Green Logistics: From Theory to Practice

Aldona Jarašūnienė[1]([✉]) [iD] and Margarita Išoraitė[2] [iD]

[1] Vilnius Gediminas Technical University, Plytinės Str. 27, 10105 Vilnius, Lithuania
aldona.jarasuniene@vilniustech.lt

[2] Vilniaus Kolegija/Higher Education Institution, Didlaukio Str. 49, 08303 Vilnius, Lithuania
m.isoraite@vvf.viko.lt

Abstract. Climate change has a profound impact on our way of life, prompting both individuals and companies to contribute to a greener future. The logistics sector is no exception, as green logistics plays an increasingly significant role within the supply chain. To practice sustainable and ecological logistics, it is crucial to implement green practices right from the initial movement of goods. This article delves into the concept of green logistics, supply chain trends, green supply chain practices, and tools for green logistics management. The adoption of green logistics by transportation companies is seen as a means to enhance their competitive advantage in today's economic, social, and environmental landscape. However, effectively implementing the principles of sustainable development requires the integration of different areas that are often treated separately, necessitating new methods and tools. Nevertheless, there exists a knowledge gap regarding the practical application of green logistics measures, highlighting the need for further understanding and insights in this area.

Keywords: Green logistics concept · Supply chain · Supply chain tools

1 Introduction

Currently, there is an increased need for sustainable development, the main element of which is the so-called green supply chain or, more broadly, green logistics. Green logistics are solutions that include everything related to production transportation activities, and supply chain. With the help of Green Logistics, the customers' needs are met with minimal costs. Despite current trends, managers responsible for supply chains are still skeptical of the changes proposed by the European Commission. The objective of this paper is to delve into the concept of green logistics, analyze the latest trends in supply chain management, and investigate the diverse array of tools available for implementing green logistics and fostering sustainable supply chains. Embracing green logistics within transportation companies is perceived as a strategic approach to enhance their competitive edge in the prevailing economic, social, and environmental landscape.

2   Green Logistics Theory

2.1   Green Logistics Concept

Green logistics forms the development prospects of the transport company linked to environmental issues. It can be said that transport is the activity in which the principles of green logistics are implemented, therefore it is important to evaluate the business activities in this sector progress and potential in the field of implementation of green logistics principles. Therefore, it is important to answer the question, how are the principles of green logistics implemented in the transport sector?

According to Cheng et al. [4], Green Logistics (GL) activities revolve around the environmentally conscious and efficient management of goods and information flows. These activities aim to generate added value for consumers while simultaneously preserving the environment and promoting the adoption of a circular business economy. By prioritizing sustainable practices, Green Logistics seeks to meet the evolving needs of consumers while minimizing negative environmental impacts. The principles of the circular economy, secondary use, sorting, and other areas of the green economy are of increasing concern to society and businesses. To be a strong market player, the business pays particular attention to sustainability and follows the path of the green course. Nowadays, the consumer chooses very responsibly. He wants to have a sustainable product that is made from recycled materials and is fully recyclable.

Based on the findings of Vienažindiene et al. [28], the integration of green logistics is of paramount importance in implementing the principles of the circular economy. By adopting green logistics practices, organizations are able to effectively address environmental, economic, and social concerns. These practices enable a more sustainable and holistic approach to resource management, waste reduction, and promoting a regenerative economy.

In contrast, Mak et al. [14], conducted an analysis and found that logistics, being largely invisible to most customers, poses difficulties in implementing green logistics policies effectively.

Wang et al. [29], expressed the belief that green logistics plays a key role in reducing the environmental impact associated with logistics activities. They argue that green logistics aims for balanced economic, social, and environmental development, distinguishing itself from traditional logistics, which focuses on cost reduction.

Discussing the broader impact of green logistics, Kwak et al. [12], noted that it considers the influence of transportation and environmental sectors on the entire logistics process. Furthermore, Kwak et al. [12], argue that green logistics, in a narrower sense, pertains to pollution reduction and management activities, including measures to decrease air pollution and gas emissions during the transportation of goods.

