

Green Supply Chain Practices: Toward A Sustainable Industry Development

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Abstract. As environmental consciousness is growing, organizations are required to implement environmental-friendly practices, and to develop sustainable strategies not just for the health of the environment but also for sustaining the industry for the future. Today consumers value organizations that go green and are willing to pay a price premium for sustainable goods. Then, it is an incumbent need for the industry to integrate sustainability concepts into its traditional supply chain management. The industry is a driving force behind sustainable development, where industry 4.0 is set to be a critical enabler. Nevertheless, to foster sustainable development of the industry, there is a need for applying uniform standards in environmental management to reduce the consumption of renewable resources and develop productive ways of reusing and recycling the used/waste resources. This paper, theoretical by nature, explores the impact of Green Supply Chain Practices (GSCP) on accelerating industry-related targets of Sustainable Development Goal (SDG) 9 on building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation. Based on the literature review, conceptual interlinkages between the targets of SDG 9 and those SDGs that address issues of social, economic, and environmental goals, are studied in the context of GSCP. This work provides an understanding of the impact of green practices on the achievement of the SDGs. **Keywords:** Green supply chain practices (GSCP), Supply chain management, Resilient infrastructure, Sustainable development goal 9 (SDG 9), Sustainable development, Sustainable industry.

1 Introduction

The role of inclusive and sustainable industrial development is one of the goals of the 2030 Agenda. The industry is a key motor of the economy but is often a major emitter of greenhouse gases and air pollutants, a promoter of degraded land and inequitable growth. The COVID-19 pandemic causing disruptions to global supply chains highlights the need for resilient infrastructure and sustainable industrialization that can withstand natural shocks. Sustainable Development Goal 9 (SDG 9), built on three interconnected pillars—infrastructure, industry, and innovation, aims to offer a systematic and effective approach to achieving socially inclusive and environmentally sustainable economic development. Despite the remarkable progress achieved over the past decades, achieving Goal 9 by 2030 will require

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addressing a range of resource constraints, processes, types of governance, and sources of finance, and encouraging collaboration and cooperation across stakeholders, sectors, and regions. Unlike previous development agendas that put an emphasis on economic growth, the SDGs constitute a global framework where some goals and targets interact with others more strongly than others. Some targets reinforce each other (synergies). Others may conflict with one another (trade-offs). The achievement of the agenda crucially depends on whether we will be able to maximize such synergies and resolve the existing trade-offs. Green supply chain practices (GSCP) incorporate sustainability concepts into traditional supply chain management and in such a context they can support SDG 9 on building resilient infrastructure promoting inclusive and sustainable industrialization and fostering innovation. Based on the literature review, this paper aims to analyse green practices that can be implemented within supply chains and explore how some of that GSCPs can help and support the goal 9. This work assists managers to understand which green practices can incorporate into their businesses to achieve sustainable industry and to drive progress in SDG 9.

The remainder of this paper is organized as follows: in section 2, the literature selection process is mentioned; in section 3, a review of GSCP is presented; in section 4, the role of SDG 9 relative to its targets and indicators, and its categorization are compiled; in section 5, a conceptual relationship between SDG 9 targets and GSCP is developed; Finally, some concluding remarks are drawn.

2 Literature Review: Objectives and Method

The purpose of the literature review is to understand the objective of research development. The literature review was organized into two different concepts: the first provides an overview of the literature related to green supply chain practices, and the second considers sustainable industry development in the context of the SDG 9 targets. These concepts were studied in the literature review, and so, two different approaches to the review of literature were conducted.

A search in the publisher's electronic databases Scopus and Web of Science was used to find out relevant documentation. The search process was based on the choice of the most convenient electronic databases and keywords used in searches. Also, other documents were identified through the snowball technique. The literature selection process used to find out the articles is shown in table 1.

Table 1. Literature selection process

Electronic databases	Scopus and Web of Science	
Search period	2017 to 2022	
Inclusion criteria	Have access to the full document; Be written in English	
Keywords selected	First concept	Second concept
	Green practices	Sustainable development
	Green supply chain	Sustainable development goals
	Green supply chain practices	SDG

3 Green Supply Chain Practices

Global environmental concern is a reality and has a strong influence on supply chain management in different industries. Supply chain management consists of several entities that involve upstream, focal company, and downstream relations with various activities [1] that involve producers (manufacturers), suppliers, transporters, warehouses, retailers, and customers [2].

