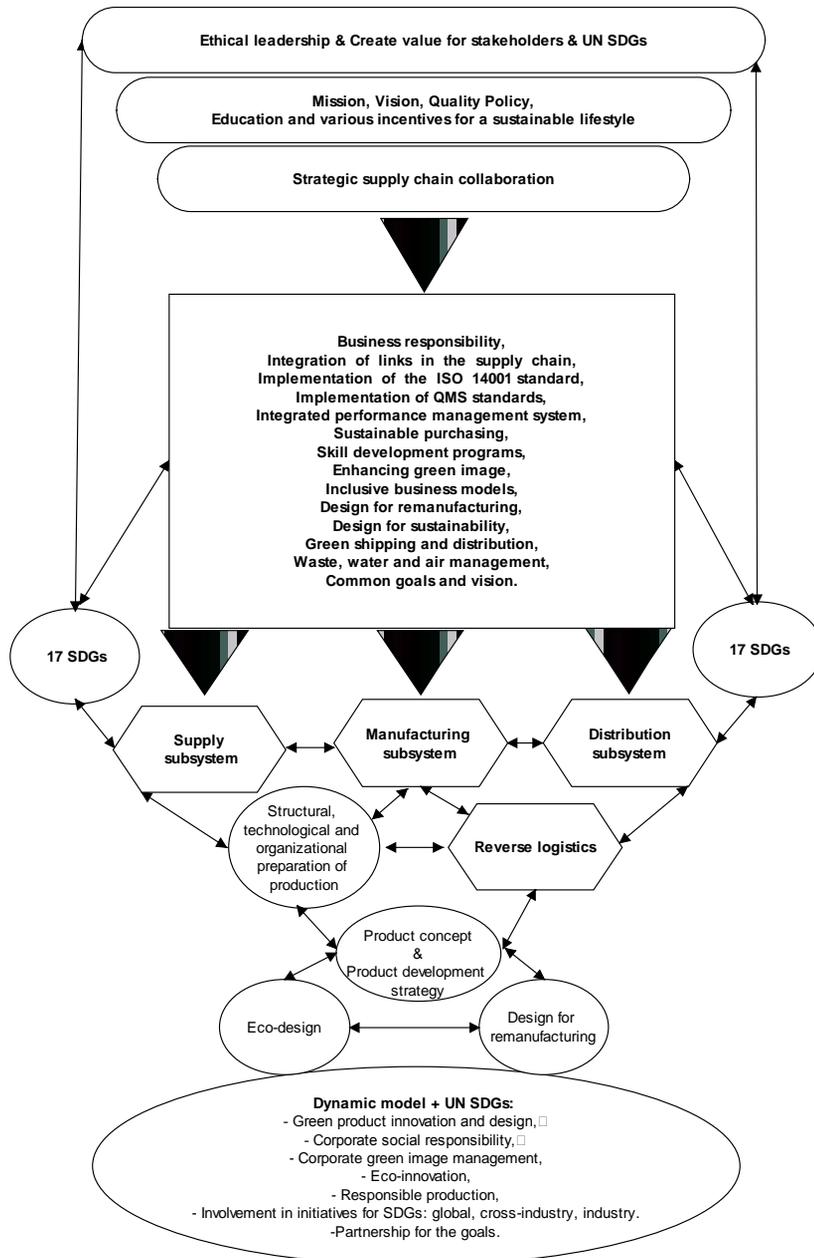


Figure 5. SSCM Model Integration of the UN SDGs

Analysis of sustainable development goals supports concluding that specific projects resulting from their implementation may prove to be extremely important for supply chains that aspire to expand their operations. Certainly, the implementation of these objectives will be both an opportunity and a significant challenge for managers managing supply chains. Their integration requires consistency, creativity, changing the way a business is run, the involvement of significant resources, patience and, above all, full consideration of the needs of key stakeholders that include the environment. It is also worth noting that the implementation of the model is a significant investment and requires a long-term perspective so that it can fully integrate into global supply chains. Long-term investments are a must for future-oriented organizations and sustainable development.

