GREEN SUPPLY CHAIN AND GREEN LOGISTICS: A BIBLIOMETRIC IDENTIFICATION OF KEY RESEARCH AREAS

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Purpose: The aim of the research is to identify the most frequently undertaken research areas in scientific publications addressing the issues of green supply chain and green logistics simultaneously.

Design/methodology/approach: The study was planned and carried out in the period from April to August 2024. The analyzed research areas were expressed through author keywords, which were assigned to individual scientific publications through their authors. The multi-stage research process used two methods for bibliometric research (systematic literature review and classical literature review). Author keywords assigned to 111 precisely selected scientific publications were analyzed.

Findings: Nine of the most frequently addressed research areas in scientific publications that simultaneously addressed green supply chain and green logistics were identified. In terms of as many as three identified research areas, there was a direct reference to the supply chain (green supply chain, green supply chain management, supply chain management). In turn, in two areas there was a reference to sustainability issues (environmental sustainability, sustainability). In addition, the issue of reverse logistics was identified as a key research area and at the same time corresponding to the issue of green logistics.

Research limitations/implications: An important factor limiting the study was the choice of database for bibliometric analyses (Scopus database). In addition, the scope of the analyses undertaken was limited to the constructed bibliometric query (Q1). However, both aspects indicated simultaneously made it possible to obtain precise and consistent results of the analyses. Moreover, it becomes possible to repeat the study in the future and compare it with other constructed studies aimed at literature review.

Originality/value: The study, compared to other such bibliometric analyses, is distinguished by the syntax of the constructed query. In addition, it was noted that research should be undertaken in learning more about the role and importance of logistics and supply chain

greening for emerging green business ecosystems. Other relevant areas are the question of green job creation due to the greening of supply chains, or how the green skills gap affects the process of green supply chain and green logistics. The article is addressed to anyone interested in issues related to green supply chain and green logistics.

Keywords: green business ecosystem, green economy, green jobs, green logistics, green supply chain, green supply chain management, sustainable development.

Category of the paper: Literature review.

1. Introduction

The issue of greening the economy is nowadays the subject of a multifaceted scientific discussion conducted in the context of sustainability issues. As a result, in the relevant literature one can see numerous sectoral studies focused on the "green" issue. For example, the issue of greening the logistics sector and the individual processes in it related to the supply chain is increasingly being raised. Such an attempt to orient the operation of the logistics sector is a kind of response to the emphasis on the various directions of the negative impact of the logistics sector on the environment (Abdullah et al., 2016; Gupta et al., 2023). As a result, scientific considerations are already raising the issue of green development of logistic enterprise (Guo, Peng, 2023), green distribution (Cvirik, Daneshjo, 2022; Khan et al., 2017), green freight transportation (Fahimnia et al., 2015a), green human resource management (Al-Minhas et al., 2020; Setyadi et al., 2023), green logistics (Jayarathna et al., 2024; Setyadi et al., 2023; Sun et al., 2022), green packaging (Chhabra et al., 2017; Wandosell et al., 2021), green passenger public transport (Fahimnia et al., 2015b), green supply chain (de Souza et al., 2022; Saengsathien, Namchimplee, 2022), green supply chain management (Jazairy et al., 2021; Karunakaran et al., 2023; Liu, J. et al., 2018), green transportation (Korucuk et al., 2023; Lu, Li, 2023; Perboli, Rosano, 2019), or the green vehicle routing problem (Lou et al., 2024; Zhou et al., 2021). These are, of course, only a selection of the issues raised in research at the intersection of green aspects and logistics. At the same time, it should be pointed out at this place that some researchers categorize the pro-environmental practices implemented in the day-to-day operation of enterprises in the field of logistics as green innovations (Chen et al., 2023; Ouni, Ben Abdallah, 2024) or simply green practices (Prataviera et al., 2024; Rapp et al., 2024; Roy, Mohanty, 2024). Further discussion in this article will be based primarily on the issues of green supply chain and green logistics. Between these issues, a kind of relationship can be outlined. Well, green logistics according to the basic practices of the green supply chain is one of its elements (Wang et al., 2023).