It is important that the supply chain activities are value-added activities to respond to the customer needs and deliver the products or services at the right time, in the right place, and in the right quantity. Also, different paradigms can be applied to supply chain management [3]. Adapting green is getting one of the most important objectives that companies, nowadays, want to include in their businesses [4].

Green supply chain management (GSCM) is based on an environmental context and could be an innovative way in implementing supply chain strategies. It helps companies to achieve organizational profits and market share goals through the reduction of environmental risks and effects along with the improvement of the environmental effectiveness of their business and the relationship with their partners [5]. However, some authors [6] state that “since the introduction of the GSCM concept there is no universal definition for it”. According to [1], the GSCM integrates environmental concepts into different supply chain operations, including product design, material sourcing and selection, logistics, manufacturing procedures, transportation to the end users, management of expired products, and management of the green product’s end-of-life. These operations applied practices such as reduction, recycling, reuse, material substitution, eco-materials, or green packaging [1, 7]. According to several authors [2, 8] the practices can be defined through four main areas: a) green procurement, b) green manufacturing, c) green distribution, or d) reverse logistics.

However, the implementation of GSCM practices is only possible when there are several internal changes that encourage companies to adopt those practices. The term drivers of GSCM refers to the factors that motivate and allow organizations to adopt green practices in their SCM [2, 8]. Several drivers are compiled in table 2 as internal and external drivers. The internal drivers are related to the focal company and the external drivers are related to the upstream and downstream supply chain. An example mentioned by [9] is that customers are externally oriented drivers of the application of green supply chain practices.

Table 2. Green drivers

	Drivers	Ref. Authors
Internal Drivers	Company image	[2, 6]
	Green innovation	[2]
	Compliance with regulations	[2, 6]
	Government regulation and legislation	[6, 10]
	ISO 14001 certification	[10]
	Reusing and recycling materials and packaging	[10]
	Reducing energy consumption	[10]
	Integrating quality environmental management into the planning and operation process	[10]
	Employee demands	[2]
	Collaboration between product designers and suppliers to reduce and eliminate product environmental impacts	[6, 10]
External Drivers	the quest to improve performance	[6]
	Certification of suppliers’ environmental management system	[10]
	Environmental collaboration with suppliers	[6, 10]
	Environmental collaboration with customers	[10]
	Customer’s environmental awareness	[2, 6]
Satisfy the customer’s needs	[6]	

Some issues related to environmental management have required companies to manage their supply chains to be in line with the GSCM. This concept is based on the perspective of how to reduce waste and the impact on the environment caused by the supply chain activities of industrial companies [2]. In the same vein, several authors [11] refer to green waste

as energy, water, material, garbage, transportation, emissions, and biodiversity. In addition, other authors [12] consider green waste as excessive resource usage, excessive power usage, excessive water usage, greenhouse effects, rubbish, pollution, and eutrophication. The reduction of green waste is made through green practices. These practices can be classified as tangible (technical practices) and intangible (social practices) [13]. Examples of technical practices are eco-design, green manufacturing, and reverse logistics; and social or behavioral practices such as top management support, supplier involvement, and customer involvement [13]. Also, the authors [7] distinguish hard from soft green practices: hard practices have a severe implication on operations while soft practices have a slight implication on operations [7].