Aiming at initial verification and evaluation of the assumptions of the proposed model, we presented it to the management of four companies acting as coordinators in the supply chain. During direct interviews, management provided the following suggestions:

- Implementation of model recommendations creates opportunities for establishing valuable partnerships, strengthens dialogue with external stakeholders, and helps supply chains to achieve business objectives. The advantage of the model and SDGs is undoubtedly the global application, as they can be implemented by parts of supply chains operating in different countries. This helpful in undertaking coherent and comprehensive activities in the field of SSCM.
- The model emphasizes the need for synergistic social and economic transformation, which in the near future may prove to be a solid basis for improving the competitive position on the market.

- Due to its complexity and multifaceted nature, the model requires entrepreneurs to adapt its requirements to the specifics of both their enterprise and the industry. It will need the largest on down to the smallest enterprises on the market to find and receive value to get to its full implementation.
- The implementation of the model can be expensive if only looking at first costs. It requires investments related to: improvement of infrastructure, implementation of certified management systems, crew training, employment of specialists, etc. and when total costs are considered, new value propositions will show payoffs for environmental, social, and governance investments in sustainable development.
- The implementation of the assumptions of the model will allow us to incorporate the expectations of employees, clients and external stakeholders into the vision of SSCM and the valuation of intangibles impacting business practices.

In conclusion, it should be emphasized that the parties deciding to implement the assumptions of the model should accept a number of performance measures whose values should be part of decision analysis and performance objectives. It is worth using the measurement opportunity at the initial stages of the model's implementation, because measurement enables not only the assessment of effectiveness of implemented projects, but it also helps to identify possible problems with the implementation of the model's guidelines and corrective actions.

4. Conclusions

Now more than ever, SSCM is a prerequisite for developing effective business models

aligned with long-term goals. However, it should be emphasized that this paradigm is complex and requires a departure from random and reactive activities. Managers need to focus on comprehensive management including social, economic and ecological performance. Additionally, the process of implementing sustainable solutions in the supply chain is time-consuming and can generate numerous problems that effectively discourage business managers and entrepreneurs from continuing their efforts to implement environmentally-friendly solutions. Yet as we all know, one entities problems are another's opportunity.

Business managers and future entrepreneurs who are good at solving problems must therefore know the limitations and opportunities of sustainable supply chain management. To this end, the information presenting in this article will be helpful for both: business representatives and researchers because it presents concepts and models which application will facilitate the selection and implementation of a long-term, SDGs aligned strategy for managing a sustainable supply chain. Applying the proposed model and guidelines can increase the positive effects and reduce barriers to the implementation of SSCM practices. It should be noted that the concepts presented in the article contain general guidelines that should be considered as a starting point for new initiatives. These guidelines should be supplemented with performance measurement opportunities and goals that take into account the specificity of a supply chain and the needs of external stakeholders. The summary of the literature and own insight strongly emphasized the need to include the 17 SDGs guidelines in the adopted strategy. The application of the SDGs should be a foundation for the implementation of sustainable, long-term solutions in a supply chain.

The analysis of literature and the considerations taken into account for this study allow for the development of the following conclusions:

- SDGs have a strong link to practices implemented under SSCM and their integration into the supply chain management process can stimulate synergistic effects.
- Managers need guidance on implementing SDGs in the supply chain. The proposed model is one attempt to clarify and emphasize the relationships involved in sustainable development, supply chain management, and SDGs. The integration of the SDGs and SSCM provides new areas of research and reflection.
- The implementation of SDGs in a supply chain require a new level of commitment from all the links that co-create value, inform strategic choices, and provide actionable options for daily tasks that align supply chains, firms, and society with goals of sustainable development.

Taking into account the above, we posit the thesis that individual actions will help solve complex global problems; and that there is a multiplicative benefit from supply chain cooperation to fight poverty, hunger, deepening inequalities, and climate change. The 17 SDGs provide opportunities imposed by present and future generations on today's political leaders, governments, and the business world. When thinking about and enabling long-term sustainable development, supply chains have one of the more dynamic roles to play here - initiators of the necessary change and management of interconnected systems.

In summary, the management of a sustainable supply chains is a messy and complicated process. Supply chains will only be more complex in the future and the paradigm of sustainable development cannot be effectively implemented without the active involvement of top management and the entire supply chain. Sustainable development is now a source of differentiation, potential

competitive advantage, and integrated value creation. SSCM implementation opportunities can be found in both developed and developing country markets. Wherever there are consumers of products and services, there is a way to source, make, and deliver value that meets evolving social and ecological sustainability standards. There is now a critical opportunity for organizations to increase transparency while enabling new SSCM practices. Trends in the field point

toward further inclusion of company-wide risk management with an integrated approach to managing and reporting ESG performance. Supply chain management innovation is possible with long-term perspective and alignment of the UN SDGs. A critical factor for successful SSCM initiatives will be the capabilities of management who understand how to develop and implement SSCM and integrated performance goals.