Some similarities can be seen between traditional and green supply chains. In both cases, participants in these supply chains seek to maximize their profits. However, in the case of a green supply chain, the drive to maximize profits is accompanied by concern for the

environment, in which the aim is to reduce the consumption of, for example, energy or various types of natural resources. Hence, within the green supply chain, various types of practices are implemented in individual enterprises to promote their positive impact on the environment (Abdallah, Al-Ghwayeen, 2020). As a result, the green supply chain and its proper management are increasingly seen as an opportunity to reduce the negative impact of enterprises operating in various sectors of the economy (Micheli et al., 2020; Noiki et al., 2023; Tumpa et al., 2019). This kind of conviction could be derived from the fact that green supply chain could be defined as the operational management method and optimization approach to reduce the environmental impact along the life cycle of the product (Lam et al., 2015). For the life cycle of a product in terms of a green supply chain, one should have in mind the path from raw material to end-of-life product management (utilization, including recyclability). Nevertheless, the design of green supply chains is a challenging yet multidimensional task. As a result, some researchers point out, for example, the possibility of using a multi-criteria decision-making approach for designing efficient and effective green supply chains (Banasik et al., 2018; Osintsev, 2022). The difficulty of implementing a green supply chain into the practice of operation of various types of enterprises is justified given the economic as well as environmental benefits of doing so. At the intersection of these areas, studies indicate that with proper management of the green supply chain, a win/win situation occurs, in which, among other things, the efficiency and effectiveness of the activities carried out in a given enterprise increases (favorable economic transformation) and there is a reduction in pollution or an increase in the rate of product recycling (Souhli, En-Nadi, 2023).

In research, one can see highlights that both green logistics and reverse logistics are important for the sustainable development of logistics activities (Derse, 2024). At the same time, it is worth noting that different researchers consider the issue of green logistics differently. For example, it is possible to see that in the field of green logistics there is an emphasis on performing individual logistics activities in an environmentally friendly manner (Zhang et al., 2020). As a result, sustainable practices (also known as green practices) are implemented in individual logistics enterprises to reduce their negative environmental externalities (Khayyat et al., 2024). In addition to environmental issues, green logistics is also seen as an opportunity to build a positive brand image and ensure customer loyalty to the enterprise (Panghal et al., 2024). Thus, green logistics can bring concrete economic benefits to individual enterprises, which is emphasized in various targeted scientific research (Liu, C. et al., 2023). In turn, Seroka-Stolka, & Ociepa-Kubicka (2019) or Ma & Kim (2023) emphasize that green logistics is a major development trend of modern logistics. At the same time, the implementation of green logistics practices in the operation of individual enterprises is, in the opinion of the authors of this article, a major challenge facing those responsible for management in these entities. In many cases, at least, it is impossible to predict the impact of the implemented solution on the environmental footprint of a particular enterprise in the long term (especially in the case of new green practices not yet tested in business practice).

The aim of the research undertaken and presented in this article is to identify the most frequently undertaken research areas in scientific publications addressing the issues of green supply chain and green logistics simultaneously. For realization of such an aim of the research scientific exploration with the help of bibliometric query Q1 was subjected to the Scopus database. The study used the systematic literature review (SLR) and classic literature review (CLR) methods. The VOSviewer software (version 1.6.20) was used to extract and visualize on bibliometric maps the most frequently undertaken research areas.

Article consists of four interrelated sections. The first section included an introduction to the area of analysis undertaken. In addition, the purpose of the research and the methods adopted are indicated here. Methodological aspects are further discussed in detail in the second section of the article. An important element of this section is the presentation of the timeline of the analyses undertaken, as well as attention to repetition and limitations due to the adopted research procedure. The results and discussion are carried out in the penultimate section. In conducting the discussion, future research directions of interest, according to the authors of this article, were identified. The conclusion, which draws attention to the inevitable further development of research around the issues related to green logistics and green supply chain, concludes the scientific considerations undertaken.