Green practices are applied according to the area of operation of each entity in the supply chain. Different practices are divided into different issues. For example, [14] identify different practices for product innovation as a) design for reduction or elimination of environmentally hazardous materials, b) design for remanufacturing, c) design for recycling, d) design for reuse, e) design for resource efficiency and f) quality improvement; and for process innovation as a) pollution prevention practices, b) environment-friendly technologies, c) effective & efficient manufacturing process, and d) remanufacturing. Other different practices were used by [15] such as a) green waste management, b) green training, c) green cooperating with suppliers, d) green cooperating with customers and e) green stakeholder commitment. Several green practices are also provided by [9] as internal practices as follows: a) reducing waste, b) life-cycle analysis of the “cradle to grave” environmental impact of materials/products, c) environmental improvements in the disposition of the organization’s scrap or excess material (re-use, recycling, etc.), and d) environmental improvements in the disposition of companies’ equipment. As external practices, some authors [9] emphasize: a) encouraging suppliers to improve the environmental performance of their processes, b) incorporating environmental considerations in evaluating and selecting suppliers, c) providing design specifications to suppliers in line with environmental requirements (e.g., green purchasing, blacklist of raw materials), d) co-development with suppliers to reduce the environmental impact of the product (e.g., ecobdesign, green packaging, recyclability, and e) involvement of suppliers in the re-design of internal processes (e.g., remanufacturing, reduction of by-products). More recently, some authors [16] studied how supply chain collaboration can contribute to the achievement of broader Sustainable Development Goals (SDGs) and found that collaborative innovation, collaborative inventory management, and collaborative information sharing could enhance industry, innovation, and infrastructure (SDG 9).

Table 3 considers several GSCM practices found in the literature (reference authors). These references were selected for being works referring to green practices in the supply chain and for being recent publications. The practices are divided into internal and external where internal practices are considered the practices used by the focal company and external practices are the practices applied in the upstream and downstream supply chain relations.

Companies recognize that there is a need to implement GSCM practices as a part of the green strategy, due to the benefits that they achieve with the implementation of such practices [18]. The types of benefits that organizations want to gain are universal to all kinds of industries across the globe and the objective is to achieve a sustainable business in a way to drive progress in SDG 9.

4 Sustainable Industry Development: The Role of SDG 9

Sustainable Development (SD), is described by the 1987 Brundtland Commission Report (also known as *Our Common Future Report*, as a systemic concept towards a “development that meets the needs of the present without compromising the ability of future generations to

Table 3. GSCM practices

	Practices	Ref. Authors
Internal	Total quality environmental management	[17]
	ISO 14000 certification	[17]
	Internal Environmental Management	[4, 17, 18]
	Eco-design, green design	[4, 13]
	Design of products for reduced consumption of material/energy	[17]
	Design of products for reuse, recycling, recovery of material and component parts	[14, 17]
	Design of products to avoid or reduce use of hazardous of products	[14, 17]
	Design of processes for minimization of waste	[17]
	Reduction, Recycling, Reuse	[1, 7]
	Green finance	[18]
	Top management support	[13, 18]
	Green manufacturing	[13, 18]
	Remanufacturing	[14]
	Green logistics	[14, 18]
	Green purchasing	[14, 18]
	Green technology; Environment-friendly technologies	[14, 18]
	Green waste management	[15]
	Green training	[15, 18]
Green stakeholder commitment	[15]	
Green Information System	[4]	
Life cycle analysis	[9, 18]	
External	Suppliers' ISO14000 certification	[17]
	Evaluation of environmentally friendly practices of a second-tier supplier	[17]
	Providing design specifications to suppliers that include environmental requirements for purchased items	[17]
	Create awareness for supplier	[14]
	Green cooperating with suppliers	[15]
	Cooperation with customers for eco-design	[17]
	Cooperation with customers for cleaner production	[17]
	Cooperation with customers for using less energy during product transportation	[17]
	Green cooperating with customers	[15]
	Green transportation	[4]
	Green logistics	[18]
	Green packaging	[7]
	Eco-materials	[7]
	Material substitution	[1]
	Reverse Logistics	[13, 14]
	Supplier involvement	[13]
Customer Involvement	[13]	

meet their own needs.” It is considered a “global agenda for change” that calls for concerted efforts toward building an inclusive, sustainable, and resilient future for people and the planet. Based on the European Treaties, sustainable development is anchored on the idea of a global development framework that promotes a high level of economic development, social cohesion, and environmental protection [19]. The concept of sustainable development is rooted in three interconnected main pillars-economy, society, and environment-comprising the goals of economic growth, social well-being, and environmental preservation.