Richnák et al. [21], examined the directions of sustainable development from the point of view of logistics, ensuring a better quality of life for both current and future generations. Transport companies should realize and take responsibility not only for the success of their operations, but also for their contribution to the development and environmental impact of the community, region, or country.

Werner-Lewandowska et al. [31] posit that companies can achieve sustainable outcomes by prioritizing the implementation of logistics solutions. Factors such as advancing technological capabilities and the growing demand for innovation can contribute to making transport infrastructure more sustainable, adaptable to user needs, environmentally friendly, and resilient to climate change. However, it is essential to have a well-defined sustainable development policy to effectively pursue these goals.

In a similar vein, Trivellas et al. [26] emphasize the increasing interest in green logistics and sustainable supply chains. They note that green solutions are viable across various domains, including renewable energy, waste management, green transport, and logistics, and the implementation of the sharing economy. This highlights the wide-ranging possibilities for incorporating sustainable practices throughout different aspects of the logistics industry.

Tan et al. (2020) focus on the use of optimization techniques and mathematical programming models in green supply chain research. It is essential to better protect the interests of consumers, ensure fair competition between producers and facilitate the free movement of organic products in the EU. The organic product control system aims to give consumers certainty that when they buy EU or equivalent organic products, the rules have been applied at every stage of the supply chain. This should apply where these products are produced in the EU or imported.

Neto et al. [8] proposed a comprehensive framework for designing and assessing sustainable logistics networks. Their study highlights the growing significance of environmental factors in the design process of logistics networks. Recognizing the evolving environmental landscape, the framework takes into account the environmental influences that impact logistics operations, ensuring that sustainability considerations are effectively integrated into network design decisions.

Paužuolienė et al. [18] stated that the implementation of green logistics in the organization highlights a few advantages. According to Paužuolienė et al. [18] this practice reveals an increase in the volume of goods delivered on time, better use of capacity, promotes the quality of products or services, increases product variety, and reduces waste. Based on Paužuolienė et al. [18] research data, it can be concluded that price and delivery are still important to consumers consistency of time and quality of services provided and socially responsible activities of the company are practically irrelevant or efforts to contribute to the reduction of environmental problems.

Zowada [34] mentioned that the concept of green logistics is still poorly recognized by many companies. In most cases, it is due to the lack of knowledge of the managers about the assumptions of the concept itself and the methods of its implementation. It is widely recognized that logistics affects the environment, so green logistics becomes a key component for sustainable management.

Mala et al. [16] investigated that the advantage of green logistics is that its application makes assumptions to reduce general operating costs, reduce pollution, reduce fuel and energy consumption, optimize logistic flows, reduce emissions of toxic substances.

Vasiliauskas et al. [27] state that the concept of green logistics is related to sustainable development and is important on three equal levels: economic, ecological and social. This is also confirmed by the definition of green logistics. The interaction between the ecological, economic, and social levels is shown in Fig. 1.
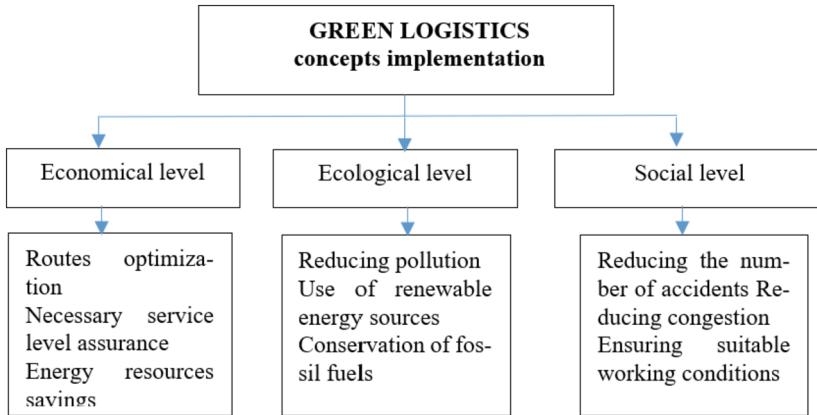
Fig. 1. The main levels of implementation of the green concept and the goals. Source: Vasiliauskas et al.