2. Research methodology

The study was planned and implemented between April and August 2024. During this period, as shown in Figure 1, all research stages were carried out according to the detailed schedule established. The obtained research results presented in the next section of the article are therefore the result of the four-stage research procedure and the research activities undertaken at each of these stages. It should be emphasized that through the research methods adopted and described further, as well as the strictly defined sequence of individual research activities, it is possible to repeat the study according to the presented description in the future.

First stage of the study was aimed at conceptualizing the research. As the authors, we assumed that we would explore the issue of greening logistics, which is an important and increasingly discussed theme in the context of the green economy (Dudin et al., 2016; Dzwigol et al., 2021; Xu, Li, 2024). One can even see outright indications in past studies that the green economy depends heavily on green logistics (Qu et al., 2017). At the same time, even though green logistics as a research area has been gaining popularity in recent years, there are still apparent research gaps in this area. Hence, at the outset, a review of selected scientific publications subtracting both the issue of greening the logistics sector and simply green logistics was conducted using the free online search engine Google Scholar (this database contains publications from various scientific fields). In addition, such a focused review was supported

at this stage by the Scopus database, which further provided insight into the area focus of the research issue addressed around the issue of green logistics. The result of the observations made was that it was observed that more and more research considerations of various kinds are being undertaken, linking the issue of green logistics with green supply chain issues. Nevertheless, this research needs to be organized. In addition, there is still a kind of research gap here in terms of identifying the key research areas addressed.

Taking the results of the first stage of the research into account, the development of key research assumptions began with the construction of the research objective. It was assumed that the aim of the research would be to identify the most frequently undertaken research areas in scientific publications addressing the issues of green supply chain and green logistics simultaneously. To realize the aim of the research thus adopted, it was assumed that the research areas would be identified through the authors' keywords. It should be noted that author keywords are words or phrases that should reflect the main/relevant issues presented in the scientific publication. Thus, assigning them to the categories of research areas addressed in scientific publications should be considered reasonable.