The Sustainable Development Goals (SDGs), adopted by the United Nations Member States in 2015 [20], define to all 193 United Nations member states the global priorities up to 2030 in response to the economic, social, and environmental challenges faced by our world. The industry takes a vital role in achieving SDGs, with Agenda 2030 emphasizing the relevance of sustainable industrial development as the basis for sustainable economic growth. Sustainable Development Goal 9 (SDG 9) is about “industry, innovation, and infrastructure that aims to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation”. This SDG integrates three key drivers of sustainable development: infrastructure, industrialization, and innovation. Infrastructure provides the basic physical systems and structures to supply chains, transporting goods and services. Industrialization is the engine of economic growth and employment, reducing poverty. Innovation advances the technological capabilities of the industry and the development of new skills.

Table 4. Targets and indicators of SDG 9

Targets	Indicators
9.1 Develop quality, reliable, sustainable, and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.	9.1.1. Proportion of the rural population who live within 2 km of an all-season road
	9.1.2. Passenger and freight volumes, by mode of transport
9.2. Promote inclusive and sustainable industrialization and, by 2030, significantly raise the industry’s share of employment and gross domestic product, in line with national circumstances, and double its share in the least developed countries.	9.2.1. Manufacturing value added as a proportion of GDP and per capita
	9.2.2. Manufacturing employment as a proportion of total employment
9.3. Increase the access of small-scale industrial and other enterprises, in developing countries, to financial services, including affordable credit, and their integration into value chains and markets.	9.3.1. Proportion of small-scale industries in total industry value added
	9.3.2. Proportion of small-scale industries with a loan or line of credit
9.4. By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries acting in accordance with their respective capabilities.	9.4.1. CO2 emission per unit of value added
9.5. Enhance scientific research and upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending.	9.5.1. Research and development expenditure as a proportion of GDP
	9.5.2. Researchers (in full-time equivalent) per million inhabitants
9.a. Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological, and technical support to African countries, least developed countries, landlocked developing countries, and small island developing States.	9.a.1. Total official international support (official development assistance plus other official flows) to infrastructure
9.b. Support domestic technology development, research, and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities.	9.b.1. Proportion of medium and high-tech industry value added in total value added.
9.c. Significantly increase access to information and communication technology and strive to provide universal and affordable access to the internet in least developed countries by 2020.	9.c.1. Proportion of population covered by a mobile network, by technology.

Industry, innovation, and infrastructure are key factors of economic progress with a huge impact on employment, social cohesion, and environmental protection. Adopting different approaches, some studies from diverse geographical contexts and industries [21–26] investigate the inter-linkages among SDGs. These authors conclude that the achievement of the SDG 9 targets invariably contributes to the achievement of other SDG targets.

The UN defined five key targets (9.1, 9.2, 9.3, 9.4, and 9.5) and three additional targets (9. a, 9. b, and 9. c) and twelve indicators to facilitate actions toward achieving SDG 9, as mentioned in table 4.

Resilient and sustainable infrastructure means adequate engineering design, through targeted knowledge, tools, and operational support to absorb the impacts of natural adverse shocks and climate change. The World Bank starts its report [27] by emphasizing that “resilient infrastructure is about people, the households, and communities for whom infrastructure is a lifeline to better health, better education, and a better livelihood. It affects people’s well-being, their economic prospects, and their quality of life”. The World Bank Group provides a framework for understanding infrastructure resilience, by analyzing four essential infrastructure systems: energy, water and sanitation, transport, and telecommunications, essential areas for raising people’s quality of life. The report finds that the extra cost of building resilience into infrastructure systems is only 3% of overall investment needs and can provide tremendous benefits over the lifetime of new infrastructures. The experts leave five recommendations to address the five obstacles to resilient infrastructures: 1) Get the basics right; 2) Build institutions for resilience; 3) Include resilience in regulations and incentives; 4) Improve decision-making, and 5) Provide appropriate financing. Resilient and sustainable infrastructure is a key feature to support targets 9.1, 9.4, and 9a.

Technological innovation is underpinned by technology and has a problem-solving origin. In this sense, it is understood as an outcome of a problem-solving activity in a specific research/technological field to achieve and/or sustain goals [28]. Technological innovation is a source of opportunity for entrepreneurs and a truly transformative vehicle in the SDG timeline. The private sector plays a pivotal role in harnessing technology innovations to achieve the SDGs. In the context of SDG 9, technological innovation namely supports targets 9.5 and 9b.