According to Vasiliauskas et al. [27] the interaction of economic, ecological, and social levels means that green logistics and the implementation of the concept in any organization should be carried out in accordance with the principles of economic, ecological, and social responsibility. The organization should prepare a green logistics implementation strategy specifically adapted to it, taking into account the external and internal factors affecting the organization's activities [27].

2.2 Supply Chain Trends

Jančiauskas et al. [19] argue that improving the supply chain is essential for a company to be competitive. The factors that determine that the company needs to be concerned and start improving its supply chain are as follows [19]:

- Rapid growth of transportation costs. Increased transportation costs mean that supply is a big loss for the company. The entire supply needs to be re-planned and transport optimized as much as possible.
- Peak production efficiency reached. This means that in order to continue to improve, it is necessary to strive for perfection not only in production but also in supply.
- Fundamental change in inventory management. When inventory management changes, the supply chain must also change.
- An increased range of products can also be a factor that forces supply chain improvement, as in this case supply needs to be re-planned and improved.
- The revolution in computer and communication technologies. To stay competitive, you need to improve your supply chain.
- Improve the supply chain to ensure supply optimization.
- Global competition. It is imperative to improve your supply chain and seek competitive advantages over your competitors.
- Foreign sources of supply. To look for cheaper and more competitive solutions, it is necessary to look abroad and at the same time to re-plan the supply chain more efficiently.

According to Rejeb et al. [20], the global impact of the pandemic has brought about visible social and economic effects worldwide. One of the sectors significantly affected by this crisis is the food supply chain (FSC), which has faced severe disruptions due to humanitarian threats and concerns about an unstable business environment.

Throughout the COVID-19 pandemic, serious challenges to the food supply have emerged, as highlighted by Rejeb et al. [20]. These challenges have had a notable influence on the four key principles of food security: accessibility, affordability, stability, and usability. The pandemic has significantly impacted these principles, underscoring the critical importance of ensuring a secure and reliable food supply chain in times of crisis.

Yuan et al. [32] mentioned that Industry 4.0 has revolutionized supply chain management. Thanks to Industry 4.0, logistics activities become more organized and simpler. The transportation company has better visibility into every process in the supply chain, making it more flexible and errors are easier to catch, and the ability to respond to last-minute changes is improved.

In terms of the importance of IT trends in supply chains, Kajba et al. [10] shed light on several trends categorized based on their temporal impact. Their research revealed that one trend holds short-term significance, namely big data analytics. Additionally, Kajba et al. [10] underscored the long-term importance of five trends, namely bionic enhancement, quantum computing, drones, 3D printing, and advanced vehicles.

Addressing the cost aspect of supply chain management (SCM), Wen et al. [30] noted that numerous practitioners have demonstrated the ability of effective SCM to reduce overall project costs. This highlights the financial benefits associated with efficient supply chain practices.

Discussing the risks faced by companies, Alkhatib et al. [1] emphasized that various risks can lead to disruptions in information and material flow. The logistics and transport sectors experienced significant disruptions during the pandemic, and stakeholders in the construction industry have raised concerns about the continued supply of raw materials, which has already had consequences for consumers. Alkhatib et al. [1] highlighted the vulnerability of the supply chain to internal and external disruptions, including economic downturns, challenges related to the loss of valuable customers, and the need for adaptation to new technologies and infrastructure quality.