References:

- Ageron, B., Gunasekaran, A., & Spalanzani, A. (2012). Sustainable supply management: An empirical study. *International Journal of Production Economics*, 140(1), 168-174. <https://doi.org/10.1016/j.ijpe.2011.04.007>
- Ansari, Z. N., & Kant, R. (2017). A state-of-art literature review reflecting 15 years of focus on sustainable supply chain management. *Journal of Cleaner Production*, 142, 2524-2543. <https://doi.org/10.1016/j.jclepro.2016.11.023>
- Azevedo, S. G., Carvalho, H., & Machado, V. C. (2011). The influence of green practices on supply chain performance: a case study approach. *Transportation research part E: Logistics and Transportation Review*, 47(6), 850-871. <https://doi.org/10.1016/j.tre.2011.05.017>
- Beske-Janssen, P., Johnson, M. P., & Schaltegger, S. (2015). 20 years of performance measurement in sustainable supply chain management—what has been achieved? *Supply Chain Management: An international Journal*, 20(6), 664-680. <https://doi.org/10.1108/SCM-06-2015-0216>
- Brandenburg, M., Govindan, K., Sarkis, J., & Seuring, S. (2014). Quantitative models for sustainable supply chain management: Developments and directions. *European Journal of Operational Research*, 233(2), 299-312. <https://doi.org/10.1016/j.ejor.2013.09.032>
- Campagnolo, L., Eboli, F., Farnia, L., & Carraro, C. (2018). Supporting the UN SDGs transition: methodology for sustainability assessment and current worldwide ranking. *Economics: The Open-Access, Open-Assessment E-Journal*, 12(10), 1-19.
- Charter, M., & Gray, C. (2008). Remanufacturing and product design. *International Journal of Product Development*, 6(3-4), 375-392.
- Chen, Y. S. (2008). The driver of green innovation and green image—green core competence. *Journal of Business Ethics*, 81(3), 531-543. <https://doi.org/10.1007/s10551-007-9522-1>
- Chiou, T. Y., Chan, H. K., Lettice, F., & Chung, S. H. (2011). The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan. *Transportation research part E: Logistics and Transportation Review*, 47(6), 822-836. <https://doi.org/10.1016/j.tre.2011.05.016>
- Costanza, R., Daly, L., Fioramonti, L., Giovannini, E., Kubiszewski, I., Mortensen, ..., Wilkinson, R. (2016). Modelling and measuring sustainable wellbeing in connection with the UN Sustainable Development Goals. *Ecological Economics*, 130(1), 350-355.