The selection of research methods was also a very important part of the second stage of the research. Due to the definition of research areas as the authors' keywords, it was assumed that the methods used in bibliometric analyses would be the most suitable for the selection of key research areas and their subsequent detailed description. Hence, it was decided to use the SLR and CLR methods in the analyses undertaken. In turn, the Scopus database was chosen as the data source for the analyses. The choice of this very database for identifying key research areas in scientific publications simultaneously addressing green supply chain and green logistics was based on three considerations. First, the Scopus database, alongside the Web of Science database, enjoys a high degree of scientific trust from researchers due to, among other things, its rigorous and transparent procedures for indexing individual scientific journals (Baas et al., 2020; Grzesiak, Sulich, 2023; Kozar, Bolimowski, 2024). In addition, data from the Scopus database can be downloaded and processed in various programs for bibliometric analysis, including through the VOSviewer software, which will be used in the study. On the other hand, the last, and therefore third, argument is that the Scopus database has already been used in variously focused literature review analyses related to both green logistics (Nikseresht et al., 2024) and green supply chain issues (de Oliveira et al., 2018; Ramli et al., 2022; Salim Ba Awain et al., 2023). This aspect of the study also opens the possibility of referring to this type of research in the scientific discussion. Then it is possible to at least consider methodological issues (similarities and differences in research).
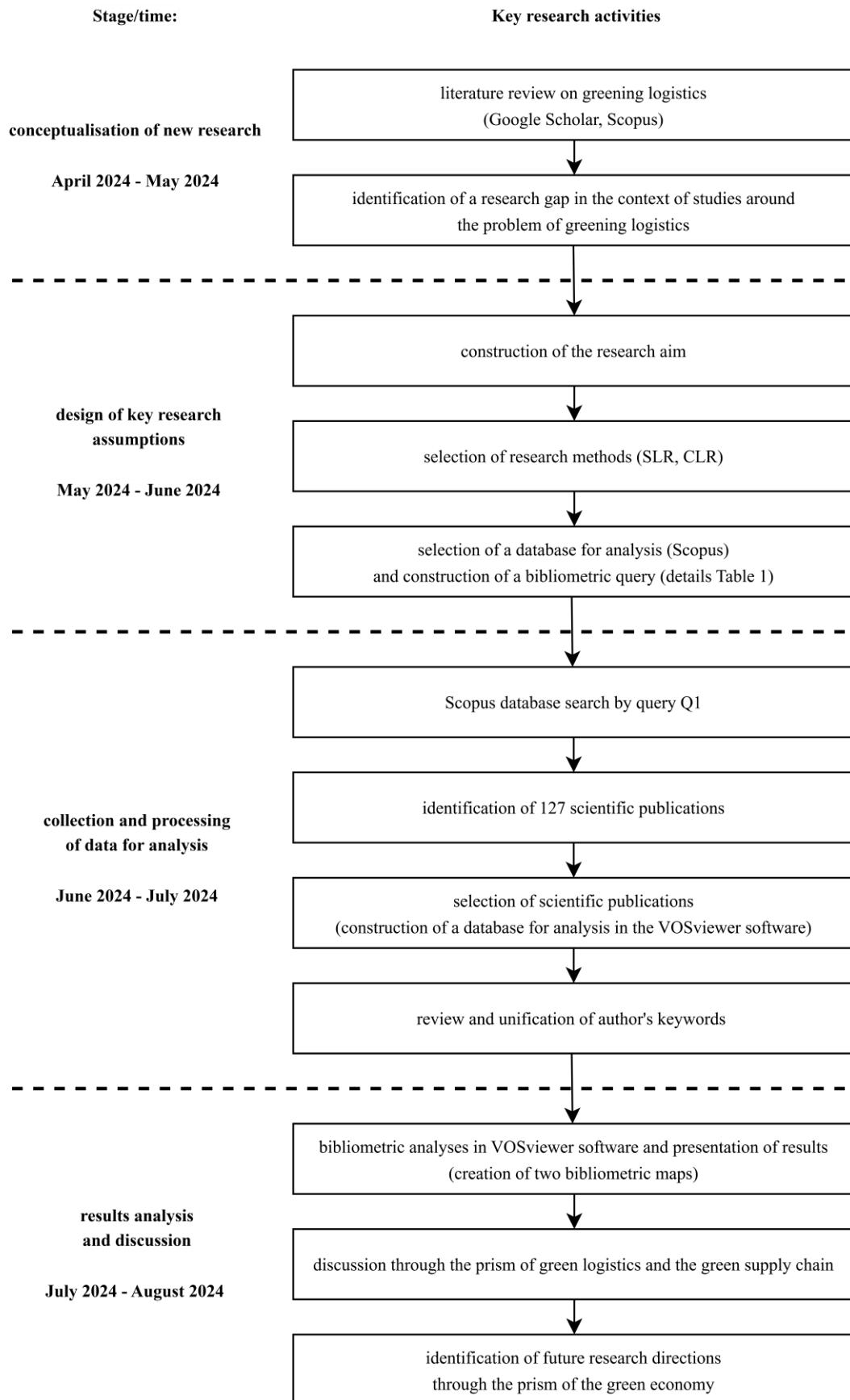
Stage/time: **Key research activities**

conceptualisation of new research **April 2024 - May 2024**	literature review on greening logistics (Google Scholar, Scopus) identification of a research gap in the context of studies around the problem of greening logistics
design of key research assumptions **May 2024 - June 2024**	construction of the research aim selection of research methods (SLR, CLR) selection of a database for analysis (Scopus) and construction of a bibliometric query (details Table 1)
collection and processing of data for analysis **June 2024 - July 2024**	Scopus database search by query Q1 identification of 127 scientific publications selection of scientific publications (construction of a database for analysis in the VOSviewer software) review and unification of author's keywords
results analysis and discussion **July 2024 - August 2024**	bibliometric analyses in VOSviewer software and presentation of results (creation of two bibliometric maps) discussion through the prism of green logistics and the green supply chain identification of future research directions through the prism of the green economy

Figure 1. Research procedure stages and timeline.