2.3   Green Logistics and Supply Chain Management Tools

Gong et al. [6] argued that green supply chain management (GSCM) needs to be addressed systematically. Green supply chain management is not only limited to reducing the harmful impact on the environment and limiting carbon dioxide emissions, but also to achieving business goals. The most important goal is to reduce the costs of logistics processes, increase profits and at the same time adhere to the principles of sustainable development.

Hejazi et al. [7] mentioned that many supply chain and operations management practitioners and researchers have become interested in green supply chain methods. Green logistics includes all activities related to the transportation of products. Green logistics meet the needs of consumers at minimum costs, causing the lowest possible CO_2 impact on the environment. Green logistics is sustainable supply chain management.

Zhou et al. [33] put forth the argument that existing research on green logistics management (GLM) has primarily focused on assessing its impact on ecological sustainability. In contrast, Qu et al. [17] asserted that a secure, stable, and sustainable supply chain is not only vital for enterprise development but is increasingly becoming an integral component of sustainable industrial chain development. Their viewpoints underline the multifaceted nature of green logistics management and its broader implications for both environmental sustainability and the overall sustainability of industrial chains.

According to Shekarian et al. [23] and Qu et al. [17] integrating sustainable business practices not only aligns with the triple framework of sustainability, encompassing economic, environmental, and social aspects, but it also leads to increased profitability. By adopting sustainable practices, businesses can effectively balance their economic goals with environmental and social responsibilities, ultimately driving higher profits.

According to the findings of García Alcaraz et al. [5], the integration of green supply chains positively impacts cost reduction due to the increased involvement of green suppliers in environmental innovation. Similarly, Cerqueira-Streit et al. [2] highlighted the concerns of supply chain managers regarding sustainability issues. Jalali et al. [9] emphasized the significance of identifying barriers to the adoption and implementation of sustainable practices as a crucial step in their successful implementation.

Silva et al. [22] argued that supply chain management (SCM) is an increasingly important concept that companies must strategically integrate with suppliers and customers to achieve profitability. In line with this, Lazar et al. [13] emphasized the importance of sustainable development in companies, as it is expected to become a critical factor for international competitiveness, even within the interconnected domain of supply chains and logistics.

Chalmeta et al. [3] considered that one of the main challenges of SCM is the integration of sustainability principles in the supply chain, taking into account economic, environmental and social impacts and a multidimensional approach (institutional, geographical and temporal).

According to Tseng et al. [25], sustainable supply chain management can be defined as the implementation of strategies, transparent engagement, and the pursuit of organizational goals through an inter-organizational professional process.

Kumar et al. [11] analyzed that sustainable supply chain management can facilitate the adoption and implementation of supply chain integration using digital technologies.

Makarova et al. [15] mentioned that sustainable development is possible only through the implementation of complex projects in which transport infrastructure is an important component.

3   Research Methodology and Data Analysis

3.1   Research Methodology

The main instrument of the interview is a semi-structured questionnaire, which consisted of questions divided into the following question areas: the importance of green logistics for the organization, the implementation of green logistics solutions in the organization,

experience and knowledge in the field of logistics sufficiency, green logistics implementation problems, improvement of green logistics. These areas have been identified based on the analysis of the scientific literature.

Purposive sampling was used to select the interview participants, only certain ones were included in the study employees of transport companies. The following criteria were used for the selection of informants: 1) position (top or middle manager); 2) awareness of the logistics situation in the company; 3) at least 3 years of work experience in the field of logistics. Sample volume using half the structured interview method consisted of 4 informants (Table 1).

Table 1. Rationale for the interview questionnaire.