- Dey, A., LaGuardia, P., & Srinivasan, M. (2011). Building sustainability in logistics operations: a research agenda. *Management Research Review*, 34(11), 1237-1259. <https://doi.org/10.1108/014091711111178774>
- Dubey, R., Gunasekaran, A., Papadopoulos, T., Childe, S.J., Shibin, K., & Wamba, S.F. (2017). Sustainable supply chain management: framework and further research directions. *Journal of Cleaner Production*, 142, 1119-1130. <https://doi.org/10.1016/j.jclepro.2016.03.117>
- Fernandes, S. M., & Bornia, A. C. (2019). Reporting on supply chain sustainability: Measurement using item response theory. *Corporate Social Responsibility and Environmental Management*, 26, 106-116. <https://doi.org/10.1002/csr.1663>
- Foerstl, K., Azadegan, A., Leppelt, T., & Hartmann, E. (2015). Drivers of supplier sustainability: Moving beyond compliance to commitment. *Journal of Supply Chain Management*, 51(1), 67-92. <https://doi.org/10.1111/jscm.12067>
- García-Arca, J., Garrido, A., & Prado-Prado, J. C. (2017). Sustainable Packaging Logistics. The link between Sustainability and Competitiveness in Supply Chains. *Sustainability*, 9(7), 1098-1105. <https://doi.org/10.3390/su9071098>
- Govindan, K. (2018). Sustainable consumption and production in the food supply chain: A conceptual framework. *International Journal of Production Economics*, 195, 419-431. <https://doi.org/10.1016/j.ijpe.2017.03.003>
- Grekova, K., Calantone, R. J., Bremmers, H. J., Trienekens, J. H., & Omta, S. W. F. (2016). How environmental collaboration with suppliers and customers influences firm performance: evidence from Dutch food and beverage processors. *Journal of Cleaner Production*, 112, 1861-1871. <https://doi.org/10.1016/j.jclepro.2015.03.022>
- Gualandris, J., & Kalchschmidt, M. (2014). Customer pressure and innovativeness: Their role in sustainable supply chain management. *Journal of Purchasing and Supply Management*, 20(2), 92-103. <https://doi.org/10.1016/j.pursup.2014.03.001>
- Körffgen, A., Förster, K., Glatz, I., Maier, S., Becsi, B., Meyer, A., ... , & Stötter, J. (2018). It's a Hit! Mapping Austrian Research Contributions to the Sustainable Development Goals. *Sustainability*, 10(9), 1-12. <https://doi.org/10.3390/su10093295>
- Lambert, D. M., Cooper, M. C., & Pagh, J. D. (1998). Supply chain management: implementation issues and research opportunities. *The international journal of logistics management*, 9(2), 1-20. <https://doi.org/10.1108/09574099810805807>
- Linton, J. D., Klassen, R., & Jayaraman, V. (2007). Sustainable supply chains: An introduction. *Journal of Operations Management*, 25(6), 1075-1082. <https://doi.org/10.1016/j.jom.2007.01.012>
- Luthra, S., Garg, D., & Haleem, A. (2014). Green supply chain management: Implementation and performance—a literature review and some issues. *Journal of Advances in Management Research*, 11(1), 20-46. <https://doi.org/10.1108/JAMR-07-2012-0027>
- Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science*, 10(1), 53-57. <https://doi.org/10.1186/s13012-015-0242-0>
- Pagell, M., Wu, Z., & Wasserman, M. E. (2010). Thinking differently about purchasing portfolios: an assessment of sustainable sourcing. *Journal Of Supply Chain Management*, 46(1), 57-73. <https://doi.org/10.1111/j.1745-493X.2009.03186.x>
- Ramudhin, A., Chaabane, A., & Paquet, M. (2009). On the design of sustainable, green supply chains. *International Conference CIE 2009*, 979-984.

- Russell, E., Lee, J., & Clift, R. (2018). Can the SDGs Provide a Basis for Supply Chain Decisions in the Construction Sector? *Sustainability*, 10(3), 1-14. <https://doi.org/10.3390/su10030629>
- Sajjad, A., Eweje, G., & Tappin, D. (2015). Sustainable Supply Chain Management: Motivators and Barriers. *Business Strategy and the Environment*, 24(7), 643-655. <https://doi.org/10.1002/bse.1898>
- Seman, N. A. A., Zakuan, N., Jusoh, A., Arif, M. S. M., & Saman, M. Z. M. (2012). Green supply chain management: a review and research direction. *International Journal of Managing Value and Supply Chains*, 3(1), 1-18.
- Seuring, S., & Müller, M., (2008a). Core issues in sustainable supply chain management—a Delphi study. *Business Strategy and the Environment*, 17(8), 455-466. <https://doi.org/10.1002/bse.607>
- Seuring, S., & Müller, M. (2008b). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, 16(15), 1699-1710. <https://doi.org/10.1016/j.jclepro.2008.04.020>
- Sisco, C., Chorn, B., & Pruzan-Jorgensen, P.M. (2011). Supply chain sustainability: A practical guide for continuous improvement. *United Nations Global Compact*, 8-10.
- Srivastava, S. K. (2007). Green supply-chain management: a state-of-the-art literature review. *International Journal of Management Reviews*, 1(1), 53-80. <https://doi.org/10.1111/j.1468-2370.2007.00202.x>
- Sroufe, R. (2003). Effects of Environmental Management Systems on Environmental Management Practices and Operations. *Production and Operations Management*, 12(3), 416-431. <https://doi.org/10.1111/j.1937-5956.2003.tb00212.x>
- Sroufe, R. (2016). Operationalizing Sustainability. *Journal of Sustainability Studies*, 1(1), 1-10.
- Sroufe, R., & Melnyk, S. A. (2017). Developing Sustainable Supply Chains: Management Insights, Issues, and Tools: Volume I Foundations. *Business Expert Press*, 7-8.
- Sroufe, R., (2017). Integration and Organizational Change towards Sustainability. *Journal of Cleaner Production*, 162, 315-329. <https://doi.org/10.1016/j.jclepro.2017.05.180>
- Stevens, C., & Kanie, N. (2016). The transformative potential of the sustainable development goals (SDGs). *International Environmental Agreements: Politics, Law and Economics*, 16(3), 393-396. <https://doi.org/10.1007/s10784-016-9324-y>
- Sudusinghe, J., Jayaratne, R., & Kumarage, A. (2018). UN SDGs Shaping Sustainable Supply Chains: The Case of Apparel Manufacturers in Developing Countries. *International Conference on Service Operations and Logistics, and Informatics (SOLI)*, 1-12.
- Tomic, B., & Spasojevic Brkic, V. K. (2019). Customer satisfaction and ISO 9001 improvement requirements in the supply chain. *The TQM Journal*, 31(2), 222-238. <https://doi.org/10.1108/TQM-07-2017-0072>
- Touboulic, A., & Walker, H. (2015). Love me, love me not: A nuanced view on collaboration in sustainable supply chains. *Journal of Purchasing and Supply Management*, 21(3), 178-191. <https://doi.org/10.1016/j.pursup.2015.05.001>
- Touboulic, A., & Walker, H. (2015). Theories in sustainable supply chain management: a structured literature review. *International Journal of Physical Distribution & Logistics Management*, 45(1-2), 16-42.
- Turker, D., & Altuntas, C. (2014). Sustainable supply chain management in the fast fashion industry: An analysis of corporate reports. *European Management Journal*, 32(5), 837-849.