Source: Authors' elaboration.

The selection of the Scopus database for analysis and the research methods adopted necessitated the construction of a bibliometric query (Q1) at stage two of the research. The content of the bibliometric query is presented in Table 1. The construction of the syntax of the Q1 query shows the author's insights on the exploration of the issue of scientific publications referring simultaneously to green supply chain and green logistics. Using the Q1 query, titles, abstracts and keywords assigned to individual scientific publications in the Scopus database were explored. The use of "*" in the endings of the individual words included in the bibliometric query made it possible to search for the same word, but with different inflectional word endings. Thus, on the one hand, the scope of the search was broadened, on the other hand, the bibliometric query considers all variants of possible constructs for the adopted phrases that are green logistics and green supply chain. As the Q1 query shows, only publications developed in English and at the final stage of publication were included in the exploration. At the same time, scientific publications were excluded, which due to the document type category were assigned to the editorial category or were published after 2023. In the case of the premise of the period of publication, we should note that the analyses are undertaken in 2024, so new publications are still coming to the Scopus database, which is related to the publication cycle in the various journals indexed in this database. Therefore, it cannot be ruled out that there will be new publications referring to the issue at hand. The indicated time restriction not taking into account the year of the analyses is evident in previous bibliometric analyses and is intended to ensure better comparability of the results obtained over time (Kozar et al., 2023).

Table 1.
Details of search query syntax for Scopus databases

Database	Symbol	Query syntax	No. results
Scopus	Q1	(TITLE-ABS-KEY ("green* suppl* chain*" AND "green* logistic*") AND TITLE-ABS-KEY (bibliometric OR review)) AND PUBYEAR > 2013 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (EXCLUDE (DOCTYPE , "ed"))	127

Source: Authors' elaboration.

At the penultimate stage of the study, research activities were undertaken aimed at collecting and processing data for analysis using the VOSviewer software. Hence, at the outset, the constructed bibliometric query Q1 was used in the Scopus database. This allowed the identification of 127 scientific publications expressed as separately stored records. Next, a selection of the selected scientific publications was made. As a result of this process, the following were excluded from further analysis:

- recurring publications, i.e. those that appear simultaneously in more than one record and have the same title, authors and assigned doi number (1 scientific publication - book chapter was excluded),

- publications without assigned author keywords, which was due to the publishing practice in the concerned journals and/or publishers (15 scientific publications were excluded - 6 article, 3 conference paper, 4 book chapter, 1 book and 1 conference review).

The above-mentioned selection led to the fact that finally 111 scientific publications (61 article, 35 conference paper, 9 book chapter, 5 review and 1 book) were included for further analysis, based on which a base for further analysis was constructed. These publications met the key requirement for exploration, that is, they had author keywords.

The last research activity undertaken in the third stage of the research was a review of the authors' keywords, which resulted in the recognition of the need to standardize them. The standardization of authors' keywords carried out, in addition to simply organizing the research areas covered, also had a very important scientific purpose. It was to possibly avoid the occurrence of the same research area in two different forms of notation among the research areas most frequently cited by researchers. In addition, it was intended to make the planned data visualizations in the form of bibliometric maps transparent. The different forms of notation of the same in the sense of meaning authors' keywords resulted, among other things, from the use of different types of abbreviations, different forms of English in scientific publications (e.g., American English, British English), synonymous terms for the same research problem, or the occurrence of the same authors' keywords in the singular and plural. A total of 381 author keywords assigned to 111 scientific publications were subjected to a standardization procedure aimed at unifying the notation. As a result of such targeted measures, 358 unique research areas were finally obtained for further analysis. Examples of unified author keywords that were included in the bibliometric map (Figure 2) are shown in Table 2.

Table 2.
Selected substituted author keywords (unification procedure)

Replaced author keyword	Replacement word	Replaced author keyword	Replacement word
CO_2 emissions	carbon emissions	gscm	green supply chain management
CO2 emissions	carbon emissions	logistics service provider (lsp)	logistics service providers
green logistic	green logistics	lsp	logistics service providers
green scm	green supply chain management	lsps	logistics service providers
green supply chain management (gscm)	green supply chain management	supply-chain management	supply chain management
green supply chains	green supply chain	sustainable development	sustainability

Source: Authors' elaboration.