Interview question areas	Questions	The authors who examined aspect
Green logistics concept and its implementation	What is green logistics and how it is implemented?	Cheng et al. (2023), Mak et al. (2022), Wang et al. (2018), Kwak et al. (2020)
Public-private cooperation	Whether the implementation of "Green logistics" measures would be far-reaching more effective through public-private cooperation?	Trivellas et al. (2020), Vasiliauskas et al. (2013)
Green logistics measures effectiveness	What green logistics measures that can be most effective?	Silva et al. (2019)
Green logistics risk	What are green logistics risk?	Mala et al. (2017)
Encourage the application of "Green logistics" measures	What would encourage the application of "Green logistics" measures	Mala et al. (2017)

3.2   Research Data Analysis

The experts were asked several questions about how they understand the term "Green logistics" and whether is there enough information about its implementation measures? Most experts understand the concept of "Green Logistics" correctly and say that there is enough information on the implementation of its measures.

The question was also asked whether the implementation of "Green logistics" measures would be far-reaching more effective through public-private cooperation. The majority of experts agree with the statement that the implementation of "Green logistics" measures would be much more efficient thanks to public-private cooperation.

From the question regarding "Green logistics" measures that can be most effective, experts singled out the promotion of intermodal transports, the application of information technologies, using vehicles that are less harmful to the environment, training employees, promotion of social responsibility, assessment of risks and extreme situations.

In response to the question, the experts distinguished the benefits of applying "Green logistics" measures improving the quality of work, increasing efficiency, better quality of services; investors attractiveness.

When asking the experts about the risks, the measures of "Green logistics" applied due to financial risk, psychological risk, risk of failure. When asked about the reasons why "Green logistics" measures are not applied, the answer was, that they are not applied due to lack of cooperation between the public and private sectors, lack of training, lack of implementation of advanced technologies.

When asking the question about what would encourage the application of "Green logistics" measures, experts answered that State support for companies or benefits, greater availability of information, technological advances.

Respondents highlighted that green logistics measures increase a company's competitive advantage, productivity, and profits and allow it to offer lower transport rates to customers due to cost savings. Experts agreed that the political and legal environment is important in encouraging companies to use green logistics measures. Another important point underlined was technological progress. Respondents identified that without technological progress, the implementation of green logistics measures in the logistics sector is not possible. Drivers, managers, and other responsible staff need to be responsible, educated, and understand the importance of going green. Educating employees is an important factor for a company to become greener. For this reason, it is important to integrate economic driving courses.

4   Conclusions

The theoretical issue of green logistics covers various research areas and challenges related to the integration of sustainability principles into logistics operations. The main aspects of the theoretical problem of green logistics are distinguished: environmental impact assessment; ecological transport and choice of transport modes; circular economy and waste management; green technology application, policy, and regulatory framework.

These aspects highlight the theoretical problem in green logistics, which encompasses multidisciplinary research involving environmental science, engineering, operations management, and policy analysis. An in-depth exploration of these issues can be found in academic journals and research publications dedicated to sustainable logistics and supply chain management.

Green logistics means methods that aim to improve the state of the environment. Since no single transport policy measure can solve all environmental problems, these measures the spectrum and scope are wider. By means of legislation, transport governments directly influence the transport sector, specifying the use of certain technologies or achieving a certain result. Market-based approaches and incentives use economic levers to balance, reduce or even eliminate the negative effects of transport on the environment. Planned green logistics measures mainly involve actions aimed at increasing the attractiveness of alternatives.

The interviews also showed that companies can more easily adopt green logistics measures due to their greater financial capacity. The interviews with the experts revealed that the implementation of green logistics measures depends not only on technological

progress, the political and legal environment and society but also on the company's own internal strategy and the available human and financial resources. It is also important to pay attention to risk assessment and extreme situations.