- Tyan, J., & Wee, H. M. (2003). Vendor managed inventory: a survey of the Taiwanese grocery industry. *Journal of Purchasing and Supply Management*, 9(1), 11-18.
- United Nations, (2015). Transforming our world: the 2030 agenda for sustainable development. Outcome document for the UN Summit to adopt the post-2015 development agenda: draft for adoption, New York.
- Vachon, S., & Klassen, R.D. (2006). Extending green practices across the supply chain: the impact of upstream and downstream integration. *International Journal of Operations & Production Management*, 26(7), 795-821. <https://doi.org/10.1108/01443570610672248>
- Walker, H., & Jones, N. (2012). Sustainable supply chain management across the UK private sector. *Supply Chain Management: An International Journal*, 17(1), 15-28. <https://doi.org/10.1108/13598541211212177>
- Willis, K. (2016). International development planning and the Sustainable Development Goals (SDGs). *International Development Planning Review*, 38(2), 105-111. <https://doi.org/10.3828/idpr.2016.11>
- Wolf, J. (2011). Sustainable supply chain management integration: a qualitative analysis of the German manufacturing industry. *Journal of Business Ethics*, 102(2), 221-235. <https://doi.org/10.1007/s10551-011-0806-0>
- Xia, Y., & Li-Ping Tang, T. (2011). Sustainability in supply chain management: suggestions for the auto industry. *Management Decision*, 49(4), 495-512.
- Zailani, S., Jeyaraman, K., Vengadasan, G., & Premkumar, R. (2012). Sustainable supply chain management (SSCM) in Malaysia: A survey. *International Journal of Production Economics*, 140(1), 330-340. <https://doi.org/10.1016/j.ijpe.2012.02.008>
- Zhu, Q., & Sarkis, J., (2004). Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management*, 22(3), 265-289. <https://doi.org/10.1016/j.jom.2004.01.005>
- Zimon D. (2017). The Impact of Implementation of the Requirements of the ISO 14001 Standard for Creating Sustainable Supply Chains. *Quality - Access to Success*, 18(158), 99-102.
- Zimon, D., & Domingues, P. (2018). Proposal of a concept for improving the sustainable management of supply chains in the textile industry. *Fibres & Textiles in Eastern Europe*, 26(2), 8-12. <https://doi.org/10.5604/01.3001.0011.5732>

Domnik Zimon

Rzeszow University of
Technology,
Rzeszow,
Poland
zdomin@prz.edu.pl

Jonah Tyan

National Chengchi
University,
Taipei,
Taiwan
jonahtyan@gmail.com

Robert Sroufe

Duquesne University,
Pittsburgh,
USA
sroufer@duq.edu