Final stage of the research was aimed at analyzing the results and scientific discussion. A detailed description of this stage is provided in the next section of the article. Nevertheless, already at this point it is necessary to point out the limitations of the research. One such limitation is the research methodology outlined above and described in detail. Deviating from

the research regime so adopted may yield different results. A similar issue applies to the selection of the base for this type of analysis. Hence, the results presented hereafter do not present all the key research areas in all the studies that have been done up to 2024, which combined the issue of green logistics and green supply chain. It presents, as already emphasized, analyses based on the Scopus database, so for researchers who will perform analyses based on other databases further presented results can provide a comparative area in the scientific discussion undertaken in their deliberations.

3. Results and discussion

The created bibliometric database consisting of 111 scientific publications whose author keywords were previously subjected to a standardization process was subjected to analyses in the VOSviewer software. These analyses were aimed at identifying the most frequently undertaken research areas in scientific publications dealing simultaneously with the issues of green supply chain and green logistics. To generate such defined research areas in the VOSviewer software, co-occurrence (type from analysis), full counting (counting method) and author keywords (unit of analysis) were selected in the analysis panel. In the next step of this analysis, as indicated by the VOSviewer software, 5 was adopted as the minimum number of occurrences of a keyword. This indicator contributed to the selection of 9 research areas out of the 358 analyzed. These are the most common research areas in scientific publications addressing green supply chain and green logistics at the same time. They were visualized using the VOSviewer software on the bibliometric map, which is presented in Figure 2. It should be noted that each of the areas identified in the study on the bibliometric map is labeled in two different ways and assigned exclusively to one of the two automatically generated clusters (red or green cluster). In the first place, there is a verbal designation. In addition, one can notice different sized dots next to each of the generated research areas (the larger the dot, the given issue was addressed in more scientific papers in the form of an authors' keyword).
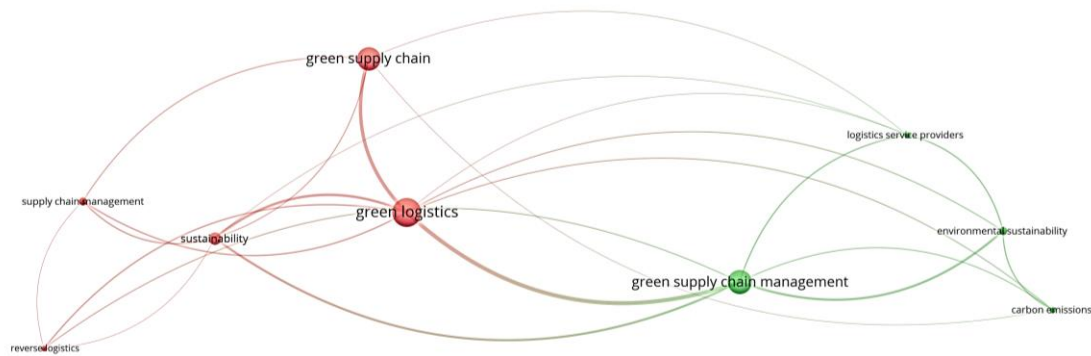
Figure 2. Bibliometric map of co-occurrence of author keywords in green logistics and green supply chain research - network visualization.

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

To deepen the analyses for each of the research areas visualized in Figure 2, bibliometric figures relating to occurrences and links were additionally generated using the VOSviewer software. These measures are shown in Table 3 next to each of the analyzed research areas in parentheses. Links (L) denotes the number of research areas depicted on the bibliometric map with which a given analyzed issue co-occurred at least once in the analyzed scientific publications. The links are visualized by lines extending from each research area depicted. Since there are nine research areas on the map, the maximum number of links can be 8. In turn, occurrences (O) indicate the number of scientific publications among the analyzed ones in which the given research area was an author keyword. Of course, one should have in mind standardized keywords in the present case, and not in the original transcript (due to the standardization procedure of author keywords). The maximum number of possible occurrences in the study could have been 111, which at the same time represents the number of scientific publications with attributed author keywords.