Information and Communications Technology (ICT) has great potential to accelerate human progress and develop knowledge societies. ICT is a support structure to attain all the 17 SDGs, playing an essential role in achieving many targets, namely in the areas of health, education, finance, and energy. ICT offers access to information and knowledge, reducing inequality (SDG 10 - reduce inequality) within and among countries, which facilitates social and economic progress. ICT facilitates cities’ innovative infrastructure and applications, such as smart buildings, intelligent transport systems, energy efficiency, and resource waste management (SDG 11 - make cities inclusive, safe, resilient, and sustainable). ICT enables progress on increased dematerialization and smart technologies for agriculture, transportation, energy, supply chain management, and smart buildings (SDG 12 - sustainable consumption and production patterns) and provides the means to foster resilience helping to meet the challenge of responding timely to climate change (SDG 13 urgent action to combat climate change and its impacts). In the scope of SDG 9, we rely on the importance of ICT to understand target 9. c.

Sustainable industrialization plays a key role in introducing and developing new technologies, facilitating international trade, and enabling the efficient use of resources [29]. The least developed countries represent an immense potential for the development of manufacturing sectors, calling for financial support to increase industrialization and the introduction of new technologies. Inclusive and sustainable industrialization and financial services are fundamental elements in achieving targets 9.2 and 9.3. Summing up, we can categorize SDG 9 targets into intervention areas, as depicted in figure 1.

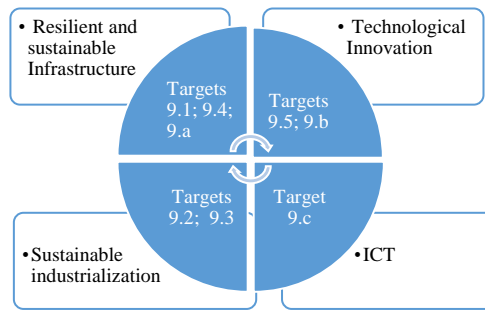


Figure 1. Categorizing SDG 9 targets

5 Green Supply Chain Practices and SDG 9

Initiatives carried out by businesses in terms of sustainable development should be in line with the expectations of the United Nations and policymakers. From the literature review, it was possible to identify a significant number of contributions focusing on the impact of green practices on the achievement of the SDGs. Table 5 establishes the relationships between SDG 9 targets and Green Supply Chain Practices (GSCP) in driving progress toward the achievement of Goal 9.

6 Discussion

In the face of global challenges, whether it be a pandemic, a military conflict, or disasters caused by climate change, every nation is compelled to build up the resilience of its organizations. GSCPs incorporate sustainability concepts and mindsets into traditional supply chain management. The aim is to help industries reduce their carbon emissions and other air pollutants and minimize waste while maximizing profits and managing sustainable growth. Every function of the supply chain - from raw materials to the consumer -, has room to accommodate green practices, contributing to achieving SDG9. This paper identifies and discusses how GSCPs can be implemented to achieve the targets of SDG9. The adoption of some practices, for instance, life cycle analysis, green training, or green cooperating with customers, improves efficiencies and the entire business benefits through higher-order rates, positive sentiments from customers, and lower costs. While the entire supply chain process is a very broad field, many green improvements opportunities with direct and indirect impacts on the environment can be adopted by industries, such as: i) actively working to switch to biofuels, incorporating recycling materials into the manufacturing process, or reducing waste and energy use (green manufacturing); ii) finding suppliers with environmentally sustainable products and services (green purchasing); iii) using packing materials made of postconsumer recycled material (green packing); iv) choosing a closer location of warehouses to the distributors (green warehousing); v) find transportation solutions that minimize the number of truck trips by, for instance, consolidating goods, investing in electric trucks or using alternative rail transportation (green transportation).