References

1. Alkhatib, S.F., Momani, R.A.: Supply chain resilience and operational performance: the role of digital technologies in Jordanian manufacturing firms. Adm. Sci. **13**(2), 40 (2023). https://doi.org/10.3390/admsci13020040

2. Cerqueira-Streit, J.A., Endo, G.Y., Guarnieri, P., Batista, L.: Sustainable supply chain management in the route for a circular economy: an integrative literature review. Logistics **5**(4), 81 (2021). https://doi.org/10.3390/logistics5040081

3. Chalmeta, R., Santos-deLeón, N.J.: Sustainable supply chain in the era of industry 4.0 and big data: a systematic analysis of literature and research. Sustainability **12**(10), 4108 (2020). https://doi.org/10.3390/su12104108

4. Cheng, Y., Masukujjaman, M., Sobhani, F.A., Hamayun, M., Alam, S.S.: Green logistics, green human capital, and circular economy: the mediating role of sustainable production. Sustainability **15**(2), 1045 (2023). https://doi.org/10.3390/su15021045

5. García Alcaraz, J.L., et al.: Effect of green supply chain management practices on environmental performance: case of Mexican manufacturing companies. Mathematics **10**(11), 1877 (2022)

6. Gong, R., Xue, J., Zhao, L., Zolotova, O., Ji, X., Xu, Y.: A bibliometric analysis of green supply chain management based on the Web of Science (WOS) platform. Sustainability **11**(12), 3459 (2019). https://doi.org/10.3390/su11123459

7. Hejazi, M.T., Al Batati, B., Bahurmuz, A.: The influence of green supply chain management practices on corporate sustainability performance. Sustainability **15**(6), 5459 (2023). https://doi.org/10.3390/su15065459

8. Frota Neto, J.Q., Bloemhof-Ruwaard, J.M., van Nunen, J.A.E.E., van Heck, E.: Designing and evaluating sustainable logistics networks. Int. J. Prod. Econ. **111**, 195–208 (2008)

9. Jalali, M., Feng, B., Feng, J.: An analysis of barriers to sustainable supply chain management implementation: the fuzzy DEMATEL approach. Sustainability **14**(20), 13622 (2022). https://doi.org/10.3390/su142013622

10. Kajba, M., Jereb, B., Obrecht, M.: Considering IT trends for modelling investments in supply chains by prioritising digital twins. Processes **11**, 262 (2023). https://doi.org/10.3390/pr11010262

11. Kumar, A., Shrivastav, S.K., Shrivastava, A.K., Panigrahi, R.R., Mardani, A., Cavallaro, F.: Sustainable supply chain management, performance measurement, and management: a review. Sustainability **15**(6), 5290 (2023). https://doi.org/10.3390/su15065290

12. Kwak, S.-Y., Cho, W.-S., Seok, G.-A., Yoo, S.-G.: Intention to use sustainable green logistics platforms. Sustainability **12**(8), 3502 (2020). https://doi.org/10.3390/su12083502

13. Lazar, S., Klimecka-Tatar, D., Obrecht, M.: Sustainability orientation and focus in logistics and supply chains. Sustainability **13**(6), 3280 (2021). https://doi.org/10.3390/su13063280

14. Mak, S.-L., Wong, Y.-M., Ho, K.-C., Lee, C.-C.: Contemporary green solutions for the logistics and transportation industry—with case illustration of a leading global 3PL based in Hong Kong. Sustainability **14**, 8777 (2022). https://doi.org/10.3390/su14148777

15. Makarova, I., et al.: The role of multimodal transportation in ensuring sustainable territorial development: review of risks and prospects. Sustainability **15**(7), 6309 (2023). https://doi.org/10.3390/su15076309

16. Mala, D., Sedliačikova, M., Kaščakova, A., Benčikova, D., Vavrova, K., Bikar, M.: Green logistics in Slovak small and medium wood-processing enterprises. BioResources **12**(3), 5155–5173 (2017)

17. Qu, S., Ji, Y.: Sustainable supply chain management and optimization. Sustainability **15**(4), 3844 (2023). https://doi.org/10.3390/su15043844

18. Paužuolienė, J., Kaveckė, I.: Žaliosios logistikos taikymo svarba: vartotojų nuomonės tyrimas. Reg. Formation Dev. Stud. **1**(36), 61–68 (2022). https://doi.org/10.15181/rfds.v36i1.2388