Table 3.
Keyword co-occurrence clusters presented in Figure 2

Cluster	Color	Keywords
1	red	green logistics (L = 8, O = 43); green supply chain (L = 5, O = 33); reverse logistics (L = 4, O = 5); supply chain management (L = 4, O = 8); sustainability (L = 6, O = 14);
2	green	carbon emissions (L = 4, O = 6); environmental sustainability (L = 4, O = 8); green supply chain management (L = 6, O = 34); logistics service providers (L = 5, O = 6)

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

Green logistics (red cluster) is the only one of the analyzed research areas that was linked to all the visualized research areas. Hence, it is important to indicate that this issue co-occurred in terms of authoritative keywords at least once with the areas indicated in the bibliometric map

shown in Figure 2. This finding is further confirmed by the visualization shown in Figure 3. Moreover, the issue of green logistics occurred as an authoritative keyword in the largest number of analyzed scientific publications. Quite often, in scientific papers in which there was simultaneous reference to green supply chain and green logistics in the titles, abstracts and/or keywords, there was also a reference to green supply chain management (green cluster), or green supply chain (red cluster) in the authors' keywords.
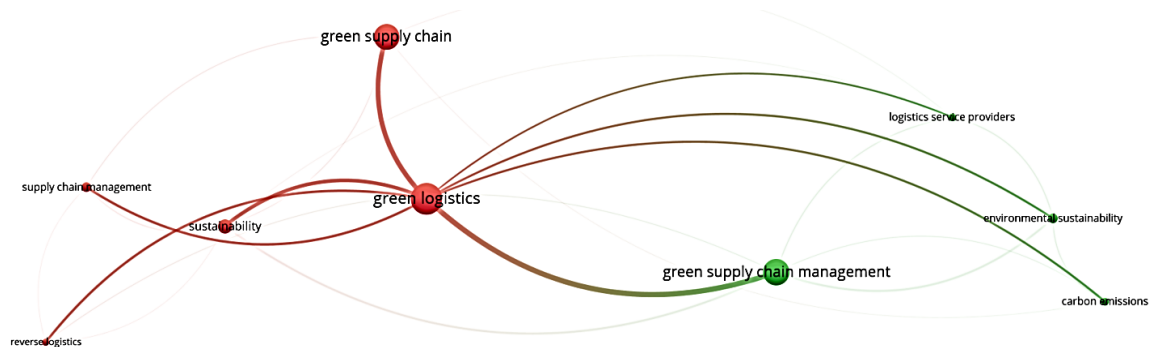
Figure 3. Visualization of green logistics connections on a bibliometric map.

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

Compared to previous research, the one presented above differed in the content of the bibliometric query. In none of the articles was there a simultaneous reference to green supply chain and green logistics. Prevalent in the constructed queries were references to green supply chain and digital technology issues (Wang et al., 2023), city logistics and environmental issues (Hu et al., 2019), or various issues related to environmental sustainability and third-party logistics (Evangelista et al., 2018). In these types of considerations, green logistics was either the result of the analyses undertaken, or the scientific background of the discussions of the results obtained and the implications aimed at future research.

Within the scope of the research areas shown in Figure 2 is the issue of reverse logistics. In three of the scientific publications analyzed, there was a simultaneous reference in terms of the authors' keywords to this issue and green logistics at the same time. In these scholarly publications, attention was focused on, among other things, whether consumers perceive products produced through green reverse logistics practices as equivalent to new products in terms of quality (Hazen et al., 2011), the problems of design and planning in reverse logistics (Mousazadeh et al., 2014), or the reasons lying in the lack of implementation of reverse logistics in the practice of enterprises (de Assis Silva et al., 2021). Given the variety of problems arising from the issue of implementing reverse logistics in the context of green logistics, it can be concluded that building a reverse logistics network requires many decisions at different levels, which is also already discernible in studies focused on this aspect (Skurpel, Wodnicka, 2023).