Management practices refer to processes or working methods and innovations formally implemented by managers to improve the effectiveness of work systems. Green management practices are a set of practices that includes environmental awareness, using eco-friendly

Table 5. Green supply chain practices driving for business to drive progress in SDG 9

SDG 9 Targets	GSCPs	Best practices for business to drive progress in SDG 9
Resilient and sustainable Infrastructure (9.1, 9.4, 9.a)	<ul style="list-style-type: none"> .Total quality environmental management .Green training .Life cycle analysis 	<ul style="list-style-type: none"> .Invest in resilient infrastructure-from transport systems to power-generation facilities, and water and sanitation networks. .Revamp existing infrastructure to make it more sustainable. .Promote inclusive infrastructure development by bringing valuable financial services and employment opportunities to small businesses.
Technological innovation (Targets 9.5, 9.b)	<ul style="list-style-type: none"> .Eco-design, green design .Design of products for reduced consumption of material/energy .Green technology;Environment-friendly technologies .Green training 	<ul style="list-style-type: none"> .Sustain technological innovations with research and development (R&D). .Expand the geographic reach of research and development facilities, bringing R&D capabilities to developing countries .Invest in least-developed countries to boost technological progress and economic growth.
ICT (Target 9.c)	<ul style="list-style-type: none"> .Green training .Green Information System .Green cooperating with customers 	<ul style="list-style-type: none"> .Make information and communication technologies available to all people.
Sustainable industrialization	<ul style="list-style-type: none"> .ISO 14000 certification .Internal Environmental Management .Green finance .Green waste management .Green training .Green packaging .Green cooperating with customers .Using of eco-materials .Life cycle analysis 	<ul style="list-style-type: none"> .Implement strong energy efficiency policies. .Establish thorough and rigorous standards to ensure industrial projects are carried out, managed properly, and do not contribute to inequities.

technologies, reuse of wastes, and recycling activities, in the entire value chain (from design and production to distribution) with a vital impact on sustainable development. Green management begins with incorporating green principles into the mission and vision of the organization and translating the same into managerial processes. It is becoming an important issue to customers and suppliers as they are increasingly demanding minimal negative impact on the environment. As GSCPs are critical to the health of the planet and the sustainability of the industry, innovation will drive supply chain sustainability in the coming years [30].

7 Conclusion

This paper aims at analysing green practices that can be implemented within supply chains, linking them to SDGs. Green supply chain practices were collected from the literature revision and the analysis of SDG 9 targets allows to identify a range of green practices that managers should incorporate into their businesses to achieve a sustainable industry and to

provide maximum value to the stakeholders. From the literature review, it emerges that research is more concentrated on supply chain and sustainable industry but with very few references to formal linkage to SDG 9. Aligning a green supply chain with SDGs depends on the individual business attitude to extending responsibility for product and service quality into social and environmental performance. To promote sustainable development within the supply chain operations, it is important to consider aspects like the impact of climate change, urbanization, smart technologies, the social impact of the introduction of new technologies, and government regulation and compliance. To achieve sustainable development, the supply chain management should focus on the energy used in the process, the possibility of integrating eco-materials or green resources, green cooperation with suppliers and customers, and the use of environmental-friendly technologies. Industrialization is a development driver for the SDGs. Also, infrastructure is at the heart of efforts to meet the SDGs. Encompassing everything from health and education for all, to access to energy, clean water, and sanitation, infrastructure is really at the center of the delivery of the SDGs. It is indeed clear that all the goals are underpinned by infrastructure development. SDG 9 has inter linkages with many other Goals and targets, including industry-related targets associated with job creation (SDG 8 - decent work and economic growth), sustainable livelihoods (SDG 11 - make cities and human settlements inclusive, safe, resilient, and sustainable), and food security, for example. In addition, innovation is required for delivering, distributing, and consumption of energy, food, water, and housing, while access to ICT is critical for achieving SDG 4 (quality education), SDG 8, and SDG 10 (reduced inequalities), among others.

More research is needed that explore the impact of green supply chain practices incorporated in business models into the achievement of SDGs.