19. Jančiauskas, B., Treigienė, D.: Supply Chain Management. Technika, Vilnius (2003)

20. Rejeb, A., Rejeb, K., Appolloni, A., Iranmanesh, M., Treiblmaier, H., Jagtap, S.: Exploring food supply chain trends in the COVID-19 era: a bibliometric review. Sustainability **14**, 12437 (2022). https://doi.org/10.3390/su141912437

21. Richnák, P., Gubová, K.: Green and reverse logistics in conditions of sustainable development in enterprises in Slovakia. Sustainability **13**(2), 581 (2021). https://doi.org/10.3390/su13020581

22. Silva, W.H., Guarnieri, P., Carvalho, J.M., Farias, J.S., dos Reis, S.A.: Sustainable supply chain management: analyzing the past to determine a research agenda. Logistics **3**(2), 14 (2019). https://doi.org/10.3390/logistics3020014

23. Shekarian, E., Ijadi, B., Zare, A., Majava, J.: Sustainable supply chain management: a comprehensive systematic review of industrial practices. Sustainability **14**(13), 7892 (2022). https://doi.org/10.3390/su14137892

24. Tan, B.Q., Wang, F., Liu, J., Kang, K., Costa, F.: A blockchain-based framework for green logistics in supply chains. Sustainability **12**, 4656 (2020). https://doi.org/10.3390/su12114656

25. Tseng, M.-L., Bui, T.-D., Lim, M.K., Lewi, S.: A cause and effect model for digital sustainable supply chain competitiveness under uncertainties: enhancing digital platform. Sustainability **13**(18), 10150 (2021). https://doi.org/10.3390/su131810150

26. Trivellas, P., Malindretos, G., Rekliti, P.: Implications of green logistics management on sustainable business and supply chain performance: evidence from a survey in the greek agri-food sector. Sustainability **12**, 10515 (2020). https://doi.org/10.3390/su122410515

27. Vasiliauskas, A.V., Zinkevičiūtė, V., Šimonytė, E.: Implementation of the concept of green logistics refering to IT applications for road freight transport enterprises. Verslas: teorija ir praktika **14**(1), 43–50 (2013)

28. Vienažindienė, M., Tamulienė, V., Zaleckienė, J.: Green logistics practices seeking development of sustainability: evidence from lithuanian transportation and logistics companies. Energies **14**(22), 7500 (2021). https://doi.org/10.3390/en14227500

29. Wang, D.-F., Dong, Q.-L., Peng, Z.-M., Khan, S.A.R., Tarasov, A.: The green logistics impact on international trade: evidence from developed and developing countries. Sustainability **10**(7), 2235 (2018). https://doi.org/10.3390/su10072235

30. Wen, S., Tang, H., Ying, F., Wu, G.: Exploring the global research trends of supply chain management of construction projects based on a bibliometric analysis: current status and future prospects. Buildings **13**(2), 373 (2023). https://doi.org/10.3390/buildings13020373

31. Werner-Lewandowska, K., Golinska-Dawson, P.: Sustainable logistics management maturity—the theoretical assessment framework and empirical results from Poland. Sustainability **13**, 5102 (2021). https://doi.org/10.3390/su13095102

32. Yuan, X.-M., Xue, A.: Supply chain 4.0: new generation of supply chain management. Logistics **7**, 9 (2023). https://doi.org/10.3390/logistics7010009

33. Zhou, B., Siddik, A.B., Zheng, G.-W., Masukujjaman, M.: Unveiling the role of green logistics management in improving SMEs' sustainability performance: do circular economy practices and supply chain traceability matter? Systems **11**, 198 (2023). https://doi.org/10.3390/systems11040198

34. Zowada, K.: Green logistics: the way to environmental sustainability of logistics. Empirical evidence from Polish SMEs. Eur. J. Sustain. Dev. **9**(4), 231–240 (2020)