The issue of logistics service providers was also a very important research area. It has been pointed out, for example, the institutional pressure on logistics service providers to adopt green supply chain management practices and provide green logistics services (Jazairy, von Haartman, 2020), or it has highlighted the differences in perceptions of green issues

between buyers and logistics service providers and the implications of this in the context of green logistics procurement (Jazairy, 2020). Regardless of the context of the scientific discussion, it should be emphasized that logistics service providers, through the provision of green logistics services, occupy an important place in the process of greening supply chains. Hence, logistics service providers should be expected to ensure that the green logistics services they provide are of adequate quality, as this has implications for the subsequent operation of the implemented green solutions within the green supply chains of individual enterprises.

Considering the contextual slope of the goals of implementing green supply chain and green logistics solutions, which were presented in the introduction of the article, it is not surprising that sustainability (red cluster), environmental sustainability (green cluster), or carbon emissions (green cluster) appeared on the bibliometric map (Figure 2). Environmental sustainability can be achieved, among other things, by reducing carbon emissions as a result of implementing green supply chain processes (Khan et al., 2020). Special attention is paid here to the role of renewable energy sources and green practices in mitigating the detrimental impact of logistics operations on environmental sustainability (Rehman Khan et al., 2018). It should also be noted that some studies explicitly emphasize that logistics efficiency plays an important role in green supply chain management, which leads to environmental sustainability (Liu, J. et al., 2018). Thus, it is possible to see a positive relationship between the economic and environmental aspects that result from the implementation of green solutions in green supply chains or green logistics. Hence, some researchers point to the issue of environmental and economic sustainability (Khan et al., 2019).

Among the most frequently mentioned research areas presented in Figure 2, there are no references to the issue of the green business ecosystem. It should be mentioned that this issue was not among the authors' keywords in any of the 111 scientific publications analyzed. Thus, in the opinion of the authors of this article, future research directions should be directed towards understanding the role and importance of logistics and supply chain greening for emerging green business ecosystems and their stability over time. In research so directed, it is worthwhile to distinguish the importance of individual green solutions implemented in green supply chains and green logistics for the process of emerging green business ecosystems.

Another important research area for future consideration around green supply chain and green logistics is the issue of green jobs. At present, at least, the scale of the impact of the creation of green supply chains on the creation of green jobs in the logistics sector is unknown. Also worthy of consideration in this area is the quality of green jobs created.

It is also worth leaning into the issue of green competencies held by those responsible for green supply chain processes and green logistics in individual enterprises. The green transformation currently taking place is taking different directions. Nevertheless, at the same time it is generating demand for employees characterized by the appropriate level of green competence. At the same time, it is still apparent that educational institutions are too slow to respond to market demands (especially in terms of green competencies). Thus, it can be

assumed that individual enterprises will increasingly observe discrepancies between the green skills needed for a particular job and those that employees really have. Such discrepancies are called the green skills gap in existing research (Nikoloski et al., 2024; Pavlova, 2018). Hence, it is worthwhile for future research to focus on the extent to which, in individual enterprises, the green competency gap affects the process of green supply chain and green logistics.

4. Summary

The study identified nine of the most common research areas in scientific publications addressing the issues of green supply chain and green logistics simultaneously. As many as three of the selected areas referred to supply chain issues. This aspect is not surprising, as supply chain issues and their management are a frequent area of analysis in various contexts linked to sustainability issues, which are now frequently addressed in the perspective of further development of the logistics sector.

Further development of research focused on green supply chain and green logistics in the light of the green transformation taking place is inevitable. Nevertheless, as highlighted in the discussion undertaken, the pace of the green development taking place may imply new challenges for those responsible for green supply chain management in individual enterprises. Thus, these individuals would be expected to continually improve their green competencies to be able to respond effectively to the greening changes taking place in the socio-economic environment. These changes are constantly influencing the shape and direction of the implementation of green solutions, both in the field of green logistics and green supply chain in individual enterprises.

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