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References

- [1] L.N. Asha, A. Dey, N. Yodo, L.G. Aragon, *Sustainability* **14**, 12790 (2022)
- [2] F. Khair, D.I. Wijaya, H.D. Yulianto, K.E.N. Soebandrija, *Designing the performance measurement for sustainable supply chain of the crude palm oil (CPO) companies using lean & green supply chain management (LGSCM) approach (Case Study: Indonesia's palm oil company)*, Vol. 426 (2020)
- [3] M. do Rosário Cabrita, S. Duarte, H. Carvalho, V. Cruz-Machado, *IFAC-PapersOnLine* **49**, 1306 (2016)
- [4] X. Qin, D.I. Godil, S. Sarwat, Z. Yu, S.A.R. Khan, S. Shujaat, *Operations Management Research* pp. 1–14 (2021)
- [5] S. Samad, M. Nilashi, A. Almulihi, M. Alrizq, A. Alghamdi, S. Mohd, H. Ahmadi, S.N.F.S. Azhar, *Technology in Society* **67**, 101766 (2021)
- [6] A.O. Ososanmi, L.D. Ojo, O.E. Ogundimu, A.E. Oke, *Environmental Science and Pollution Research* pp. 1–14 (2022)
- [7] L. Salandri, G.L.C. Rizzo, A. Cozzolino, P. De Giovanni, *Journal of Cleaner Production* **375**, 134091 (2022)
- [8] A. Nteta, J. Mushonga, *Journal of Transport and Supply Chain Management* **15**, 17 (2021)
- [9] Z. Wang, Q. Wang, S. Zhang, X. Zhao, *Journal of Cleaner Production* **189**, 673 (2018)
- [10] A. Diabat, K. Govindan, *Resources, conservation and recycling* **55**, 659 (2011)
- [11] S. Choudhary, R. Nayak, M. Dora, N. Mishra, A. Ghadge, *Production planning & control* **30**, 353 (2019)

- [12] B. Verrier, B. Rose, E. Caillaud, H. Remita, *Journal of Cleaner Production* **85**, 83 (2014)
- [13] N. Nureen, D. Liu, B. Ahmad, M. Irfan, *Environmental Science and Pollution Research* **29**, 63444 (2022)
- [14] A. Andaregie, T. Astatkie, *African Journal of Science, Technology, Innovation and Development* **14**, 960 (2022)
- [15] A.S. Hassan, A.A. Jaaron, *Journal of Cleaner Production* **308**, 127366 (2021)
- [16] C. Chauhan, P. Kaur, R. Arrawatia, P. Ractham, A. Dhir, *Journal of Business Research* **147**, 290 (2022)
- [17] R.M. Vanalle, G.M.D. Ganga, M. Godinho Filho, W.C. Lucato, *Journal of cleaner production* **151**, 250 (2017)
- [18] M. Birasnav, R. Chaudhary, J.H. Dunne, J. Bienstock, C. Seaman, *Computers & Industrial Engineering* p. 108441 (2022)
- [19] N. Sakalasoorya et al., *Open Journal of Social Sciences* **9**, 396 (2021)
- [20] G. Assembly, *United nations: transforming our world: the 2030 agenda for sustainable development. 2015* (2020)
- [21] J. Estevao, J.D. Lopes, D. Penela, *Technological Forecasting and Social Change* **187**, 122178 (2023)
- [22] L. Velazquez, *Assessing Progress Towards the Achievement of SDG9* (Emerald Publishing Limited, 2021)
- [23] K.B. Mantlana, M.A. Maoela, *Business Strategy & Development* **3**, 344 (2020)
- [24] D. Griggs, M. Nilsson, A. Stevance, D. McCollum et al., *A guide to SDG interactions: from science to implementation* (International Council for Science, Paris, 2017)
- [25] D.L. Blanc, *Sustainable Development* **187**, 176 (2015)
- [26] D.L. McCollum, L.G. Echeverri, S. Busch, S. Pachauri, S. Parkinson, J. Rogelj, V. Krey, J.C. Minx, M. Nilsson, A.S. Stevance et al., *Environmental Research Letters* **13**, 033006 (2018)
- [27] S. Hallegatte, J. Rentschler, J. Rozenberg, *Lifelines: The resilient infrastructure opportunity* (World Bank Publications, 2019)
- [28] M. Coccia, *Technology Analysis & Strategic Management* **29**, 1048 (2017)
- [29] S. Pizzi, A. Caputo, A. Corvino, A. Venturelli, *Journal of cleaner production* **276**, 124033 (2020)
- [30] A. Amjad, K. Abbass, Y. Hussain, F. Khan, S. Sadiq, *Environmental Science and Pollution Research* **29**, 66622 (2022)